NEWARK, OHIO
AND ITS ENVIRONS:
A GEOGRAPHIC EVALUATION

Dissertation
Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State
University

by
William N. Harris, A.B., M.A.
The Ohio State University
1963

Approved by:
[Signature]
The role of the small city and its environs in the nation's economy is becoming increasingly important. In 1947 only 40 percent of the persons engaged in manufacturing in the United States worked in factories in cities larger than 100,000. A geographic evaluation of Newark, Ohio, and its environs entails a study of the small city which has recently come into its own as an industrial center. Long the focus of a prosperous, though somewhat limited agricultural area, Newark has experienced a definite "industrial awakening" during the post World War II period.

To carry out this investigation a great variety of source materials has been examined and utilized in one way or another. Also many persons have contributed information or made helpful suggestions. Maps used to illustrate the development of Ohio's drainage system were drawn after a series which appeared in *Geology of Water in Ohio*, Bulletin 44. Distribution of settlement maps were developed from the U.S. Census reports for townships. The map showing 34 selected farms is the result of a reconnaissance survey made by the author during the spring and summer of 1951. Aerial photographs were taken in conjunction with the county air tour, a project sponsored by the local conservation district and county agricultural extension service committees.

This study represents the logical beginning for an investigation
of the geography of the Newark Area by this author, who, for the two years (1939-1940) of his four-year association with the Soil Conservation Service (1937-1940), was assigned to a camp located on the outskirts of Newark. Although his field work at that time was limited to land utilization problems which confronted the local farmers, he became increasingly aware of the need for a further investigation of this area as an industrial and trade center.

Contributions to this study were made by various individuals and are gratefully acknowledged. Professor Guy-Harold Smith of The Ohio State University, acting as adviser, gave freely of his time and made many suggestions that have added to the accuracy and comprehensiveness of the manuscript. Professor Alfred J. Wright, Department of Geography of The Ohio State University, read the entire manuscript and offered a number of helpful suggestions, particularly in connection with the industrial developments in the Newark Area.

The author is indebted to numerous persons of the Soil Conservation Service for the contacts and associations that have added to the background knowledge and techniques that have unconsciously aided in the presentation of the material, and particularly to Morton Hamilton, local district conservationist, who has responded most readily with various data requested and here presented in one form or another. George Milliken, of the Newark Chamber of Commerce, was especially helpful in establishing contacts between the author and the city's various industrial leaders.

To my wife, Joanne Reed Harris, I am especially indebted for her
aid in the typing and secretarial work in connection with the final
draft of this dissertation and for her patience through the three
years required for its completion.
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CHAPTER I

INTRODUCTION

Purpose of the Study

A study of Newark, Ohio, and its environs presents an opportunity for the geographer to investigate the transformation of a small agricultural area to one which has recently been dominated by manufacturing and related activities. Although the relationships existing between man's agricultural and industrial activities and the natural setting have frequently been the subject of geographic investigation, there has been little attempt to evaluate the role of the small city as it evolved from a community within a local environment to an urban center with the more complex national environment of the present. The importance of the small city in our nation's industrial structure is clearly revealed in the fact that of the 15,000,000 persons engaged in manufacturing in the United States in 1947, only 5,956,000 or 40 per cent were employed in cities larger than 100,000.\(^1\) It is the purpose of this paper to present the results of such a regional study by an objective analysis of the factors which have accelerated or retarded the development of the Newark Area and the part this segment has played in the larger agricultural and industrial economy.

\(^1\)Based on data contained in the United States Census of Manufacturers.
A consideration of the geography of a city and its environs cannot be complete without using a certain amount of material that is essentially historical in nature but the utilization of such factual information will be limited to that which is necessary and fundamental in the interpretation and understanding of its development. As James so clearly stated: "Geography cannot be strictly contemporary. If we are to seek the meaning of area differences in terms of causes and consequences, this inevitably involves the time perspective, for processes must operate over time."  

Since the investigation is limited to an area of approximately 47 miles in length (New Albany to Fraseyburg), and 33 miles in width, the term "Area" is deemed more appropriate than "Region" and will be used throughout the dissertation. Many geographers inevitably raise the question of what size of area should be considered worth of research in regional geography. The regional studies launched in France under Vidal de la Blache's leadership formerly examined areas the size of a province, but later increasingly smaller areas were selected. Finch maintains that an area may have a special significance to our science of the world if it includes some unanswered question -- if it has some peculiar association of features.  

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Fig. 1. Location map: the Newark area.
This area, henceforth referred to as the "Newark Area", is a functional rather than a homogeneous section, for its unity comes from the binding influence of the city of Newark as a trade center, rather than from inherent physical qualities. As delimited on the accompanying map, the area includes parts of seven counties -- Franklin, Delaware, Coshocton, Knox, Fairfield, Perry, and Muskingum, as well as all of Licking County, and contains approximately 103,000 people. Figure 1, on which the delimitation of the generalized area is based, comprises the tributary areas of selected services or functions of the city and is based on interviews with the personnel of appropriate agencies and the boundaries will vary in degree of coincidence. Except for the radio area, which is based on a study of the listening area for a single radio station, all areas chosen represent careful studies by competent authorities of the many firms and agencies representing each activity. The individual areas for which interviews were the source of information are the telephone area\(^5\), the milkshed area\(^6\), the newspaper area\(^7\), and the wholesale and retail trade areas\(^8\). On the basis of these interviews and other pertinent information from a number of agencies the generalized boundary was drawn. In spite of lack of coincidence of the lines in places, the area decided upon is fairly accurately delimited and shows the city's sphere of influence as a social, cultural, and economic center.

\(^5\)George Milliken, Newark Chamber of Commerce, personal interview.

\(^6\)George W. Kreitler, Licking County Agricultural Agent, personal interview.

\(^7\)J. Stanley Billow, Newark Advocate, personal interview.

\(^8\)Newark Chamber of Commerce, Sales Management Survey of Buying Power, 1948.
According to Fenneman's classification of the physiographic provinces, the Newark Area lies in the Till Plain section in the eastern extremity of the Central Lowland, and includes a part of the Kanawha section of the great Appalachian Plateau Province. Barnes and Marschner show the western two-thirds of the area as the Northwestern Appalachian Plateau (Western Division) and the eastern third as the Upper Ohio Hills. Baker includes the western two-thirds of the area in the Corn Belt and the eastern third in the Hay and Dairy Region. General farming has characterized this section of Ohio since the first pioneers established permanent settlements on its fertile soils.

On a manufacturing map of the United States, the Newark Area does not stand out as a major zone or belt of intensity but is isolated from a zone of concentration in and around Columbus. Wright's map, based on value added by the manufacturing process,

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shows Newark as one of many industrial cities that dot central Ohio, while Jones' map\textsuperscript{14}, with data based on counties rather than cities, presents a more generalized picture of the areal distribution of manufacturing in this part of the state.

The marginal position of the area presents a complexity of geographic factors which are reflected in its diversity of economic activities, for here are found both glaciated and unglaciated topography, a complexity of soils, and an area which is depleting the power resources which were so essential to the establishment of its early industries.

Nature of the Investigation

The information and data used in the prosecution of this study have been secured by means of field investigation supplemented by a rather limited amount of background material available from library sources. Since this represents a pioneer attempt at a geographic evaluation of the Newark Area the writer has relied upon personal research for a great portion of the agricultural and industrial information embodied in this paper. With the aid of the local soil conservation personnel, a field survey of 34 selected farms was accomplished and each of the respective operators was questioned as to methods and procedures used on his particular farm. Carefully-prepared industrial questionnaires, accompanied by letters explaining the nature of the problem, were distributed to the appropriate

representatives of the 27 major industrial concerns of Newark. These served to introduce both the problem and the investigator and were followed by personal interviews in which a more intensive examination of the individual establishment was made.

Such a quantitative study cannot be accomplished without extensive cooperation and backing which, unfortunately the geographer is not always able to secure. Sometimes the sources for which the desired information could be secured are closed because of non-appreciation of the practical value of such studies, and oftentimes a disinclination to impart information may be traced to either wartime restrictions or that the facts would benefit competitors if disclosed. These difficulties are real — they are faced regularly by every civic and commercial association attempting to acquire information from its members and they confront the geographer who works alone to an even greater extent.
CHAPTER II

THE NATURAL SETTING

The City and its Area

Newark is the trade center of a prosperous agricultural area and an industrial center of reasonably diverse manufacturing. In many ways this city of 34,000 inhabitants both serves and dominates an area which covers 875 square miles and contains 103,000 people. It lies in the eastern extremity of the Central Lowland province, near the foothills of the Appalachian Plateau, and its hinterland includes Licking County, as well as parts of Franklin, Delaware, Coshocton, Knox, Fairfield, Perry, and Muskingum counties. In this section of east central Ohio, Newark is a functional center, lending itself to analysis as a trade center which serves and dominates an area.

Newark stands at the junction of two fertile gravel-filled valleys, one extending east and west of the city for approximately seven miles and one extending north for twelve miles. Most of the built-up area within the city limits lies on a comparatively level section of the valley below the 840 foot contour, although residential districts climb 50 feet above this level east of Cemetery Hill.

1 The population of Newark's trading area is based upon the local sales management survey, conducted in 1948 by the Newark Advocate.

2 A geographical trade center involves no fixed areal boundaries, no population limits, and few, if any, legal restrictions as to size. Thus a functional or geographical trade center is created when people derive certain economic advantages by mutual cooperation and association.

-8-
Weather and Climatic Phenomena

The interior position of the Newark Area gives it a humid continental long summer phase type of climate (Cfa). Although Newark has experienced temperatures ranging from a maximum of 106°F to a minimum of -25°F, its summer mean temperatures average 71.2°F and its winter mean temperatures average 29.1°F. The average annual temperature, based on the records at Granville, Ohio,3 is 50.8°F, which is very nearly the same as the average for the state. July is the warmest month and January generally the coldest month of the year, although February is occasionally colder than January.

Precipitation is rather evenly distributed throughout the year with a maximum of 4.02 inches occurring during June. The average total amount for the year, based on the 50-year records at Granville, is 39.63 inches. The average number of days with 0.01 inch or more of precipitation is 119. Total crop failures are seldom caused by a deficiency of moisture although marked differences in the moisture content of soils may occur under similar amounts of precipitation. Snowfall has been recorded in every month of the year except June, July, August, and September. The average amount for the year varies, with Granville reporting 26.7 inches; Gratiot, 34.3 inches; and Toboso, 20.5 inches.

Although considerable damage may occur in low and wet situations the crops are seldom damaged seriously by killing frosts. The central and southeastern sections of the area have slightly different killing frost dates; the weather station at Granville (elevation, 960 feet) reports the last killing frost as April 30, whereas Gratiot (elevation,
Fig. 2. Climograph: Newark, Ohio.
TABLE 1.

NORMAL MONTHLY, SEASONAL, AND ANNUAL TEMPERATURE AND PRECIPITATION OF GRANVILLE, OHIO.

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature</th>
<th>Precipitation</th>
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<tr>
<td></td>
<td>°F.</td>
<td>°F.</td>
</tr>
<tr>
<td>December</td>
<td>30.8</td>
<td>68</td>
</tr>
<tr>
<td>January</td>
<td>27.7</td>
<td>73</td>
</tr>
<tr>
<td>February</td>
<td>28.9</td>
<td>67</td>
</tr>
<tr>
<td>Winter</td>
<td>29.1</td>
<td>73</td>
</tr>
<tr>
<td>March</td>
<td>39.3</td>
<td>84</td>
</tr>
<tr>
<td>April</td>
<td>49.8</td>
<td>90</td>
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<tr>
<td>May</td>
<td>60.3</td>
<td>97</td>
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<tr>
<td>Spring</td>
<td>49.8</td>
<td>97</td>
</tr>
<tr>
<td>June</td>
<td>69.1</td>
<td>99</td>
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<tr>
<td>July</td>
<td>73.3</td>
<td>105</td>
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<tr>
<td>August</td>
<td>71.2</td>
<td>104</td>
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<tr>
<td>Summer</td>
<td>71.2</td>
<td>105</td>
</tr>
<tr>
<td>September</td>
<td>66.5</td>
<td>98</td>
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<tr>
<td>October</td>
<td>53.1</td>
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<tr>
<td>November</td>
<td>40.7</td>
<td>77</td>
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<td>Fall</td>
<td>53.0</td>
<td>98</td>
</tr>
<tr>
<td>Year</td>
<td>50.8</td>
<td>105</td>
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Source: U.S. Weather Bureau
However, the average dates of the last and first killing frosts are April 30 and October 11 respectively, giving an average frost-free season of 164 days, which is ample for the production of a variety of crops.

Prevailing winds are from the southwest, with an average velocity of 10 to 12 miles per hour. Although high winds sometimes occur within the region, destructive winds are rare.

Physiography as influenced by Glaciation

Evidences of Complexity

A deep pre-glacial channel enters the Newark Area from the north, extends southward along the Sandusky branch of the Baltimore and Ohio Railroad as far as Newark. It is now occupied by the North Fork of the Licking River. At the city the old channel divides; one branch turning directly to the east in the valley of the Licking, and one branch extending in a northwesterly direction through what was evidently at one period a broad lake and in which the Raccoon Creek flows in a reversed direction to join the main stream at the Newark junction. The larger channels are filled with water-washed pebbles, resting in places on the old rocky bed and in other places upon the remains of the original drift now covered with alluvium. On the banks of the Licking north of Newark fragments of old lacustrine plains can be traced at different elevations. These are represented in places by four well-marked terraces at heights of eight, twelve, sixteen, and eighteen feet above the flood plain. South

Ibid., p. 17.
and southwest of the city these same plains expand, covering a larger area.
Borings for wells indicate that the rock has been excavated to a depth
corresponding to that of the old channels, and that a lake of considerable
size must have covered the surface during the latter part of the glacial
period.

An examination of materials in a small stream immediately west of
Linnville reveals an upper layer of stratified gravel underlain by a
finely laminated and compact blue clay, which is similar to that found
on the north side of the divide and in the deep valleys penetrating the
divide from the north. The effects of ponding back the streams, forcing
them over the divides, and overcharging them with waste was apparently
repeated in the advance of the major ice sheets.

Further examples of the ponding effects are two deposits which
occur north and northeast of Reynoldsburg, along the western margin of
the Newark Area. These deposits possibly belong to the same body of
water, although their exposures occur approximately 50 feet apart verti-
cally. The beds are horizontally stratified and consist of clays and
very fine sands which carry perfect ripple markings five inches from
crest to crest and one inch high. These ripple markings of such large
size indicate the presence of a considerable body of static water which
must have occupied this area during the period of ponding.

The valley of Raccoon Creek, one of the major tributaries of the
Licking River, is wide at Alexandria, becomes narrow at Granville,
broadens out towards Newark and Claylick, and finally narrows again.
From here and for a distance of approximately two miles the stream flows
through a gorge, known as the Licking Narrows, but its valley widens again at Taboso, a village located along the eastern margin of the area. Hence the Licking, longest river within the limits of the area, does not flow through a valley that broadens with the direction of stream flow. Elsewhere in the area numerous illustrations of this same condition may be observed. Lost Run Creek originates in a mature valley east of St. Louis, flows for some distance before passing through a gorge, then occupies a valley which broadens downstream. Lost Run, a tributary of Wilkins Run, leaves a valley of over a half mile in width and passes through a much narrower one before entering its master stream, Rocky Fork.

The Old Newark Valley

Perhaps the outstanding physiographic feature of the area is an old broad valley which extends a little south of west from Newark and through which many of the present routes of transportation funnel. This old valley, referred to in this study as the "Newark Valley", is a silent reminder of the most ancient river in this section of Ohio, since long ago the drainage of the area was directed to the southwest by a stream which then occupied this abandoned valley. That stream, known as the Newark River, had its headwaters many miles to the east of Newark and entered the area just west of the village of Fraseyburg, flowed past the present junction of the Raccoon and the Licking, and made its way near the present site of Buckeye Lake. The depth and configuration of this buried valley has been determined by numerous well drillings, but its

5 These and other examples may be seen on the Granville and Newark Quadrangles, United States Geological Survey, Department of Interior, Washington, D. C.
existence was suspected years ago on the basis of observed irregularities in the valley patterns. 6

Although this valley was produced by a stream which flowed southwest, the bottomlands are now traversed by a stream, the Racoon, which flows in the opposite direction. Several tributaries of the abandoned river came from the north and joined the master stream in the vicinity of Newark. North Fork occupies one of these tributary valleys.

The Ice Invasion

Many different theories have been presented to explain the complex drainage changes that have occurred within the area under discussion but the most logical one is that associated with the ice invasion. Most geologists maintain that when the ice moved into this region the broad Newark Valley was still carrying a stream flowing to the southwest, and that the ice, advancing from the north and west, moved across the valley and formed a dam. Water accumulated in front of this obstruction, converting the river into a lake which deepened owing to the impounding until it reached a place along its margin over which the water could spill into adjacent valleys. Such an escape probably occurred in the area where the Licking Narrows is located today. Moreover, the valleys of other streams, such as Lost Run, Rocky Fork, and Wilkins Run were once occupied by similar lakes formed by the impounding waters and those lakes, in escaping, cut vertically through their overflow channels, now represented as the narrow valleys of the present streams. The complexities of the local drainage pattern may be revealed by an examination of the general

6 R. E. Lamborn, Ohio Geological Survey, personal interview.
development of Ohio's present drainage system.

Ohio's Drainage System

The Teays System. Although the name "Teays" was first used by Tight in his reference to the stream that eroded the broad channel known as the Teays Valley in Cabell and Putnam counties, West Virginia, the term is now used in a more general sense to indicate that period of erosion before glaciation. Near Chillicothe the old valley floor disappears under a thick mantle of Wisconsin drift but the ancient river has been traced northwestward, by means of well drillings, as far as the St. Mary's Reservoir near the Ohio-Indiana line. Beyond the state line this drainage system has not been definitely established but the general course appears to have been westward into Indiana and then possibly southwest along the present valley of the Wabash River to the Ohio and Mississippi Rivers.

In southern Ohio parts of the Old Teays Valley have been left relatively undisturbed and present some excellent sections for study. Although no regular succession is evident, the most common arrangement is sand or highly sandy silts near the bedrock and extremely fine laminated silts, known as Minford, at the higher levels. These silts are described by Stout and Lamb as follows:

The outstanding deposits in these old valleys are the plastic, highly laminated silts which are well distributed throughout the entire basin, being present locally in the small tributaries as well as on the main stream. . . .

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Fig. 3. Generalized relationship of the drainage pattern: Teays Stage.
The Minford silts are characterized by fineness and uniformity of grain, by high plasticity, by closely spaced laminations, by high content of sericite mica, and by a consistency of character throughout a wide area. They were deposited in rather deep and comparatively quiet waters which were ponded to lake-like conditions throughout the valleys, which had slight motion, and which stood well towards the rims of the basins.  

The Groveport River, largest tributary of the Teays within Ohio, was close to 160 miles in length and drained the area now included in Coshocton, Knox, Franklin, Licking, Fairfield, Muskingum, and Perry counties. Throughout its entire course the valley of this stream is masked by deposits of Illinoian and Wisconsin drift which makes exact positions of floor levels, and tributaries rather obscure. From Mount Vernon southward the course is so rock-bound as to be defined, past Utica, St. Louisville, and Vanetta to Newark, where the pre-glacial Groveport was augmented by the waters of the Cambridge River and Putnam Creek, major tributaries which drained a large area to the east. West of Newark the course of this ancient stream is less definite for here it enters a region of low relief covered with a thick accumulation of glacial drift.

Deep Stage Drainage. The Kansas or pre-Kansas glacier advanced southward to about the Newark Area where the ice blocked the westward passage of the Teays River, causing the waters of this stream and its tributaries to seek new outlets south of the glacial border. Courses of the new stream were along the troughs of the basins or along old Teays Stage streams, either in normal or reversed directions, with the lower divides or cols.

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Fig. 4. Generalized relationship of the drainage pattern: Deep Stage.
being cut away in the formation of the new drainage lines. Soon after the new pattern was outlined regional uplift took place with consequent active cutting of stream beds which were degraded much below the level of the Teays. Main features of the Deep Stage drainage cycle were the development of many new streams, especially in the old Teays basin, the deepening of most channels below their former levels, the steep slope of the valley walls, and the general lack of maturity of the basins.

Lamborn has defined the Newark River as an important tributary of the Cincinnati River and the one which drained a large area in central and southcentral Ohio during this period of erosion. During Deep Stage the Newark River followed the course of the former Dover River, of Teays Stage, from Snadenhutten through Coshocton, Frazeysburg, Newark, and Hebron to Canal Winchester where it took a southward course to Circleville and Chillicothe. Beyond the latter place the stream cut a new channel to Higby, skirted the old Teays Valley to Waverly, and then followed generally but not definitely, and in reverse direction, the course of the old Portsmouth River, Teays Stage, to Portsmouth, where it joined the Cincinnati River.

During this cycle of erosion a deep channel was cut along the site of the present valley of Raccoon Creek, at least as far as Alexandria where the depth of the valley fill is about 220 feet below stream level. Scheffel reports the depth of fill at Granville at 250 feet. 11

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Fig. 5. Generalized relationship of the drainage pattern: Post-Illinoian Stage.
TABLE 2.

STREAM CHANNEL ELEVATIONS
OF THE OLD NEWARK RIVER

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portsmouth</td>
<td>460</td>
</tr>
<tr>
<td>Chillicothe</td>
<td>500</td>
</tr>
<tr>
<td>Newark</td>
<td>594</td>
</tr>
<tr>
<td>Gnadenhutten</td>
<td>625</td>
</tr>
<tr>
<td>Dover Dam</td>
<td>850</td>
</tr>
</tbody>
</table>

Post-Illinoian Stage Drainage. That thick sheet of glacial ice known as the Illinoian glacier had a marked influence, both directly and indirectly, in shaping the surface features of Ohio, for almost three-fifths of the entire state was leveled through burial by drift which further changed the drainage pattern. Stout and Lamb\textsuperscript{12} have placed the border of this drift as extending southward from Loudonville past Brinkhaven, Hanover, Sugar Grove, Chillicothe, and Bainbridge to the Ohio River near Ripley.

