

**PETROLEUM PRODUCTION AND POPULATION
CHANGE IN NORTH CENTRAL KANSAS**

by

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INTRODUCTION

The purpose of this research was to study the possible influence of amounts of petroleum production on population trends within particular counties. A study of selected cities was made because they are an integral part of the counties and because all of the cities are not equally distant from oil fields. A definite relationship between the discovery year of any oil field and the year of change in population of the city is more easily observed than relationships between the county population and petroleum production as a whole.

To study any possible effects that the petroleum production might have had in inducing population changes within a county it is necessary to select, as well, a comparable county that has had no oil production.

In order to study the influence of petroleum production on population change, six counties in Kansas have been chosen for investigation. The counties are Rush, Osborne, Lincoln, Rooks, Ellis and Russell. (Plate 1)

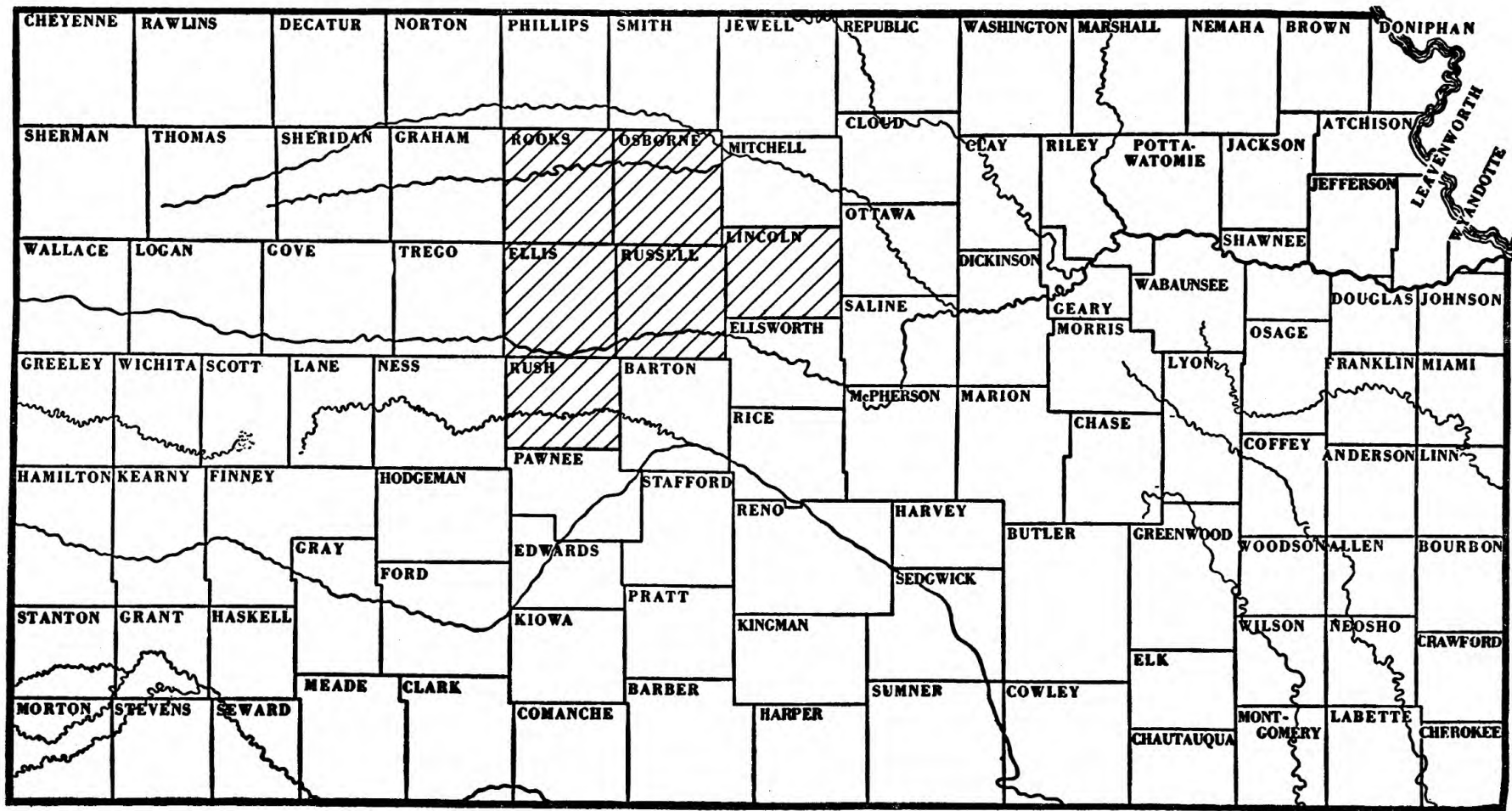
These counties have a total area of 5,038 square miles and each county is of approximately the same area.

Table 1. Area of counties in square miles

Counties	Area	Counties	Area
Rush	724	Ellis	900
Osborne	898	Rooks	893
Lincoln	726	Russell	897

EXPLANATION OF PLATE I

Index map of Kansas showing the location of the area covered by this report.



Selection was made of these counties in particular because they are contiguous, and three of the counties have considerable petroleum production. It was also considered advisable to choose the distribution of the counties with little or no petroleum production, so that they would lie adjacent to sides of oil producing counties. Such an arrangement substantially offsets factors, other than petroleum, that may influence population trends.

The counties of Rush, Osborne and Lincoln are classified in this paper as "non-oil" counties. Rush and Osborne Counties have oil, but the quantity is small. Lincoln County has never had oil production.

Ellis, Rooks and Russell Counties each have petroleum, and are classified as oil counties.

Table 2. Cumulative production of oil to January 1, 1960

¹			
Non-Oil Counties	Barrels	Oil Counties	Barrels
Rush	9,831,028	Ellis	226,934,477
Osborne	619,438	Rooks	86,040,921
Lincoln	0	Russell ²	302,339,505

1. Estimated from 1957 production and cumulative of Kansas Geological Survey

2. Contains estimates from 1937 to 1947. All other years are from Kansas Geological Survey Bulletins

This study provides a definite set of figures indicating the population changes in oil counties as compared to the population trends of the non-oil counties. It provides a better understanding of the factors affecting the population growth in the oil counties in contrast to a general decline or stagnation of population in the non-oil counties. Future population growth of the counties is predicted on the basis of this research.

Information is presented which is based first on a county level and then explained on a city basis. Other factors which may have contributed to the rise or fall in population have been included in this analysis.

The data has been assembled for this study from a variety of sources including: personal interviews with local residents, bankers, newspapermen, and the respective Chambers of Commerce. Data was also collected from other theses, current literature, the Bureau of Census, current periodicals and State oil records.

Interesting information concerning the presence of an oil industry and its effects on a city were derived from many sources. The local citizens provided information concerning the benefits of oil income to their businesses. Bankers contributed data on percentage of money deposited by oil men, in comparison to men engaged in agriculture. Newspapermen permitted access to past articles relating the development of each city since the advent of the oil industry to the area. The Chambers of Commerce volunteered information about the changes and civic

improvements that had been brought about by the oil industry.

Written sources of information aided in obtaining a wider scope of understanding of the presented material. The graphs and tables contained in this thesis were constructed or derived from these sources.

PHYSICAL GEOGRAPHY

Physiographic History

Creation of the Rocky Mountains at the culmination of the Cretaceous period resulted in the existence of an uplifted area available for Cenozoic erosion. Streams became an active agent of both erosion and aggradation since they eroded the mountains and deposited the sediments from eastern Colorado to central Kansas. A vast sheet of debris was created thereby; the deposition of this debris sheet continued until the mountain area was leveled. Peneplanation was accomplished by late Oligocene age.

During the Miocene and Pliocene the entire area experienced broad upwarping. Streams were rejuvenated, and the eastern portion of the debris sheet became dissected. This greatly dissected portion forms the present topography of the greater part of the six county area under examination. Toward the western margin of these counties, and including practically all of Rooks County, the interstream areas become flattened and form a plain that extends into Colorado.

Near the mountains, erosion has eliminated sediments so that a relatively low area intervenes between the mountains and the plain. Greater erosion in this area east of the mountains may be attributed to a deficiency of rainfall which has inhibited the development of a protective vegetation cover. Even though rainfall is less here than it is farther east, it has been more effective in eroding the unprotected land surface.

Fenneman (1931) used the name Colorado Piedmont for the low area adjacent to the mountains. The flattened area farther east was designated as the High Plains. He called the eastern area the Plains Border, but this area has also been called the Smoky Hills upland (Adams 1903).

