AN ANALYSIS OF LAND OWNERSHIP AND RANGE MANAGEMENT PRACTICES IN THE NORTHERN KANSAS FLINT HILLS

BY

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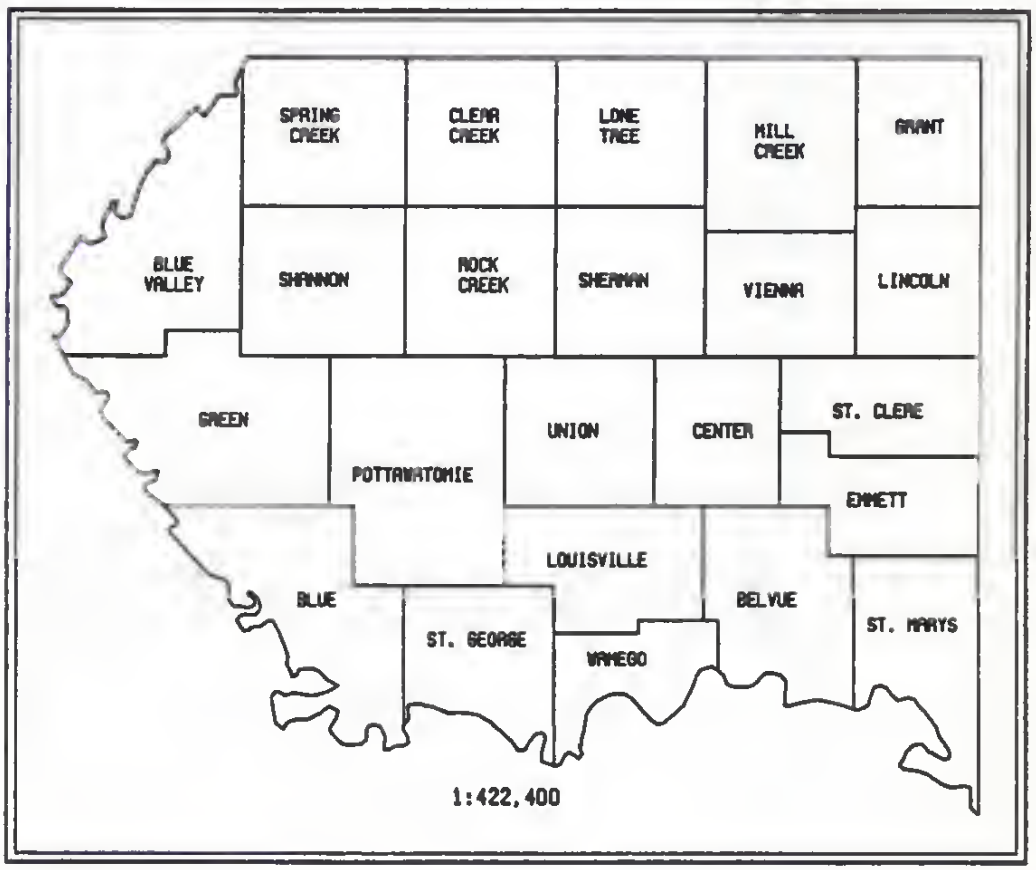

BY

STAN WILDS

1985

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Finally, I would like to acknowledge W. P. Webb for the inspiration he gave me to study and write about the Great American Prairie and the cattle industry that still exists on its vast rangelands. I could not agree more with his words... the cattle kingdom is the most logical thing that has happened in the Great Plains, where, in spite of science and invention, the spirit of the Great American Desert still is manifest.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

Chapter 1

INTRODUCTION

Land ownership has long been an important part of the American capitalist system. From the earliest land alienation policies it has been considered by many to be an inalienable right. Galusha A. Grow proclaimed in 1852 that

> If man has a right on earth, he has a right to land enough to rear a habitation on. If he has a right to live, he has a right to the free use of whatever nature has provided for his sustenance - air to breathe, water to drink, and land enough to cultivate for his subsistence. For these are the necessary and indispensable means for the enjoyment of his inalienable rights, of "life, liberty, and the pursuit of happiness" (Magnusson 1919, 19).

Not only have individuals been given the right to own land, they have also had the assumed prerogative to use the resource in the best way they see fit.

A large portion of the land area in the United States (54 percent) today consists of rangeland which is in the hands of both public and private sectors (Owensby 1983). Management of public lands is controlled by state and federal agencies whereas private lands are managed by the individuals having title. Since many individuals own and

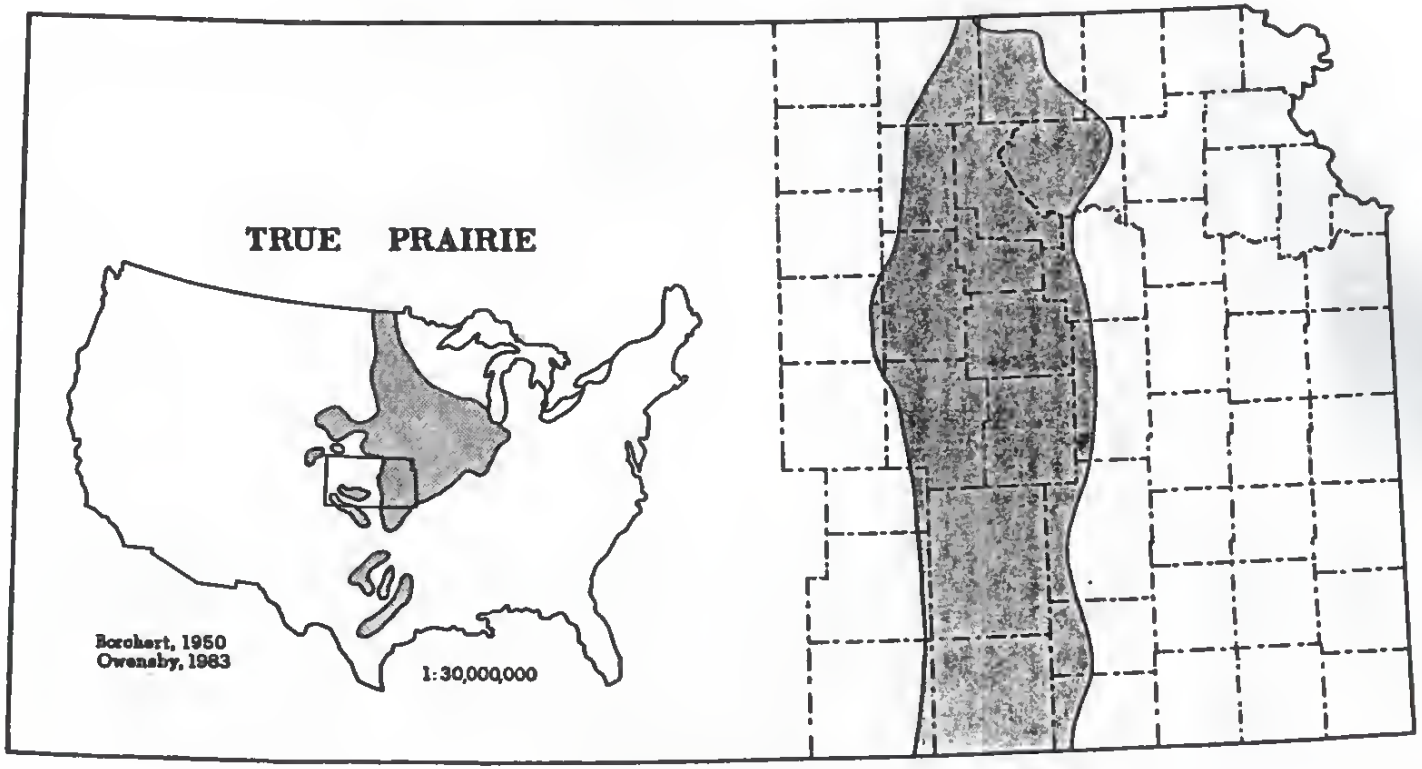
thus manage their rangeland, management practices often differ.