Deep Stage Drainage was completely obliterated in the glaciated area, with great quantities of debris-drift and expanses of outwash. This mantle of drift, which averaged 20 feet in thickness, buried the previous Newark drainage from Hanover to Chillicothe and was an effective barrier against the waters from southeastern Ohio which were forced to seek new outlets. The most apparent outlet is that of the preceding drainage reversed eastward past Portsmouth, Marietta, Steubenville, and East Liverpool to Beaver, Pennsylvania, then northward along the line of the Pittsburgh River, Teays Stage, across Pennsylvania and New York to the Atlantic.\textsuperscript{13}

Another important shift in drainage occurred within the Newark Area at this time. East of Newark the wall of ice completely blocked the Newark River, Deep Stage, and buried its large tributary, the Utica River. The waters were thus deflected northward along the flank of the glacier past Coshocton to New Philadelphia and followed the course of the old Dover River, Teays age, to Massillon, Akron, and Cleveland.

\textsuperscript{12}Stout and Lamb, \textit{op. cit.}, pp. 74-75.

\textsuperscript{13}Ibid., p. 28.
Wisconsin Glaciation. Last of the great ice sheets to invade Ohio, the Wisconsin glacier, covered about two-thirds of the state and made many changes in the surface features, leveling certain areas to a smooth even plain, piling up drift in others, and filling certain valleys with great quantities of outwash materials. Where the ice was thicker, lobes or fingers advanced in a fan-shaped pattern. Of the four major glacial lobes of the Wisconsin, the Scioto was by far the largest affecting the topography of central Ohio for it occupied all the northcentral portion of the state, including the area within the limits of this study.

The Wisconsin glacier caused considerable shifting and modifications of the drainage system, the most important of which was the reestablishment of the master stream along the original course and in the direction of flow of the Cincinnati River, Deep Stage, of post-Kansas or post-pre-Kansas time. This line of drainage resulted from the damming of the New Martinsville River near Homewood, Pennsylvania, which caused the waters of both the Allegheny and the Monongahela Rivers to pass westward through the channel cut and deeply entrenched by the Cincinnati River, Deep Stage.

Other changes took place which resulted in the present drainage pattern of the Newark Area. The great mass of ice and rock debris reversed the drainage of the Massillon River, post-Illinoian Stage, and caused it to flow westward and southward from Dover past Gnadenhutten and Coshocton to Zanesville, then to cut out the ool at the Muskingum-Morgan County line and to flow down a tributary of Deep Stage time to Marietta, where it joined the post-Wisconsin Ohio River.

14 The four glacial lobes in Ohio are known as the Grand River, Killbuck, Scioto, and the Miami.

15 Stout, Ver Steeg, and Lamb, op. cit., p. 34.
Fig. 6. Generalized relationship of the drainage pattern: Post-Wisconsin Stage.
Limits of Glaciation

The Illinoian Boundary. Field observations indicate that the outer limits of the Illinoian drift extends in a general north-south direction across the Newark Area, but the boundary varies in distinctness. In some places it is marked by a continuous drift, in other places by only scattered boulders and pebbles, while in still others it is only conjectural and must be mapped by extending a line between two known points. White made an extensive search of all the road outs, ravines, and fields of the area in order to ascertain that the most eastern foreign pebbles were actually found, and drew in his boundary after having thoroughly studied all the available facts. His map showing the Illinoian boundary agrees with that of Leverett in this area, but to the north, White's investigation shows the line to be considerably west of that mapped by his predecessor.

The Illinoian boundary, in that part of the Newark Area included in Figure 7, extends from the northern portion of Perry Township into Fallsbury Township (Licking County). From the great glacial dam at Hanover to Fallsburg, in the northwest part of the county, the line is exceedingly vague since erosion has removed most of the drift, not only in the region mapped but from the area several miles to the west. It may be possible that White has drawn the boundary too far to the east in the section of Fallsburg for but few cobbles and pebbles of resistant foreign material were found on the north side of a road-out one mile northeast.


Fig. 7. Limits of glaciation: the Illinoian and Wisconsin boundaries.
of the village, and these were taken as the limit of the ice advance.

Areas of Ground Moraine Topography. Although a large portion of the Illinoian drift region is an area of ground moraine, small areas of kames and kame terraces are present. Much of the area consists of a maturely dissected bedrock topography with a veneer of drift which forms minor relief features on the surface. The eastern part of Washington Township and the western part of Eden Township are, for the most part, drift covered, although bedrock may be observed outcropping in gullies and along road-outs, especially near the hilltops. The drift is extremely thin and discontinuous in eastern Eden Township and western Fallsbury Township, being confined to scattered boulders and small masses of till on the ridges.

The "Low Plateau". White refers to the section between the Till Plain and the Appalachian Plateau as the "Low Plateau". He applies this term to the area having an elevation of 1,000 to 1,200 feet, lying between the Appalachian Plateau on the east and the Till Plain on the west, and entirely covered by Wisconsin drift. In elevation, in relief, and in prominence of glacial features, this region may be considered as intermediate between its bordering regions. A generally abrupt rise of the Appalachian Plateau marks its eastern boundary, while its western limit is a scarp which follows an outcrop of resistant Berea sandstone, rising from 50 to 100 feet above the Till Plain.

18 George W. White, op. cit., p. 18.
Present Drainage Pattern

Glaciation has either rearranged or obliterated many of the pre-glacial drainage courses of the Newark Area, with a general filling of the old valleys taking place in the main lines of drainage as well as the tributaries. As a result the present streams are in a new cycle of erosion, and their valleys are generally shallow, lying but a few feet below the levels of their flood plains. The original course of the Licking River, master stream of the Newark Area, was definitely changed by glacial action. 19

Thus drainage is not well established in the western part of the Newark Area, the run-off being carried by relatively few streams having tributaries which extend only short distances from their main valleys. Broad interfluves, in which little development of natural drainageways has taken place, occupy the central part of the area. Stream bottoms range from narrow trenches along the minor tributaries to over two miles in width along the larger streams, such as the Racoon and the Licking. The general landscape changes immediately east of Newark and marks the approximate limits of the Wisconsin and Illinoian ice sheets (See Fig.7 ). Although many of the ridge tops and adjoining steeper slopes show no marked evidence of glacial action, a number of tongues or small lobes of the ice sheets extended along the valleys and up their tributaries, altering considerably the character of the lower elevations by scouring, grinding, and deposition.

19 Frank Leverett, op. cit., p. 155.
Major Soil Divisions

A grouping of the soils into two major soil divisions, based on origin and parent material, serves to show their relationship to the crop production of the area. In one area the soils have developed from glacial material, and are calcareous. Most of the surface soils are silt loams, but may range in texture from sandy loam to moderately heavy silt loam and silty clay loam. In the other area are soils which have developed from weathered shale and sandstone. They are acid, lack the carbonates of lime, and differ from the glacial till in their comparative thinness over the underlying rock formation. In general, the fertility and productivity of the glacial soils are of better grade than are the soils derived from the sandstone and shale materials of the unglaciated portion.

Well-Drained Light-Colored Soils of the Uplands. The light-colored group of soils includes the Alexandria, Wooster, Hanover, Otisville, Zanesville, Fallsburg, and Lordstown series, as well as a colluvial phase of Muskingum silt loam.20 Soils of this group are light in color, well-drained, friable, and occupy similar topographic positions. The Alexandria silt loam is the most extensive of this series, occupying approximately 51,392 acres or 12 per cent of the Newark Area, and is most fully developed in a belt of land occupying parts of Washington, Burlington, McLean, and Liberty townships, as well as several small areas along the South Fork of

Licking River and Raccoon Creek. Farming activity on the Alexandria silt loam is below that of former years and the general increase in the acreage of idle land has been due primarily to the scarcity and high price of farm labor.

Light-Colored Soils of the Uplands, Having Deficient Drainage.
The soils which constitute this group, the Cardington silt loam, Canfield silt loam, and the heavy subsoil phase of the Hanover silt loam are, in many respects similar to the preceding group, but inadequate drainage has caused characteristic mottlings with depth. The slower flow of groundwater through the lower part of the soil is due to the slight topographic differences.

Cardington silt loam is the most extensive series of this group, occupying approximately 43,584 acres, or 10 per cent of the Newark Area, and dominates the western part of Licking County, where the topography is undulating and includes many shallow depressions in which drainage is poorer than on the adjacent higher areas. At least 96 per cent of this land is cleared and is used for general farm crops and pasture, with corn occupying the largest acreage of cultivated land, followed by wheat and oats. Most farmers, to obtain profitable yields, tile their fields, and some of those interviewed claim that the resulting increased yields will pay the cost of the tile in two or three years.

Ibid., p. 22.
Fig. 8. Generalized soil map of Licking County.
Imperfectly Drained Soils with Heavy Subsoils. These soils are usually light-colored or gray at the surface, although in a few of the more depressed localities, they may be darkened considerably by accumulations of organic matter. The members of this group, the Bennington silt loam, the Marengo silty clay loam, and the Condit silt loam, when properly drained, produce excellent yields of corn and make good grasslands.

Light-Colored Soils of the Hill Lands. This group, which includes the Muskingum, Eifort, Frankstown, and Rarden soils, comprises the more hilly parts of the eastern sector not modified by glacial action. Having developed under a forest cover they are light in color and are well drained, but a large portion of the area is unsuitable for farming because of the steep slopes. Although unfavorable relief has limited the possibilities for crop production, several woodlots remain in this section, furnishing stands of second-growth hickory, chestnut, white oak, dogwood, maple, beech, and poplar. A number of abandoned farms in the hill lands indicate the difficulty some farmers have experienced in attempting to secure a living; nevertheless, sheep raising is gaining in importance in the plateau section; in fact, approximately 70 per cent of the total land area is now being used for grazing purposes.

Well-Drained Soils of the Stream Terraces. The Chenango and Mentor soils constitute the important farmland of the valleys. Of excellent surface and internal drainage, these soils are productive, but leaching has reduced their fertility to some extent. The Chenango silt loam has reached
its greatest development along the Licking River, with virtually all the
land under cultivation.

Inadequately-Drained Soils of the Stream Terraces. Diverse drainage
conditions have a direct influence on the crop-production of the two
general subgroups, the light-colored or gray surface soils and the dark-
gray or nearly black surface soils, which occupy the terraced positions.
Although the former are not particularly fertile, crops will respond to
applications of commercial fertilizers, while poor internal drainage
necessitates ditching or tiling for higher yields of hay or corn on the
darker soils.

Soils of the Alluvial Flood Plains. Soils of this group may be
divided into three general subgroups: well-drained light-colored friable
and easily-tilled soils, poorly-drained soils which have been subjected
to leaching, and the dark-colored soils which have been influenced by the
accumulation of organic matter. The first group, represented by the
Chagrin silt loam, is derived from glacial shale and sandstone and is
located mainly along the Licking River. Much of the land is utilized for
the production of corn which should be planted after the danger of spring
floods is past, while both wheat and oats occupy the higher benches which
are less susceptible to flooding. Holly silt loam represents the second
group and occupies the upper parts of the smaller stream bottoms. Although
this is an acid and a poorly-drained soil, small patches of land are used
for corn, timothy, and alsike clover, even though yields are below average
for the general area. The Papakating silt loam, a dark-colored soil,
rich in organic matter, occupies the wet first bottomlands of the narrow valleys in the western part of the Newark Area. This soil, although producing excellent timothy, alsike clover, and red clover, becomes quite cloddy and difficult to work when too dry or too wet.

The Muck Lands. The muck lands of the Newark Area constitute approximately 448 acres and are composed of plant matter which has accumulated in wet situations. Basins of this muck occur in Washington Township near the Redbrush School, in the vicinity of Kirkersville, and in an area known as Bloody Run Swamp, and the utilization of such areas is impractical except in unusually dry seasons. Attempts have been made to clear sections of the land of its sedges, reeds, and rushes in order to utilize the organic material for crop production, but any practical method is prohibited because of the drainage difficulties encountered.

Natural Vegetation

Swamp Forests

On the till plains of the Newark Area deciduous swamp forests are of frequent occurrence, especially on the level sections between the streams. American elm, black ash, and soft maple are the dominant species, but in places where drainage has been improved, bur oak, shellbark hickory, white ash, and honey locust have successfully invaded the swamp association. A further improvement in drainage, usually brought about by headward erosion of the smaller streams, results in white oak, black walnut, and hard maples coming into the assemblage. The shade conditions established by the beeches and maples are such that elms, soft maples, black ash,
Fig. 9. Natural vegetation map of the Newark Area.
and swamp white oak are "starved out", and only the larger oaks and hickories remain. Observations in the field reveal an approaching dominance of the beech-maple or the oak-maple types which eventually succeed the swamp forests. Beech, sugar maple, and white ash are the most successful species in the reproduction, so that the climax type is perpetuated in a state of equilibrium. Undercutting of the streams, when accompanied by a lowering of the water table, may cause a beech-maple forest to revert to oak-maple or even to an oak-hickory type. Wolfe terms such a process "retrograde succession", since the mesophytic type is succeeded by a more xerophytic type related to physiographic changes.

Beach and Maple

The beech and maple association, which dominates the glaciated part of the area, includes primary forests in which beech and sugar maple are the principal species, comprising from 50 to more than 90 per cent of the dominant stand. Commonly found in mixture with them are the following species: northern red oak, white ash, yellow poplar, white oak, red maple, bitternut hickory, shagbark hickory, buckeye, basswood, blue ash, and hop-hornbeam. In the shale ravines beech appears to be dominant and is associated with red oak and sugar maple. Specimens of hemlock (Tsuga canadensis), club moss (Lycopodium lucidulum), wood fern (Dryopteris noveboracense), Indian cucumber root (Medeola virginica), and partridge berry (Mitchella repens) occur as relics in the deciduous forest and reveal that some of the beech-maple forests in the area affected by glaciation contained hemlock in prehistoric times. These plants are not normally

22 John N. Wolfe, Botany Department, Ohio State University, personal interview.
present in the undergrowth of beech-maple forests, but are characteristic, if not common, in hemlock forests to the north and east. Disappearance of the hemlock was no doubt due to climatic changes with increased evaporation, or to physiographic changes which have widened the gorges and ravines, thus lowering the humidity to which the forest was exposed.  

Oak-Chestnut Association

This type includes also two variants or sub-types, the chestnut-oak, and the oak-hickory-chestnut. The former occurs on drier sites and the latter on moister sites than those occupied by the oak-chestnut. This association reaches its greatest development on the western ridges and upper slopes of the Appalachian Highlands, but occurs locally on the Appalachian Plateau and the unglaciated Low Plateaus. Today there are practically no chestnut trees which have not been attacked by Endothia parasitica so it seems fairly certain that the oak-chestnut as a type will disappear entirely from the area.  

Mixed Mesophytic

The mixed mesophytic, sometimes designated as the "cove hardwoods", comprise a mixture of many species, of which chestnut, yellow poplar, northern red oak, white oak, and hemlock are probably the most characteristic throughout the area. This type occupies the moist coves or ravines with their adjacent lower slopes, in places extending for a distance up protected slopes with a north exposure.  

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23 Robert G. Gordon, The Primary Forest Types of the East Central States, PhD Dissertation, Ohio State University, Columbus, 1931, p. 57.  
24 Ibid., p. 39.
Transeau\textsuperscript{25} and Sampson\textsuperscript{26} have referred to such types as mixed mesophytic forest. In extent, they range from northeastern Ohio to the lower slopes of the Great Smoky Mountains, clothing many of the slopes throughout the dissected Appalachian Plateau and the Appalachian Valley Region. Sampson states "the species frequently found occupying first place in the mixed mesophytic community in east-central Ohio, on the basis of number of individuals present, are beech, sugar, black and red maple, tulip, magnolia, chestnut, white and red oak, and white ash.\textsuperscript{27}

\textsuperscript{25}E. N. Transaau, "Vegetation Types and Insect Devastations; Distribution of the Mexican Bean Beetle and the European Corn Borer in Ohio", \textit{Ecology}, Vol. 8, 1928, pp. 286-288.


CHAPTER III

OCCUPANCY OF THE LAND

Moundbuilders

Earliest of all the known occupants of the Newark Area are thought to be the Moundbuilders whose name indicates a characteristic which differentiates these people from their Indian successors. Two of the three most notable examples of effigies in Ohio are located within the area under discussion. One, known as the "Eagle Mound", occupies the center of the Newark Group, whereas the other, sometimes called the "Alligator Mound", is situated on the summit of a hill overlooking the village of Granville.

Perhaps the most extensive of all the earth works is the so-called Newark Group, which is located approximately a mile and a half southwest of Newark, between the South Fork of the Licking River and Raccoon Creek. Although expansion of the city has obliterated large portions of the walls and many of the mounds, important sections of the earthworks are now preserved both in Octagon State Memorial, containing 120 acres, and in Moundbuilders State Memorial, which contains 66 acres. The major structure consists of a circular wall of earth about one mile in circumference and in the general shape of a horse-shoe, with a base of 50 to 75 feet through and a height of approximately 25 to 30 feet. Huge trees, three feet in diameter, grow
upon the summit, -- trees which were probably planted there long after
the wall was constructed, centuries ago. Another important feature of
the original Newark Group, known as the Wright Earthworks, is located
approximately a quarter of a mile northeast of the Great Circle Earth-
works, near the intersection of the present James and Waldo streets
in Newark.

The variety and number of earthworks discovered in this area in-
dicate that these people occupied the valleys for a considerable period
of time and that their economy was essentially agricultural. Quantities
of shelled corn as well as carbonized cornstalks and ear corn which have
been uncovered furnish ample proof that maize was known and cultivated
in the Newark Valley hundreds, perhaps thousands, of years ago. From
the bones recovered, the dog appears to have been their only domesticated
animal. The numerous stone pipes which have been discovered in the graves
would indicate a local culture of tobacco, or, at least, a trade with
other tribes to the south. Whereas the origin, customs, and final dis-
appearance of these peoples are a matter of conjecture, we are certain
that they practiced an agricultural economy.

One of the known leading industries of the Moundbuilders was the
quarrying and working of flint. The fact that flint and flinty rocks
were used by aboriginal peoples in manufacturing tools and implements
which served the same basic purposes for which metal tools are used to-
today makes it readily apparent that flint was of utmost importance.

1 Ohio Archaeological and Historical Society Publication, Vol. XIII,
Columbus, Ohio, 1924, p. 189.

2 W. A. Lloyd, J. I. Falconer, and C. E. Thorne, The Agriculture of
Ohio, Bulletin 326, Ohio Agricultural Experiment Station, Wooster,
Ohio, 1918, p. 18.
It is but natural for one to indulge in speculations regarding these ancient works of a pre-historic people. There can be little doubt that the Moundbuilders were a numerous people. Such an elaborate and gigantic display of works could not have been erected by a people insignificant in numbers. This supposition becomes more apparent when one considers that they were without iron or any suitable metal implements or similar tools with which to perform such herculean tasks. The number and magnitude of their works and their extensive range and uniformity indicate that the Moundbuilders were essentially homogeneous in customs, habits, religion, and government.

Indian Occupance

Although Colonel Whittlesey's map of the Indians of Ohio assigns the Newark Area to the Delawares it does not appear that this tribe occupied it over any considerable period, since both the Wyandots and the Shawnees used the area as a hunting ground. During the latter half of the eighteenth century the Shawnees occupied the Scioto country and sometimes spread themselves over into this section, but the Wyandots (also called the Hurons) as well as the Delawares occupied much of the area between the Muskingum and the Scioto rivers. In accordance with the treaty of Fort McIntosh, in 1785, a large portion of the Ohio territory, including the area under discussion, was ceded to the United States. Many Indians, however, continued to occupy this land for many years after the treaty was signed since there were no permanent white settlers to dispute their possession.

Previous to 1800 there were several Indian villages located within the limits of the Newark Area. One of these, known as "Raccoon Town", was situated on the bottomland of that river and near the present site of Johnstown. All the possessions of this Wyandot village were reported purchased by two brothers, Charles and George Green, then living along the Licking River, five miles below the present site of Newark. Thomas Hutchins, United States Geographer from 1785 to 1789, estimated the total number of Indians in this area at 800, -- 300 Wyandots and 500 Shawnees.

Since this territory was out of the line of the major Indian trails it was occupied only in limited numbers and was used chiefly as a hunting ground. One of their main trails, a "trunk-line", as it were, crossed the Muskingum River near Zanesville, but passed to the south of the Newark Area. However, a branch trail crossed the Muskingum near the present site of Dresden and extended southwestward to the "Big" and "Little" lakes, now occupied by Buckeye Lake.

Preparation for Settlement

The Newark Area, as here delimited, occupies a portion of that great interior lowland west of the Appalachian Highlands coveted by both the French and the English for some time. Although each had laid claim to this region, it was, for the most part, a great wilderness uninhabited except for the Indian, hunter, and trapper. An environment of hardwood forests proved much to the liking of these early occupants.

4 Isaac Smucker, Centennial History of Licking County, Ohio, Newark, Ohio, 1876, p. 6.

whose life was centered around the production of a few necessities and the taking of fur-bearing animals.

Subdivision of the Land

That territory which is now within the limits of Ohio was formerly a part of a vast region claimed by the king of France, and known as the province of Louisiana. Following the French and Indian Wars (1756-1763) this tract was ceded to Great Britain by the Treaty of Paris, in 1763. Settlement was forbidden by the British government at that time. Claims by the English monarch to this territory were ceded to the United States, by the treaty signed at Paris in 1783. Connecticut sold to the Connecticut Land Company all lands except the Firelands of the Western Reserve and Virginia retained for her veterans the Military District until 1853. After further claims by the Indians had been settled, legislative action by Congress became necessary before settlements could begin and, finally, in 1785, an ordinance prescribing the manner of land disposal was passed. Both the Land Ordinance of 1785 and the Government Ordinance of 1787 did much to encourage and to hasten settlement by the whites. The section that includes most of the area under discussion was known as the United States Military District and was set aside by an act of Congress in 1796 to pay Continental Army bounties. The rectangular system of survey which was used for all parts of the state except the Virginia Military District has had an important effect.