The edge of the High Plains is marked by a scarp running in and out among the heads of streams. Several factors have tended to produce this feature. The firm compactness of the sod cover of the Plains has tended to resist erosion. Another is the presence of porous Tertiary sediments which often rest upon impervious strata. Frequently this relationship creates springs, wherever the rock contact meets the land surface. Tertiary sediments become sapped by this process, and the fault scarp location moves westward. The Plains Border is increased in area at the expense of the High Plains.

Within the Plains Border, the Dakota Formation, Benton limestone and the Niobrara chalk, all of Cretaceous age, have developed escarpments which appear as broad hilly belts.

The "Smoky Hills Upland" is the name applied to the eroded Dakota escarpment, and the Blue Hills is applied to the

escarpment at the outcrop of the limestone farther west. A third line of hills have formed from the Niobrara chalk along a line extending from Jewell County, Kansas, southwest almost to the Arkansas River.

The Plains Border, High Plains, and Colorado Piedmont are included in the Great Plains Physiographic Province. This province extends from northern Canada to the Rio Grande River. The province has a width of approximately four hundred miles. However, its eastern boundary is not distinct at several places.

Geologic Structure

Geological conditions were favorable for the accumulation of petroleum in Rooks, Ellis, and Russell County and, to a lesser extent in Rush County. These counties are underlain primarily by the Central Kansas uplift, an elongated anticlinal feature which trends northwest-southeast across west-central Kansas. Several smaller structures are associated with this uplift. It is within these smaller structures that petroleum has tended to accumulate.

Some of the anticlines were formed parallel to the axis of the uplift. Other anticlines were formed normal to the axis of the uplift, possibly as a result of local folding or by consolidation of sediments over a buried fault scarp.

The following structures are listed by Jewett: (1951)

Rush and Russell Ribs. The Rush and Russell ribs are structural highs in Ordovician and pre-Ordovician rocks

(Koester 1935). Rush rib trends northwest-southeast across southwest Ellis County. Russell rib has the same general trend across southwestern Russell County.

Stockton, Fairport-Natoma, and Pfeifer Anticlines. The Stockton, Fairport-Natoma, and Pfeifer anticlines are discernable in Cretaceous rocks.

The Stockton anticline trends north-northeast from northwestern Ellis County through Rooks County (Bass 1926).

The Fairport-Natoma anticline trends northeast-southwest across northwestern Russell County and southwestern Osborne County (Rubey and Bass 1925).

The Pfeifer anticline appears to be in alignment with the Fairport-Natoma anticline. It crosses southeastern Ellis County and extends into Russell County (Bass 1926).

Chief Horizons of Petroleum Production

The principal stratigraphic units noted for petroleum production belong either to the Arbuckle group of Cambrian-Ordovician age or to the Lansing-Kansas City groups of Pennsylvanian age. Ordinarily the Pennsylvanian sediments unconformably overlie the Cambrian-Ordovician sediments, possibly the result of either the long period of erosion following Mississippian time or a lack of deposition of these missing units over the Central Kansas uplift.

A study in Ellis County (Carr 1958) tends to show that accumulation of petroleum in the Arbuckle group is controlled by anticlines, but in the Lansing-Kansas City groups oil

accumulation appears to be a combination of structural highs and stratigraphic traps. Carr suggests that possibly the Lansing-Kansas City groups did not suffer as much erosion as the Arbuckle group and as a result greater differential permeability is present in these younger sediments.

Other units that have contained petroleum in the oil counties include the Waubaunsee group, Shawnee group, and Marmaton group of the Pennsylvanian age, the Simpson group of Ordovician age, and the Lamotte (Reagan) sandstone of Cambrian age.

Practically all the oil wells of Ellis, Rooks, and Russell Counties produce oil from the Lansing-Kansas City or Arbuckle horizons.

Lincoln and Osborne counties are underlain by the Salina basin. Osborne has had only minor production from one oil pool in alignment with the Fairport-Natoma anticline. Lincoln has had no oil production.

Rush County, although underlain by the Central Kansas uplift has had little production. Its total number of wells was only 146 in 1958 (Goebel et al 1959).

Climate

Precipitation. Normal precipitation for Kansas as a whole ranges from about 40 inches per year in the southeastern counties to about 30 inches in the northeastern, and decreases fairly uniformly to the west.

At the Kansas-Colorado border the average is about 16 inches. The middle third of the state has an average of 19.49 inches between the crop growing months from April to September. This compares with 24.64 inches in the eastern third of the state and 14.70 inches in the western part of the same months.

Generally, June is the month of the greatest rainfall, while January is the month of least precipitation.

The six counties of north central Kansas approximate a normal annual precipitation of 23 inches computed over a 45 year period between 1898 through 1942 by the U.S. Weather Bureau and reported by the Board of Agriculture (1948).

Average annual snowfall is about 18 to 21 inches in these counties.

Temperature. The average mean temperatures of Kansas range from 56 to 58 degrees along the southern border to 52 to 54 degrees along the northern border.

July is the warmest month of the year with a mean of 79 degrees for the state. January has a mean of 30 degrees, and is the coldest month.

Differences in day temperatures and night temperatures may be 8 to 10 degrees greater in the western part of the state than in the eastern.

Relative Humidity. The relative humidity of Kansas is low. Average mid-day and early evening relative humidities in July range from 35 to 40 percent in the western part of the state, and from 45 to 50 percent in the eastern. During the winter

season they range from 60 percent in the western part to 70 percent in eastern for those hour.

Frosts. The first killing frost of the season generally occurs about October 15 in the six counties represented.

Wind. Southerly winds prevail in summer and northerly winds prevail in winter over the counties of north central Kansas. The windiest months are March, April and May, while the month of least wind is August. Wind movement is considerably greater during the day than during the night.

Drainage and Water Reservoirs. Three eastward flowing rivers and their tributaries drain the area of the six counties. These rivers are the Solomon, Saline and Smoky Hill.

The Webster reservoir, southwest of Stockton on the Solomon River, and the Cedar Bluff reservoir, southwest of Hays on the Smoky Hill River, have been created so that more year around water is available for city use. Supplies of water are available in sufficient quantities for irrigation purposes.

Agriculture

All of the six counties lie within the winter wheat and grazing region of the Great Plains.

Lincoln County lies primarily in the subhumid wheat sub-region. Wheat is the predominant agricultural crop, but corn, alfalfa, and sorghum are also grown.

The other five counties are a part of the summer fallow subregion. Fallow is used on any particular field only about once in four or five years. Farther to the west fallow is practiced in alternate years. Just how efficient a fallow period is in storing moisture depends on the type of soil and climate. Moisture storage efficiency of only 15 percent was measured at Hays, Kansas over a forty year period (Yearbook of Agriculture 1957). High evaporation and runoff contribute greatly to lower storage ability.

Wheat is the principal crop grown in this area. Sorghums as well as a limited acreage of barley, oats and rye are also raised there.

PETROLEUM PRODUCTION AND COUNTY GROWTH

Population Study of Non-Oil Counties

The non-oil counties include Rush, Osborne, and Lincoln. The number of inhabitants in these counties is given by decades on Table 3. Graphical representation of the population trends are shown on Plate 3.

Rush County. Rush County has shown a decline in population in every ten year period since 1930 (Plate 3). Between 1930 and 1940 there was a decrease in population of 808, which is undoubtedly related to the period of economic difficulty, including drought conditions which prevailed through most of these years. It is also noted that the State as a whole lost population.

Rush County also registered a loss in the decade prior to 1950. This loss may be attributed to unstable conditions that existed during the War years.

Lack of present economic activity is a factor in this county's continued population decline.

Osborne County. Osborne County had a total population greater than any of the other five counties in 1890, 1900 and 1910. In 1920, Ellis County became the population leader and Osborne County exhibited a decrease from the 1910 population. This trend has continued in the county through 1960.

Lincoln County. Lincoln County reached a population peak of 10,142 in 1910 and has decreased in population since that time. Its' 1960 population was 5,535.

Table 3. Population of non-oil and oil counties by decades

	1890	1900	1910	1920	1930	1940	1950	1959
<u>Non Oil</u>								
Lincoln	9709	9886	10142	9894	9707	8338	6643	5922
Osborne	12083	11844	12827	12441	11568	9835	8558	7632
Rush	5204	6134	7826	8360	9093	8285	7231	6222
<u>Oil</u>								
Ellis	7942	8626	12170	14138	15907	17508	19043	20509
Rooks	8018	7960	11282	9966	9534	8497	9043	9845
Russell	7333	8489	10800	10748	11045	13464	13406	12387

Population Comparison of Non Oil Counties

From the above discussion and the use of Plate 3, it is evident that all three counties lost population since 1930. In fact both Osborne and Lincoln Counties had been losing population since 1910, but Rush County had a slow growth until 1930.