One such area where rangelands are dominated by private ownership is the Flint Hills of eastern Kansas. This area is the largest remaining segment of the tallgrass (true) prairie and comprises the finest native grazing area in the United States (Figure 1). Included in this region are parts of eighteen Kansas counties, the majority of which are composed of natural or replanted native rangelands.

These rangelands provide grazing for hundreds of thousands of range livestock each year. In 1984 over a half million cattle were reported to have grazed on these pastures (1982 Census of Agriculture). An estimated 200,000 to 300,000 cattle are brought in from other ranching regions for seasonal grazing (Self 1978). These cattle are referred to as "transient cattle". The remainder consists of stable cattle herds for year-round grazing. In all, the two general types of grazing mentioned above are considerably different, thus the management practices associated with them also differ.

Why ranchers in this region have chosen different range management approaches is not fully understood; one possible explanation has been the diversity of landownership. This study will examine the influence of landownership on range management practices in the Flint Hills. To understand this influence, a brief overview of landownership and range management practices in the Flint Hills is in order.

Figure 1- FLINT HILLS GRASSLAND WITHIN THE TRUE PRAIRIE REGION



A REVIEW OF LAND OWNERSHIP AND RANGE MANAGEMENT

Kollmorgan and Simonett (1965) were the first to introduce the idea of a relationship between the type of land ownership and range management practices. Their findings indicated that the type of tenure influenced the management practices in Chaae County, Kansas (Kollmorgan and Simonett 1965). Absentee owners, for example, were likely to burn pastures more frequently than local owners to insure a higher quality forage in the early part of the grazing season for increased weight gains on transient cattle.

> The adverse effects of regular burning have for some time been publicized by range management specialists and agronomists, with the result that annual burning has decreased among home owners, operators and operators maintaining foundation herds. The practice persists more stubbornly on absentee-urban owned pastures used to graze transient cattle (Kollmorgan and Simmonett 1965, 287).

Not only did local owners burn less, they were more likely to maintain stable herds in the form of cow-calf operations or registered herds. Locals involved with ranching were generally not involved with intensive farming activities. Their livelihood was derived only from ranching, thus creating the potential for different management schemes as compared to those also involved with more intensive farming practices.

Land tenure in the Flint Hills was investigated at an earlier date by Socolofsky (1949). This study concerned the ownership of one man, William Scully, and his ability to

acquire land during the settlement period of Kansas. Land ownership and management in this case were in the hands of an individual living beyond the confines of the local area, which is common throughout the Flint Hills today.

Management is also impacted by the size of land holdings and the proximity to the operator. Throughout the northern part of the Flint Hills parcels of land are small, and an owner may have title or operate a number of noncontiguous pieces of land. Smith states:

> They face extra costs in time and money to move themselves, their implements and animals, and additional help to dispersed tracts; physical separation of parcels prohibits operators from living "on the farm" in a real sense; and fragmented holdings may reduce farmers opportunities for varying crop and livestock plans (Smith 1975, 58).

Owensby further points out the importance this has on livestock operations. He claims that with greater dispersion of land holdings in smaller parcels, management of rangeland becomes more complex (Owensby 1983).

Diversity of management is inherent in the definition of range management which includes the 'integration of inputs into range ecosystems for maximum use of multiple range resources with sustained maintenance of the system's integrity'(Owensby 1983, 8). In the Kansas Flint Hills land owners have incorporated many practices which have been examined with much interest. This study concentrates on the burning of rangeland, stocking rates, and grazing systems in the northern part of the Kansas Flint Hills. Burning has been an integral part of maintaining the

prairie system'a integrity and increasing animal production (Sauer · 1950, Ohlenbush and Hodges 1983). Burning dates vary however, which leads to different resulta in species composition, grazing distribution, and animal productivity (Anderson, et.al. 1970). Grazing systems also vary in that operators incorporate different grazing periods along with varying types of livestock operations. In addition, stocking ratea range from heavy to light stocking among individuals, which produces differing resulta on the system's integrity and animal production (Launchbaugh and Owensby 1978).

THE SETTING

In the northern part of the Kansas Flint Hills, there exists a unique situation in regard to ownership and management practices. This area has portions of the generally ahallow and rocky soils covered by glacial drift and loess depoaita. Much of this land has been cultivated, along with stream valleys, leading to a mixture of intensive farming practices and extenaive grazing activitiea. Therefore, the ability to combine the two activities is greater than in areas to the south where glacial deposition does not exist.

Beyond the physical attributes, local ownership appears to dominate and land holdings are generally small and fragmented. Since parcels are small, an owner may have title to a number of noncontiguous pieces of land. Thus, fragmentation mentioned by Smith (1965) and Owensby (1983)

suggests diversity of management among agricultural operators.

Within this context additional clarification of the study area is in order. Until now, only the Kansas Flint Hills in general had been referred to with reference to Chase County, Kansas and the northern part of the Flint Hills. From this point the latter is referred to as the northern Kansas Flint Hills (Figure 2). Although no attempt is made to identify this area as a region in all respects, the points made in the preceding material have indicated this area differs physically and with regard to land ownership. Therefore, an area in the northern Kansas Flint Hills was selected for this study.