6 Henry Howe, Historical Collections of Ohio, Cincinnati, Ohio, 1847, p. 6.
7 Ibid., p. 9.
8 Christopher Elias Sherman, Original Land Subdivisions, Vol. III of Final Reports, Ohio Cooperative Topographic Survey, Columbus, Ohio, 1925.
upon land holdings and transportation patterns. This is clearly shown on the topographic maps of the area.

Congress officially recognized the organization of the Northwest Territory by the Ordinance of 1787 and authorized the Governor, General Arthur St. Clair, to form districts or counties, and to appoint such civil officers as might be deemed necessary for the government of these divisions. Washington County, the first political division to be organized (1788), included the greater portion of what is now the state of Ohio, and the Newark Area continued as a part of this county for the next ten years. On August 20, 1798, Ross County was organized as the seventh county of the territory and Licking County continued as a part of this division for two years, but finally became a separate unit in the governmental organization at that time.

Refugee Lands. In 1801 Congress provided land for those refugees from Canada and Nova Scotia who had been actively sympathetic with the American cause during the Revolutionary War. Many had either left their homes or had been driven from them and had suffered the loss or confiscation of their property. The tract surveyed extended eastward from the Scioto River 48 miles into Muskingum County, and was four and one-half miles in width. Two and one-half miles of this parcel of land is in Licking County and two miles of it is included in the adjoining counties to the south, so the entire tract may be considered to be a part of the area under consideration in this study.

Early Settlement

The first settlers entered the Licking valley from the direction of Zanesville over roads of their own construction. Elias Hughes and John Ratcliff with their families, numbering 20 persons, settled on what has been called the "Bowling Green", a level, untimbered, green lawn or prairie located four miles east of the present site of Newark and a short distance from Bowling Green Run. This was the first white settlement within the limits of the Newark Area and it is believed that but four families constituted the entire population in 1801, although from that time there was a steady influx of settlers.

Origin and Character of the Early Settlers

The early settlers of the Newark Area were largely from New England, Pennsylvania, Maryland, Virginia, and New Jersey, as well as from distant Wales, Germany and Ireland. Coming into a territory where institutions, habits, and values were as yet unfixed, they found it much more a "mixing-bowl" than a "melting-pot", for here was a place where divergent elements could adjust themselves to the frontier. Each made his contribution to the community by bringing with him the livelihood and culture of their eastern and southern homes. For example, the early emphasis upon wheat production in this section of Ohio may be explained, in part, by the interest of the Pennsylvania farmers who settled here, since many came from the great wheat-producing counties of Lancaster, Bucks, York, and Washington, in Pennsylvania. The Welsh, who settled

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10 Roderick Peattie, Geography of Ohio, Bulletin 27, Geological Survey of Ohio, Columbus, Ohio, 1925, p. 115.
the hilly section of Licking County, brought with them certain practices of their native land as well as practices of the eastern seaboard states through which they migrated. Here the urban, eastern settler met the farmer from the south.

One of the most important of the early arrivals was General William C. Schenck, who laid out Newark at the broadest part of the valley junction, and named it after his native city in New Jersey. It is evident that the city gained much from the liberal-minded Schenck, whose plans included broad streets and an ample public square. His original plat was a section enclosed on three sides by the North Fork, the South Fork, and the Racoon, major tributaries of the Licking River, and is the land occupied by the "City Square" and downtown section today. Schenck, whose military rank determined the extent of his holdings, owned this area of land consisting of some 4,000 acres.

Factors Influencing Settlement

That surface features influence lines along which immigration moves and settlement takes place is well illustrated in this region. The first settlers came through the valley of the Ohio River to the southeast, and entered the Newark Valley through the Licking Narrows. Their settlements were built along the extensive floodplains of the Licking River. Soils, not climate, attracted men to Ohio.

Drinking water was also important in the location of early habitations and, wherever possible, log cabins would be constructed near springs to eliminate the necessity of digging a well. In fact, the early highway maps reveal a close correlation between the location of
Fig. 10. Early settlement and land holdings.
springs and the location of roads. Field studies in Mary Ann Township show that approximately 75 per cent of the houses are located near springs, and approximately 20 per cent of all the houses are approached today by lanes or private roads. In all probability the early roads connected most of the farmsteads, but as the travelled routes became more permanent and highways shortened, a large number of the farmers found themselves off the main roads.

Occasionally, the two factors, good water and rich bottomlands became of secondary importance to those settlers having an inherited topographic proclivity. A person reared in hill country, however desolate, oftentimes has a tendency to build his new home in similar surroundings. This situation is well illustrated by the choice of lands made by the Welsh immigrants who came into this region, for they bypassed thousands of acres of fertile lowlands and chose to settle in a rugged portion of the area still known as the "Welsh Hills".

Changing Landscapes

The early settler first chose a site near an adequate water supply, constructed his cabin of logs from the forests, cleared and cultivated a small plot of ground, and hunted fur-bearing animals which he either sold or bartered. He differed from the hunter or trapper, however, in that his were ever-increasing wants. His crude cabin served its purpose only until something more comfortable could be built; his hunting served only a means of providing capital for the further development of his crops.

This wilderness presented a challenge to the hardiest of the newcomers
since only the bare necessities could be carried over the crude trails and hardships were to be expected. However, the rigorous winters of an interior location were more than compensated for by the relatively long growing season which permitted a variety of crops. By 1820 the proportion of cleared land was rapidly increasing. Each year a patch of corn, beans, melons, squashes, pumpkins, and turnips was added to the clearing. Such crops were often stored in a cellar built into the side of a hill and protected the family from want during the long winter months.

There is some doubt if self-sufficiency ever existed among the early settlers in America, since many of the goods either originated in Europe or came from the Indians. By 1812, despite isolation, there was a growing trade. Settlers were using silk, glass, china ware, and pewter brought from the Middle Atlantic industrial communities. Hence, self-sufficiency, as applied to pioneer economy, is a term signifying relative conditions.

Distribution of Settlement

Period of Rapid Rural Growth

The settlement at the junction of the Raccoon, North Fork and Licking rivers was, by 1810, a substantial community. Although a number of the original settlers continued further west, many settled permanently in this section of east-central Ohio and, during this period, Newark grew from a village of 200 inhabitants, in 1810, to a flourishing town
of 3,664, in 1850. The population of Licking County was reported as 3,852 in 1810, and by 1820, 11,861, for a gain of more than 208 per cent and, during the next decade the growth was 75 per cent, bringing the total to 20,869 (See Table 3.). Gains of 40 per cent and 10 per cent were made in succeeding decades to 1850, when the total reached 38,846.

The major features of the distribution pattern for the forty year period (1810-1850) are shown in Fig. 11, with the greatest density occurring at the valley junction. Areas of 50 or more persons per square mile appear as "islands" of population concentration and are limited to the city of Newark and the trade centers of the adjacent counties, each of which is located near a major stream of east-central Ohio. An interesting feature of this distribution pattern is the area included between the 20-30 isopleths, which practically coincides with the glacial boundary as it passes through the region, from north to south, for this unglaciated sector has retained this character of sparse settlement even to the present time. Most attractive areas for rural settlements were the rich alluvial floodplains of the Raccoon, North Fork, and the Licking Rivers, as well as the enriched soils of the glaciated portion which occupies the western two-thirds of the area under discussion.

Before 1850 the growth of population in the Newark Area involved the development of a prosperous, though limited, agricultural region, with the city of Newark becoming the dominant center of local economic activities. Factors which permitted the region to support a greater

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11 Abstract of the Population of Ohio for the Year 1850, Seventh Census, Ohio Constitutional Convention, Columbus, Ohio, 1851, p. 3.
12 Ibid., p. 2.
Fig. 11. Distribution of settlement, the Newark Area, 1850.
population by 1850 were: improved roads, the construction of the Ohio Canal, an increase in the production of crops and farm animals, an increase in rural manufacturing in the mills and handicraft industries, and an increase in wholesale and retail trade. The Canal, in particular, was an important factor accounting for increased settlement during the latter decade of this period for the expanding markets afforded increasing opportunities for the local labor, and many workers were brought into the area for construction of the locks and dams.

Movement to the Urban Centers.

From 1850 to 1900 the total population of Licking County rose from 38,846 to 47,070, which indicates a general leveling-off of the overall population, and, during this same period a definite change was noted in the rural-urban picture. A movement of people from their farms to the nearby towns, and especially to the city of Newark, was induced by an industrial expansion and an increase in the use of farm machinery. According to the census reports, Newark's population increased from 3,691 in 1850, to 18,157 in 1900, for a net gain of 39.13 per cent.

In 1900 the population density in a large part of the valleys was greater than 50 persons per square mile (Fig. 12). This area of concentration encompassed the city of Newark and extended westward up the Raccoon valley, eastward down the Licking, and northward to St. Louisville on the North Fork, with the areas of more than 50 persons being considerably larger than they had been a half century previous.

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13 Census of Ohio, 1900. Compiled by the Secretary of State, Columbus, Ohio, 1901, p. 4.
Fig. 12. Distribution of settlement, the Newark Area, 1900.
(Fig. 11). A lower population density, 20 to 30 persons per square mile, covered most of the eastern unglaciated portion of the Newark area.

Although no figures are available to show the actual number of people who left this region during the 1850-1900 period, many were attracted westward by the cheap lands. Movements of people within the area continued to be directed toward its dominant commercial center, Newark.

Increasing Urban Concentration of Settlement

In the years from 1850 to 1900 the rapid growth of employment, chiefly in industries, led to an increase in the population of Newark, a trend which continued during the first half of the present century, with a general levelling off noted during the decade preceding World War II. On the other hand, a decline in agricultural population of the tributary areas became general after 1900, reducing the rural farm population to what probably was its lowest level in proportion to the total population during the entire period of study. Major factors which have contributed to the decline in agricultural population during this period include: a decrease in the number of farms, a decrease in the area of land in farms, and an increasing use of mechanized equipment.

The population of Licking County increased from 47,070 in 1900 to 70,645 in 1950, for a gain of almost 51 per cent. Perhaps the

Fig. 13. Distribution of settlement, the Newark Area, 1940.
outstanding change in the settlement pattern during this 50-year period was the growth of the regional center and its associated urban-rural fringe, particularly in the Newark Valley. Whereas the rate of growth of urban population was considerably greater than that of the total population, the rural population, especially that of the unglaciated section, was declining at an increasing rate. The principal growth of the urban-rural fringe was made possible by the increasing use of the automobile, the establishment of bus lines, and the accompanying improvement of the county's highways.
<table>
<thead>
<tr>
<th>Year</th>
<th>Ohio</th>
<th>Per Cent of Increase</th>
<th>Licking County</th>
<th>Per Cent of Increase</th>
<th>Newark</th>
<th>Per Cent of Increase</th>
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<td>1800</td>
<td>45,365</td>
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<td>1810</td>
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<td>3,852</td>
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<td>11,861</td>
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<td>1850</td>
<td>1,980,529</td>
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<td>-3.5</td>
<td>9,600</td>
<td>43.5</td>
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<td>3,198,062</td>
<td>19.9</td>
<td>40,450</td>
<td>13.1</td>
<td>14,270</td>
<td>48.7</td>
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<td>1890</td>
<td>3,672,329</td>
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<td>7.0</td>
<td>18,157</td>
<td>27.2</td>
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<tr>
<td>1900</td>
<td>4,157,545</td>
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<td>47,070</td>
<td>8.7</td>
<td>25,404</td>
<td>39.8</td>
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<td>1910</td>
<td>4,767,121</td>
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<td>55,590</td>
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<td>56,426</td>
<td>15.4</td>
<td>30,596</td>
<td>14.5</td>
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<td>1930</td>
<td>6,646,697</td>
<td>16.4</td>
<td>62,279</td>
<td>3.9</td>
<td>31,487</td>
<td>2.9</td>
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<td>6,907,612</td>
<td>3.9</td>
<td>70,645</td>
<td>15.4</td>
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Source: U.S. Census Reports. Percentages of increase are sliderule computations.
CHAPTER IV

TRANSPORTATION IN TRANSITION

Development of Highways

Early Land Routes

The evolution of transportation in Ohio has been, to a great extent, influenced by both the topography and the location of the state with respect to the surrounding regions. Its "crossroads" position has been one of importance in the development of both the early land routes and waterways.

First contacts with the Newark Area were made from the east by way of the established trails and roads through the Appalachian passes. Pittsburgh and Wheeling were the two western termini for major land routes extending by way of Pennsylvania to the Ohio River. The Forbes Road, opened in 1758 between Philadelphia and Pittsburgh, and the Braddock Road, opened in 1754 between Cumberland and Pittsburgh came together at the Ohio River. The other route, known as Zane's Trace (1789), extended across southern Pennsylvania and northern Virginia (now a part of West Virginia) to Wheeling. One trail formed a junction

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with the Wheeling route near Washington, Pennsylvania, and continued through eastern Ohio by way of Steubenville, terminating at Duncan Falls, near Zanesville. Still another trail, also known as Zane's Trace (1797) originated at Bridgeport, opposite Wheeling, and crossed Ohio by way of St. Clairsville, Cambridge, Zanesville, Lancaster, and Chillicothe, to Maysville, Kentucky. Although the Newark Area was not located on a major trail, the valley of the Licking River afforded easy access eastward as far as Zanesville on the Muskingum.

Early trails and traces to the Ohio River soon became important highways connecting the east and the west. Congress ordered the construction of the Cumberland Road (National Pike) in 1806. This hard-surfaced road, which permitted traffic throughout the year, extended from Baltimore to Wheeling by 1818. Subsequent extensions reached Zanesville in 1828, and Columbus in 1833. Although stage coaches had traveled over Zane's Trace as early as 1808 on a haphazard basis, the hard-driven, four-or six-in-hand could dash along the improved National Pike, delivering their mail and passengers according to a strict schedule. Newark, located eight miles north of the federal route, fared much better than those towns situated more distant from any major highway. By 1850 the mud road leading from Newark to Jacksontown on the National Pike was covered with planks to facilitate the increasing traffic.

The above land routes represent, in brief, the early thoroughfares

which had either a direct or indirect influence upon traffic of the area under discussion. Local roads followed the Raccoon, North Fork, and Licking rivers to the valley junction at Newark, thereby affording limited trading privileges for the back-country people of Licking County.

Methods for Securing Early Roads

The Three Per Cent Act of 1803 provided $17,000 for laying out an extensive road system throughout the state and gave local county commissioners power to repair and open roads, as well as to levy taxes. Such a paltry sum was by no means effective, but it was significant that the legislature, even at this early date, recognized the need for road developments. After 1810 a favorite method of securing roads was the construction of improved highways by turnpike companies. Although little was actually spent by counties to improve local means of transportation, collective efforts of private individuals and aid by the federal government resulted in 25 post-roads being constructed throughout the state by 1814.

As prosperity began to return in the 1840's and as the state had definitely ceased to aid in highway construction, many of the local governments began to construct free turnpikes, known as "Two-Mile Turnpikes". The year 1851 was critical in the development of Ohio's highways for at that time a new constitution was adopted which hastened transfer of turnpikes from private to public control. Later acts were passed which provided easy methods of transferring private turnpike and plank roads to county commissioners as well as increasing the powers of local officials to acquire and construct highways. This
marked the beginning of free public roads on an extensive scale.

In his discussion of highway development in Ohio, Gephart has summarized the different periods of growth as follows:

First, the period of state construction, either by applying the proceeds of the Three Per Cent Fund or by subscribing to the stock of private turnpike companies. This period extended from 1804 to 1844, although the subscription period covered only the last decade of the period; second, the period of private turnpikes and plank roads, the former beginning in 1850 and extending to 1865; third, the period of local assessment extending from 1845 to 1885, although from 1845 to 1851 many local governments subscribed to the stock of private turnpike companies and the practice of assessing abutting property is still followed to a limited extent; fourth, the period of construction by general assessment, extending from 1870 to the present, the first fifteen years of the period being characterized by a transfer of the private turnpikes to the public; fifth, the period of direct state aid, which began in 1900.*

Property taxes continued as the chief source of highway funds until the early 1930's, when gasoline taxes and other motor vehicle imposts became predominant. In recent years three-fourths of all highway revenues have been derived from motor vehicle taxes.  

Modern Highways of the Newark Area

The influence of early roads on Licking County's present highway pattern dates back to the time when the Newark Valley was first being settled. The first roads, which were constructed in the valleys of

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Ohio Program Commission and the Highway Study Committee, Ohio's Highways, Roads, and Streets, Columbus, Ohio, 1960, p. 7.
the Racoon, the North Fork, and the Licking, conformed to the major lines of drainage and have become the state highways of the present system. The rural road network still follows patterns established during the pioneer period, with road practices in the western glaciated part of the area adhering, in most instances, to the straight sections and township lines, whereas those of the unglaciated eastern section show a definite relationship to the terrain features.

According to a recent report of the Ohio Program Commission and the Highway Study Committee, the township roads of Licking County, totaling 41,066 miles, are reasonably adequate to handle the present flow of traffic. About 77 per cent of the total mileage is satisfactory for the light traffic carried, and for the direct access provided to farms and homes from nearby county primary and state routes. Modern state highways provide easy access to the nearby trade centers of Zanesville, Mt. Vernon, Lancaster, Delaware, Coshocton, and Columbus, whereas the National Road (U. S. Route 40), eight miles to the south, provides access to the more distant places.

Despite a central geographical location within the state, Newark occupies an "off-center" position in relation to the major east-west and north-south highways of Ohio. (See Fig. 14). This has been an important factor accounting for Newark's long period of slow industrial growth and the late accessibility with respect to the national environment.

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Ibid., P. 96.
Fig. 14. Traffic flow map of east central Ohio, 1950.
The Canal Period

The Erie Canal, which linked Lake Erie with the Hudson River, was completed in 1825, the very year in which construction of the Ohio Canal was initiated at Newark. A channel for the transportation of heavy and bulk produce of the area, at comparatively cheap rates, was opened from the center of Ohio to New York in 1827, and was extended to the Ohio River in 1833. The "Grand Canal", as it was first called, extended entirely across the state from north to south and was 306 miles in length, exclusive of the lateral canal to Columbus, the Dresden side-cut, and slack-water navigation to Zanesville. Terminal points were Cleveland and Portsmouth.

At this time the most densely populated sections of Ohio were the northeastern, the central, and the southwestern parts. The first proposal was to begin operations in the northeastern part of the state, extend the canal in a southwesterly direction, and to terminate it at or near Cincinnati. This route, however, was found impracticable and a compromise was made providing for a canal to begin at Cleveland, extend south to the divide, then west to the Scioto, and thence through the center of the state to the Ohio River at Portsmouth. To secure the support of the densely populated section of the southwest a second proposal was made to construct a canal between Cincinnati and Dayton, with the promise that it would be extended to Toledo. Thus the numerous sectional interests were served and, at the same time, economic demands were in large measure satisfied.

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Fig. 15. Ohio's canal system.
Expanding Markets for the Newark Area

Prior to the building of the canal the area under discussion had no outlet for its produce except by wagons to Lake Erie, or by wagons to the Muskingum River and thence by flat-boats to New Orleans. This section of east-central Ohio was rapidly increasing its agricultural production but lacked a market. Ham was selling at three cents per pound, eggs at four cents a dozen, flour at one dollar per hundred pounds, whiskey at twelve cents per gallon, and other items proportionally cheap. Availability of relatively cheap land of good quality and lack of transportation facilities had kept prices on farm produce low for many years preceding the canal period. However, even before the southern portion of the canal was completed and only the northern section between Dresden and Cleveland was in operation, wheat had jumped to 75 cents per bushel along the route. Many former objectors to the undertaking, large land holders or high tax payers, began to see the possibilities of expanding markets. One of these land owners, a Mr. Shoemaker, had reported, before the canal's construction, that the whole enterprise would increase his taxes and then probably fail. He later admitted that his boys had hauled potatoes from their farm near Tarlton to Ciroleville and sold them for 40 cents per bushel, which resulted in more than enough money to pay his taxes for the entire year. Although there had been a limited overland traffic in wheat prior to the canal period the price of this

8 N. N. Hill, History of Licking County, Ohio, Columbus, Ohio, 1881, p. 473.

9 Ibid., p. 547.
major crop increased from 25 cents to one dollar per bushel at the time of the canal's completion.

Topography as a Conditioning Factor

That topography of the Newark Area had a tremendous influence upon its early commercial development is well illustrated in the selection of the canal route. From the Scioto to the Muskingum the canal passed through the area under discussion, following the broad and partially buried pre-glacial valleys. By following the valley courses as much as possible the engineers were able to minimize construction costs and to utilize natural water storage basins.

Difficulties were encountered in attempting to carry out the original compromise plan since the divide between the Scioto and Miami rivers was nearly everywhere higher than the sources of the streams, so neither could be used to feed the canal on the summit level. However, the water supply was sufficient across the Licking Summit between the Scioto and Muskingum rivers, and was an important factor of consideration when the east-central route was selected. Seasonal fluctuation of stream flow necessitated the construction of vast reservoirs to feed the canals during the regular period of operations, which was from early April to the latter part of November. Two of these reservoirs, the Portage and the Licking, were constructed on major summits of the Ohio Canal, and were used not only to supply water for the canals, but have always been popular resorts for fishing, hunting, and boating, and are reserved by the legislature as
public parks and pleasure resorts. The Licking reservoir is now popularly known as "Buckeye Lake" and is one of central Ohio's major resort centers.

TABLE 4.
MAJOR RESERVOIRS OF OHIO'S CANAL SYSTEM.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>No. of Acres</th>
<th>When Constructed</th>
<th>Cost</th>
</tr>
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<td>St. Marys</td>
<td>17,003</td>
<td>1837-41</td>
<td>$528,222.07</td>
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<tr>
<td>Lewistown</td>
<td>7,200</td>
<td>1851-80</td>
<td>600,000.00</td>
</tr>
<tr>
<td>Licking</td>
<td>4,200</td>
<td>1828-32-36</td>
<td>200,000.00</td>
</tr>
<tr>
<td>Portage (Summit Co.)</td>
<td>2,000</td>
<td>1840</td>
<td>80,000.00</td>
</tr>
<tr>
<td>Loramie</td>
<td>1,900</td>
<td>1844</td>
<td>22,000.00</td>
</tr>
</tbody>
</table>

Source: C. C. Huntington and C. P. McClelland, History of Ohio Canals, Columbus, Ohio, p. 42.