Osborne and Lincoln Counties lost approximately 40 percent of their 1910 population by 1959. Rush County lost 30 percent of its' inhabitants since the population peak of 1930. By 1950, Rush County had passed Lincoln in population.

Population Study of Oil Counties

The oil counties include Ellis, Rooks and Russell.

Ellis County. Ellis County has gained population in every decade since 1890. The largest increase occurred between 1900 and 1910, when 3,544 new residents were added. This is attributed to the founding of Fort Hays Kansas State College in 1902.

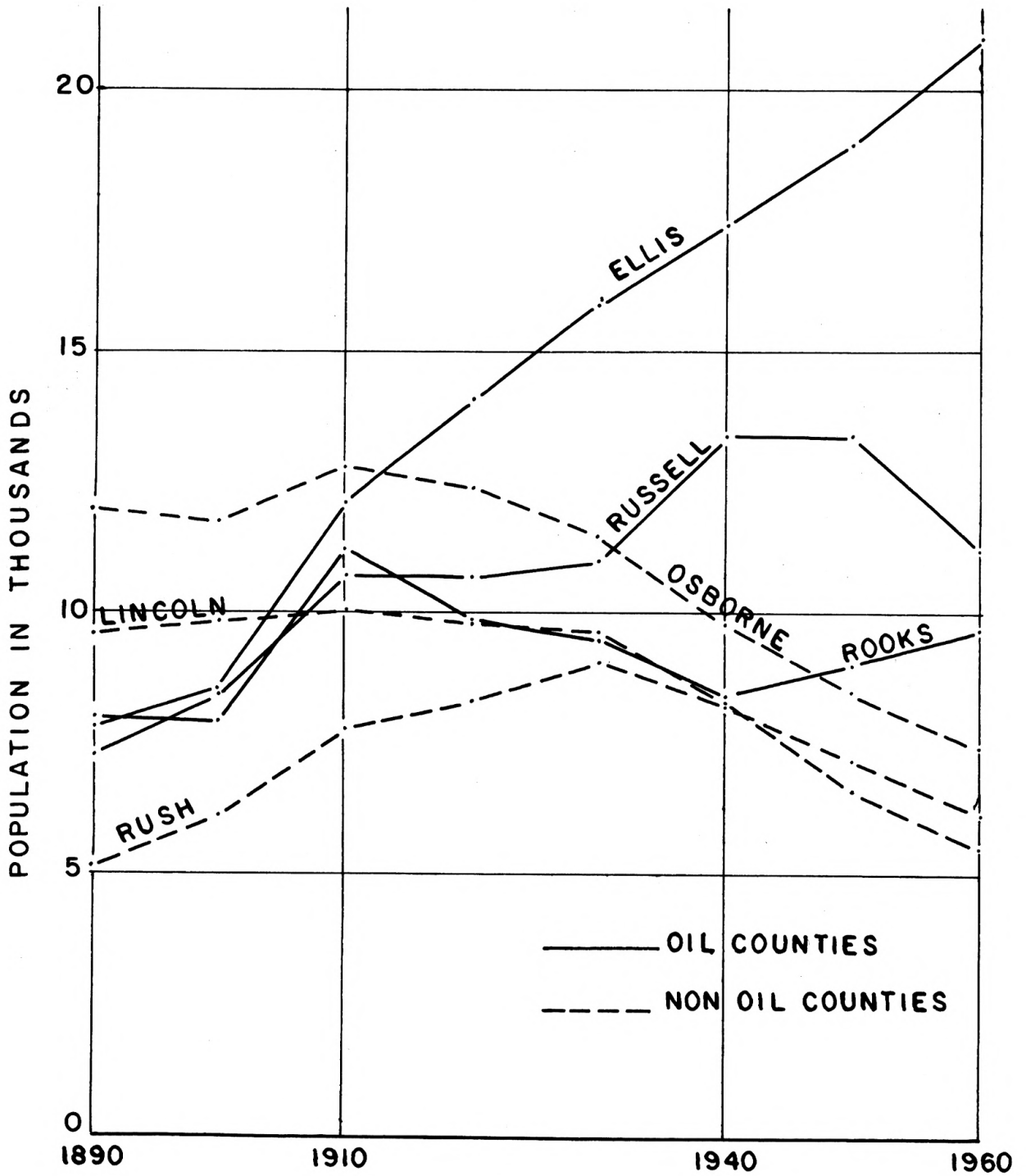
Rooks County. Rooks County declined in population from 1910 to 1940. From 1945 to 1959 gains were registered for the county. A loss of population occurred in 1960.

Russell County. Russell County gained in population from 1890 to 1910. From 1910 to 1920 a slight decrease is noted. This decline did not continue as increases are apparent in 1930 and 1940. From 1940 to 1950 only a slight decrease in population

EXPLANATION OF PLATE 3

Population trends of six counties in Kansas. Oil counties are larger than the non-oil counties in 1960, although they were smaller than the counties of Lincoln and Osborne in 1890.

PLATE 3



Population Comparison of Oil Counties

The oil counties do not appear to exhibit any comparable trend (Plate 3). Principal growth periods in Russell County do not correspond with the main growth periods in Rooks County. The counties also differ from Ellis since decades in which they have experienced both increases and decreases. Ellis County has registered the only constant gains in population. From 1940 to 1959, Ellis and Rooks had similar growth rates. In Ellis this trend continued in 1960, but Rooks lost 139 people.

Major Trends of Oil and Non-Oil Counties

It is useful to compare major population trends in non-oil counties. The population total of the three oil counties has been combined, so that a single graph is produced. A graph similarly constructed of the non-oil counties was plotted for comparison with the oil counties graph (Plate 4).

It is apparent that since 1930 the oil counties have experienced a rapid rate of population increase, while the non-oil counties have registered a rapid decline. The trend first appeared in the decades from 1910 to 1930, largely as a result of the population growth of Ellis County. But the rate of increase of the oil counties and the rate of decrease of the non-oil counties was much less during these periods.

Prior to 1900, the combined total population of the non-oil counties was greater than the combined total population of the

oil counties. Between 1900 and 1910 the oil county total indicated a rapid increase and surpassed the non-oil county population.

There are three main segments in the non-oil counties population graph. The first segment was created by the general population increase in all three counties between 1900 and 1910. The second segment occurred between 1910 and 1930 as a result of population losses in Lincoln and Osborne Counties, coupled with continuing growth in Rush County. The third segment is the result of the population decline of all three counties during the 1930 to 1960 interval.

At the same time, the population graph of the oil counties also may be divided into three segments.

Between 1900 and 1910 all of the oil counties had an increase in number of inhabitants, a pattern common to all of central Kansas.