Within this area Pottawatomie County, Kansas (Figure 2) was selected as the study site. The county lies within the once glaciated part of the Kansas Flint Hills. Land ownership varies throughout the county both in type and parcel size. It also is defined as a unit in agriculturally based data from various sources, which is vital for this type of study. Furthermore, it consists of more than half of the land area in the northern Kansas Flint Hills, providing a representative study site for the area. A more extensive review of the setting is done in Chapter II.

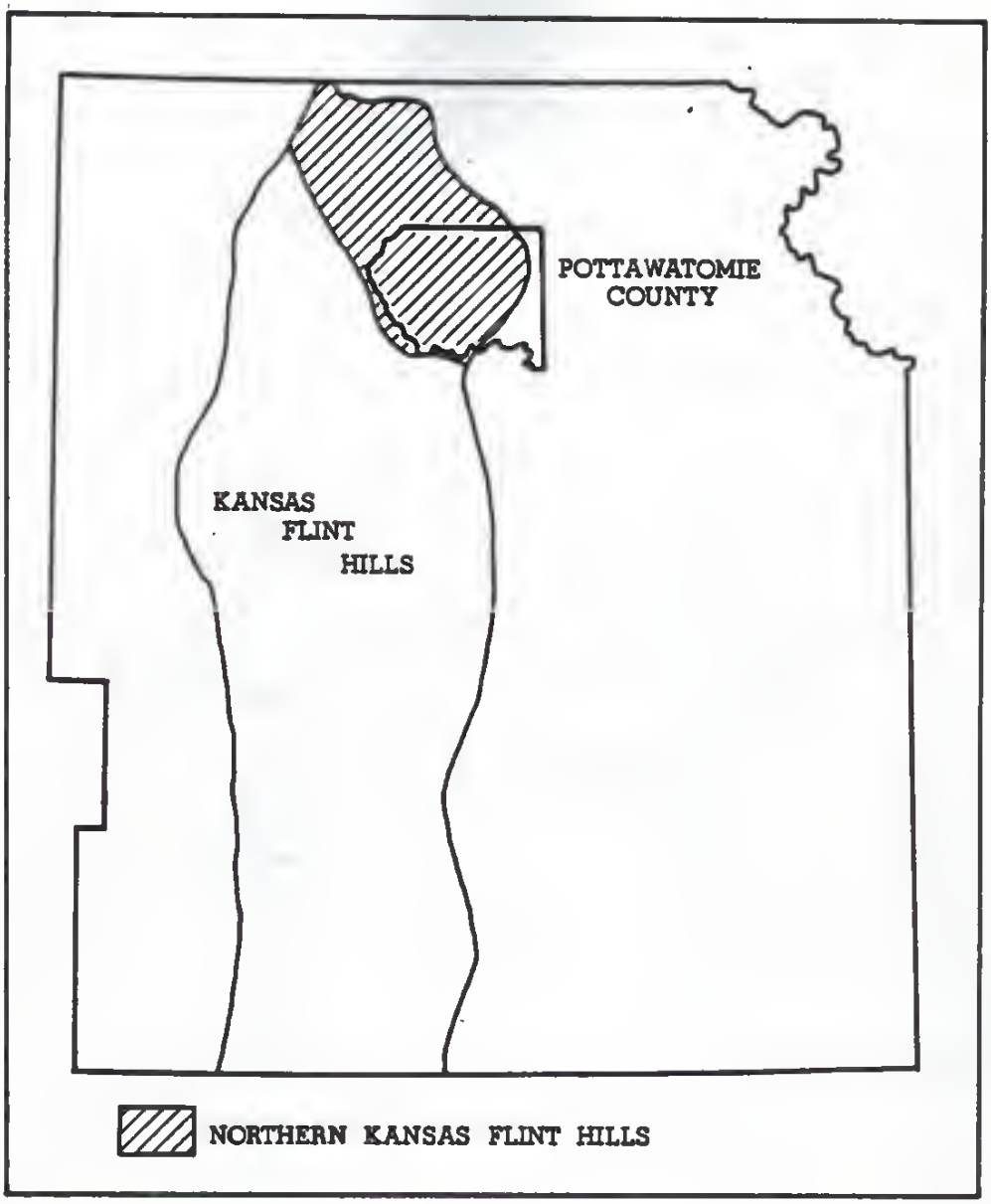


FIGURE 2. Pottawatomie County, Kansas within the northern Kansas Flint Hills.

PURPOSE OF THE STUDY

Although Kollmorgan and Simonett (1965) provided some understanding of the relationship between land ownership and range management practices in the Kansas Flint Hills, much is still to be learned on this subject. It is

the purpose of this research to examine characteristics of range management practices in the northern Kansaa Flint Hills and how land ownership influences these practices. In light of this statement it is propoaed that the type of land ownership and parcel size influences range management practices in this region. The study specificlly focuses on defining a classification of northern Kansas Flint Hilla ownership groups based on the type of land ownership and the size of land holdings. Beyond this classification, this research explores the management strategies of these groups towards range management practices. Moreover, the areas of management that are examined include burning practices stocking rates and grazing syatems, all of which are important management components in maintaining the integrity of northern Kanaaa Flint Hills rangeland.

Insight into human interaction with the environment has intrigued many geographera for the better part of this century. The question of conservation and wise use of natural resources has led many to investigate the best possible uses of these resources. Even though much has been discovered about the use of our range resources, the need to further our understanding is essential for the sustained use of these resources. Therefore, this study provides information for persons involved with research of this kind and those involved with the management of range resources.

Methodology. The research approach for this study has utilized four ateps. First, literature that dealt with range management in the Kansas Flint Hilla region was

gathered. This included material pertaining to the different management practices, such as burning, grazing system types, and stocking rates, used by operators in this region. Additional literature concerning the physical characteristics of the region was investigated for background information. Furthermore, reviewing material relating to the settlement of Pottawatomie County provided insight to current ownership.

Data collection of material from the Pottawatomie County Agricultural Stabilization Conservation Service (A.S.C.S.) office was the second phase of this study. Land use data delineating rangeland, cropland, and other uses were derived from aerial photographs (1:5,000) for the purpose of mapping current land use in the county. Collection of A.S.C.S. farm records added additional land use data along with information on land ownership. Acreage figures on cropland and rangeland were compiled from these records as were addresses and number of land owners in the county.

The third stage consisted of the submission of a questionnaire to land owners dealing with range management practices in the Northern Flint Hills. The questionnaire was sent to a sample of land owners throughout Pottawatomie County. The results of this survey were collected and compiled. The compilation, or phase four, consisted of frequencies of given range management practices used by land owners. In addition, a chi-squared analysis was performed

to determine if any relationship existed among the frequencies.

Thesis Organization. This atudy commences with an overview of the phyaical characteristics and land use in Pottawatomie County. This provides background on the setting, including reference to the physiography, soils, and natural vegetation. Land use data derived from aerial photographs at the Pottawatomie County A.S.C.S. office introduces the interaction between intensive farming practices and extensive grazing activities.