Significant Results of Canal Transportation

Although it is difficult to prove the effects of canal transportation upon the industrial and social life of Ohio, evidence of increased wealth can be presented for those regions served during the canal period, 1830 to 1855. Real estate and personal property value of the 37 canal counties rose from $33,000,000 to $486,500,000 during this period, whereas the non-canal counties reported an increase from $41,000,000 to $390,000,000 for the same interval of time. Certain Ohio cities along the canal were making rapid strides in population growth (See Table 4.).

10 Ohio, Annual Report of the Auditor of the State, Columbus, 1859, p. 21.
TABLE 5.

GROWTH OF CERTAIN OHIO CITIES DURING THE CANAL PERIOD

<table>
<thead>
<tr>
<th>City</th>
<th>1820</th>
<th>1857</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cincinnati</td>
<td>2,602</td>
<td>200,000</td>
</tr>
<tr>
<td>Cleveland</td>
<td>400</td>
<td>60,000</td>
</tr>
<tr>
<td>Dayton</td>
<td>1,139</td>
<td>25,000</td>
</tr>
<tr>
<td>Chillicothe</td>
<td>2,416</td>
<td>10,000</td>
</tr>
<tr>
<td>Toledo</td>
<td>500</td>
<td>14,000</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>500</td>
<td>5,000</td>
</tr>
<tr>
<td>Newark</td>
<td>700</td>
<td>4,000</td>
</tr>
<tr>
<td>Akron</td>
<td>700</td>
<td>4,000</td>
</tr>
</tbody>
</table>

Source: U. S. Census

In the decade following the completion of the canal, 1832-1842, Newark's population rose from 999 to 2,705. Cessation of canal operations was a bitter blow to the Newark Area for the region did not get the accessibility it had anticipated. No longer could Newark benefit by a favored location along the north-south corridor afforded by the canal, and, as the transportation pattern again shifted to an east-west alignment, the local area resumed its slow rate of agricultural and industrial growth of pre-canal days.

Era of Railroad Expansion

Newark's first railroad, the Columbus and Lake Erie, was chartered in March 12, 1845, and extended from that city to Mansfield, a distance of 62 miles. At that point it joined the Mansfield and Sandusky City railroad, forming a connection with Lake Erie and covering a total distance of 116 miles. This railway, later known as the Sandusky.

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\[\text{Hill, op. cit.}, \text{p. 429}.\]
Mansfield, and Newark system, had more charters, amendments, consolidations, reorganizations, and adjustments than any other railroad in the state.

Changing Railroad Patterns

East-west rail routing through the Newark Area was not to be denied. The city's second railroad, chartered in 1847 under the name Central Ohio, extended from Columbus to Bellaire and enabled both Newark and Zanesville to reach more distant markets. By 1873 this company, under the control of the Baltimore and Ohio, had pushed its lines westward to Chicago and business had increased tremendously. The B & O follows the identical course taken by the first settlers of the Newark Area, namely, through The Licking Narrows and westward across the level bottomlands of Madison, Newark, and Union Townships.

The third railroad to pass through Newark was known as the Pittsburgh, Columbus, and Cincinnati road. It connected Columbus with Pittsburgh and was the shortest and most direct line between the two cities, a distance of 193 miles. Later, in 1867, the company reorganized under the name "Pan Handle" and upon its completion was leased to the Pennsylvania Railroad. This railroad crosses Licking County from east to west, with extensive cuts in the glacial filled old valley immediately east and west of Hanover.

During this early period of increasing industrialization many Ohio cities became interested in projecting lines to the vast coal reserves of the eastern and southeastern parts of the state. One of these roads, the Straitsville, was intended to operate in conjunction with the
Sandusky, Mansfield, and Newark road and was to tap the coal fields of Perry County. Construction of this section began in 1854 and work was pushed forward almost to completion when financial disaster overtook the enterprise, forcing suspension of activities. After 20 years of supposed abandonment, the project was rejuvenated by a group of "coal men" in Newark who had purchased a large section of coal land in Perry County. This road was finally completed just before the great financial panic of 1873 and, although hurting many of the local citizens monetarily, it did enable the city to obtain cheaper coal. Soon after its completion the railroad became the property of the Baltimore and Ohio Company. One branch line follows The North Fork of the Licking, whereas another branch of the same railway extends southward from Newark, rises out of the old valley to higher land, and then crosses Jonathan Creek valley.

In 1870 the last of the railroads through the area covered by this investigation was completed. Terminal points were Toledo and Pomeroy. This railroad, called the Atlantic and Lake Erie, met the usual fate of new roads and was absorbed by a larger company, the Ohio Central, which at present is a division of the New York Central system. It enters the local area from the south near Licking Summit, passes north along the old canal to within three miles of the city, and projects northwest through the towns of Granville, Alexandria, and Johnstown.
Fig. 16. Railroad pattern of the Newark Area.

1. Baltimore & Ohio
2. New York Central
3. Pennsylvania
Rivalry for Ohio's Trade

Three major commercial centers of the mid-Atlantic coast played important roles in the development of Ohio's railway system, with each claiming to be the natural market for western trade. Once the Ohio canals were opened, traffic on the Erie became so congested that all realized the necessity for additional routes. New York strengthened its transportation link through the Mohawk Valley by the addition of a railroad. Both Philadelphia and Baltimore established their first contacts by turnpikes, then made unsuccessful attempts by canals, and still later used the railroads. New Orleans, their competitor to the south, had to rely upon river improvements and more efficient boats.

Although the Baltimore and Ohio, the Pennsylvania, and the New York Central railroads were being extended to the mid-west they did not expect to secure a monopoly of this trade, for New Orleans had been an important market for the areas tributary to the Ohio River. However, the spoilage in transit of large quantities of produce caused many shippers of grain, flour, and provisions to favor the railroads as carriers of their products. The Civil War was also a factor which accelerated the movement of through traffic by trunk lines. Not only was the market for provisions to the south affected by the war, but dangers incident to the arrival of goods were so great that, at the close of the conflict, a considerable amount of former river traffic now moved east over the railroads or over the lake route. After the disastrous effects produced by the Civil War on southbound traffic
the railroads found that, in 1872, they had carried 83 per cent of
the grain and produce from the west to the eastern market. In
1875 the average price received for east-bound freight through Newark
was .757 cents per ton mile. The following table shows the increase
in tonnage and the gradual increase in rates received for transporting
this traffic eastward to the seaboard.

**TABLE 6.**

**TONS OF FREIGHT MOVING EASTWARD THROUGH OHIO FOR SELECTED YEARS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tons moving east through Ohio</th>
<th>Average freight rate per ton mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1870</td>
<td>1,673,000,000</td>
<td>1.993 cents</td>
</tr>
<tr>
<td>1872</td>
<td>2,223,000,000</td>
<td>1.569</td>
</tr>
<tr>
<td>1874</td>
<td>3,717,000,000</td>
<td>1.344</td>
</tr>
<tr>
<td>1876</td>
<td>3,779,000,000</td>
<td>1.117</td>
</tr>
<tr>
<td>1878</td>
<td>4,286,000,000</td>
<td>.961</td>
</tr>
<tr>
<td>1880</td>
<td>6,665,000,000</td>
<td>.816</td>
</tr>
<tr>
<td>1891</td>
<td>11,856,000,000</td>
<td>.682</td>
</tr>
<tr>
<td>1907</td>
<td>21,385,000,000</td>
<td>.276</td>
</tr>
</tbody>
</table>

Source: *Reports of the Railroad Commission*

Influence of the Railroad as a Means of Transportation

The formation of through lines was not wholly a gain to Ohio for
it brought local agriculture into competition with that of cheaper
lands to the west. Although most producers along trunk lines had better
facilities to market their goods, they, in turn, were brought into
more direct competition with eastern centers of production in supplying
both the central and eastern populations. For example, Pennsylvania

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coal could be carried as a return load at cheaper rates and this
affected both the coal mining and manufacturing industries of Ohio.
Cheaper rates available to western producers of grain affected the
state's agriculture, and the cheaper transportation of eastern manu-
factured goods to the west at a time when Ohio was trying to manu-
facture for the western market made it more difficult for this section
to compete with the east. Nevertheless, Ohio, with its abundant
resources and favored location, could compete with eastern manufacture
and, as a result, there was a proportionate decrease in agriculture
and a noticeable upswing in manufacturing.

The introduction and improvement of railroads led to radical
changes in methods of conducting the mercantile business of the Newark
Area, for instead of stocking up for long periods the local merchants
could buy in smaller quantities, have the use of their capital, and
still have enough flexibility to take advantage of favorable changes
in the market. However, Newark lies south of the state's major rail
network. Central Ohio's one important railroad center is Columbus,
33 miles to the west of the city under discussion. Newark's "off-
center" position with respect to the north-south and east-west
transportation alignment has minimized the importance of railroads
in the city's economic development for much of its rail freight is
"through traffic".
CHAPTER V

THE DEVELOPMENT OF AGRICULTURE

Period of Self-Sufficiency, 1800-1840

Woodland Farming

The existence of a forest cover was important to the early settler of the Newark Area. His disposition to neglect the openings or "prairies", except for pasturage, and to clear the woodlands for farming seems, at first glance, to have been unfortunate. However, Americans had been pioneering in the forest lands for almost two centuries and had accumulated a considerable amount of technical knowledge in the processes of girdling, grubbing, logrolling, and the building of log houses.\footnote{Percy Wells Bidwell and John I. Falconer, Agriculture in Northern United States, Washington, D.C., 1925, p. 157.} Clearing of wooded areas had become an accepted practice during this period for the forests furnished logs for houses, fuel for cooking and heating, and material for fencing and for the numerous household furnishings and farm tools. Hall, in his writings of midwestern agriculture, summarized the role of woodland farming in pioneer economy when he wrote:

Not to speak of wooden houses, bridges, and roads - - of wood for fuel and fencing - - we find it adapted in the west for purposes more anomalous, where wooden pins are substituted for nails, and wells are curbed with hollow logs, where the cabin door swinging on wooden
hinges, is fastened with a wooden latch, and the smoke escapes through a wooden chimney. Well may ours be called a wooden country; not merely from the extent of the forests, but because in common use wood has been substituted for a number of the most necessary and common articles — such as stone, iron, and even leather.²

One technique used in this type of farming was the selection of soils according to the type of forest cover. A heavy growth of hardwood was generally regarded as evidence of "strong soil" whereas the soils of the prairie, which grew no timber, were regarded with suspicion.³ High and rolling uplands, covered with a thick growth of oak, were considered the best land for wheat, whereas areas covered with a substantial growth of sugar maple, elm, black walnut, and cherry were believed suitable for other crops.

Moreover, prairie farming required more capital than woodland farming. Whereas the settler of the wooded areas, equipped with an axe and a hoe, could grub out the underbrush, girdle the trees, plant corn and have a good crop the first year, the prairie farmer needed three or four yoke of oxen and a heavy plow, and often had to allow his newly plowed land to remain fallow at least one year, until the grass roots had thoroughly rotted.

The Pioneer Economy

Organization of the farm enterprise was determined by the needs of the family and not by market conditions. A persistent lack of capital, scarcity of labor, and an abundance of relatively cheap land, with almost no market for the plentiful crops — these were the

³Bidwell and Falconer, op. cit., p. 158.
economic conditions faced by the pioneer farmers of east-central Ohio. It was natural that this region should have developed a self-sufficient economy until improved transportation removed the bonds of isolationism imposed by the Appalachian barrier. Fortunately, however, the physical conditions of the Newark Area — climate, topography, and soils — permitted the growth of crops similar to those of the seaboard colonies.

High cost of labor was a constant deterrent to the individual farmer throughout the period of self-sufficiency. So important a factor was the shortage of workers that it may explain, in part, such diverse phenomena as the rise of tenant-farming on a share-crop basis, the cooperation of the pioneers in their log-rollings and husking bees, and the early marriages and large families which were so much a part of frontier life. General farm work was performed by all members of the family who were physically able to make their contribution. Women regularly worked in the fields along side the men, as well as caring for the family vegetable garden, feeding the poultry, milking the cows and churning the butter. Welker, in his writings of the early settler of central Ohio stated:

"Except in a Yankee family no man or boy could be induced to milk the cows, it being regarded as a woman's work. But, wherever a New Englander was found, he and the boys did the 'pailing of the cows'."

In the subsistence farming stage farm labor was essentially that of the family itself. Exceptional jobs, such as the building of a new settler's log-house or harvesting the crops, required a larger work force and oftentimes were done on the "exchange of work" basis.

"Martin Welker, "Farm Life in Central Ohio Sixty Years Ago", Western Reserve Historical Society, Tracts, Vol. 4, 1921, p. 50."
Early Farming Methods

Normal requirements for the Newark pioneer and his family were four or five acres of cleared land, on which a half-acre was devoted to garden vegetables, another half-acre to wheat, and the remainder to corn. Corn was the first crop on the newly-cleared land and was the chief support of the early settlers. Actually the general methods of planting indicate little change from those of the colonial days; corn was planted by hand, covered with a hoe, and cultivated with the one-horse plow or the shovel plow. A few of the more progressive farmers would carefully pick the tops and blades from the stalks, preserving them for the winter fodder, but this system required expensive labor and caused considerable loss of weight of the ears. A new method of cutting and shocking corn and feeding it to the stock in the field was introduced into this region by the settlers from Virginia.

About 1805 the first herd of cattle was successfully driven across the Appalachian Highlands to Baltimore and, from that time until 1850 the practice of "droving" was a regular feature of pioneer farming in central Ohio. Travelers crossing the mountains frequently commented on the great droves of cattle, hogs, and sheep which they met along the way. This practice of moving livestock along the National Road, eight miles south of Newark, enabled the local farmers to sell their corn on the hoof and to obtain much-needed cash.

Trade in agricultural products was not entirely absent from the

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5Bidwell and Falconer, *op. cit.*, p. 166.
6Ibid., p. 170.
Newark Area, even though the crop selection and the domestication of animals were essentially for the production of food for basic family needs. Certain items of high value, such as flour, pork, whiskey, and tobacco were shipped to the New Orleans and eastern seaboard markets as transportation became available. In 1820 the Welsh settlement at Granville first organized a cooperative society, known as the Licking Export Company, for the purpose of marketing their produce. Their first venture was the marketing of hogs which were driven overland to Sandusky, where they were slaughtered and then shipped by boat to Montreal.

Although a few of the local farmers were producing corn in rotation, it was still the common practice, particularly in the Newark Valley, to allow corn to follow corn on the same plot of land year after year. Early records reveal that some of the bottomlands of the Licking River had been cultivated for 40 years without rotation or rest, and still continued to yield from 50 to 70 bushels of corn to the acre. However, on farms of the unglaciated part of Licking County, where wheat was the staple crop, the corn yield was much less.

When the supply of flour and meal was more than sufficient for local needs the products of the mills furnished one of the most dependable sources of income. Grist-mills were more widely distributed than any other type of pioneer manufacturing and, since their efficiency meant so much to the local communities in both food and money, their sites were carefully chosen. Utter, in his discussion of agricultural

activities of Ohio, states that a rather complete report of the milling activities of Licking County was made by a local auditor in 1820 when "a total of 27 mills, several with more than one pair of stones, ground 109,907 bushels of corn, 61,700 bushels of wheat, 24,914 bushels of rye, and 4,520 bushels of barley." Another method of marketing corn was to convert it into whiskey. Utter further states that Licking County had "a total of 38 stills in 1820 which consumed 10,000 bushels of rye and 26,000 bushels of corn, and produced 97,000 gallons of whiskey. Twenty-eight thousand gallons were exported, leaving a net of 69,000 gallons to be consumed by a population of less than 12,000."^8

Cultivation of Yellow-Leaf Tobacco. Hewells reported the cultivation of yellow-leaf tobacco in the hilly region of Ohio, centering around Licking, Perry, and Muskingum Counties as early as 1825.10 This particular variety was brought into the Newark Area by settlers from Maryland, and differed from the Virginia crop in that it was a lighter and finer plant. Although tobacco prices were high during this period, and the local tobacco farmer cleared large profits, he often neglected his other crops. Most of the demand for the yellow-leaf came from Europe where it was consumed by the more wealthy classes. However, the market proved inelastic and within a few years became so over-stocked that prices fell from $6. to $4.0. per hundred-weight to


Ibid., p. 246.

^10 William C. Hewells, Recollection of Life in Ohio, New York, 1895, p. 131.
between $2. and $3. per hundred-weight, and tobacco was never again an important crop of the Newark Area.

Wheat. Wheat was the cash crop of this region. Francois A. Michaux, as early as 1802, wrote that "the Americans of the interior cultivate wheat rather for speculation, in order to send the flour made from it to the seaports, than for their private consumption, because nine-tenths of them use bread made of corn." During the first half of the nineteenth century the Licking County was a part of Ohio's major wheat producing region, the so-called "Old Backbone", a strip of land located along the major drainage divide of the state and which included Knox, Richland, Ashland, Wayne, Stark, Muskingum, Fairfield, and Belmont, as well as the local area. By 1840 the western frontier had so expanded that commercial production was already divided between the regions east and west of the mountains; New York, Pennsylvania, Virginia, and Ohio were leading states at that date, with Ohio ranking first.

According to Utter in his report of the frontier state, methods of wheat farming varied amongst the early settlers but most farmers agreed that it was not a good practice to plant wheat on newly cleared land, believing that crops of corn, oats, or buckwheat should be raised first to "tame" the soil. Little attention was paid to crop rotation but a practice of summer-fallowing, inherited from England, was used.

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11American Farmer, 1825, pp. 348-411.
13U.S. Census, 1840.
14Utter, op. cit., p. 163.
to improve the soil and kill the weeds. Although wheat and corn were frequently grown successively on the same land, it was discovered early that wheat raised on the bottomlands of the Licking and its tributaries was often so heavy in the head that it went down before harvesting. For this reason wheat farmers who entered the area from Pennsylvania almost invariably selected the heavily timbered white oak land of the uplands rather than the more fertile bottomlands of the Licking.

Transitional Period, 1840-1860

Evidence and Extent of the Change

A transition from self-sufficient economy to commercial agriculture was not easily accomplished for the powerful forces of habit and tradition tended to keep the farmers conservative in methods of producing what they needed for their own use and many were slow to see the need for change. Agriculture as a business was further impeded by the lack of working capital. In many instances the farmers themselves were to blame since surplus funds were too often used to purchase more land, or were invested in outside enterprises rather than being used to increase productivity on the farm itself. A decline of the household industries occurred during this same interval of time. As soon as cash could be obtained from sales of wool, grain, whiskey, pork, or beef, the farmers began purchasing goods that they formerly produced at home.

As self-sufficiency gave way to commercial agriculture there were

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changes, not only in methods of securing a living, but also in the ways of thinking and of living. To the relatively simple qualities of hard work and saving there was added shrewdness in buying and selling; to the already attendant risks of weather conditions was added the risk of price fluctuations.

Transportation as a Controlling Factor

The major limiting factor which confronted the farmer of the Newark Area was the lack of a market. Seasonal use of both the rivers and the early roads, the length of journey, together with an uncertainty of profits discouraged any great export trade and prices for farm products remained low for many years. Encouraged by New York's experience with the Erie Canal, Ohio's inland communities, including Newark, hoped to dispel isolation by the construction of canals which would give them Great Lakes-Ohio River accessibility, thus expanding their markets. For 30 years (1830-1860) the Ohio Canal was an important factor in increasing commerce, industry, population, as well as agricultural production of the local area.

Farming -- A Business, 1850-1900

Trends towards Diversification in Ohio

At no time has Ohio occupied a more significant position as an agricultural state than in 1850 when it ranked first in the production of corn and wool, and second in wheat. In numbers of horses and sheep Ohio led all other states, held second place in

cattle and milk cows, fourth in hogs, and third as a producer of oats and potatoes. Truly Ohio was the leading farm state at the middle of the nineteenth century, at least in diversified agriculture, and the area under discussion was especially representative of such diversity.

TABLE 7.

<table>
<thead>
<tr>
<th></th>
<th>Rank in 1850</th>
<th>Rank in 1860</th>
<th>Rank in 1870</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Corn</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Oats</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Potatoes</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Wool</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sheep</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Horses (on farms)</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Milch cows</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Other cows</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Hogs</td>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Value of</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>improved lands</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Although by 1860 Ohio had dropped from first to second place as a corn-producing state, from second to fourth in wheat production, and from fourth to sixth in number of hogs, it maintained its leadership in horses and sheep and remained second in milk cows. Actually the state had not declined in production but had been overtaken by its Mississippi Valley rivals as the agricultural center of the United States moved westward to the prairies.

More significant changes, however, were occurring in markets than in production, for wheat, flour, and livestock moved eastward by rail. Even though the great trunk lines brought Texas cattle, trans-Mississippi wool, and northwestern grain into competition with Ohio products in the eastern markets the more efficient mode of transport added to the value of Ohio farms and farm products by breaking down the economic isolation of many communities thus enabling the farmers to reach a market.19

Diversity in the Newark Area

Sectionalism of production, a feature of Ohio agriculture during the first half of the century, had become of minor importance by 1870. Licking County, along with other counties of the old "back-bone" wheat region, lost its position as a major wheat producer to the Miami Valley. Although damage inflicted by the Hessian fly and the wheat midge as well as unfavorable weather conditions were factors contributing to acreage reduction in the Newark Area they were not, in themselves, sufficient reasons for the decrease. Average yields had decreased and cost had increased on the older farming areas. A more intensive preparation of the soil was accomplished by the addition of manure, lime, and commercial fertilizers, but this resulted in increased costs.