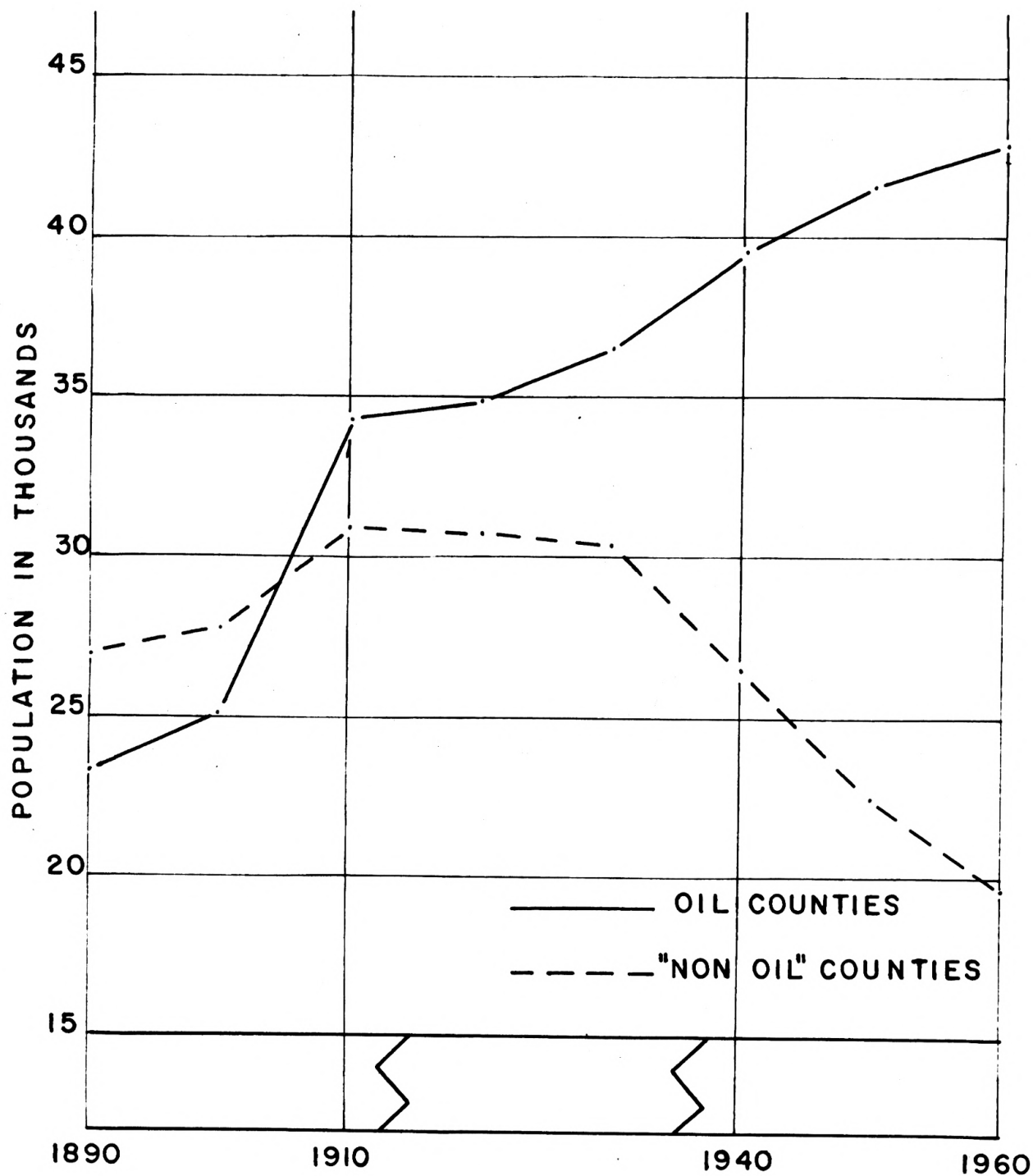
The rate of growth in these counties was less in the 1910 to 1930 decades, due largely to the decline in Rooks County population, while the other two counties continued to gain.

Ellis County made the greatest contribution to the rise of the 1930 to 1959 portion of the graph. Factors contributing to the rate of population growth during this time were the increase in number of inhabitants in Russell County during the 1930 to 1940 decade and the general growth of Rooks County between 1945 and 1959.

EXPLANATION OF PLATE 4

Major population trends of non-oil and oil counties.
Base line is 15,000 people.

PLATE 4



The population decline of Russell after 1950, and Rooks between 1930 and 1945 are reflected in these segments of the graph.

In summary, the three non-oil counties had more population than the three oil counties in both 1890 and 1900. By 1960, however, the three oil counties had risen from 23,000 to 43,000, while the comparison counties had dropped from 27,000 to less than 20,000.

Comparison of Oil Counties Population and Petroleum Production

In order to determine the possible effect of petroleum production on the population trend of the oil counties a graph has been constructed (Plate 5). The population of each of the oil counties has been plotted at five year intervals for the period of 1925 through 1960. In addition, the oil production of these counties has been plotted on the same graph. Oil production statistics are given in Table 5. Since population data were shown only by decades in Table 2, pertinent intermediate years are given below for the oil counties

Table 4. Population of oil counties for Years: ¹

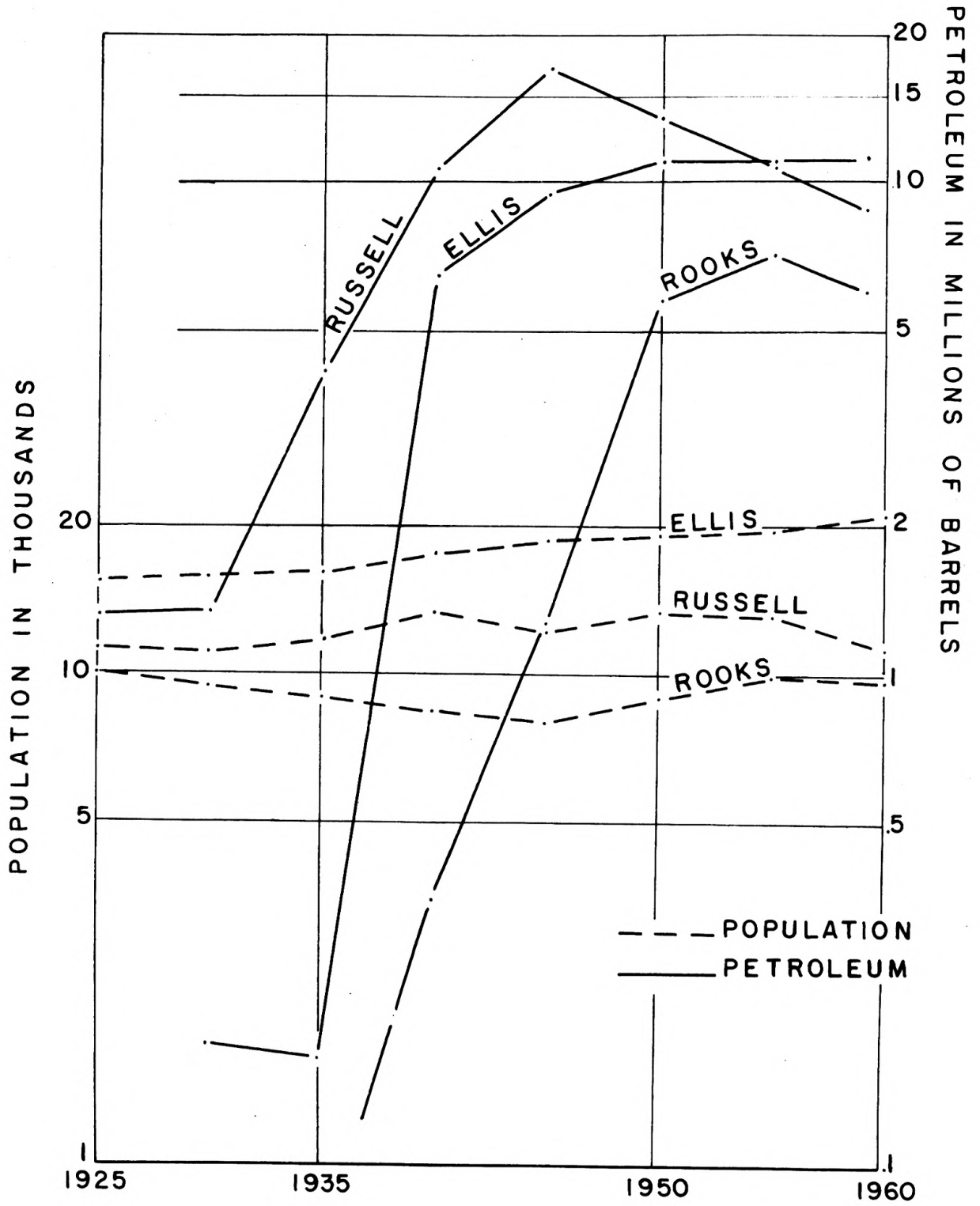
Counties	1925	1935	1945	1955
Ellis	15,433	16,042	18,758	19,719
Rooks	10,104	9,074	8,035	10,145
Russell	11,324	11,712	12,213	13,268

1. Biennial Reports of State Board of Agriculture, Vol. 30,35, 40,44

EXPLANATION OF PLATE 5

Population and petroleum production trends of the oil counties.

PLATE 5



EXPLANATION OF TABLE 5

*

All yearly production data are from the Kansas Geological Survey Bulletins, except for the years 1937-1947 for Russell County. Cumulative production was adjusted by the Survey at various years. The total of the yearly production figures shown for the three counties, therefore, do not add up to the cumulative given by the Geological Survey through 1958

**

The Trapp field lies in both Russell and Barton Counties. All yearly production from this field was allocated to Russell County for the years 1937-1947. In 1941 and from 1948 to date, the cumulative production of this field is given by the Kansas Geological Survey, with shares of the total cumulative shown allocated to the proper county. From this date, estimations of yearly production was made for this thesis, for the years 1937 through 1947.

Un published Kansas Geological Survey figures.