Differencea in local versus absentee land ownership and small versus large land holdinga are then addressed. In addition, operation size is investigated. Examination of A.S.C.S. farm records helped determine land ownership groups by type and parcel aize, and provided information on small, intermediate, and large farm operations. Thus, examination of land ownership from settlement to present in Pottawatomie County will be undertaken in Chapter III.

Chapter IV examines range management practices in the northern Kansas Flint Hills. A review of range management literature provides a better understanding of the different management practices employed in this region. In addition, the results of a queationnaire submitted to a small number of landowners are analyzed in this chapter. These reaults give an indication of the management differences that exist among landowners.

Within this context, a statistical analysis in Chapter IV evaluates the relationship between landownership

and range management practices. This approach seeks to discover whether ownership does in fact influence the management of rangelands. More specificaly, the analysis evaluates how land ownership groups by type and parcel size influence management.

Literature Cited

Anderson, K.L. and others 1970. "Burning Bluestem Range", Journal of Range Management. 23/2 : 81-92.

Kollmorgan, W.M. and D.S. Simonett. 1965. "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas", Annals, The Association of American Geographers. 55/2: 260-290.

Lauchbaugh, J.L. and C.E. Owensby. 1978. Kansas Rangelands: Their Management Based on a Half Century of Research. Manhattan: Kansas State Experiment Station, Bulletin 622.

Magnusson, L. 1919. Disposition of the Public Lands of the United States. Washington: Department of Labor.

Ohlenbush, P.D. and E.P. Hodges 1983. Stocking Rates: Tips for Managing Rangeland Series. Manhattan: Kansas State Experiment Station, Bulletin 690.

Owensby, C.E. 1983. "Range Management." Manhattan: Unpublished Range Management Notes. Department of Agronomy, Kansas State University.

Sauer, C.O. 1950. "Grassland Climax, Fire, and Man", Journal of Range Management. 3/1: 16-21.

Self, H. 1978. Environment and Man in Kansas: A Geographical Analysis. Lawrence: The Regents Press of Kansas.

Smith, E.G. 1975. "Fragmented Farms in the United States", Annals. The Association of American Geographers. 65/1: 58-70.

Socolofsky, H.E. 1947. The Scully Land System in Marion County, Kansas. Manhattan: A Masters Thesis, Department of History, Kansas State University.

United States Census of Agriculture for Kansas, 1982. Washington D.C.: U.S. Department of Agriculture.

Chapter 2

PHYSICAL CHARACTERISTICS AND LAND USE

PHYSICAL CHARACTERISTICS

The surface features that exist in the northern Kansas Flint Hills, which includes Pottawatomie County, are a result of glacial deposition and of differential erosion by streams. The resulting landforms of differential erosion are known as the Flint Hills Upland. Glacial deposits have affected these uplands by covering portions of the surface with glacial drift and loess deposits. Each is examined to provide background on the physical setting and to indicate how this influences land use throughout the county.

The Flint Hills Upland. Pottawatomie County lies in the Flint Hills Upland which is a subdivison of the Central Lowlands. This upland marks the western border of the Central Lowlands, extending across Kansas north and south from Marshall to Cowley County (Self 1978, Schoewe 1949, Muilenburg 1953). Ranging from fifteen to seventy miles wide, the surface is characterized by a succession of prominent scarps and benches that are dissected by well incised streams (Kollmorgan, Simonett 1965).

The rock units are Permian in age, conaisting of alternating layers of limestones and shales. The limestone layers, most of which contain flint (chert), are more resistant to weathering than the easily eroded ahales. Thus, differential erosion by streams has created varying types of uneven surfaces.

> Their beds, strewn with angular fragments of flint (chert), are incised in narrow boxlike channels where cut in the flint-bearing rocks, but at points where cut in weaker shales the valleys immediately open out and the valley slopes are much gentler. The valleys of the east or west-flowing streams are characteristically asymmetrical with the steeper slopes on the south side of the valleys (Schoewe 1949, 286-288).

As the slope increases along many of these formations ao doea the local relief. It is not uncommon to view relief exceeding 150 feet, creating quite rugged topography in various areas. In fact, the prominent rocky escarpment forming the eastern border of the subdivision is considered to be the most rugged surface feature in Kansas, where the east-facing slope is composed of two or three steplike benches rising several hundred feet high (Self 1978).

The landforms mentioned above characterize those in Pottawatomie County. The Kansas River runs along the southern county border, while the Big Blue River, Rock Creek, and Vermillion Creek have carved deep valleys stretching north to south across the county (Figure 3). These well defined stream valleys and their numerous tributaries have dissected the county, leaving a succession of terraced uplands. In addition, Vermillion Creek follows

the prominent escarpment which flanks the eastern one-fourth of the county.