W.S. Wright has reported the general condition of agriculture in Licking County for the year 1857 as follows: "Wheat, a small crop of not more than 10 bushels per acre; corn, one-half the average in quantity, but better in quality; oats, one-fourth the average crop;
fruit, very little, with not more than one-fourth the best year; and woodland, most valuable along the railroads.\textsuperscript{20} He further stated that the principal local causes for this decline were the cold of April and the canker worms which damaged the apple trees.\textsuperscript{21}

Staple crops of corn, wheat, oats, and hay, along with a livestock economy of cattle, sheep, and hogs, continued to represent farming activities of the Newark Area. Instead of a specialized crop a number of varied farm products found a market in the nearby trade centers of Columbus, Zanesville, and Lancaster, as well as Newark. During the latter half of the nineteenth century the industrial revolution was well underway within this region, and industrialization meant urbanization, which in turn, created markets for farm products.

\textbf{TABLE 8.}

\textbf{STATISTICS OF LICKING COUNTY LIVESTOCK}

<table>
<thead>
<tr>
<th>Number</th>
<th>Rank in Ohio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horses</td>
<td>14,655</td>
</tr>
<tr>
<td>Cattle</td>
<td>33,107</td>
</tr>
<tr>
<td>Hogs</td>
<td>48,219</td>
</tr>
<tr>
<td>Sheep</td>
<td>169,697</td>
</tr>
</tbody>
</table>


Other Changes

During this period the average size of an Ohio farm decreased in total acreage from 110.3 acres, in 1880, to 88.5 acres at the turn of

\textsuperscript{20}\textit{Second Annual Report of the Commissioner of Statistics}, Columbus, Ohio, 1859, p.66.
\textsuperscript{21}\textit{Ibid.}, p. 66.
the century, whereas the number of farms steadily increased from 195,000 to 276,000. Within the same interval of time the average farm of the Newark Area decreased from 114.5 acres to 93.5 acres, whereas the total number of farms showed a slight increase from 4,003 to 4,458. By this time some farmers were learning the merits of quality farming and that the expansion of production could be achieved by increasing the yield per acre through the use of power machinery, more fertilizer, and other improvements in technique.

### Table 9

**Agricultural Statistics of Licking County**

<table>
<thead>
<tr>
<th></th>
<th>1880</th>
<th>1890</th>
<th>1900</th>
<th>1910</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land in farms</td>
<td>458,324</td>
<td>405,269</td>
<td>417,030</td>
<td>414,806</td>
</tr>
<tr>
<td>Improved land in farms</td>
<td>339,796</td>
<td>353,122</td>
<td>357,029</td>
<td></td>
</tr>
<tr>
<td>Woodland in farms</td>
<td>79,709</td>
<td>65,673</td>
<td>63,618</td>
<td>13,247</td>
</tr>
<tr>
<td>Other improved land</td>
<td>114.5</td>
<td>104.2</td>
<td>93.5</td>
<td>96.3</td>
</tr>
<tr>
<td>Area of average farm (Acres)</td>
<td>114.5</td>
<td>104.2</td>
<td>93.5</td>
<td>96.3</td>
</tr>
<tr>
<td>Total number of farms (No.)</td>
<td>4,003</td>
<td>3,889</td>
<td>4,458</td>
<td>4,307</td>
</tr>
<tr>
<td>Improved Land per farm (Acres)</td>
<td>93.4</td>
<td>87.4</td>
<td>79.3</td>
<td>83.1</td>
</tr>
</tbody>
</table>

*Source: U.S. Census reports.*
Agriculture in a Period of Industrial Growth, 1900-1950

A series of widespread changes occurred in Ohio agriculture during the first half of the twentieth century. Expanding industrial employment made fundamental changes in agriculture. As Falconer has stated, "Probably no period of equal length has seen in Ohio a greater advance in the facilities for farm life than the period since 1900."\(^{22}\) Changes in farm organization, farming practices, farm living, and marketing reflect the progress of twentieth century agriculture in Ohio just as mechanical achievements had characterized the post Civil War period.

The rapid increase in urbanization was in part at the expense of the rural population. But 15 per cent of the people were living on farms in 1930 as compared with 33 per cent in 1900. Increased use of power machinery was permitted by the nature of the crops grown and the terrain, but was compelled by higher wages. The output per farm worker increased by fully 40 per cent. According to Wright\(^{23}\) the number of acres farmed by each farmer increased by 26 acres in 1900, 30 in 1920, 35.7 in 1940, and 41 in 1950. Although tractors made their appearance on Ohio farms during World War I it was another 20 years before their use was dominant. By 1938 a farmer could plow seven acres per day as compared to two acres plowed with a team of horses in 1900.

Numerous changes were bringing the farmer in closer contact

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\(^{22}\) John I. Falconer, "Agricultural Changes", in Harlow Lindley's Ohio in The Twentieth Century, Columbus, 1942, p. 120.

\(^{23}\) Alfred J. Wright, Economic Geography of Ohio, Columbus, 1953, p. 32.
with his market. No longer was the market confined to those located near growing cities or near railroad facilities for the hard road and the motor truck greatly expanded the range of market accessibility.

The relative importance of the leading crops of the area under discussion experienced little change during this period, but there has been a definite trend towards decreasing the general crop-producing land and increasing the total acreage of pasture land. In fact, acreages of permanent grassland have exceeded the total crop-land since 1930. Table 10 gives comparative data indicating the land use as reported by the census for the 1924-1944 period. Pasture land reaches its greatest extent in the unglaciated section immediately east of Newark where the production of hay and the raising of sheep became major farming activities. Licking County has ranked as a leader among Ohio counties in numbers of sheep since 1860.

TABLE 10.

CLASSES OF LAND, ACCORDING TO USE, IN SELECTED YEARS, LICKING COUNTY

<table>
<thead>
<tr>
<th>Class</th>
<th>1924</th>
<th>1934</th>
<th>1944</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop land, total</td>
<td>182,163</td>
<td>179,590</td>
<td>178,080</td>
</tr>
<tr>
<td>Harvested</td>
<td>174,218</td>
<td>167,932</td>
<td>171,091</td>
</tr>
<tr>
<td>Crop failure</td>
<td>3,248</td>
<td>3,315</td>
<td>4,727</td>
</tr>
<tr>
<td>Pasture land, total</td>
<td>179,297</td>
<td>193,693</td>
<td></td>
</tr>
<tr>
<td>Plowable</td>
<td>120,889</td>
<td>123,576</td>
<td>129,196</td>
</tr>
<tr>
<td>Woodland</td>
<td>24,530</td>
<td>27,653</td>
<td>22,314</td>
</tr>
<tr>
<td>Other</td>
<td>33,878</td>
<td>42,653</td>
<td></td>
</tr>
<tr>
<td>Woodland not in pasture</td>
<td>15,630</td>
<td>15,930</td>
<td>19,672</td>
</tr>
<tr>
<td>All other land</td>
<td>19,550</td>
<td>18,120</td>
<td></td>
</tr>
</tbody>
</table>

Land Utilization

An inspection of crop patterns reveals a close correspondence with soil types. This is not surprising in view of the glacial history and relief; exceptions related to drainage are minor.

One of the most extensive groups of soils is the Alexandria silt loam which, with 12 per cent of the total county acreage, occupies parts of Washington, Burlington, McKeen, and Liberty Townships, as well as small areas along South Fork and Raccoon Creek. Approximately three-fifths of the region is kept in hay and pasture and the remainder is used for corn, wheat, and oats. On the average farm yields of hay range from one to one and one-half tons an acre, corn from 60 to 85 bushels, wheat from 10 to 30, and oats from 40 to 70 bushels. Potatoes are often the only field crop yielding a cash return since most of the hay, oats, and corn produced are fed to livestock, but a steady additional cash income is derived from the sale of dairy products and eggs. Farming in this section has been below that of the pre-World War II period and many of the formerly productive fields are growing up in weeds, briars, vines, and low-grade grasses.

Cardington silt loam, with 9.9 per cent of the total county acreage, is most extensive in the western part of Licking County, and is one of the dominant light-colored soils of the uplands. Corn, wheat, and oats occupy the largest acreage of cultivated land, with corn yields averaging from 25 to 60 bushels an acre.

24 Ibid., p. 24.
Fig. 17. Thomas Hislop Farm - contour strips and pasture improvement.
wheat from 10 to 20 bushels, and oats from 20 to 50 bushels. More
than 50 per cent of the cleared land is in pasture and hay, with the
latter, generally timothy and alsike clover, alone or mixed, aver­
ing one to one and one-half tons to the acre.

Marengo silty clay loam occupies 9.4 per cent of the Newark
Area and is located along the western edge of Licking County. Al­
though the Marengo is one of the best corn soils in the area it is
often planted to oats and wheat as part of the crop rotation and is
excellent for hay, producing high yields of timothy and alsike clover.
Tilling is necessary on this soil, and once the land has been adequately
drained, corn production may run as high 100 bushels to the acre.

Bennington silt loam, which occurs on the poorly drained and
more level areas of the till plain, comprises 13.1 per cent of the
total county acreage. About 10 per cent of this area is covered by
timber, whereas the remainder is classified as pasture, idle, and
hay. But 25 per cent is devoted to cultivated crops. Under
normal conditions crop yields are lower on the Bennington, with corn
averaging from 20 to 40 bushels an acre, wheat 10 bushels, and oats
from 25 to 30 bushels and, without tiling, these yields become even
lower.

East of Newark the Muskingum soils dominate the hilly unglaciated
section and comprise 14.1 per cent of the total county acreage. Agri­
culture is not so extensive in this area as in the western part of
the county for unfavorable relief has limited farming activities to
the more level ridge tops and the bottomlands. A smooth phase of the

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25 United States Census Reports
Fig. 18. Gaile Davies farm - woodland management, contour strips, and reforestation.
Muskingum occurs in Hopewell Township, just north of Gratiot, and, although limited in areal extent, relief favors farming operations and the use of power machinery. Here crop yields run higher than on the typical Muskingum soil which produces 25 to 30 bushels of corn to the acre, 10 to 12 bushels of wheat, and 25 to 35 bushels of oats. The most practical use for the hilly and steep land included in this region is the production of timber and pasture since some places have a gradient of 30° or more.

Soils developed from stratified deposits occur on terraces and outwash plains and constitute some of the most productive agricultural land of the area. Chenango silt loam, which makes up six per cent of the total county area, reaches its greatest development in the vicinity of Newark and Utica along the Licking and its tributaries, with scattered sections near Alexandria, Pataskala, and Kirksville. Soil fertility, ease of cultivation, and favorable surface features have promoted higher yields on this soil than the average for the county, with corn producing 50 to 75 bushels an acre, wheat 15 to 30 bushels, oats 25 to 40 bushels, and hay about one and one-half tons. Farms in this area are generally prosperous and well-managed.

Soils of the alluvial flood plains, although occupying but six per cent of the total area, are important agriculturally because of their fertility. Chagrin silt loam lies along the bottomlands of the Licking and is utilized largely for the production of corn, with yields ranging from 75 to 100 bushels an acre. Frequent inundations of the flood plains may favor or limit productivity of these areas, depending on the timing and severity of the floods. Enrichment of the land

27 Ibid., p. 36.
Fig. 19. Orville Scott farm - pasture improvement, diversions, and pond.
at each overflow lessens fertilizer requirements, yet saturation and waterlogging may render them useless for crop production unless planting is delayed until after the danger of spring flooding has past. Low areas along the streams support a good natural cover of white clover and bluegrass, whereas wheat and oats are confined to the higher benches where there is less likelihood of flooding.

Agricultural Economy

According to a recent survey by Westcott and Falconer the total farm income for Licking County in 1950 was $11,623,600, of which $11,521,500 was income from sales and the remaining $102,100 was government payments. Dairying is the chief source of farm income, with 35 per cent of the total, and hogs rank second, with 18 per cent. Terms used to describe the agricultural economy of the Newark Area, such as "general", "dairying", and "livestock" suggest the character of agriculture locally. Figure 20 which is based upon the sources of cash income received by farmers of east-central Ohio, substantiates this trend. The transitional character of the area is revealed by an examination of the local average incomes as compared with those of counties to the west and to the east. Licking County, in 1950, reported an average income per acre of $36.34, whereas Franklin County reported $55.69 and Muskingum County $20.37. Such

28 E.R. Westcott and J.I. Falconer, Estimated Gross Cash Income to Ohio Farmers from the Sale of Agricultural Products and from Government Payments, by Counties, 1950, Mimeograph Bulletin No. 228, Department of Agricultural Economics & Rural Sociology, Ohio State University and Ohio Agricultural Experiment Station, Columbus, 1951, p. 11.
TABLE 11.


Rank and percent of income from sales for each of the major enterprises

<table>
<thead>
<tr>
<th>District and County</th>
<th>Income from Sales</th>
<th>First Pct. of total</th>
<th>Second Pct. of total</th>
<th>Third Pct. of total</th>
<th>Fourth Pct. of total</th>
<th>Fifth Pct. of total</th>
<th>Sixth Pct. of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td>$11,785,200</td>
<td>Dairy 39 Hogs 21 Poultry 9 Soybeans 7 Wheat 6 Cattle 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairfield</td>
<td>12,481,900</td>
<td>Hogs 30 Dairy 25 Cattle 11 Wheat 10 Poultry 10 Corn 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Franklin</td>
<td>11,219,500</td>
<td>Dairy 27 Hogs 25 Poultry 8 Wheat 8 Soybeans 8 Cattle 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knox</td>
<td>10,450,700</td>
<td>Dairy 32 Hogs 20 Poultry 16 Wheat 10 Sheep 7 Cattle 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licking</td>
<td>11,521,500</td>
<td>Dairy 35 Hogs 18 Cattle 11 Poultry 11 Wheat 7 Corn 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coshocton</td>
<td>7,238,400</td>
<td>Dairy 36 Hogs 21 Poultry 13 Cattle 11 Wheat 7 Sheep 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muskingum</td>
<td>6,980,300</td>
<td>Dairy 34 Hogs 17 Poultry 14 Cattle 14 Corn 6 Sheep 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perry</td>
<td>4,993,700</td>
<td>Dairy 26 Hogs 25 Cattle 19 Poultry 15 Corn 5 Wheat 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: E.R. Westcott and J.I. Falconer, *Estimated Gross Cash Income to Ohio Farmers from the Sale of Agricultural Products and from Government Payments, by Counties*, 1950. Mimeograph Bulletin No. 228, Department of Agricultural Economics & Rural Sociology, Ohio State University and Ohio Agricultural Experiment Station, Columbus, Ohio, 1951, p. 7.
figures reflect the dual character of the conditions: the permissive factors of the physical landscape, such as soils and slope, and the compelling factors of an economy where urbanism and industrialisation affect the value of crops and farmlands.

The Influence of Location upon Cropping Systems

Even though a large number of the farms of the area under discussion includes different kinds of soils the same general system of farming prevailed until the early 1940's. In view of the complexity of soils and the different results obtained the question is raised: "Why did similar practices and systems of farming exist within the area for such a long period?" An examination and comparison of the position of the Newark Area with respect to other systems of farming practiced within the state may serve to explain the influence the various systems have had on farming methods within the area of this study.

Newark is located on the eastern edge of the American Corn Belt. The best corn yields of the local area are those produced on soils having a high humus and moderately high lime content. Such soils, however, occur only in limited areas in the vicinity of Newark, but those sections of the Corn Belt proper, with their high average yields, tend to influence the extension of acreage to other soils. Thus Newark lies in a transitional zone; the western part of its environs is best suited to corn and production diminishes towards the eastern unglaciated section. This transitional character is further revealed in the method of feeding corn to both hogs and dairy cattle, instead of feeding the cereal to hogs alone, as the common practice of the Corn Belt proper.
Wheat is centered in the same general part of the Newark Area as corn for wheat serves as an excellent nurse crop for hay in the rotation system. Total wheat acreages are conditioned by such factors as unfavorable weather, plant diseases, and fluctuating market prices, so the amount of land devoted to this crop varies from year to year. Although some of the local soils have the necessary physical properties for moderate wheat production they require the addition of fertilizers for the best results.

Finally, the oat belt of Ohio lies in the northern half of the state, with the Newark Area again occupying a location marginal to major areas of concentration.

The marginal location of the Newark Area with respect to major crop belts of the state, the complexity of soils, and the varied surface features represented are factors which necessitate a method of planning the individual farm, rather than a general acceptance of the prevalent systems of agriculture. Such a system of scientific planning was afforded the farmers of Licking County in 1939 when the Soil Conservation Service established a Civilian Conservation Corps camp on the outskirts of the city. Although the CCC program was dissolved two years later the Soil Conservation District system was continued, and has been most effective in providing the farmer with information and has actively aided him in formulating cropping programs designed for his particular farm.
A Case Study of Soil Conservation

An examination of the conservation program as developed on the John Rodman and Robert Latham farms (See Fig. 23) may serve to explain the necessity for farm planning in the Newark Area. The procedure and methods of planning followed on these adjoining farms are typical of any farm operating under the present Licking District conservation program.

After Rodman and Latham had submitted their applications to the local soil conservation district planners, a soil scientist prepared a survey map of both farms which showed steepness of slope, percentage of soil loss, soil type, and present land use (See Fig. 22). Information on this map was used by the local district planners to prepare a land capability map which showed classes of land according to their capacity to produce.

Rodman and Latham, with the local conservation agent acting as technical adviser, then worked out the most logical field arrangement for a sustained maximum production. Fields 3, 6, 11, 12 and 15 were continued as cropland and farmed on a four-year rotation of corn, small grain, meadow and meadow. The entire section was contour strip cropped as a two-unit system, using fields 3, 6, and 12 as one, and fields 11 and 15 as the other. Each unit was farmed in alternate strips of corn and meadow or wheat and meadow, alternating the corn and wheat from one unit to the other each year. A diversion terrace was constructed in field 15, just below the new line fence (See Fig. 20), with sodded terrace outlet to take care of excess water. Fields 4 and 13 were converted from cropland to semi-permanent meadow and used for the production of hay. Both fields were on slopes too steep for crops. Fields 2, 8,
9, and 14 were designated as permanent pasture land. Diversion terraces were constructed in field 9 as indicated on the land use map and served as a protective measure for the cropland below. Fields 5 and 16 were converted from idleland and field 7 was converted from cropland to a wildlife refuge. Such areas are managed to produce food and cover for useful kinds of wildlife which will, in turn, improve pollination of legumes and fruits, help control insect pests, and provide recreation and food. Since the farm spring had proved unreliable, both men decided to construct a pond in field 7 to water the livestock and to provide fire protection, recreation, and food.

In 1946, these adjoining farms, totaling 208 acres, were scarred with deep gullies and about the only plants thriving were poverty grass and broomsedge. By 1952 both were showing definite signs of a comeback - both in crop returns and general rehabilitation. Wheat yields have more than tripled. Corn yields, which were averaging from 15 to 20 bushels per acre before the "facelifting" operations were put into effect, are approximating 50 bushels to the acre. Contour strips have handled the rainfall so effectively that there is no longer need to install mechanical devices for the control of runoff.

Even though it will take more money, careful planning, and continued hard labor to keep erosion at a minimum on their farms, both Rodman and Latham remain enthusiastic and take great pride in seeing their conservation programs develop. By September of 1952 a total of 500 farmers of the Newark Area were cooperating in the local district program of putting conservation on the land.
Fig. 21. Original field layout map of the Rodman and Latham farms.
Fig. 22. Soil conservation survey map of the Rodman and Latham farms.
Fig. 23. Conservation plan map of the Rodman and Latham farms.
Fig. 34. Reconnaissance survey map: Licking County Conservation District.
<table>
<thead>
<tr>
<th>Farm No.</th>
<th>Farm Name and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ohio Hybrid Research Farm - machinery, demonstrations, and experimental plots.</td>
</tr>
<tr>
<td>2.</td>
<td>Harry Roberts Farm - tile drainage system.</td>
</tr>
<tr>
<td>3.</td>
<td>P. E. Grubb Farm - hybrid corn plant.</td>
</tr>
<tr>
<td>5.</td>
<td>Lester Mitchell Farm - contour strips and drainage.</td>
</tr>
<tr>
<td>6.</td>
<td>George Smith Farm - contour strips.</td>
</tr>
<tr>
<td>7.</td>
<td>Ralph Amore Farm - contour strips.</td>
</tr>
<tr>
<td>8.</td>
<td>Allen McClelland Farm - contour strips.</td>
</tr>
<tr>
<td>9.</td>
<td>Elmer Smith Farm - pond and drainage.</td>
</tr>
<tr>
<td>11.</td>
<td>Keith Warner Farm - strips, diversions, trees and pond.</td>
</tr>
<tr>
<td>12.</td>
<td>Gail Davis Farm - trees.</td>
</tr>
<tr>
<td>13.</td>
<td>Thomas Hislop Farm - contour strips and pasture improvement.</td>
</tr>
<tr>
<td>14.</td>
<td>Orville Scott Farm - strips, pond and trees.</td>
</tr>
<tr>
<td>15.</td>
<td>Wendell Stevens Farm - trees, tile drainage.</td>
</tr>
<tr>
<td>16.</td>
<td>Russell Hoar Farm - strips and pond.</td>
</tr>
<tr>
<td>17.</td>
<td>John Goldsberry Farm - pond.</td>
</tr>
<tr>
<td>18.</td>
<td>J. E. Van Fossen Farm - hybrid corn, meadows and pond.</td>
</tr>
<tr>
<td>19.</td>
<td>M. S. Edmunds Farm - contour strips, diversions.</td>
</tr>
<tr>
<td>20.</td>
<td>Cyrus Martin Farm - contour strips, diversions.</td>
</tr>
<tr>
<td>22.</td>
<td>Price Fruit Farm - Orchard, pond, woodland management, reforestation.</td>
</tr>
<tr>
<td>23.</td>
<td>Forest Ashcraft Farm - pond, reforestation.</td>
</tr>
<tr>
<td>24.</td>
<td>Earl Divan Farm - contour strips, waterways.</td>
</tr>
<tr>
<td>26.</td>
<td>Wilbert Claggett Farm - contour strips, diversions.</td>
</tr>
<tr>
<td>27.</td>
<td>K. D. Hoover Farm - contour strips, diversions, woodland management, and pasture improvement.</td>
</tr>
<tr>
<td>29.</td>
<td>Russell Fairall Farm - meadow, pasture improvement, pond, diversions, and reforestation.</td>
</tr>
<tr>
<td>30.</td>
<td>Marie Hickey Farm - contour strips, woodland management.</td>
</tr>
<tr>
<td>32.</td>
<td>Forest Morrison Farm - contour strips, diversions.</td>
</tr>
<tr>
<td>33.</td>
<td>J. Criss-Parley Ogg Farms - contour strips, diversions, pond, reforestation, woodland management.</td>
</tr>
<tr>
<td>34.</td>
<td>Rodman-Latham Farms - contour strips, pond, woodland management.</td>
</tr>
<tr>
<td>Practice</td>
<td>Acres/FT</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Strip cropping</td>
<td>7,003</td>
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<tr>
<td>Pasture improvement</td>
<td>1,892</td>
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<tr>
<td>Wildlife area improvement</td>
<td>50</td>
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<tr>
<td>Wildlife management</td>
<td>871</td>
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<tr>
<td>Tree planting</td>
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<tr>
<td>Farm ponds</td>
<td>48</td>
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<tr>
<td>Terraces</td>
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<tr>
<td>Field diversions</td>
<td>20.0</td>
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<tr>
<td>Protected woodlots</td>
<td>1,103</td>
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<tr>
<td>Field reorganization</td>
<td>3,936</td>
</tr>
<tr>
<td>Waterways</td>
<td>3.2</td>
</tr>
</tbody>
</table>

*Source: Morton Hamilton, Licking County Conservation Agent.*
CHAPTER VI

INDUSTRIAL DEVELOPMENT OF THE NEWARK AREA

Early Period of Isolation

Prior to the expansion of transportation facilities, the industries of the Newark Area progressed through two stages of development; first, a period in which the household type of industry contributed to the local self-sufficiency, and secondly, a period in which industries based upon the surplus of agricultural products dominated the local manufacturing economy.