Table 5. Production in barrels

	Ellis	Rooks	Russell
1924			232,266
1925			1,336,148
1926			1,858,159
1927		7,829	1,043,049
1928		25,102	1,273,371
1929	72,493	24,256	1,284,225
1930	176,572	22,550	1,340,006
1931	198,251	64,208	1,217,315
1932	192,145	49,056	1,090,713
1933	225,000	12,518	1,067,000
1934	167,000	20,053	2,548,000
1935	166,814	25,800	4,146,000
1936	758,152	50,934	7,074,226
1937	2,694,663	147,000	11,536,431**
1938	3,107,134	175,000	8,646,000
1939	3,441,512	248,523	8,607,000
1940	6,484,185	351,098	10,754,325
1941	8,740,076	686,867	13,585,665
1942	10,590,674	865,553	16,358,550
1943	12,115,070	780,885	15,916,330
1944	9,931,011	1,028,091	15,302,307
1945	9,548,034	1,276,513	17,051,735
1946	9,851,226	1,527,064	12,317,817
1947	11,696,661	2,506,085	10,170,795
1948	12,742,936	3,596,944	13,638,374
1949	10,556,821	4,437,454	13,125,372
1950	11,077,013	5,759,190	13,561,393
1951	11,694,249	7,088,170	12,959,676
1952	11,070,399	7,287,132	11,635,324
1953	11,164,383	7,016,581	12,583,124
1954	11,366,975	7,190,986	11,195,338
1955	11,165,885	7,112,975	10,772,297
1956	11,618,360	6,988,701	9,883,069
1957	11,783,161	7,212,001	9,300,056
1958	11,314,968	6,389,441	9,005,985
1959	11,222,654***	6,066,361***	8,922,064***
<hr/>			
	226,934,477	86,040,921	302,339,505

Russell County. Petroleum was first produced in Russell County in 1924. One year later it had reached 1,336,148 barrels, which was the approximate production in 1930. Corresponding population figures were 11,324 in 1925 and 11,045 in 1930.

Petroleum production in the county during this period did not show any change in population. Examination of population figures for 1920 shows that the population at that time was 10,748. This figure is 52 people less than in 1910. This slight decline appears significant in view of the fact that several other counties in this area decreased in population during that time (Table 3). It is probable that the 1925 population increase over the 1920 figures is largely the result of exploration teams or crews moving into Russell County prior to discovery.

Production was 4,146,000 barrels in 1935, and the county attained a population of 11,712 for an increase of 667 inhabitants.

Five years later over 10 million barrels were produced and the population rose to a peak of 13,464 people. This is a population gain of 1,752 in a period of five years which correlates very well with the significant increase in petroleum production that occurred.

In 1945 Russell County reached its peak production of over 17 million barrels. Population numbers fell to 12,213. The fact that the world was at war undoubtedly contributed to the decline of the county. It will be observed that every county except Ellis lost population during this period. Also there was a great need for petroleum, so that field development restrictions were probably reduced.

This is indicated by the higher production during the War years, with much lower production prior and following those years.

Oil production in 1950 was approximately the same as in 1941. The population of Russell County was also about the same in these two years.

A decline in oil production occurred in 1955. The trend in oil production was reflected in a corresponding decrease of 138 people in Russell County.

In 1959, oil production was 8,922,064 barrels, over a million and a half barrels lower than the 1955 figures. Meanwhile population declined by 881 from the 1955 figures.

The discussion above indicated that the oil production in Russell County has a significant relationship to the population of the county. Where indication of an apparent parallel in rise and decline was not possible, some justification was given for the discrepancy.

Ellis County. Among the three counties Ellis County ranks second in petroleum production through 1960. The county began its production record in 1929 with 72,493 barrels of oil. Production more than doubled the following year, and by 1933, it was up to 225,000 barrels. However, in 1935 production fell to 166,184 barrels. By 1940 production was in excess of 6 million barrels and ten years later over 11 million barrels were recorded for the county. Peak production in the next decade occurred in 1957. The 1959 production was only slightly greater than the 1950 production.

Population figures for the county indicate a marked increase in the number of inhabitants during the entire period of petroleum production. It seems apparent that the rate of petroleum production has significantly influenced the population change. However, no conclusion can be drawn as to the extent this extractive industry has been a causative factor in the population change. Notable increases in population occurred even before the advent of oil in the county. Obviously, other factors were important in increasing population prior to the year of oil discovery.

Rooks County. Only meager yearly amounts of petroleum were produced in Rooks County from the beginning of the oil business there in 1927 to the middle nineteen forties. It was not until 1944 that the yearly production equalled 1 million barrels. The small quantities of petroleum produced during those years did not affect significantly the population of the county. From a peak population reached in 1910 the county population steadily declined until 1945. It declined by 3,247 people.

It is apparent that the population trend of Rooks County paralleled that of the non-oil counties at that time. By 1950, however, petroleum production rose to almost 6 million barrels; and 546 new inhabitants were registered by the census for that year.

After 1950 production was fairly stable at 7 million barrels a year until the late nineteen-fifties when production declined to about 6 million barrels.

Population continued to rise during this nine year span, but a decrease is anticipated for 1960.

The population growth in Rooks County after 1945 is attributed to the oil business. There appears to be no other reason for the population increase. Without the presence of petroleum this county would have undoubtedly continued in the same trend as Lincoln and Osborne counties.

POPULATION CHANGES OF CITIES

Cities in non-oil Counties

Cities and the economic factors that have contributed to their growth are presented in the following section. The location of the cities described is shown on Plate 6. Occasionally, an oil field has been discovered within the vicinity of one of the cities. An oil field location map is given in the end pocket of the manuscript so that the geographic relation between cities and oil fields can be observed.

Rush County. LaCrosse is the largest city in Rush County. This city does not reflect the county population trend (Table 6). Advantages such as a central location and the fact that it is the county seat have contributed largely to the growth of the city (Ames, 1946 P.29).

The LaCrosse high school district is larger than any other district. Since people tend to trade where their children go school, this has created a larger trade area than the other

towns enjoy (Ames P. 73).

The town is a shipping point for wheat, livestock, poultry, and dairy products. Local industries include a machine shop and grain elevator. Oil and gas wells are economic factors that have caused an increase in population. Oil production from Rush County increased by more than seventy-five percent in 1956 and an increase in population for the city is noted in 1959. The city lost population from 1950 to 1955. Oil production increases were responsible for the reversal in the population trend since 1955.

McCracken, a village in the western part of the county, has never been very large and has decreased in population since 1950. Chief industries include a grain elevator, a wheat-type mill, and a lumber and grain company.

Otis, a hamlet east of LaCrosse, had minor changes in population that were related to the oil business.

EXPLANATION OF PLATE 6

Index map of six Kansas counties showing the location of cities.