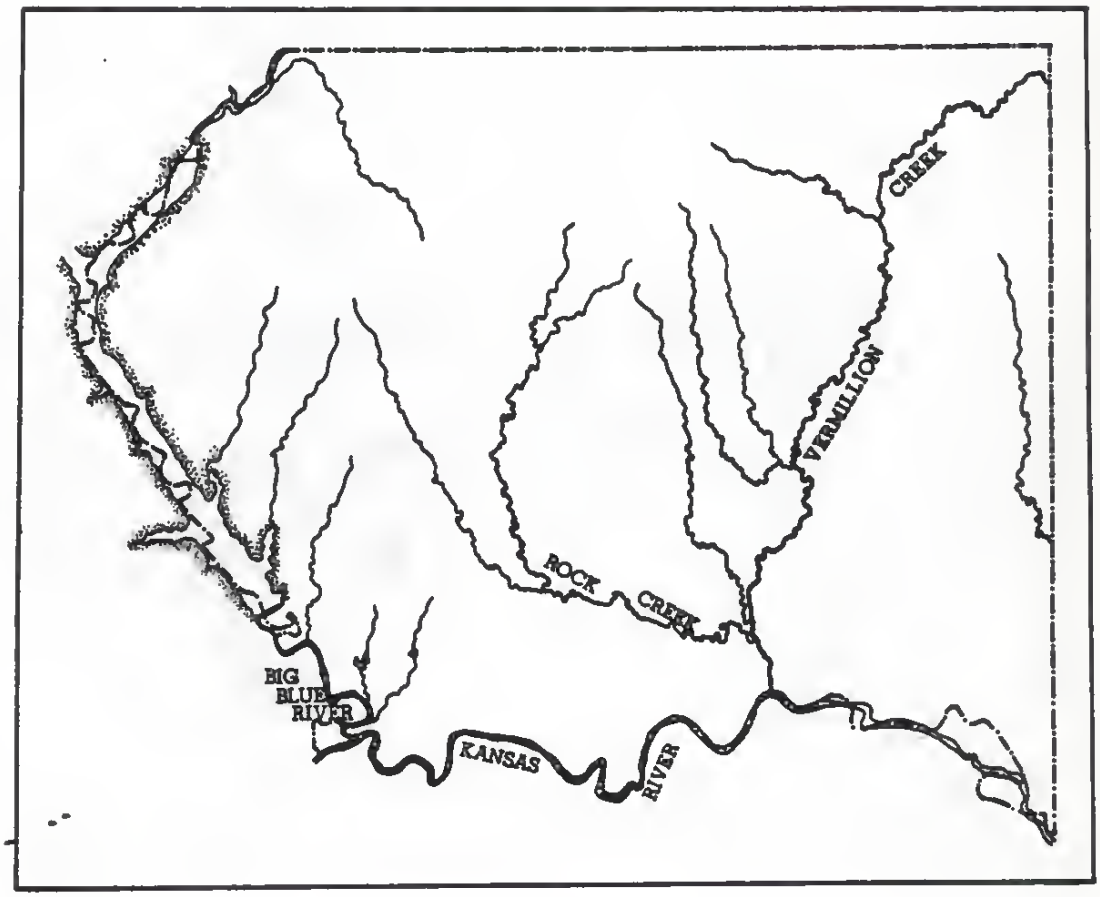


FIGURE 3. Major Streams in Pottawatomie County, Kansas

The soils found on this upland are dominated by the Tully-Cline-Pawnee association (Figure 4). This association covers nearly sixty-five percent of the county, is found on

the tops and sideslopes of ridges dissected by drainage-ways and streams, and has slopes ranging from one to forty percent (Table 1). Tulley and Cline soils have formed in the residuum of local limestones and shales and are found on lower sideslopes, footslopes, and sideslopes (Unpublished Pottawatomie County Soil Survey 1984). Pawnee soils have formed in glacial till on ridgetops and upper sideslopes. These soils are found where the topography is charactistic of the bench-like terraces formed through diffential erosion of limestones and shale layers. The resulting agricultural land use on this rolling topography consists primarily of rangeland; however, some cultivated land can also be found.

Cultivation also occurs on two bottom land soil associations that cover twelve percent of the county. The Muir-Eudora-Wabash association is found along the Big Blue and Kansas river valleys while the Kennebec-Wabash-Reading association dominates the bottom lands of Red Vermillion and Rock creeks (Figure 4). Slopes range from zero to one percent for the former and zero to twelve percent for the latter. These soils are primarily cultivated and are considered to be prime agricultural lands (Table 1).

Of lesser importance (zero to fourteen percent of the county) is the Elmont-Sibleyville-Vinland variant association (Figure 4). This association is found on narrow ridgetops and sides of ridges dissected by intermittent drainageways (Unpublished Pottawatomie County Soil Survey 1984), (Table 1). A combination of rangeland and cropland exists on these soils with small areas in native woodlands.

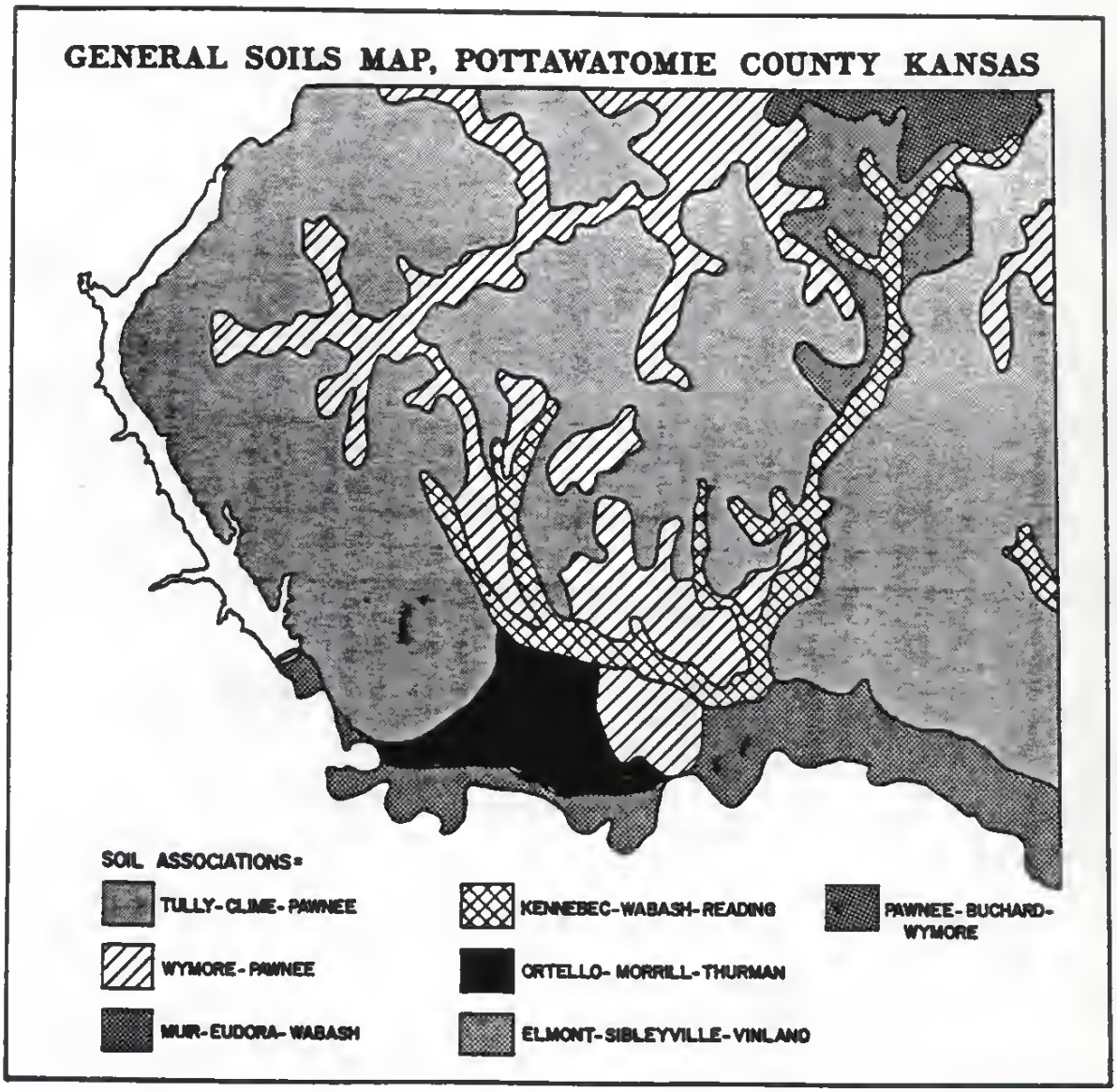


Figure 4. General Soils Map of Pottawatomie County, Kansas.