The Appalachian Highlands had presented a physical barrier which separated the eastern seaboard states from Ohio and forced the local settlers to rely upon their own initiative and ingenuity to satisfy their needs. Such conditions of self-sufficiency were destined to be short-lived, however, for although these demands were relatively simple, each required the appropriate manufacture.

Types of Early Industries

Agriculture, as could be expected, was by far the leading industry and its success was to a great extent responsible for the introduction and location of a considerable number of manufacturing establishments.

-111-
Early industries, consisting chiefly of grist-mills, saw-mills, distilleries, and iron foundries, reflect the immediate needs of the settlers as well as dependency upon the local environment for their raw materials. Corn was one of the major agricultural products that could be raised in excess of local needs but its characteristic bulkiness limited the distance which it could be transported efficiently to market, so many farmers would convert the crop either to "corn-on-the-hoof" or into whiskey. Lippincott reports that in 1840 the capital investment in the distilleries alone was $834,000 for the five states of Ohio, Indiana, Illinois, Kentucky, and Missouri.  

Saw-logs for the mills came from the nearby forests of poplar, cherry, walnut, ash, oak, and pine. Utter reported a total of 346 sawmills in 18 counties with an annual output of 22,570,000 feet of lumber, which meant an average of about 68,000 feet for each mill. Licking County ranked third with 29 mills, exceeded only by Trumbull County with 47 mills and Green County with 32, each reporting more than two and one-half million feet of lumber.  

Important as were these early industries based on the vast forests of Ohio they were surpassed in significance by the flour-mills, the distilleries, the pork-packing establishments, and other industries which prepared farm products for the market.

The Mary Ann Charcoal Furnace. The Newark Area's first industrial

1 Isaac Lippincott, A History of Manufacturing in the Ohio Valley to the Year 1860, New York, 1914, p. 156.

concern, the Mary Ann charcoal furnace, turned out iron ingots from a limited supply of local ores as early as 1816. Operations began at a location immediately south of a section known locally as "The Narrows" and along both sides of Rocky Fork Creek. The stone stack of the furnace was constructed on the east bank of the floodplain adjacent to a steep hillside which served as a stock-bank on which ore could be conveniently stored and put through steps leading to the smelting. A bridge probably extended from the bank to the top of the stack where the local workers wheeled barrows containing the charge.

In order to operate such a furnace at a profit the early "iron master" must have considered many important items before choosing the actual site of operations. Necessary supplies of ore, flux, and fuel had to be located near each other, as well as near the furnace, to keep transportation costs at a minimum. It was thought necessary to have from 4,000 to 5,000 acres of heavily timbered land properly cared for to provide adequate charcoal supplies. The site of the Mary Ann furnace must have been well chosen for ores both of substantial quality and quantity were found in the local hills. Noyes reports that sandstone was plentiful for construction needs and that year-around water supplies were available.

Products resulting from the casting and forging operations consisted of bar iron, rod iron, stoves, grates, irons, and miscellaneous...
utensils. Stoves and grates were best known of the wares produced for they were of high quality in respect to style and to other details and were sold throughout central Ohio.

Fire finally destroyed the works in 1853, although other forces were emerging which doubtlessly would have caused a cessation of operations. Local ores had already begun to diminish in importance. More significant, however, was the opening two decades later of the valuable Lake Superior ore deposits which were linked to the rich Pennsylvania coal beds by cheap water transportation. Thus an industry of local self-sufficiency, based upon the processing of local raw materials to serve a limited local market yielded to the inter-regional forces of specialization.

Period of Slow Industrial Growth, 1860-1940

During the period between the Civil War and World War II the Newark Area evidenced definite limitations as far as future expansion into the national markets was concerned. Although manufacturing industries tend to become less dependent upon the local environment once an efficient transportation system has been established, those of Newark remained for many years identified with the particular needs of the community.

Resources Favoring Industrial Development

The availability and development of natural resources merit consideration in an evaluation of Newark's manufacturing during this period.

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6For a sample listing of Mary Ann wares, see advertisement, "New Iron Store", The Newark Gazette and Farmer's Journal, May 9, 1838, Newark.
period of slow industrial growth for these were still significant factors of plant location.

Natural Gas. Natural gas was available in central Licking County and, as a source of relatively cheap power, served as an inducement for many early industries to locate in the valley. The first gas well of the area was begun in 1885 and was located on the western edge of the city. After a series of unsuccessful dry runs the drillers finally struck a pocket of substantial capacity on the property of the Everett Glass Company and secured a flow of approximately 300,000 cubic feet per day. By 1889 the supply not only met the demands of the glass plant but was sufficient to warrant piping the gas into the city. During the ensuing fifteen years there were about 24 wells drilled in the immediate vicinity of Newark, but the promise of unlimited cheap power did not materialize, for by 1901, only two of the original wells were still producing, and these at a relatively low rate. Even though the advantage of using local gas as a major source of power was somewhat limited at this time, these early discoveries encouraged further drillings in what proved to be more productive areas to the south and north. Accessibility to gas favored plant location for a number of years.

With a decrease in local production the city was compelled to look elsewhere for a supply which fortunately could be obtained from the Thurston Field, located between Lancaster and Newark, or the

Fig. 25. Generalized relationship of the Newark area to Ohio's major coal, gas, and oil fields.
Sugar Grove Field, located immediately southeast of Lancaster. The Logan Natural Gas and Fuel Company, organized in 1894, piped gas both from the Sugar Grove Field, reported to be most productive of central Ohio's natural gas fields, and from the Homer Field, located approximately 15 miles north of Newark.

Coal. Although local coal has been of little value as an industrial fuel the valley corridors to the east and south have facilitated movement of this fuel into the region from the productive fields of eastern and southeastern Ohio. About 1860 coal seams to the southeast of the city were worked for the manufacture of coal oil, but shortly after the more productive Pennsylvania oil fields were in operation the local coal-oil distilleries went out of business.

Ground Water. Ground water resources in the Newark Valley are considered by competent authorities to be good. Both the bedrock formations and overburden of glacial drift have offered excellent sources for farm and domestic use, as well as for local industrial and municipal supplies. Most desirable sources for industrial ground water have been from gravel beds of North Fork and South Fork of the Licking River and along the latter stream just east of the city. In his report concerning Ohio's industrial water supplies, Foulk has stated that the city of Newark, in 1915, secured water from a gravel bed in the north fork of Licking River by extending a perforated suction line into the gravel bar ten feet below the normal level

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8 C. W. Youngquist, Ohio Water Board, personal interview.
of the stream.

Privately-owned ground-water systems are used by 17 industrial and commercial establishments in the area, with pumpage being concentrated in Newark, where 15 systems exist, and at Utica, where two more units were in operation. One local concern, the Licking Laundry Company, used Ohio Canal water before the old canal beds were filled in, and another, A. H. Heisey and Company, manufacturers of glass, used water piped from springs in the nearby hills. Daily requirements of individual plants are low as a whole, although aggregate pumpage of three plants accounts for about 75 per cent of the total. A breakdown of water consumption by type of consumer is as follows:

TABLE 14.

INDUSTRIAL WATER CONSUMPTION, NEWARK, OHIO

<table>
<thead>
<tr>
<th>Gallons per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioning</td>
</tr>
<tr>
<td>Breweries &amp; Bottlers</td>
</tr>
<tr>
<td>Chemical Products</td>
</tr>
<tr>
<td>Dairy Products</td>
</tr>
<tr>
<td>Electrical Appliances</td>
</tr>
<tr>
<td>Food Processing &amp; Storage</td>
</tr>
<tr>
<td>Glass</td>
</tr>
<tr>
<td>Ice</td>
</tr>
<tr>
<td>Irrigation</td>
</tr>
<tr>
<td>Meat Packing</td>
</tr>
<tr>
<td>Refineries</td>
</tr>
<tr>
<td>Rubber</td>
</tr>
</tbody>
</table>

Total - - 4,254,000

Source: C. W. Youngquist, Ohio Water Board

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Industries of the Area

Iron and Iron Products. During the winter of 1868 a group of gentlemen who were stockholders in the Alliance Rolling Mill selected Newark as a new site of operations. Incorporated as a joint stock company under the name of the Newark Rolling Mill, the concern was first put into operation as a merchant-mill, and then was converted into a rail-mill. The plant, which covered an acre of ground, had 12 puddling, six new-rail and two old-rail heating furnaces, six foilers, four engines, a guide and bar mill, together with an 18-inch train having a capacity of approximately 2,000 tons of finished rail per month, and consumed about 14 cars of coal daily. Reorganized in 1872 under the name of the Newark Iron Company, the establishment operated for a time as a rail-mill, manufacturing railroad iron for the Baltimore and Ohio Railroad and its divisions.

Glass. The Newark Star Glass Works began operations in October of 1873 and was located approximately a half-mile north of the present court-house, on the Lake Erie division of the Baltimore and Ohio Railroad. This company made a full line of bottles, fruit-jars, and prescription ware of every description. Sand used in making their glass was white and clear and was shipped into the city from Glenford, a small town located but a few miles away on the Straitsville Railroad.

By the beginning of the present century glass-making had become a major industry of Newark. The American Bottle Company, a ten million dollar corporation with an annual capacity of 300 million bottles,
purchased the Ohio Bottle Company, with factories at Newark, Massillon, and Wooster, Ohio; the Streator Bottle and Glass Company of Streator, Illinois; and the A. Busch Glass Manufacturing Company, with plants at Belleville, Illinois, and St. Louis, Missouri. This vast industry, whose strength lay in its control of the Owens bottle machine, was directed by Mr. E. H. Everett and Mr. A. Busch. Although general offices were in Chicago, the main plant was located in Newark, employing approximately 1,700 people, with a payroll exceeding $75,000 a month. The availability of relatively cheap fuel, natural gas, a rich sand quarry at Black Hand, 16 miles away, together with a central location with respect to markets afforded ample inducement for the selection of Newark as the site for their new plant. Furthermore, Mr. Everett had a major controlling interest in the Licking-Knox County gas fields, largest producers in the state, and also owned the Black Hand sand quarries.

A. H. Heisey and Company, manufacturers of fine table glassware, located in Newark in 1895. This company, with 600 employees and a payroll of $200,000 reported an output of approximately 300,000 barrels of table glassware annually. This is an ideal plant of three-story buildings and occupies six acres of land. Heisey glass has a distinctive color and finish that differ from other wares. The company manufactured all of the Holophane Glass Company's goods during this period, which in itself was an excellent indicator of the quality of its glass. Holophane ware is made primarily to increase the brilliancy of light through glass, which is accomplished by making it with a prism both inside and out. This is manifestly
enhanced by using glass of perfect clearness. After many trials in factories both in the United States and abroad, Holophane selected Heisey glass as being the clearest and most nearly flawless, and gave Heisey exclusive rights to manufacture its ware. The manager, Captain A. H. Heisey, owned extensive gas interests in the area and the company operated with gas from its own field in Union Township, approximately nine miles distant.

Another of the major industries to locate in Newark during this period was the Wehrle Stove Foundry, established in 1883 by Colonel J. C. Wehrle and John Moser. This enterprise attracted little attention during its formative stage as a small foundry on the east side of the city, but when the new site was established adjacent to the railroads, business began to expand. By 1900 this was reputed to be the largest stove foundry in the world, producing one complete stove unit every minute and marketing its products to everyone of the 45 states of the Union (1907). Products of the company consisted of stoves, ranges, and fire-proof safes, the latter feature having been added in 1904, when the Atlas Safe Company of Fostoria, Ohio, was purchased and transferred to Newark. This foundry, as reported by Spencer, was a model plant, with 22 acres of floor space, 15 acres of which were under roof and, when operating at full capacity, employed 3,000 men. In 1906 Wehrle also took advantage of the natural gas development in the area and leased several thousand acres of land for drilling purposes. Entire output from this source was

10 C. H. Spencer, "Industrial Newark", The Ohio Magazine, Vol. 3, Columbus, Ohio, 1907, p. 47.

11 Ibid., p. 48.
consumed in operating the electric and steam power plant as well as in running several gas engines distributed throughout the foundry. By 1907 the total production was 1400 stoves and 35 safes daily. Sales agencies had been established as far west as Denver, east to Portland, Maine, south to New Orleans, and north to Duluth.

Other Types of Industries. During this early period Newark was headquarters for the largest cigar factory in Ohio, the Swisher Brothers, a busy firm which employed approximately 400 and which had a payroll of over a half million dollars a year. Another establishment, the Jewett Car Company, moved its shops from Jewett, Ohio, to Newark in 1900 at the solicitation of the local Board of Trade. Jewett was one of the model car shops in the country, being equipped with modern machinery in both the wood and iron-working departments.

Factors Favoring Industrial Location

The fact that these industries selected Newark for their field of operations makes the conclusion self-evident that certain geographic factors were favorable. Newark was located near the largest natural gas field in this part of Ohio; the city had an excellent water supply for both domestic and industrial usage; it was accessible to extensive coal fields in eastern and southeastern Ohio; its shipping facilities were adequate; and its central location with respect to markets minimized transportation costs.

However, certain factors, non-geographic in nature, must be recognized as having been influential in industrial location at this
time. Many of Newark's industries located there because of the aggressive activities of local industrial leaders. Organized as the Board of Trade (later known as the Chamber of Commerce), this group induced industries to locate by offering substantial sums and on occasion free land. Firms which have located in Newark primarily because of this inducement were: the Jewett Car Company (1900), the Rugg Halter Company (1890), and the Owens-Corning Glass Corporation (1934).

**Recent Changes in the Industrial Development of Newark (1940-1960)**

**Occupational Structure**

Approximately 13,412 people are employed in the manufacturing and industrial services of the Newark trade area. In number of employees the most prominent manufacturing activities are those producing fiberglass, table glassware, and prismatic glass products, whereas those activities associated with metal products rank a close second. Of the total urban population, estimated at 34,000 by the 1950 census, 36 per cent were gainfully employed in seven major industrial groups and divisions, shown in the accompanying Table 15. The percentages of 49, 26, 8, 6, 5, 4, and 2, which represent the relation of the several groups to the total gainfully employed, compares favorably to the occupational structure for Ohio as a whole. This diversity and balance of the employment structure reflects a stability of a rather conservative community which has never experienced spectacular
TABLE 16.

<table>
<thead>
<tr>
<th>Industrial Group</th>
<th>Average Number of Workers</th>
<th>Average Weekly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>6,652</td>
<td>64.11</td>
</tr>
<tr>
<td>Food Products</td>
<td>269</td>
<td>44.29</td>
</tr>
<tr>
<td>Paper Products</td>
<td>328</td>
<td>57.66</td>
</tr>
<tr>
<td>Printing &amp; Publishing</td>
<td>166</td>
<td>59.67</td>
</tr>
<tr>
<td>Chemicals</td>
<td>47</td>
<td>41.58</td>
</tr>
<tr>
<td>Stone, Clay, and Glass Products</td>
<td>3,343</td>
<td>65.27</td>
</tr>
<tr>
<td>Fabricated Metal Products</td>
<td>351</td>
<td>59.12</td>
</tr>
<tr>
<td>Miscellaneous Manufacturing</td>
<td>2,148</td>
<td>67.44</td>
</tr>
<tr>
<td>Transportation and Utilities</td>
<td>1,057</td>
<td>60.05</td>
</tr>
<tr>
<td>Transportation and Allied Services</td>
<td>398</td>
<td>63.33</td>
</tr>
<tr>
<td>Communication &amp; Utilities</td>
<td>659</td>
<td>58.08</td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>3,519</td>
<td>42.13</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>415</td>
<td>49.16</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>3,104</td>
<td>41.19</td>
</tr>
<tr>
<td>Service Industries</td>
<td>820</td>
<td>30.82</td>
</tr>
<tr>
<td>Hotels, Rooming houses</td>
<td>145</td>
<td>26.06</td>
</tr>
<tr>
<td>Personal Services</td>
<td>221</td>
<td>36.76</td>
</tr>
<tr>
<td>Motion Pictures &amp; Amusements</td>
<td>253</td>
<td>23.40</td>
</tr>
<tr>
<td>Other Service Industries</td>
<td>201</td>
<td>37.05</td>
</tr>
<tr>
<td>Mining and Quarrying</td>
<td>528</td>
<td>51.86</td>
</tr>
<tr>
<td>Contract Construction</td>
<td>523</td>
<td>64.97</td>
</tr>
<tr>
<td>Finance, Insurance, Real Estate</td>
<td>270</td>
<td>59.24</td>
</tr>
<tr>
<td>Banks, Securities, and Finance</td>
<td>188</td>
<td>58.86</td>
</tr>
<tr>
<td>Insurance Carriers and Agents</td>
<td>62</td>
<td>70.19</td>
</tr>
<tr>
<td>Real Estate Operators &amp; Agents</td>
<td>20</td>
<td>29.88</td>
</tr>
</tbody>
</table>

Source: Division of Research and Statistics, Ohio Bureau of Unemployment Compensation, Columbus, Ohio.
rises or depressions in the business cycle as have many cities of a more specialized nature.

In Newark, as in most Ohio cities, more people are employed in manufacturing than in any other occupation with this group accounting for 6,652 or almost 50 per cent of the total gainfully employed. Food and kindred products; paper and allied products; printing and publishing; chemicals and allied products; stone, clay, and glass products; fabricated metal products and miscellaneous manufacturing are the significant divisions listed as manufacturing by the Division of Research and Statistics. Average weekly earnings for this group were $64.11 in 1950, with wages paid for the same year totaling $22,117,291.

Second largest occupational group is wholesale and retail trade, which employs 3,519 persons. In the proportion of its workers in trade, 26 per cent, Newark is not unlike other Ohio cities of similar size, and of the two divisions listed, retail trade leads by far with 3,104 persons, followed by wholesale trade, which employs but 415. Average weekly earnings for this group in 1960 was but $42.13 as compared with that of $64.11 for manufacturing, and the total wages paid by trade for the year was $7,708,865.

Transportation and utilities, third largest occupational group in the city, employs 1,067 persons, which approximates eight per cent of the total and is about average for cities of similar size. The two major divisions of this group are transportation and allied

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12 William Papier, Director, Division of Research and Statistics, Ohio Bureau of Unemployment Compensation, personal interview.
services, employing 398, and communication and utilities, which support 669 persons. Average weekly income for this group was $60.06 in 1960, and the total wages paid by transportation and utilities for the year was $3,300,820. The latter figure represents about ten per cent of total wages for the city and indicates the increasing importance of transportation in terms of dollars brought into the Newark Area as well as carriers of raw materials and the finished products.

The fourth largest occupational group is the service industries which employ 820 persons. Motion pictures and amusements, personal services, hotels and rooming houses, and other service industries are the significant divisions of this group. Average weekly earnings for the service industries were $30.82 in 1950, or approximately half that paid factory workers, and total wages paid for the year was $1,314,061, as compared to $22,177,291 paid by manufacturing.

Mining and quarrying, although physically located outside the city proper, is an important occupational group and is considered an integral part of the local industrial structure since its products are raw materials essential to industry plus the fact that its workers live in the city. The Ohio Bureau of Unemployment Compensation reports an average weekly earning of $67.86 in 1950 for this group, with total wages for the year as $1,423,731.\footnote{Ibid., personal interview.}

A group which has gained momentum during the post-war period is contract construction, which employs 623 persons at an average weekly earning of $64.97, a figure which compares favorably with that paid
Fig. 26. Occupational structure: Newark and Ohio
in manufacturing.

Finance, insurance, and real estate comprise the last of the major occupational groups listed. Significant components are: banks, securities, and finance; insurance carriers and agents; and real estate operators and agents, 270 workers in all, with an average weekly earning of $69.24, and total wages paid for the year as $831,729.

Major Industrial Districts

Most important of Newark’s four major industrial districts, in number of factories, is the southwestern industrial area, which contains over two-thirds of the city’s industry. In this section of the city factories have been built near the two railroads, with short spurs connecting them to the main lines. The northern industrial area lies in the broad valley of North Fork of the Licking and its two industries are adjacent to the northern branch of the Baltimore and Ohio Railroad. Two glass plants and a golf club establishment comprise the eastern industrial area. The central industrial area, although most favorably located in respect to the political limits of the city, is least important in number of major industries and is essentially the commercial and political center of Newark.

TABLE 16.