PLATE 6

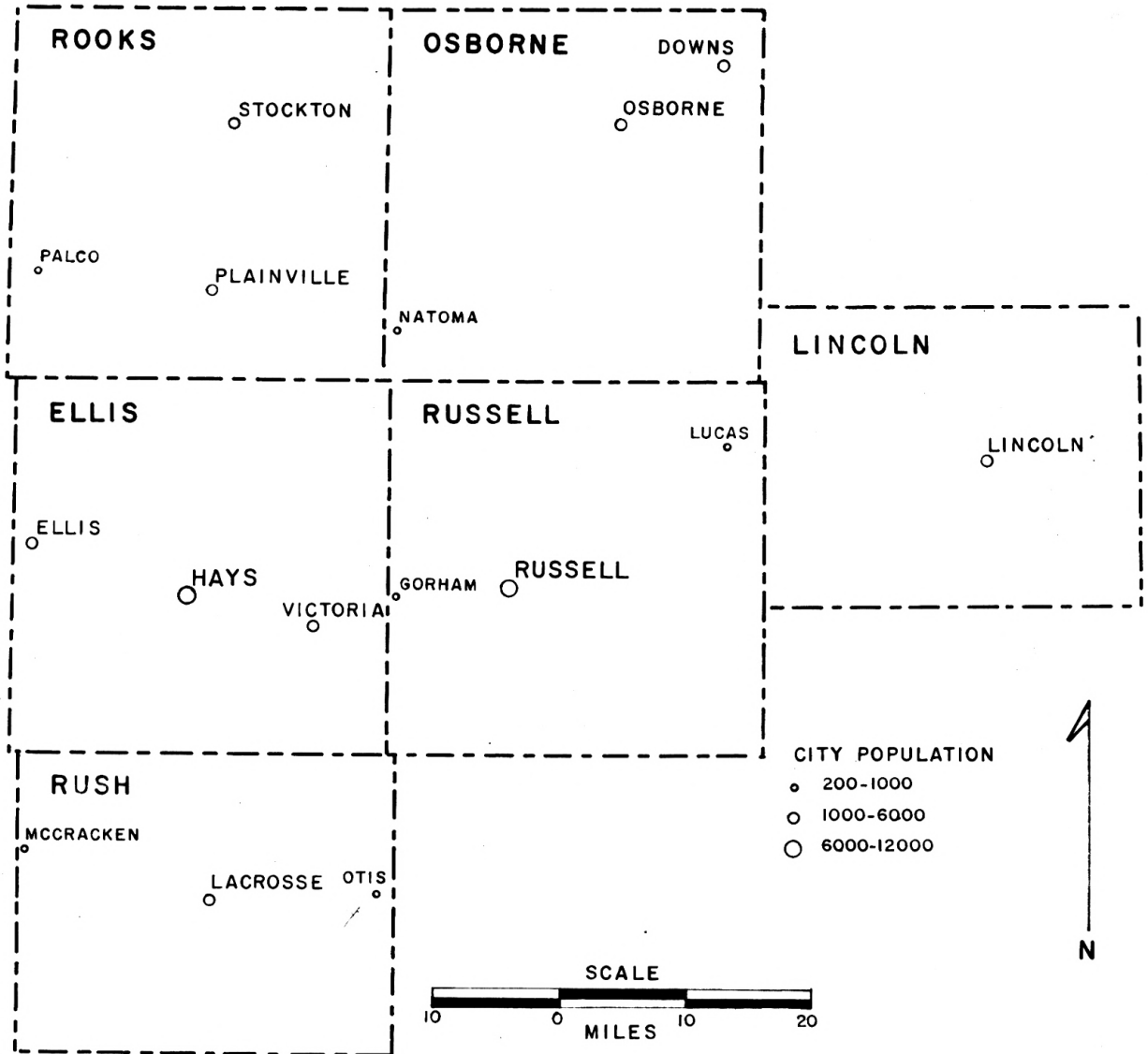


Table 6. Population of cities of non-oil counties by decades

	1890	1900	1910	1920	1930	1940	1950	1959
<hr/>								
Lincoln County								
Lincoln	1100	1262	1508	1613	1732	1761	1636	1708
<hr/>								
Osborne County								
Downs	938	938	1427	1508	1383	1219	1221	1223
Natoma			407	518	583	651	775	766
Osborne	1174	1075	1566	1635	1881	1876	2068	2016
<hr/>								
Rush County								
LaCrosse	513	536	806	808	1355	1407	1769	1772
McCracken	281	312	371	491	594	534	553	430
Otis				505	407	413	410	384
<hr/>								

Between 1920 and 1930 Otis lost almost 100 people. The Otis oil and gas field produced gas in 1930 and oil in 1934. Population remained fairly stable during this period. Otis has been losing population since 1940. The stable population between 1930 and 1940 is attributed to the discovery of oil and gas.

Osborne County. Osborne is an important shipping point for grain and livestock. A monument works is the leading local

industry. The county seat is located there, which is probably the reason it is the largest settlement. From a population of 1,075 in 1900, it reached a population of 1,881 by 1930. The population remained fairly stable in the next decade. By 1955, the city had 2,167 people. It had declined to 2,016 in 1959.

Downs is about half the size of Osborne. Grain, livestock, and poultry are the principal products of the farming country surrounding the city. The local industries include a monument works and produce packing plants. Downs attained a population peak in 1920. Since 1940 the population has remained at about 1,200 people.

Natoma is close to the only oil field in Osborne County. Natoma grew in population from 1910 to 1955, but declined in population in 1959.

Lincoln County. Lincoln is the only city over 1,000 population in the county. The county seat is located there. Lincoln is primarily an agricultural community. It is possible that an early start is responsible for the development of the city while other cities remained small. Evidently, there was no real need for more than one city of this size in the county. From 1930 to the present Lincoln has maintained a steady population.

Cities in Oil Counties

Russell County. The city of Russell is centrally located in Russell County. Because of its size, Russell has tended to

dominate the population pattern of the county (Table 2).

A visit to the city is all that is really needed to convince a person that this is an oil city. Upon entering the city from the east, a sign proclaims the three main economic commodities of wheat, cattle, and oil that provide the livelihood of the population.

It is obvious that the growth of Russell is related to the amount of petroleum production from the county. Prior to the discovery of oil, the city of Russell had a population of only 1,700. The county as a whole was sparsely settled, and farming and cattle raising were the principal occupations. Farms were heavily mortgaged and the general attitude of the population was one of despair (Russell Daily News, October 18, 1949).

With the discovery of the Fairport Pool in 1923 by the M.M. Valerius Oil and Gas Company, Russell experienced a revival in its growth. This city became the headquarters of several oil companies interested in oil prospects in the area. At this time no oil had been discovered within 150 miles of the Fairport pool. According to John G. Deines, Vice President of Russell State Bank, in the Russell Daily News, October, 18, 1949:

"After comparing Russell with 18 county seat towns in this area before the advent of oil and a similar comparison today, Our population would be 2,380 instead of over 6,000, that we now have. The population estimate takes into consideration the growing trend of farmers of western Kansas moving into towns and handling their farm operations by remote control, because this not only gives them extra money during the season when they are not busy with their farm work, but makes it possible to educate their children in town schools, be close to church,

belong to bridge clubs and save in transportation costs."

Concerning bank deposits, Mr. Deines further states that:

"Our bank deposits would be \$5,332,000.00 instead of over 12 million that we now have. The above stated comparison on bank deposits does not reflect a true picture for the reason that it does not show the hundred of thousands of acres of prime farm land in the northwest quarter of Kansas now owned by our residents and acquired, largely by reason of our oil income. The income from the outside ownership, through the years will be an important factor in the financial well being of Russell."

It is also noted that without oil Russell would not have their new high school, courthouse, swimming pool, park system or the amount of paved street now in use. Deines estimates that over half of Russells population would be classified as "oil folks." One bank president estimated that perhaps as much as 75 percent of the wealth of the present community was the result of oil. This is probably a close estimate, if it is considered that much of the land and cattle surrounding Russell has been bought and paid for from oil income.

From various articles that appeared in the Russell Daily News on October 18, 1949, the importance of the oil industry there becomes obvious. During the year Cities Service was the largest taxpayer in the county. A sum of \$55,000 in taxes per year is not an unusual amount for this company to pay. Sohio Petroleum Company located there has a \$222,000 annual payroll. Also the largest drilling organization in Kansas has its main office located in Russell and provides a yearly payroll of \$600,000.00. The R.C. Williams Trucking Company, an oil field trucking firm had a payroll close to \$150,000.00 in 1948.

Only a few of the firms have been listed to show the main cause of Russells population growth. The availability of capital has stimulated job opportunities and has, in effect, attracted people from outside the city and county.

The two banks of the city now have combined assets of over \$20,000,000.00. Those banks carry a higher total of loans, compared to total assets, than is often found to be the practice in other communities (Russell Chamber of Commerce). This is because oilmen usually have investments other than oil interests which will serve as collateral. Those banks are also larger than would be ordinarily be expected to be found in a community of that size, which is a reflection of the amount of banking business contributed both directly and indirectly by the oil business. Many civic improvement bonds have been voted and passed in Russell, which is undoubtedly due to the prosperity of the people there. The community now has anew modern air-conditioned hospital and the latest equipment and facilities. The park system is considered excellent. Recently the new Veterans Memorial Park has been added in an expanded program to increase these facilities. A new \$2,000,000.00 high school is under construction in 1960. Russell has been attempting to attract additional industries to the community.

An industrialization program is being carried out by the Chamber of Commerce Industrial Committee and Russell Industries, Incorporated.

Russell Industries, Incorporated is a community corporation which raises its funds by selling stock. It owns an 80 acre tract of land east of the city of Russell on which industrial sites are being developed. Industrial buildings are built often on a rental-purchase agreement by the corporation.

Ellis County. Hays is the largest city in Ellis County. Its apparent growth in population has been substantial since it became a town in 1867. The only exception to the pattern of growth occurred at the turn of the century when Hays lost population (Table 7).

Many factors have contributed to the growth of this community. Of great importance was the establishment of Fort Hays Kansas State College in 1902. Originally the present site of this college was a part of a pioneer military reservation. This reservation, Old Fort Hays, was abandoned and the land was taken over by the state. Division of this land into a park, a college, and an agricultural experiment station was made by the state.

Fort Hays Kansas State College attracted a considerable number of people to Hays. It has continued to attract people through the years and is one of the main causes for the growth of Hays.

St. Josephs Military Academy has created the same type of growth on a smaller scale. It is a private school with about 350 students.