Table 1. Upland Soil Associations in Pottawatomie County.

Association	Percent of county	Percent slope	County Location
Tully-Cline-Pawnee	65	1-40	Tops and sideslopes of ridges dissected by drainageways and creeks.
Muir-Eudora-Wabash	6	0-1	Bottomland along the Big Blue and Kansas rivers.
Kennebec-Wabash-Reading	6	0-12	Bottomland along the Vermillion and Rock creeks.
Elmont-Sibleyville-Violand	3	1-20	Narrow ridgetops and sides of ridges dissected by intermittent drainage.
Ortello-Morrill-Thurman	4	3-8	Tops and sideslopes of ridges dissected by drainageways and creeks.

Source: Unpublished Pottawatomie County Soil Survey, 1984.

Table 2. Soil Associations Influenced by Glacial Deposition in Pottawatomie County.

Association	Percent of county	Percent slope	County Location
Wymore-Pawnee	16	0-10	Broad ridges dissected by drainageways and creeks.
Pawnee-Burchard-Wymore	2	1-12	Tops and sideslopes of ridges dissected by drainageways and creeks.

Source: Unpublished Pottawatomie County Soil Survey, 1984.

Influence of Glaciation. During the Kanaan Ice age (Pleistocene time) moat of northeastern Kansaa was covered by a continental ice sheet. Pottawatomie County waa overlapped by this ice sheet as the Big Blue and Kansaa river valleys generally marked its weaterly and southerly limits (Figure 5). Surface features for the most part were not greatly affected; however, iaolated patches of till, outwash, and glacial erratics still remain. Likewise, loess deposits of the Wisconain ice age cover parta of the land surface.

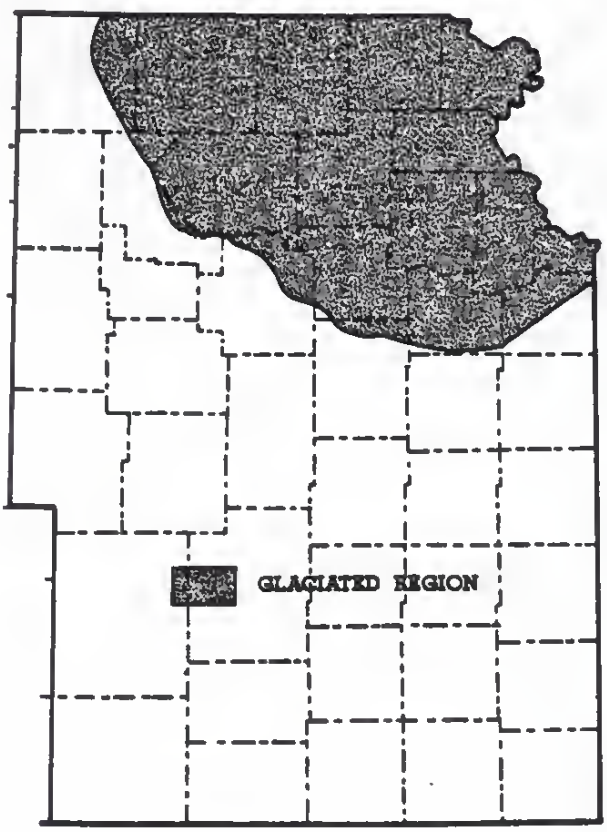


FIGURE 5. Region covered during the Kanaan Ice Period.

Glaciation has influenced most of the soil associations in the county, two of which were formed entirely from glacial deposits. Calcareous loess of the Wisconsin age and glacial till of the Kansas age have provided parent material in the formation of the Wymore-Pawnee association (Figure 4). This nearly level to moderately sloping soil formation covers about sixteen percent of the county (Table 1). Pawnee soils are found on the gently sloping shoulders and sideslopes while the Wymore soils occupy the gently sloping interfluves (Unpublished Pottawatomie County Soil Survey 1984). Cultivated lands are found in abundance on these soils, intermixed with rangeland. The Pawnee-Burchard-Wymore association (Figure 4) also was formed from these tills and loess deposits; however, this association is confined to the tops and sideslopes or ridges dissected by drainageways and streams (Table 1).

Overall glaciation, as mentioned, has impacted to some degree the majority of the soil associations found in Pottawatomie County. This influence in part has helped create deeper, richer soil. These factors, along with the reduction of slope, have increased the potential for cultivation in many parts of the county. This is especially evident where Wymore and Pawnee soils are found. Consequently, cultivation in parts of the county might not exist if it were not for the influence of glaciation.

Natural Vegetation. The Kansas Flint Hills were once part of the True Prairie System. This prairie, which is

dominated by bluestem grasses, is commonly known as the tallgrass prairie. According to Bragg (1974), forty to sixty percent of the total plant production is big and little bluestem. Indiangrass, switchgrass, sideoats grama, blue grama, hairy grama, buffalograss, and Kentucky bluegrass make up another ten percent. The remaining vegetation conaists of perennial and annual forbs and various woody plants.

The existence of thia climax vegetation in the Northern Kansas Flint Hills is the result of various factora. Climate ia one such factor which is characterized as temperate continental (warm summer subtype) (Self 1978). Temperatures average at least 50 degrees Fahrenheit from four to seven months. Average temperaturea for the coldest and warmest montha are below 32 degrees Fahrenheit and 75-85 degrees Fahrenheit respectively. The annual growing season ia roughly 170 to 180 days with an annual average of 32- 34 inches of precipitation. Conaequently, the subhumid nature of the climate creates an environment that is highly conducive to tall grasses. This climatic condition also favors the development of forest systems; however, the influence of fire, native grazers, and frequent drought periods have reduced the potential invaaion of woody species (Weaver, Albertson 1956, Self 1978).