APPROXIMATE PERCENTAGES OF NEWARK’S INDUSTRIAL EMPLOYMENT

<table>
<thead>
<tr>
<th>District</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southwestern Industrial District</td>
<td>45</td>
</tr>
<tr>
<td>Northern Industrial District</td>
<td>40</td>
</tr>
<tr>
<td>Eastern Industrial District</td>
<td>11</td>
</tr>
<tr>
<td>Central Industrial District</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Statistics based on field work data, 1960.
TABLE 17.

NUMBER OF EMPLOYEES IN NEWARK'S INDUSTRIES, 1950 - 51.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Employees</th>
<th>Per cent</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Products</td>
<td>3,230</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Fiberglass products</td>
<td>2,600</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Table glassware</td>
<td>400</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Prismatic glass</td>
<td>220</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Metal Products</td>
<td>2,526</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Stoves</td>
<td>1,123</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Fabricated metal</td>
<td>351</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Aluminum wire &amp; cable</td>
<td>750</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Munitions</td>
<td>250</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Heating apparatus</td>
<td>52</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Paper</td>
<td>328</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Foods</td>
<td>269</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Printing and Publishing</td>
<td>166</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Chemical &amp; allied products</td>
<td>47</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Other industries</td>
<td>96</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>6,652</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Source:**
U.S. Employment Service and contacts with individual factories
Southwestern Industrial District. Approximately 3,200 people are employed in the 20 factories of the southwestern industrial area and more than two-thirds of them are associated with metal goods. No other district is represented by such a diversity of products: stoves, fabricated structural steel, heating apparatus, aluminum wire and cable, and petroleum refining. This area has a definite linear pattern of industry with solid industrial belts paralleling the two railroads which lead into the city from the south and southwest. Higher and more nearly level land, unrestricted by valley walls, makes this an attractive area for industrial expansion and many of the post-war factories are locating here.

There are several large factories in this section of Newark. Here is the city's second largest plant, the Newark Stove Company, which employs over a thousand people producing stoves, vertical heaters, and electric roasters for the Sears, Roebuck and Company. Perhaps the plant which has had the most spectacular development during the World War II and post-war years is the Kaiser Aluminum and Chemical Corporation, a "war-baby" purchased from the War Assets Administration in 1949, and producer of aluminum wire and cable. Although the process of manufacture is an almost continuous, fully automatic operation, the average number of employees in 1950 was 760 and, with the expansion of new products, the number of workers is increasing yearly. A recent addition to Newark's industrial community, the Timken-Detroit Axle Company's new Ohio Axle and Gear Division, has started production
of axles and transfer cases for military trucks and, at full capacity, will employ approximately 1,600 persons.

Northern Industrial District. Although containing but three of Newark's 31 major industries, the northern industrial area is conspicuous in total number of persons employed. Here is the Owens-Corning Fiberglas Company, employers of approximately 2600 workers and producers of insulation for home appliances, as well as for building construction. One of the older establishments of the city, the E. T. Rugg and Company, is a manufacturer of cordage, twine, and lawnmowers. The Kilgore Manufacturing Company, which employed 350 persons when forced out of business by the disastrous munitions explosion at South Amboy, New Jersey, produced hand and rifle grenades and anti-personnel mines for military use.

Eastern Industrial District. This industrial section lies in the broad valley of the Licking, just east of the North and South Fork junction. Its three major factories occupy adjacent sites flanking the Pennsylvania Railroad. Only 700 people are employed by its industries, yet this is perhaps the most homogeneous collection of factories in Newark, since two of the three plants are associated with glass products. The other establishment, Burke Golf Incorporated, is the fourth largest manufacturer of golf equipment in the country.

Central Industrial District. Within the downtown business district,
Fig. 27. Aerial photograph of Newark, Ohio.
and surrounding the original city square, are numerous small factories of diverse types: manufacturers of pharmaceutical products, a brewing company, a newspaper plant, and a number of printing shops. Numerous trucking terminals and warehouses occupy its southern limits immediately north of the east-west rail-lines.

Leading Industries of Newark

**Glass Products.** Because of a wide range of products and variance in size of markets, the glass industry is not homogeneous but comprises three distinct industries, even though the fundamental technology is the same.\(^{14}\) Two of the three divisions are represented in Newark: the glass container industry, manufacturer of containers for food, beverage, and other industries; and the pressed and blown glassware industry, producers of a wide range of products including tableware, lighting ware, and technical and scientific glassware. The relative importance of each of the three divisions for the United States as a whole is shown in the table on page 135.

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TABLE 18.

AN EVALUATION OF THREE DIVISIONS OF THE GLASS INDUSTRY

<table>
<thead>
<tr>
<th></th>
<th>No. of establishments</th>
<th>No. of workers</th>
<th>Wages: ( \text{\textdollar}000,000 )</th>
<th>Cost of materials omitted ( \text{\textdollar}000,000 )</th>
<th>Value added ( \text{\textdollar}000,000 )</th>
<th>Value of products ( \text{\textdollar}000,000 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressed and blown glassware</td>
<td>126</td>
<td>42,170</td>
<td>$104</td>
<td>$70</td>
<td>$169</td>
<td>$235</td>
</tr>
<tr>
<td>Glass Container industry</td>
<td>87</td>
<td>47,132</td>
<td>$127</td>
<td>$192</td>
<td>$252</td>
<td>$422</td>
</tr>
<tr>
<td>Flat Glass industry</td>
<td>34</td>
<td>27,241</td>
<td>$84</td>
<td>$69</td>
<td>$174</td>
<td>$243</td>
</tr>
</tbody>
</table>

Source: Census of Manufacturers, 1947.

The pressed and blown glassware industry has the most establishments, ranks second in number of workers, and last in value added and value of product. Its representative in Newark is the A. H. Heisey and Company, manufacturers of fine table glassware and one of the older industrial establishments of the community, having located in the city in 1895. This company, with a payroll of $200,000 and an employment of from 500 to 600 people, reports an output of 300,000 barrels of table glassware annually during its period of operation. At one time Heisey manufactured all the glass that Holophane used but today the company does not subcontract.

Competition in this industry is keen. Since wages represent such a large proportion of total costs and are so much higher than wages paid in foreign countries, the industry is extremely sensitive to changes in tariff rates. In the Tariff Act of 1930 the duty on

\[ T. \, C. \, Heisey, \, A. \, H. \, Heisey \, and \, Company, \, personal \, interview. \]
imported handmade glassware averaged 60 per cent ad valorem (country of foreign origin). In agreements negotiated under the Trade Agree­ments Act rates have been reduced from 25 to 50 per cent, but a substantial devaluation of foreign currencies could, in effect, wipe out the existing tariff protection of some of the industries.

Since the end of World War II, Heisey glass has been receiving a substantial amount of foreign competition which is due, to a great extent, to the new or rejuvenated glass industry of Japan. Because of the policy of our government to help Japan become self-sufficient, an intensive program of training and information has been provided which has placed the Japanese glass industry in a favorable com­petitive position with American producers. Export of Japanese glass­ware to the United States during the prewar years is shown in the following table:

TABLE 19.

JAPANESE EXPORTS OF GLASSWARE TO THE UNITED STATES, 1928-1937

<table>
<thead>
<tr>
<th>Year</th>
<th>Yen (000 omitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1928 to 1932, average</td>
<td>235</td>
</tr>
<tr>
<td>1933</td>
<td>800</td>
</tr>
<tr>
<td>1934</td>
<td>1818</td>
</tr>
<tr>
<td>1935</td>
<td>2309</td>
</tr>
<tr>
<td>1936</td>
<td>3059</td>
</tr>
<tr>
<td>1937</td>
<td>4543</td>
</tr>
</tbody>
</table>

Source: Foreign Economic Administration, 1945, Washington, D.C.

However, the absence of foreign competition and the shift to war production made the industry very profitable during the war period.
Factory of A. H. HEISEY & CO., NEWARK, OHIO, U. S. A.

Fig. 29. The A. H. Heisey and Company. Early View
Future prosperity of the handmade division depends, to a great extent, upon the national income and our ability to meet foreign competition under lowered tariffs. Handmade glass products are considered luxury items and thus are sensitive to changes in disposable personal income. Future of the machine-made glassware, on the other hand, is much brighter, for this division has firmly established itself in the low-price household dinnerware field against pottery products and is now making progress in the hotel and commercial field. To expand in this field, the industry must meet the competition from plastics, and further rehabilitation of the Japanese industry will possibly revive competition from this source, but it is doubtful whether Japan will enjoy the great differential in costs that prevailed before the war period.

The Holophane Glass Company, producers of illuminating and prismatic glass, located in the city in 1898 for two chief reasons: activities of the local Board of Trade and the choice of Heisey as the manufacturer of its glass needs. Their product is of a durable nature and its market is in the international commercial and consumer construction field. To meet the problem of a world-wide market, this company, whose executive and sales offices enjoy the prestige location of New York City, established subsidiary plants in Canada, England, and France, with a new plant being constructed in Mexico. Holophane is thus locating near the market. Raw materials for the Newark plant: sand, soda ash, lime, borax, and feldspar, are located

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Alderfer and Michl, op. cit., p. 232.
Fig. 30. The Holophane Glass Company.
within a 300-mile radius of the plant, with the exception of borax, which moves by rail from the Pacific coast, and feldspar, which comes by rail from North Carolina. Production in 1950 was 8,000 pieces of prismatic glass daily, and total number of employees for the same period was 220, an increase over the 125 figure reported for 1940. 17

In 1934 the Owens-Corning Glass Corporation began operations in Newark in the abandoned works of the former world's largest bottle manufacturer, the E. H. Everett Company. Three factors of location were outstanding: (1) the presence of adequate plant facilities, (2) reasonably low utility rates (gas), and (3) the availability of labor. Although the company began operations at the time of the depression, there was a remarkably rapid growth because their product, fiberglas, was unique. Further encouragement was gained from a management with an optimistic point of view and an enthusiastic selling program, and a research division which was constantly attempting to find new uses for their product.

The Newark plant is a basic industry, main products being insulation for home appliances, such as stoves and refrigerators, and air filters and acoustical tile for building construction. Its main selling point is the light weight and relatively high insulation qualities of fiberglas, even in small amounts. Sand, aplite, and rassorite (novaculite) are the raw materials of this industry and all are reported to be purchased within a 300-mile radius of the city. 18

17 H. J. Tait, Holophane Glass Company, a personal interview.

18 Games Slayter, Owens-Corning Glass Corporation, a personal interview.
market of the finished goods is seemingly unlimited, with approximately 80 per cent in the durable home construction and appliance fields.

Because of increasing freight rates the present policy of Owens-Corning is to locate near the market. Average monthly rail transportation in 1950 was 3,600 cars, while motor trucks, with 3/5th the capacity of freight cars, are used to the number of 600 per month. Since freight rate is applied to the full-car weight of 38,000 pounds and but 4,000 pounds of the finished product can be placed in a car, it appears that this company is buying a "lot of air" in using this particular mode of transport.

During the World War II period Owens-Corning received a great impetus to its growth through receipt of war contracts, mainly from the Army Air Force, which could use very effectively the light-weight insulating materials.

Owens-Corning is attempting to meet rising competition by improvements in processes and materials, and creation of new products, thereby developing greater diversity. In 1950, the sales dollar for the Corporation, of which the local plant is a subsidiary, was spent as follows: 35.0 cents for wages and salaries; 30.5 cents for materials and supplies; 11.5 cents for freight and delivery; 7.5 cents for selling, administrative, research, and development expenses other than salaries; 4.5 cents for profit; 4.3 cents for fuel and power; 3.7 cents for taxes, both federal and state; and 3.0 cents for depreciation.

Employment at the local plant showed an increase from approximately 19

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19 Ibid., a personal interview.
Fig. 31. The Owens-Corning Glass Corporation.
550 in 1940 to 2600 in 1950, with over 3,000 reported in 1952, a payroll figure of $350,000 monthly for salaries and $600,000 for production wages. Figures indicate that one out of every three of Newark's payroll dollars goes to Fiberglas employees, with the company spending $2,000,000 locally in 1950 for raw materials.

Whereas the home plant is located in Toledo, Ohio, other plants are widely scattered: Ashton, Rhode Island; Kansas City, Kansas; Santa Clara, California; and Huntington, West Virginia.

Metal Goods. Approximately 2,526 people, or 38 per cent of Newark's industrial employment, produce some type of metal goods. The history of the stove industry is significant, for it was the city's first major industry and a stove company has occupied the site of the present Newark Stove plant since 1882. This first company, a foundry and fabricating plant, was formed by the Wehrle brothers who began production in 1883, with 17 employees and a capital investment of $1,000,000. By 1900, at the peak of production, the Wehrle factory produced 800 to 900 stoves daily and its employees numbered nearly 2,000, with a payroll of from $100,000 to $112,000 per month. During the years from 1937 to 1941 the plant was called the Florence-Wehrle Stove Company and finally, in 1941, assumed its present name, the Newark Stove Company. At this time most of the foundry was closed down because of high production costs and the plant became primarily a fabricator of sheet steel and an assembler of stamped steel. The Sears, Roebuck and Company obtained full ownership of the company in 1945 and completely closed down
Electric stoves, vertical heaters, and electric roasters are produced here on an assembly line basis, with an average output of 353 stoves per day. Raw materials include sheet steel, rock wool, and fiberglass, which come mainly from out of state (75 per cent from outside Ohio) and, like the finished goods, are transported by both truck and rail. This product has a nation-wide market and competition is great. The Newark plant is completely independent in its operations and answers only to the owning company for production, annual budget, and profit.

Aluminum. Prior to the Second World War, the aluminum industry of the United States and the Aluminum Company of America were virtually one and the same. Aluminum needed for production of military aircraft during the war period brought about a six-to sevenfold increase in aluminum-producing capacity, with the major company nearly trebling its own productive facilities, and also building and operating about 500 million dollars' worth of government-owned capacity. After the war period, the Aluminum Company of America had 44 per cent of the total capacity for producing alumina from bauxite and 37 per cent of the aluminum ingot capacity. Its largest competitor, the Reynolds Metal Company, had 36 per cent of the capacity for producing alumina and 22 per cent of the aluminum ingot capacity, while the Permanente Metals Corporation had 20 per cent of the alumina and 15 per cent of the

20 F. H. Guthrie, Newark Stove Company, a personal interview.

Fig. 32. The Newark Stove Company.
the aluminum capacity. The remaining 26 per cent of the aluminum-producing capacity was owned by the War Assets Administration. 22

Kaiser interests purchased the Newark plant from the War Assets Administration for $4,500,000, and, with an additional capital investment of $4,500,000 began production in July of 1949. This 200-acre plant was built during the war period by the government for $28,000,000 and had operated for only two years, 1943-1945, producing aluminum products for use in airplanes. The present plant is a part of the completely integrated aluminum production facilities of the Kaiser Aluminum and Chemical Corporation, formerly the Permanente Metals Corporation.

At present the local plant manufactures aluminum wire and cable, but plans for the immediate future include the addition of aluminum rods and bars, the latter becoming necessary due to increasing competition in the field of aluminum wire and cable. It is the intent of the Kaiser Corporation to assure its market by producing diversified products. Much of the market has been related to various projects of the Rural Electrification Administration, and attempts are being made to induce private electric and telephone companies to use aluminum wire and cable. The advantage of aluminum for this use lies in the fact that, because of its light weight, towers can be spaced farther apart, resulting in lower costs of power-line construction and maintenance. Steel-cored aluminum cable has virtually supplanted copper cable for high-tension power lines.

22 Ibid., p. 108.
The local plant transports its raw material, pure aluminum ingots, by rail from the Kaiser reduction plant in Tacoma, Washington. With expanding markets for aluminum wire and cable, as well as for many proposed new products, expectations are that this plant, by 1955, will have a payroll figure of approximately 1,000.  

Air Force Installation. Construction is to begin soon on a huge plant in Newark for the manufacture of aircraft parts for the United States Air Force. This plant will be located on a 380-acre tract along Hebron Road, a site now occupied by two large units of the Kaiser Aluminum and Chemical Corporation, and will be a government-owned installation, placed under the control of the United States Air Force. As the new installation will use a light metal, presumably aluminum, in the manufacture of aircraft parts, it is understood that the Kaiser plant will be designated to operate the facility.

Included in the program are the design, construction, and operation of heavy forging and extrusion presses. These presses, larger than any heretofore built and operated in this country, are designed to speed the manufacture of aircraft, save materials in short supply, and to reduce the costs of fabrication. Present plans call for the installation of 20 heavy forging and extrusion presses in a number of special plants located to serve the aircraft industry, and to take advantage of existing supporting plants and equipment. Cost of the entire program has been estimated as $210,000,000 over the four-year period.

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23Mr. T. W. Tressler, Kaiser Aluminum and Chemical Corporation, a personal interview.

24The Newark Advocate, April 8, 1952.
period, 1952-1956. The use of heavy forging and extrusion facilities to make large light metal component parts for aircraft has proved to be more efficient than present methods of assembling the large component from numerous smaller pieces. Heavy press manufacturing techniques have been proved by production on presses up to 18,000 tons now in use in several plants located throughout the country. However, present capacity is inadequate in view of the proposed "speed-up" of the aircraft production program, which includes additional forging presses of the capacity proved in operation, as well as presses of heavier capacity. Discussions have included the technical advantages and limitations of a forging press of a 75,000-ton capacity.

**Axles and Gears.** Completed months ahead of schedule because of its importance to the defense effort, the Timken-Detroit Axle Company's new Ohio Axle and Gear Division has started production of axles and transfer cases for military trucks. The factory, which is a modern, single-story building of saw-tooth construction, will constitute a completely integrated manufacturing unit for machining, heat treating, and assembly operations, with a well-equipped metallurgical laboratory.

Location of the plant is in keeping with a basic program of Timken-Detroit, which closely follows recommendations of the National Security Resources Board regarding dispersal of manufacturing facilities. The Newark site was chosen because of its central location in respect to raw material sources and also because of good labor markets. In response to an inquiry concerning industrial location
the President of Timken-Detroit Axle made the following interesting comments: "This plant (Newark's) is a fine example of the growing trend toward decentralization. The motor trucks, which carry a continuous stream of materials to Newark, actually function as part of our assembly line. When the Ohio Axle and Gear Division reaches full production, it will be a carefully planned component of the entire Timken-Detroit manufacturing program. We are now operating nine production plants in strategically located centers: Oshkosh, Wisconsin; Detroit and Jackson, Michigan; Utica, New York; New Castle, Pennsylvania; Kenton, Ashtabula, and now Newark, Ohio. It will be a continuing policy to situate our operations with the benefits of wise decentralization in mind."

By 1952 the new plant was gradually moving toward full production. Machine tools, gear-cutting machines, welding machines, and material-handling equipment are being installed and operated as rapidly as received. Much of the machinery has been provided through the acquisition of military surplus machines which have been rebuilt to serve the needs of axle manufacturing, but many of the tools have been ordered from the machine tool builders, with resulting extended deliveries. At full capacity, approximately 1600 persons will be employed and the entire output will be for defense, particularly units for the all-important "six-by-six" all-wheel drive trucks.

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A letter from Walter F. Rockwell, President of Timken-Detroit, April 22, 1962.
Rubber. From 1910 to 1948 the Pharis Rubber Company, manufacturer of automobile and bicycle tires, was one of the city's principal industries. Its importance in the industrial structure is revealed in a payroll figure of 1,000 in 1940, an employment which increased to almost 2,000 persons during the war period.

Whereas the stove and glass industries were virtually shutdown during the depression period, Pharis continued working full-time, which meant a three-shift operation. Passing of this company from the local scene was a major reason for the relatively high unemployment of 1,200 persons in 1948 which, in turn, led to an increasing number of commuters to Columbus.

Over the years Pharis developed into one of the larger independent tire producers in the nation, employing approximately 1,500 people at its peak of operations in 1947. Concentrating on the brand-tire, mass-merchandise market, Pharis was able to prosper and meet competition largely because its production costs were lower than those of the big-name, higher-price producers who dominated the markets. The local concern was able to hold its own in the replacement fields and against other independents, largely because of the wage differential which existed between the home operation and "big rubber" in Akron. In 1948, without this differential and facing an increasingly competitive market, Pharis could have little hope of producing a tire that could be sold for less and still profit sufficiently to justify remaining in business.

The company was forced to close its Newark plant.
Petroleum Refining. Outside the city limits of Newark but within the southwestern industrial area is the Pure Oil Refinery at Heath. This refinery, constructed in 1920 with a capital investment of $30,000,000, is the third largest in the Pure Oil System and is an automatic refinery. Although the local plant, originally located here because of a supply of local crude oil, this source is somewhat depleted today so that 75 per cent of the crude must be brought in from outside the area via pipe lines. Petroleum is transported by both tank car and tank truck, with the latter playing an increasingly important role. Since the refinery's operation is largely an automatic process the employment figure of 300 persons has been relatively stable over its period of operation.

Other Types of Industries. The Larson Manufacturing Company, which moved to Newark in 1951, specializes in making hand saws. Two major processes are accomplished: heat-treating of metal for the saws and cutting of the handles from laminated wood. The latter feature eliminates breakage of handles and losses in manufacture. Larson has made two contributions to the saw-making industry: first, the development of a "hollow-ground" hand saw, and second, the development of a stainless steel hand saw, which will be on the market in the immediate future. According to Mr. Derr, president of the local plant, "hollow-grinding" means that the saw is wider at the cutting edge than at the back edge, a condition which
eliminates part of the "set" required in the teeth of an ordinary saw. The stainless steel saw is made of a specially hard type of metal which is not only rust-proof, but provides a harder, more durable edge, and is less brittle than ordinary saw steel. The company has been experimenting with a greater number of women employees doing this type of work and so far reports have been exceptionally satisfactory. Of the 72 workers about 60 per cent are women.