The Fort Hays Experiment Station is the largest dry land station in the world. Every year thousands of interested persons, from this county as well as foreign lands, visit this farm. The federal government carries on an extensive research program at the station.

Hays has tended to become the retail trading center for the several nearby counties. Early in the history of this community, it became a trade and supply center because of its location half way between Kansas City and Denver along the Union Pacific Railroad route. Retail trade has been a stimulus to population growth by influencing people to move to the community for the greater variety of commodities. The quality of the products also drew people to the city of Hays.

Transportation has become rapid enough, so that distance from city to farm may take a comparably shorter time to traverse than it did in the past. This factor has permitted people to live in urban settlements and still be close enough to their farms for daily commuting. The greater the number and variety of retail outlets and services offered by urban settlement, the more likely that the people in this category will choose that community for their home.

Agriculture is the countys chief activity, and industries allied with agriculture have been established in Hays. An example of such an industry is the Hays City Milling Company.

The city of Hays has exceptional medical facilities ordinarily found in cities much greater in population. Two of the finest hospitals in the state are found there. Of particular importance is the fact that fourteen medical specialists have attracted people of wealth to the city for the medical services. Also many people have chosen Hays as their place of retirement because of the many advantages they can enjoy there, which include medical care.

The oil industry has generously supplemented the agricultural wealth of Ellis County (Chamber of Commerce). The effect of this industry on the city of Hays is not as apparent as it is in the city of Russell. Instead a visitor will usually be more aware of the existence of the college. Or perhaps in discussing economic factors of the city with the local townspeople the factors of agriculture, the college, or the medical facilities hold a more prominent place in the conversation.

The petroleum industry has, however, been generous in its support of the hospitals and has played a large role in the creation of such superior services. It is doubtful that such first rate facilities would have been found in Hays if petroleum had not been available in the county. The industry has, in this way, helped indirectly to induce population growth within the city.

Hays has an airport which was financed largely by the oil business. This airport is used presently by private and company planes.

Scheduled air service has been assured in the future.

Attempts have been made to attract industry to the city. Hays Industries, Incorporated was organized by civic leaders of Hays in order to provide areas of development for prospective industries which are considered necessary to further diversify the economic base of Hays. Land located about two miles east of Hays has been selected for industrial expansion.

So far the city is not greatly industrialized. The two principal industries are the Hays City Flour Mill and the Carswell Pipe and Steel Company, Incorporated. These companies do not have a large number of employees.

Potential industrial and commercial activities which the city hopes to attract include chemical plants, furniture manufacturing, vending machine manufactures, wearing apparel factories, protective coating manufactures, wholesale beverage warehouses, oil field equipment and supply companies and many other industries. It is a matter of speculation just how much success the city will have with its industrial expansion program.

Ellis is second in population in Ellis County. This urban settlement increased in population between 1900 and 1950, but registered a decline after the latter year. Only moderate population increase was apparent through 1940. Between 1940 and 1950, however, six hundred new residents came to Ellis. No city in this area except oil cities grew as much in this period of time. A check of oil fields reveals that the Ellis oil pool was discovered in 1943.

This population gain is directly related to this discovery. This oil pool never produced a tremendous amount of petroleum and the city registered a decline in population after 1950.

Victoria is an urban settlement of eastern Ellis County. It is about half the size of the city of Ellis and had its period of greatest growth between 1930 and 1940. No population figures for Victoria are given by the Bureau of Census prior to 1920. Victoria gained only 552 residents between 1920 and 1959 and cannot be classified as a rapidly growing city. Since, however, its greatest growth period followed the discovery of petroleum in Russell County it appears that a good percentage of the population gain after 1930 may be attributed to the influx of oil exploration men. No large oil fields were discovered immediately surrounding the community, but apparently enough small fields were located to induce oil men to stay. Since 1920 this community has not lost population; but neither has it gained significantly except in the decade prior to 1940.

Rooks County. Stockton was the largest city in Rooks County in 1920 and maintained this superiority until after 1940 when Plainville became the dominant urban settlement. Population decreased in Stockton in 1930 but by 1940 an upward trend had become evident. Stockton continued to gain population until after 1955. A population decline was registered in 1959. This city gained 576 people between 1930 and 1950 and in view of the fact that a downward population trend was observed between 1930 and 1920, this does not appear to be normal growth.

Rather, this city should have grown similar to Osborne and Downs. Both of those reached a point of relative stability. Osborne was stable after 1930 and Downs after 1940.

Several oil fields were discovered near Stockton between 1930 and 1950. The Stockton field was discovered in 1937, and the Lone Star field was found in 1948. Petroleum production has been greater from the Lone Star field, which was discovered in the decade of greatest population gain for Stockton. Also a population gain is noted in the 1930 and to the 1940 decade which parallels the discovery of the Stockton field. It appears that petroleum production near Stockton has played a role in the population growth of the city.

It will be noted that Stockton also gained population in 1955. Part of this gain may be attributed to oil production, but it should also be observed that the city of Osborne also had an increase in population at this time. According to interviews with people in Stockton, much of this gain was due to the influx of workers involved in the construction of the Stockton Dam. It is possible that the population increase in Osborne is associated with irrigation projects in the vicinity of that city. In 1959, both places registered a population loss.

Petroleum production may be said to have been a supplemental economic factor. Little oil work, if any, is here at the present time. Livestock raising along with wheat farming is still the important industry in the area surrounding the city.

Plainville is now the most populated city in Rooks County. Only in the decade prior to 1920 did the city experience a loss of people.

Petroleum discoveries in the vicinity of Plainville began after 1930. Since no city in the area of oil activity approached the size of Plainville, the oil people tended to use this city as their home. The greatest population growth occurred between 1940 and 1950, the decade in which several oil fields were found, including the largest oil field in the county. Several fields were discovered since 1950 and the city continued to gain in population. Since 1955 the number of discoveries has decreased, and the rate of population growth has also decreased.

Plainville may be compared to Downs in Osborne County. In 1930, Downs was the larger of the two, but was losing population. By 1940, Downs had a population approximating 1200 people, a number it retained for the next nineteen years. As has been stated, Plainville was losing population in 1920. Since both of these places are similar, it would be expected that Plainville would also decrease in population until it reached a point of population stability. Since this is not the case, it is contended that the major cause of the relatively great increase in the population of Plainville is due to its advantage of location, near to the oil fields. The fact that it was also the largest city near the oil fields was an added advantage over the small surrounding hamlets.

The hamlet of Palco illustrates the importance of location as a population builder. In 1940 there were only 276 people living in this small community. This number was even a decrease from the population of 290 it had in 1930.

The discovery of the Marcotte oil field in 1943, caused the population of this hamlet to increase to 405 by 1950. Evidently, some of the oil people preferred to live in this small community rather than commute from Plainville. Palco had a 1959 population of 602, which although not a great number is a significant growth over the 1940 census figure. The gain of almost 200 people in this hamlet from 1950 to 1959 corresponds to the years of greatest petroleum production from the Marcotte field.

Comparison of Size between Oil and Non-Oil Cities

Some cities within the area of interest are outstanding because of their much larger size in comparison to the average size city located there. On examination of city population figures within the counties (Tables 6 and 7) it becomes apparent that the oil counties have either larger cities or several cities which are much greater in size than the average size city found in the area. The second largest city in each county tends to be as large as the largest city of each non-oil county. These relationships are shown in Table 8.

Table 8. Population of cities in 1959

Population	1000		2000	3000	6000	11000
Non-Oil						
Lincoln			X			
Osborne	X	X	X			
Rush	X		X			
Ellis		X		X		X
Rooks			X	X		
Russell					X	

FUTURE PETROLEUM AND POPULATION TRENDS

Future Petroleum Possibilities

Oil production has been presented as inducing population growth in some cities and counties in north central Kansas. Continued growth of those governmental units is necessarily dependant upon continued, and increased petroleum production. The potential oil production in the oil counties is of considerable importance in the estimation of future population trends of those counties. Quantities of petroleum remaining in any oil field are indicated by the proven reserves of that field. The estimated proven remaining reserves of crude oil and condensate are given in Table 9.