Soils and management are additional factors influencing the potential natural vegetation in this region. Rangelands in the Kansas Flint Hills are grouped into a classification based on different range sites. This was

pioneered by Anderson and Fly (1955) using a classification based on relationships of species' composition and soil types. This type of classifying has been extended to include productivity, reaction to grazing, and management input (Owensby 1983). The typical range sites for the Kansas Flint Hills region are: lowland site, loamy upland site, breaks site, shallow site, clay upland site, and claypan sites (Bidwell 1966, Nieman 1975). Lowland sites, found in alluvial bottoms, consist principally of floodplain trees, switchgrass, and big bluestem along the border of loamy upland sites. The largest community in terms of land area is the loamy upland site which is dominated by big bluestem, little bluestem and Indiangrass. Soils in general are sufficient in depth with medium or loamy texture to support high productivity from plants. Break sites, which contain limestone outcroppings, have rockier and steeper soils than loamy upland soils, and productivity is also greatly reduced. The same tall grasses are found; however, sideoats grama is also found in abundance. Shallow range sites have very thin soils underlain by massive limestones and are dominated by short grasses. The last two range sites, clay uplands and claypans, are found on the flat to gently sloping uplands that differ in their soils and topography. Clay uplands have sufficiently deep soils; however, they are droughty due to reduced infiltration rates. Thus productivity is much lower than on loamy upland sites and will consist of more short grasses than tall

grasses. Claypana are even more droughty than clay uplands and will only support shortgrassea.

Naturally occurring vegetation is still found in abundance throughout Pottawatomie County. Parta of the county, however, have been put to other uses. The following section discussea the land uses found in the county.

LAND USE

Land uses in Pottawatomie County are the result of physical characteristics and cultural practices. The physical environment has created, in some circumstances, limitations to intensive agricultural practices, yet in other inatances it has provided prime agricultural lands. Since the beginning of aettlement over 100 years ago, individuals have blended a number of land uses throughout the county. As auch, a high percentage remaina in ita natural state. In other cases the landacape has been transformed into cultivated agricultural landa. In addition, settlements have been created in which residential, commerical, industrial, and recreational uses are to be found. Table 3 describes the general land use in the county.

As Figure 6 ahows, agricultural land use dominates in the county, which is subdivided into rangeland and cultivated cropland. Rangeland is the predominant land uae and is located mainly on upland areas (Table 4). Much of the rangeland is in large uninterrupted segments of tallgrass prairie, which is characteriatic of what has been

Table 3. Land Uses in Pottawatomie County, Kansas 1984.

Land Use	Definition
Agricultural Land.	Land primarily used for production of food or fiber.
Rangeland.	Land on which the native vegetation is predominately grasses, grass-like plants, forbs or shrubs suitable for browsing or grazing.
Shrub and Brush Rangeland.	A mixture of native vegetation which has been invaded in varying degrees by a mixture of woody species; predominately dogwood, buckbrush, and redcedar.
Cropland.	Land that is used for cultivated practices including idle cultivated lands, cropland in soil-improvement grasses and legumes, and cropland used for pasture in rotation with crops.
Deciduous Forest Land.	Land having a predominance of trees that lose their leaves at the end of the frost-free season or at the beginning of a dry season.
Reservoirs	Artificial impoundments of water for flood control, industrial water supplies, recreation, or transportation purposes.
Urban or Built-Up Land.	Land that is comprised of areas of intensive use with a large portion of land covered by structures; including cities, towns, villages, strip developments along highways, transportation, power, and communications facilities, and areas occupied by commercial and industrial purposes; all which may be isolated from urban areas.

Source: Based on A.S.C.S. programs and Anderson, et.al. Land Use and Land Cover Classification System.

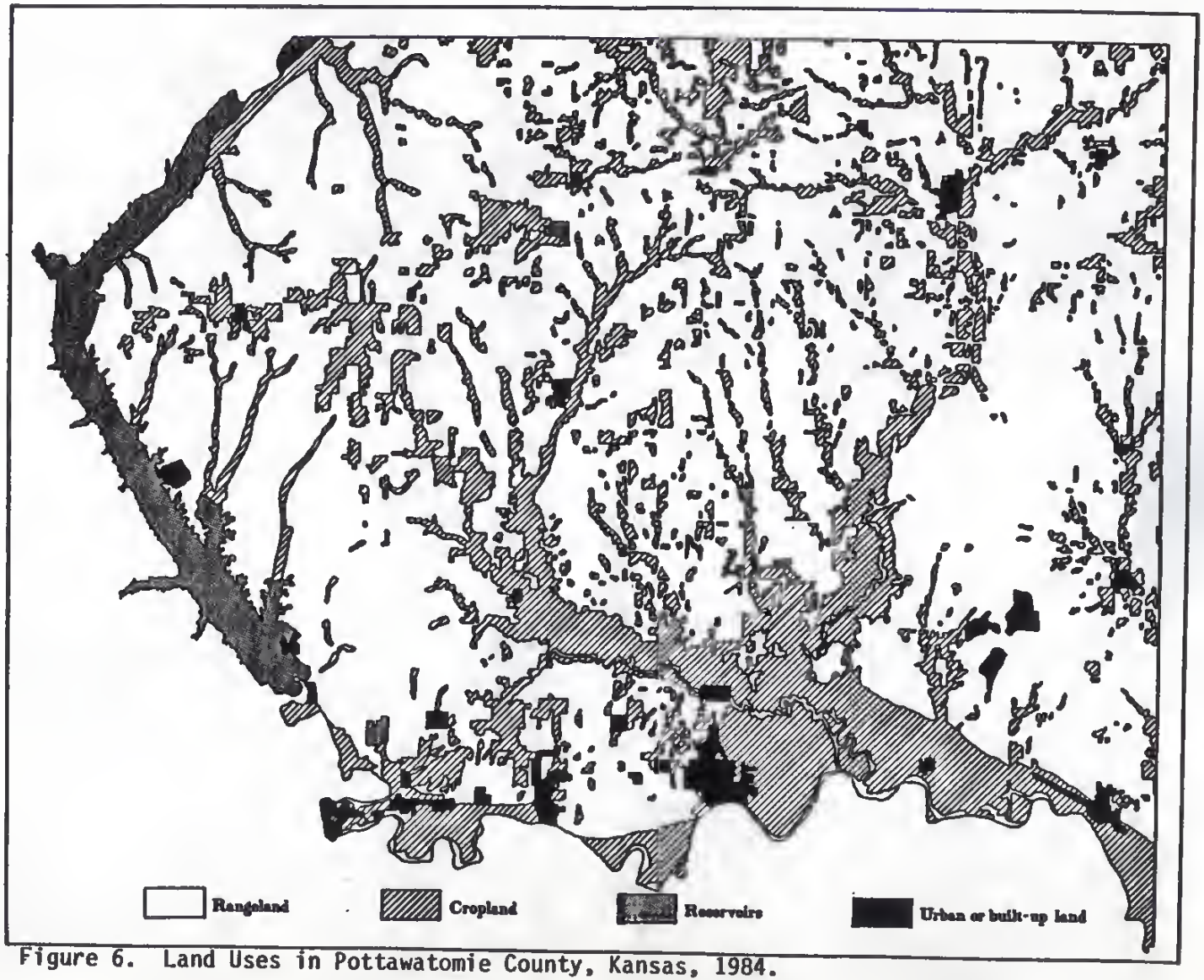


Figure 6. Land Uses in Pottawatomie County, Kansas, 1984.

known as "big pasture country" (Kollmorgen and Simonett 1965). Not all of this land use is found in this type of arrangement, however. In many areas (especially along major streams) rangeland is in small units mixed with cultivated cropland. Futhermore, some of the rangeland in recent times has had an increase in woody species, so that it now a mixture of shrub and brush rangeland.