Newark's Kilgore Manufacturing Company, a subsidiary of the Columbus plant, was in operation for only two years, 1949 to 1951. To find a desired location for its establishment, Kilgore had serial photos taken of all likely sites in the vicinity of the city, and finally chose a location north of the city limits on Dry Creek Road. The plant, part of which was underground, was constructed in a deep valley, and was surrounded by hills which facilitated camouflage and served as a protective measure. Such a careful selection of the site was necessary for this plant, which employed approximately 300 people, produced hand and rifle grenades and anti-personnel mines for the military program. The Newark concern fabricated the casings, manufactured the charge and assembled the two, but did not make or insert the detonator. Recently the local plant has been forced to suspend operations, at least temporarily, because of the disastrous munitions explosion at South Amboy, New Jersey which, it was alleged, was started by munitions shipped east from Newark.

Western Products, Inc., manufacturer of many types of cellophane packaging, aluminum foil, and vinyl, came to the city in 1946.
Their cellophane is shipped in from the du Pont plant at Fredericksburg, Virginia. Present employment of the plant is 180.

Tectum, Inc., maker of a new construction material, began operations in 1951 with 250 employees. Tectum is unique in that it was begun by local personnel and is based upon a locally developed process. Raw materials move into the city from distant areas: excelsior from Michigan and Arkansas, and magnesia cement from Texas. Its product, a fibrous board material, is cut to convenient sizes and thicknesses for building walls and ceilings.

Significant Factors in Newark's Industrial Development

Newark experienced no appreciable boom in its industries until the World War II period. With the coming of the Ohio Canal, in 1832, the city had anticipated a vigorous industrial development which failed to materialize. The intra-regional accessibility established during this period proved to be temporary in nature for, with the cessation of canal operations, Newark became just another city on a railroad. Although three railroads serve the city only one is a trans-Appalachian line, and railroads as a mode of transport have failed to provide the attachments necessary for an expanding industrial market.

It may be that the external versus the internal forces which explain the recent "industrial awakening" of Newark can account for the development of manufacturing in numerous similar locations of small cities which have suddenly become "industrialized".
The Human Factor. In his discussion of some theories accounting for the location of industries, Hoover states that, in 1935, about 28 per cent of the working population of the United States were in activities "close to resources," about 48 per cent in activities "close to resources," about 48 per cent in activities "close to consumers," and about 24 per cent in "relatively foot-loose" activities. Many of Newark's industries are in the last category and are based, to a great extent, on the human element. Although this factor is difficult to measure in terms of the absolute, people have played an important role in the city's industrial development through industrial genius, productive labor, and willingness to supply capital.

Industrial genius has not manifested itself locally in ability to invent, as in the case of the Miami Valley, but certain local men have been outstanding business executives, with foresight and a genius for organization. Such industrial opportunists as E. H. Everett, who had a controlling interest in the Licking-Knox County gas fields and owned the Black Hand sand quarries, and Captain A. H. Heisey, who operated his glass company with gas from his own fields, were outstanding examples of the role of directive ability in the city's industrial development. The leadership of these men and others instilled in their workers a certain amount of "local pride" and "community workmanship" which has carried over into the small city's industrial development today.

26 Edgar M. Hoover, op. cit., p. 36.
Labor. A substantial amount of public financing of industrial facilities in central Ohio during World War II was allocated to the Newark Area. (See Table 20). New commodities were introduced to the local scene, as well as a considerable amount of new labor from the hill regions of southeast Ohio. According to President K. H. Guthrie, Newark Stove has reached its largest payroll since World War II and, to meet the demand of its expanded production schedule, has tapped labor markets as far away as West Virginia, with many employees commuting from neighboring counties.

In his discussion of Central Ohio, Wright states that some training in metal working was accomplished by Curtis-Wright of Columbus in anticipation of its need during the war period. At the cessation of hostilities production levels continued high and nearby cities, including Newark, profited by making use of some of this trained labor.

Newark need not fear unemployment in the 1950-1955 period. In fact, as soon as several plants now under construction are in full production a shortage of workers may exist. In January, 1952, only 230 persons were collecting unemployment compensation. This situation is quite different from that which developed in 1948 when Pharis Tire and Rubber closed its plant, then employing 1,300 and industrial employment dropped to a low of 5,854. Three years later the latter figure had increased to 9,486, with an additional 2,000 to 3,000

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TABLE 20.

ALLOCATION OF GOVERNMENT FUNDS IN CENTRAL OHIO, 1941-1945.

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<th>County</th>
<th>Total $115,923</th>
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<th>Ships</th>
<th>Ordnance</th>
<th>Explosives</th>
<th>Iron-Steel</th>
<th>Non-Porous</th>
<th>Machinery</th>
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<td>1,190</td>
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Source: War Production Board Program and Statistics Bureau, Facilities Branch, June 1, 1945.
more workers needed as soon as the new plants are in operation. In
1952 Newark’s industrial employment had nearly doubled the 1941
figure of 4,976.

Local Raw Materials. Availability of local raw materials, a
potent factor in the establishment of many of Newark’s early in-
dustries, affords little inducement for industrial location today.
Raw materials for Holophane: sand, soda ash, and lime, are located
within a 300-mile radius of the plant, but borax moves by rail from
the Pacific coast, and feldspar comes from North Carolina. Sand,
aplite, and razerite, raw materials used by Owens-Corning, are also
reported to be purchased within a 300-mile radius. According to
Mr. F. H. Guthrie of Newark Stove at least 75 per cent of their sheet
steel and rock wool must be shipped from outside Ohio. Kaiser trans-
ports its pure aluminum ingots by rail from its reduction plant in
Tacoma, Washington. Heath, Pure Oil’s refinery, originally located
in Newark because of local crude oil, but today, with local supplies
diminishing, must pipe 75 per cent of its crude from outside the
area.

Transportation. Newark’s pattern of industry conforms closely
with that of railroads, of which there are three serving the city.
The Baltimore and Ohio, with 35 freight trains and eight passenger
trains running daily in and out of the city, gives more service than
the other two roads combined. The Pennsylvania has a double-track leading east-west along the north bank of the Licking River, and the New York Central has a branch line which extends northwest up the Raccoon Valley, but does not enter the city proper.

Truck service to industry has increased steadily since World War II. The city is served by two major trucking companies, the B. & L. Motor Freight, Inc., and the Commercial Motor Freight, with many of the leading industries having their own fleet of trucks to supplement rail as a carrier of their products. Motor trucks have given industry a certain degree of locational flexibility and, as one industrial leader stated, actually function as part of the assembly line. Less-than-carload shipments have also promoted truck transportation.

Market. Originally local markets created the demand for the products of Newark factories. As previously stated, Newark did not secure the inter-regional accessibility which had been anticipated during the Canal Period and industrial growth was slow. New industries which are locating in the city are those serving a national market and the present trend is away from the "home-owned" and "home-controlled" type of industry. Although Newark has always occupied a central position in Ohio this seemingly favorable factor has been

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28 Baltimore and Ohio pays its 900 local employees $310,000 each month, --over $3,500,000 annually. This city is headquarters of the Newark Division, which has charge of 447 miles of track from Sandusky to Bellaire, Newark to Midland City, Newark to Shawnee, Zanesville to Parkersburg, and Lore City to Cumberland.
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Fig. 33. Industrial development chart of Newark, Ohio, 1880-1950.
somewhat limited by its "off-center" position with respect to the
state's major rail transportation routes. With the increased usage
of motor trucking Newark can attain a central position with respect
to markets as well.

Housing. Newark is fortunate in having more living accommoda-
dations for its residents, in proportion to population, than have
most communities. A recent national tabulation (1950) shows that
there are now 11,371 dwelling units in the city, a ratio of 332
units per 1,000 people, which is more than the average reported for
the United States as a whole, 307 per 1,000. In fact, the present
housing situation is more favorable than at the time of the 1940
census when there were 308 living accommodations per 1,000 residents.
In the east north-central states, dwelling units amounted to 309 per
1,000 people and, in Ohio, 305 per 1,000.

This improvement in local housing facilities is largely due to
the greater increase in numbers of dwelling units since 1940, 17 per
cent, than that in population, 8.5 per cent. The relatively good
housing situation in Newark follows the general upswing in construction
activity, helped in part by government priorities, and by financial
assistance to veterans and civilians in the purchase of homes.
Fig. 31. Zoning map of Newark, Ohio, 1950.
CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

Newark both serves and dominates an area which covers 875 square miles and includes Licking County and parts of Franklin, Delaware, Coshocton, Knox, Fairfield, Perry, and Muskingum counties. The city is located approximately 33 miles east of Columbus in the eastern extremity of the Central Lowland province. Its site is the junction of the North Fork, Raocoon Creek, and Licking River, six miles west of the Wisconsin glacial boundary.

Glaciation has influenced the physiography of the western two-thirds of the Newark Area. Old lacustrine plains can be traced at different elevations, leaving in places four well-marked terraces. Well borings indicate that a lake of considerable size must have covered a large portion of this surface during the latter part of the glacial period. The outstanding landscape feature of the region is the old "Newark Valley" along which many of the present transportation routes are located. Complexities of the local drainage pattern were evolved in the relation to the drainage system of the Ohio River as it developed through four major erosion periods: Teays Stage, Deep Stage, Post-Illinoian Stage, and Post-Wisconsin Stage.

Soils of the Newark Area are grouped into two major divisions.
(1) those which have developed from glacial materials and which are calcareous and (2) those which have developed from weathered shale and sandstone and which are acid. Crop yields show that the glacial soils are generally the more productive.

Dominant vegetation associations of the area include: (1) the deciduous swamp forests, with species of American elm, black ash, soft maple, bur oak, shellbark hickory, white ash, and honey locust; (2) the beech and maple association; (3) the oak-chestnut association; and (4) the mixed mesophytic, which comprise a mixture of many species, including chestnut, yellow poplar, northern red oak, white oak, and hemlock.

The climate of the Newark Area is Humid Continental, long summer phase. Rainfall is sufficient for the normal growth of crops although marked differences may occur in moisture content of soils having similar amounts of precipitation.

There was a steady influx of settlers of the Newark Area from the date of the first permanent settlement in 1798. Early settlers were a heterogeneous group which included farmers from Virginia and Pennsylvania as well as factory workers from Connecticut and Maryland. Many came from a fairly well-developed town and money economy and had to adjust themselves to the more primitive conditions of self-sufficiency in an isolated village economy or a rural setting.

Settlement of this region has been divided into three periods: (1) rapid rural growth, 1810-1850; (2) movement to the urban centers, 1850-1900; and (3) increasing urban concentration of settlement, 1900-1960. During the first period Newark grew rapidly from a village of
200 inhabitants in 1810, to a flourishing town of 3,854 in 1850, and the population of the Newark Area increased from 3,852 to 38,846. By 1900 the areas of greatest population density had encompassed the city and extended into the valleys of the Racoon, Licking, and North Fork. During this second period the population of the city rose from 3,691 in 1860, to 18,157 in 1900, while the total for the area increased from 38,846 to 47,070. Movement to the urban center is indicated in the general leveling-off of the total population. Perhaps the outstanding change in the settlement pattern of the 1900-1950 period was the growth of the trade center and its associated urban-rural fringe, particularly in the Newark Valley. The city showed an increase from 18,157 in 1900 to 34,000 in 1950, while the trade area showed a population gain of from 47,070 in 1900, to approximately 90,000 in 1950.

The evolution of transportation in the Newark Area has been correlated with the general development of transportation in Ohio. Three means of transport have been examined and evaluated: (1) highways, (2) canals, and (3) the railroads.

Ohio's highway development may be divided into four stages: (1) period of state construction, 1804-1844, (2) period of private turnpikes and plank roads, 1850-1866, (3) period of local assessment, 1845-1885, and (4) period of construction by general assessment, 1870-1900. Property taxes continued as the principal source of Ohio's highway funds until the early 1930's when gasoline taxes and other motor vehicle imposts became predominant. In recent years three-fourths of all highway revenues have been derived from motor vehicle taxes and gasoline taxes.

A lack of effective transportation facilities had kept prices of local farm products low for many years. Many of Newark's inhabitants
believed that a cheap means of transport, such as that afforded by an inland waterway, would loosen their bonds of isolationism and enable them to expand their market accessibility. The new era of hope came with the construction of the Ohio Canal in 1826. Although the "golden age" of Ohio's canals had ended by 1855 they were influential in the establishment and development of many industries and gave accessibility to markets for surplus products. Cessation of canal operations was a bitter blow to the Newark Area for the region could not maintain the inter-regional commerce it had anticipated.

Newark's first railroad, the Columbus and Lake Erie, was chartered in 1845 and extended to Mansfield where it joined the Mansfield and Sandusky City road, opening a connection with Lake Erie. East-west routing was not to be denied, however, for the city's second railroad, the Central Ohio, extended from Columbus to Bellaire. In 1873 this company came under the control of the Baltimore and Ohio and is one of the important east-west lines through the area today. The third railroad to pass through Newark was known as the Pittsburgh, Columbus, and Cincinnati. In 1867 the company reorganized under the name "Pan Handle" and upon its completion was leased to the Pennsylvania Railroad. Last of the railroads through the area was completed in 1870. This railroad, then called the Atlantic and Lake Erie, met the usual fate of new roads and was absorbed by a larger company, the Ohio Central, which at present is a division of the New York Central system.

Agriculture of the Newark Area has been divided into four stages of development: (1) a period of self-sufficiency, 1800-1840, (2) the transitional period, 1840-1860, (3) farming—a business, 1860-1900, and
(4) Agriculture in a period of industrial growth, 1900-1950.

Lack of capital, scarcity of labor, and an abundance of cheap land, with almost no market for the plentiful crops—these were the economic conditions faced by the pioneer farmers of the Newark Area. High cost of labor was a constant deterrent to the local farmer. Farm labor was essentially that of the family itself, with exceptional jobs, requiring a larger working force, oftentimes being done on the "exchange of work" basis. Although crop selection and domestication of animals were essentially for the basic family needs, certain items of high value, such as flour, pork, whiskey, and tobacco were shipped to New Orleans and the eastern seaboard markets as transportation became available. Corn was the first crop on the newly cleared land and was the chief support of the early settlers. Wheat was the cash crop of the area, in fact, until 1860 Licking County was a part of Ohio's major wheat producing region.

The transition to commercial agriculture was not easily accomplished for certain factors tended to restrict any radical changes from the more conservative methods of farming. Among these were a general lack of business experience on the part of the farmers, a shortage of working capital, and the tendency by many to invest in other enterprises than farming when and if surplus funds became available. Although the Ohio Canal was short-lived as a mode of transportation it was, to a great extent, responsible for the greater accessibility which was conducive to the commercialization of agriculture in this region.

Agriculture in a period of industrial growth, 1900-1950, was a period of rapid urbanization. Although heavy demands were imposed on
the farmer his opportunities were many. Fortunately, however, the increased use of power machinery not only reduced his labor requirements but increased his output by fully 40 per cent.

A survey of the present cropping systems of the Newark Area was accomplished by a reexamination of the major soil groups and their relationship to the crop production. Average yields on the Alexandria silt loam for hay range from one and one-half tons an acre; for corn, from 60 to 85 bushels; for wheat, from 10 to 30; and for oats, from 40 to 70 bushels. Farming activity on the Alexandria is below that of former years. Deterrent factors are the scarcity and high cost of farm labor. Corn, wheat, and oats occupy the largest acreage of cultivated land on the Cardington silt loam. More than 50 per cent of the cleared land is in pasture and hay. Although the Marengo silt loam is one of the best corn soils, it is often planted to oats and wheat as part of the crop rotation. If the land is properly drained corn production may run as high as 100 bushels to the acre.

East of Newark agriculture is not so extensive for unfavorable relief has limited farming activities. Most practical use of the land in this region is for timber and pasture.

Soil fertility, ease of cultivation, and favorable surface conditions have promoted higher yields on the Chenango silt loam, with corn producing 50 to 75 bushels an acre, wheat 15 to 30 bushels, oats 25 to 40 bushels, and hay approximately one and one-half tons. Farms in this area are generally prosperous and well-managed.

Although occupying but six per cent of the total Newark Area the soils of the alluvial floodplains, such as the Chagrin silt loam, are
the glacial-filled valleys are good.

Approximately 13,412 people are employed in the manufacturing and industrial services of the Newark trade area. Of the total urban population, estimated at 34,000 by the 1950 census, 30 per cent were gainfully employed in seven industrial groups: manufacturing, transportation and utilities, wholesale and retail trade, service industries, mining and quarrying, contract construction, and finance, insurance, and real estate. In number of employees the most prominent manufacturing activities are those producing fiberglass, table glassware, and prismatic glass products, but those activities associated with metal products rank a close second.

Approximately 3,200 people are employed in the 20 factories of southwest Newark. More than two-thirds of these are associated with metal goods. No other section of the city is represented by such a diversity of products. Here is Newark's second largest plant, the Newark Stove Company, which employs over a thousand people producing stoves, vertical heaters, and electric roasters for the Sears, Roebuck and Company. Perhaps the plant which has had the most spectacular development during the World War II and post-war years is the Kaiser Aluminum and Chemical Corporation, a "war-baby" purchased from the War Assets Administration in 1949 and producer of aluminum wire and cable. Construction has begun recently on a government-owned plant which will manufacture aircraft parts for the United States Air Force. Presumably aluminum will be used and the Kaiser Corporation will operate the facility. Timken-Detroit Axle Company's selection of Newark as a site for its new division closely follows recommendations of the government regarding dispersal
of manufacturing activities. Its entire output will be for defense, particularly units for the all-important "six-by-six" all-wheel drive trucks.

Although containing but three of the city's 31 major industries, the northern industrial district is conspicuous in total number of persons employed. Here is the Owens-Corning Fiberglas Company, employers of approximately 2,600 workers and producers of insulation for home appliances and building construction.

Only 700 persons are employed by industries of the eastern section of the city yet this is perhaps the most homogeneous collection of factories since two of the three major plants are associated with glass products. Feisey Company, with an employment of from 500 to 600 people, reports an output of 300,000 barrels of table glassware annually. The Holophane Glass Company, with an employment of 220, reported a production of 8,000 pieces of prismatic glass daily in 1960.

Other industries which have located in Newark during the post-World War II period are: the Larson Manufacturing, the Kilgore Manufacturing Company, Western Products, Inc., and Westinghouse Electric Corporation. Each reports market and labor as the significant factors of industrial location.

Conclusions

A geographic evaluation of Newark and its environs is in essence a study of an economy in transition. In this respect it is like a score or more of small cities in the northern half of Ohio.

Although agriculture remains an important part of the total economy
of the Newark Area it is no longer dominant. The contrast between the
 glaciated and unglaciated parts of the region is becoming more pronounced
 as agriculture is better adjusted to its environment, both natural and
economic. Balanced cropping programs, such as those developed in co-
operation with the Soil Conservation District advisers and adopted by
more than 500 of the Licking County farmers, have facilitated this
adjustment.

Mixed farming yielded to general farming with livestock and dairying
as increased urbanization and industrialization have provided new
opportunities for the farmer. The dairying speciality is in response
to the increased accessibility to Columbus, now in the process of in-
dustrialization. This growing Columbus market is making specialized
agriculture more attractive than is the growth of the immediate Newark
Area. This situation may in time tend to reduce the attraction of
relatively low-wage factory employment to the farm youth.

The industrial economy of the Newark Area today shows no repre-
sentatives of processors of farm products, local timber, or local
minerals, with the exception of some Black Hand sand for the glass
plants. Industries of this area are still predominantly of local
origin and managed by local entrepreneurs.

The government-built plant of World War II has been converted to
peace-time use. The Kaiser Aluminum and Chemical Corporation took
over the city's single war-plant facility. This choice was made be-
cause of the available labor and accessibility, plus the fact that the
national structure of the Kaiser Corporation seemed to make this a
desirable location. These same two factors were likewise attractive
to Timken-Detroit Axle Company in carrying out its functional de-
centralization policy of establishing a branch plant within the
permissive range of the parent factories. These industries in turn
have become attractive to other manufacturers. Accessibility and
factory space have brought the Westinghouse Electric Corporation to
Newark where it occupies a number of buildings vacated by the Pharis
Tire and Rubber Company.

It would seem, therefore, that Newark is representative of the
recentralization of manufacturing in Ohio, induced largely by the
desire to secure a little cheaper and a more peaceful labor force.
Newark's size and accessibility have enabled the city to participate
in this recentralization of industry. Newark lies midway between the
producers of special steels and the final assembly of the product.
From observations the writer is inclined to believe that nearness to
Columbus' growing demand for labor may soon limit the number of in-
dustries that will be attracted to Newark.

Diversification of Newark's industries affords some insurance
against a general collapse of its economic life. This proved to be the
situation in 1948 when the Pharis Rubber and Tire Company was forced to
liquidate its operations in Newark. Within one year its employees were
absorbed into other manufacture, and within two years the principal
building was occupied by Westinghouse Electric Corporation.

Although the aluminum plant is the only industry financed by the
government, national forces are active in the recent industrial awaken-
ing of Newark. The new Air Force extrusion plant which manufactures
aircraft parts under the Kaiser Corporation's management, is government-
That available labor in Newark is being depleted is evidenced by the Newark Stove Company, which is drawing upon West Virginia counties for a part of its needs. One must conclude that Newark’s factories accept this labor pool as an integral part of the economic complex. One must further conclude that the trend away from the home-owned and controlled manufacturing establishments to the branch plants of national concerns which are embarked upon a program of functional recentralization, is, in all probability, a permanent development.
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AUTOBIOGRAPHY

I, William Norman Harris, was born in Byers, Ohio on December 9, 1915. I received my secondary school education in the public schools of Chillicothe, Ohio. My undergraduate training was obtained at Ohio University, from which I received the degree Bachelor of Arts in 1937. From 1937 to 1940 I served as Educational Supervisor for the Soil Conservation Service at various field camps located near Gallipolis, Mt. Vernon, and Newark, Ohio. In 1941 I received the degree Master of Arts from The Ohio State University. After serving in World War II as combat intelligence officer in the United States Air Force, I received an assistant professorship at the University of Toledo and held this position for two years. In 1948 I entered The Ohio State University to continue work leading to the PhD degree. Until 1951 I taught in the Department of Geography, first in the capacity of graduate assistant, and later, as an assistant, while continuing my graduate studies. In the autumn of 1951 I received an assistant professorship at Ohio Wesleyan University, Delaware, Ohio, and held this position for two years while completing the requirements for the degree Doctor of Philosophy.