Table 9. Cumulative Production and Reserves of Selected Fields

Oil Fields	in Thousands of Barrels ¹			
	January 1, 1954		January 1, 1958	
	Cumulative	Estimated Reserves	Cumulative	Estimated Reserves
Russell Co.				
Gorham	55,804	22,196	61,999	23,001
Hall Gurney	60,725	39,275	76,483	30,517
Russell	10,373	4,627	16,706	4,294
Trapp	143,429	66,571	162,073	47,927
Fairport	25,060	9,940	28,798	10,202
Ellis Co.				
Bemis-Shutts	75,597	34,403	155,383 ²	194,617 ²
Rooks Co.				
Marcotte	7,776	12,224	17,345	17,655

1. Oil and Gas Journal Figures.

2. Bemis-Shutts includes Barnett, NW., Pleasant Ridge, SW., Walters (Ellis Co.), consolidated in 1957.

Cumulative production is listed to determine the approximate percentage of petroleum that has been removed from the fields. Where the cumulative production is greater than the proven reserves, the field may be considered being over half exhausted. As the fields approach exhaustion, production will decline. Future predictions of population trends can be forecast by a knowledge of the future possibilities for petroleum production.

A high percentage of the petroleum that was originally in the large fields of Russell County has already been produced. The reserves for the fields are in every case less than they have been in the past.

Remis-Shutts field, in Ellis County, had only one-third of its original oil by 1954. Other fields had become consolidated with it by 1958, increasing both its cumulative production and estimated reserves. This field will permit Ellis County to remain ahead of Russell in amounts of yearly oil production. Less oil will be produced in future years and the production trend in the county will continue downward.

The Marcotte field in Rooks County had produced about half of its original oil by 1958. Development of this field did not progress rapidly until after 1950.

Secondary recovery methods are becoming increasingly more important in the oil counties. Russell County produced 177,181 barrels of oil by secondary recovery in 1956, as compared to 471,154 barrels or twice as much in 1958. Ellis and Rooks have had relatively little produced thus far by this method.

Future Population Trends

Population trends in both the non oil and oil counties have become established and should continue through the next decade. Of the six counties, only Ellis has the potential to increase in population. Petroleum production will not be the cause of population gains in this county. Rather, the main factor will be growth in the city of Hays. Hays Industries, Incorporated (1960) estimates that Hays will have a population of 17,000 by 1970. Personally, this figure appears overly optimistic. It would require the city to gain 6,000 people, or one-half its present population in only a ten year period. Such a gain would necessitate the introduction of industry capable of building a city two-thirds the size of Russell. If Hays were an excellent location for industry it is reasonable to believe that more industries would have already been attracted to the city. It should also be pointed out that the city of Russell as well as others have tried to attract industry and so far have had little success.

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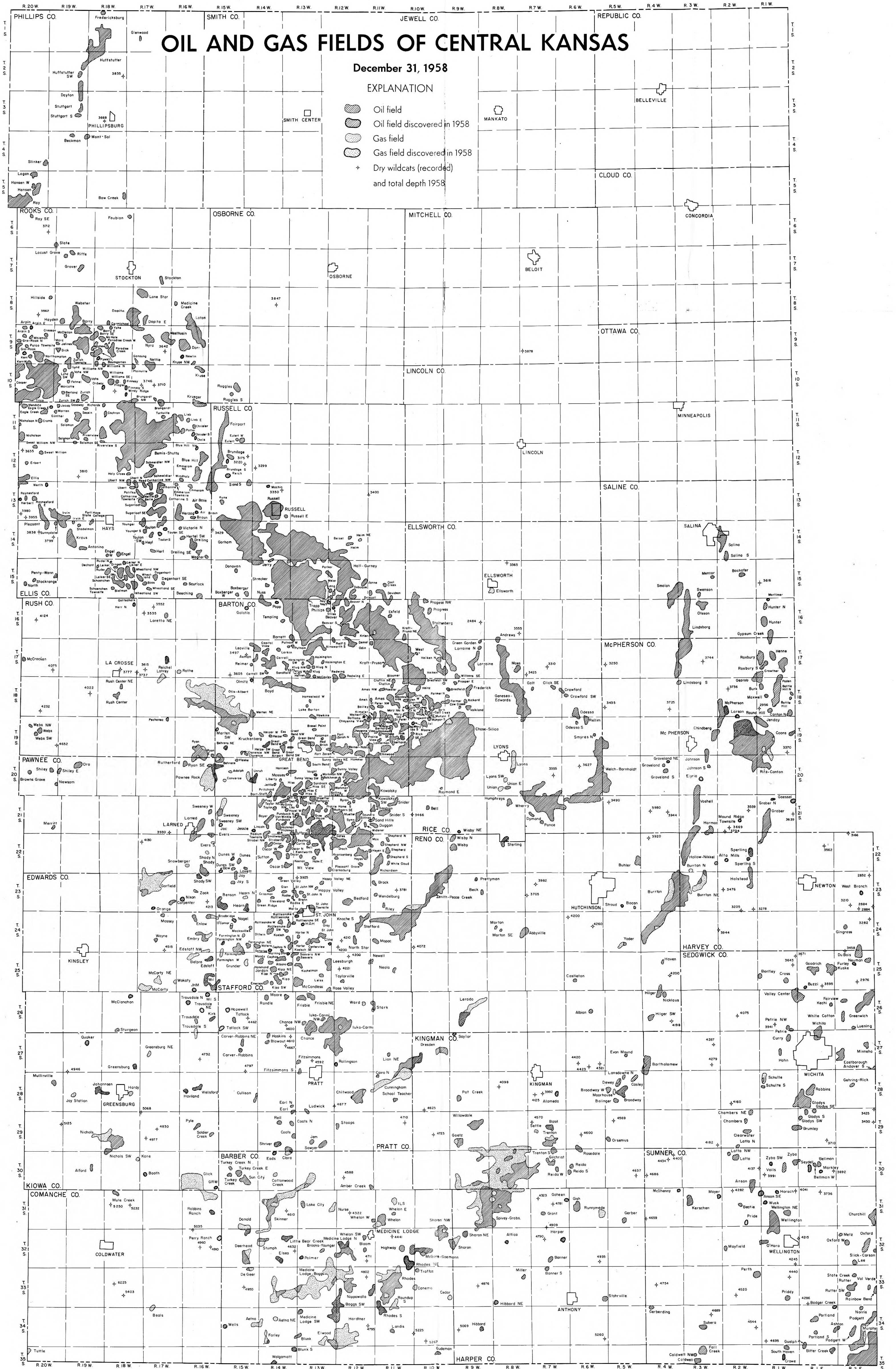
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APPENDIX



Map. Oil and Gas Fields of Central Kansas

Jack Eugene Harding



**PETROLEUM PRODUCTION AND POPULATION
CHANGE IN NORTH CENTRAL KANSAS**

by

JACK EUGENE HARDING

**B.S., Kansas State University
of Agriculture and Applied Science, 1953**

AN ABSTRACT OF A THESIS

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MASTER OF SCIENCE

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The purpose of this research was to study the possible influence of amounts of petroleum production on population trends within particular counties. Six counties in north central Kansas were chosen for investigation. The counties include Russell, Ellis, and Rooks, which have had considerable production, and Lincoln, Osborne, and Rush, which have had little or no production. The counties are shown to be similar except for the factor of petroleum production.

A population study was made, first of the "non oil" counties and then of the oil counties. It is noted that the "non oil" counties have a similar downward trend after 1930, or about the time oil was discovered in Russell County. The oil counties do not exhibit such a trend, but rather have varying population growth and decline in the different decades. Comparison of the total population of the three oil counties with the total population of the three "non oil" counties substantiates the fact that the oil counties have increased greatly in population since the advent of oil in those counties, while the "non oil" counties have rapidly lost population since that time.

Oil production is compared with population in the oil counties to show correlation between the decades of greatest oil production and the decades of greatest population increase. This correlation is obvious in the counties of Russell and Rooks.

A population study of cities within the "non oil" and oil counties further substantiates that petroleum production is the dominant cause of population increase in the oil counties.

Cities which lie closest to oil fields are the cities of greatest growth in the area. The phenomenal growth of the city of Russell after the advent of petroleum near this city, the rapid increase of population of Plainville after oil fields were discovered in the vicinity of the town, coupled with the stagnation or decline of cities in the "non oil" counties, furnishes evidence of the importance of the petroleum production as a builder of cities.

Only the city of Hays would have experienced substantial population gains even though petroleum had not been discovered in the county. This city is a college town and would have increased its number of inhabitants along with increasing school enrollments.

Future oil production in the area is predicted to decline on the basis of dwindling oil reserves. There is little chance for finding new large fields in such an extensively explored area. As oil production declines, population numbers will decrease in the counties. The only hope for sustained and increased population for most of the oil towns seems to depend upon the ability of the town to attract industry. It is doubtful that much industry will locate there in future years.

There is little possibility that new fields of any great size will be discovered in any of the oil counties. Certainly if such fields existed they would have been discovered by now. Exploration has been extensive and only small fields could have escaped detection.