Table 4. Existing Land Use in Pottawatomie County, 1984.

Land Use	Number of Acres	Percent of Total Land
Rangeland(1)	339,381	64
Shrub and Brush Rangeland(2)	8,050	2
Cropland(1)	125,233	24
Woodlands(2)	6,863	1
Reservoirs(3)	13,110	3
Urban or built-up land and other lands(4)	30,234	6
Total	529,734	100

Sources: (1) Based on Pottawatomie County A.S.C.S. records, 1984.
(2) Based on U.S. Census of Agricultural, 1982.
(3) Based on Land Use and Open Space Plan of Riley and Pottawatomie Counties, 1972; includes recreational areas around Tuttle Creek Reservior and both State lakes.
(4) Based on Land Use and Open Space Plan of Riley and Pottawatomie Counties, 1972; includes all urban areas, transportation routes, and all other lands.

Cultivated cropland ranks second to rangeland in total land area and is primarily located in the bottom lands and areas affected by glacial till and loess deposits. The Kansas river floodplain is almost entirely cultivated except

for some urban-built-up areas, which near Manhattan and Wamego are increasing each year. This land use ia alao found in abundance on bottom land along Vermillion and Rock creeks. Likewise, where glacial till and loess depoaits exist, cropland is quite extensive; however, it is predominately mixed with rangeland.

Woodlands are scattered throughout the entire county but make up a low percentage of the total land area. They are most abundant along ravines and bottom lands. Often they are located along steep side-slopes that were until recently rangelands. Examples of thia occurrence are found along the eastern edge of Tuttle Creek Reservoir, and along Rock Creek, Vermillion Creek, and the Kansas River where the adjacent ateep side-slopes aupport a mixture of brush and shrub rangeland and woodlands.

Urban and/or built-up-land is alao found in scattered units throughout the county. Much of thia land use consists of settlements such as Westmoreland, Onaga, St. Marys, and Wamego. In addition scattered developments and single residences are located throughout the county. Highest concentrations are situated on the eastern edge of Tuttle Creek Reservoir and border much of the U.S. Highway 24 corridor between Manhattan and Wamego. Many of the residences are on plots of 5 to 20 acres where no significant agricultural production occurs. These are not considered agricultural and will be termed here as rural residential. The eastern edge of Manhattan alao has a mixture of commercial, residential, and industrial uses.

Furthermore, a large industrial zone northwest of St. Marys has been added in the past ten years for the construction of the Jefferies Energy Center, a major coal-powered electrical generating power plant. At present and in the future built-up lands will continue to increase in land area as the urban fringe creeps into the rural landscape.

State and federally-owned lands also have a role in the local land use structure. These lands are mainly covered by Tuttle Creek Reservoir accompanied by a number of state and federal parks. Their importance locally is to provide recreation for local inhabitants as well as for others from urban areas in Kansas and neighboring states. Moreover, the existence of the reservoir has largely been the influencing factor in the establishment of the rural residential settlements found along the lakes eastern edge.

Literature Cited

Anderson, J.R. and others. 1976. A Land Use and Land Cover Classification System For Use With Remote Sensor Data. Washington: Geological Survey Professional Paper 964.

Anderson, K.L. and C.L. Fly. 1955. "Vegetation-Soil Relationships in Flint Hills Bluestem Pastures", Journal of Range Management. 8/4: 163-169.

Bragg, T.B. 1974. Woody Plant Succession on Various Soils of Unburned Bluestem Prairie in Kansas. Manhattan: Dissertation,Kansas State University.

Bidwell, O.W. 1966. "The Flint Hills Range Sites", Transactions of the Kansas Academy of Science. 69: 205-213.

Kollmorgen, W.M. and D.S. Simonett. 1965. "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas", Annals, The Association of American Geographers. 55/2: 260-290.

Muilenburg, G. 1953. The Kansas Scene. Lawrence: State Geological Survey, University of Kansas.

Nieman, L.N. 1975. "Rangeland", Soil Survey of Riley County and Part of Geary County, Kansas. D.R. Jantz and others, pp. 40-43. Washingto D.C.: Soil Conservation Service, United States Department of Agriculture.

Oblinger-Smith Corporation 1972. Land Use and Open Space Plan for Pottawatomie and Riley Counties. Wichita: Oblinger-Smith Corporation.

Owensby, C.E. 1983. "Range Management", Manhattan: Unpublished Range Management Notes, Department of Agronomy, Kansas State University.

Schoewe, W.H. 1949. "The Geography of Kansas", Transactions of the Kansas Academy of Science. 52/3: 261-333.

Self, H. 1978. Environment and Man in Kansas: A Geographical Analysis. Lawrence: The Regents Press of Kansas.

Unpublished Pottawatomie County Soil Survey. 1984. N.p.: n.p.

Weaver J.E. and F.W. Albertson 1956. Grasslands of the Great Plains. Lincoln: Johnson Publishing Co.

Chapter 3

LAND OWNERSHIP IN POTTAWATOMIE COUNTY

THE DISPOSAL OF PUBLIC DOMAIN

The diapoaal of public lands in Pottawatomie County began when the Kansaa-Nebraska Act became law on May 30, 1854. Settlera were allowed to settle on open lands in the area in accordance with the Preemption Act of 1841. This act gave the right to settle on and improve unappropriated public lands and later buy them at the minimum price without competition' (Hibbard 1924, 144). Under the provisiona of thia act, land was open to the head of a household who had to be twenty-one years of age or a widow, and an American citizen. Each was granted 160 acres on which to settle and buy at a later date at a minimum price from the government. Aa a result of this legislation, settlement began along Rock Creek and the Kansas River Valley. Soon after, the towns of St. George, Louisville, and Rockingham (Fluah) were founded. Also at this time, a settlement on the Pottawatomie Indian Reservation evolved to later become the village of St. Marya.

During this territorial period the county's boundaries were established. Until 1857 the western portion of the county was part of Riley County while the eastern half lay in Calhoun County (Figure 7). Late in 1856 a petition was drawn asking for a new county to be named Pottawatomie, derived from Potawatamink meaning "People of the Place of the Fire" (Riley County Genealogical Society 1976). This request was granted on Feburary 20, 1857, creating the present county boundaries (Figure 7).

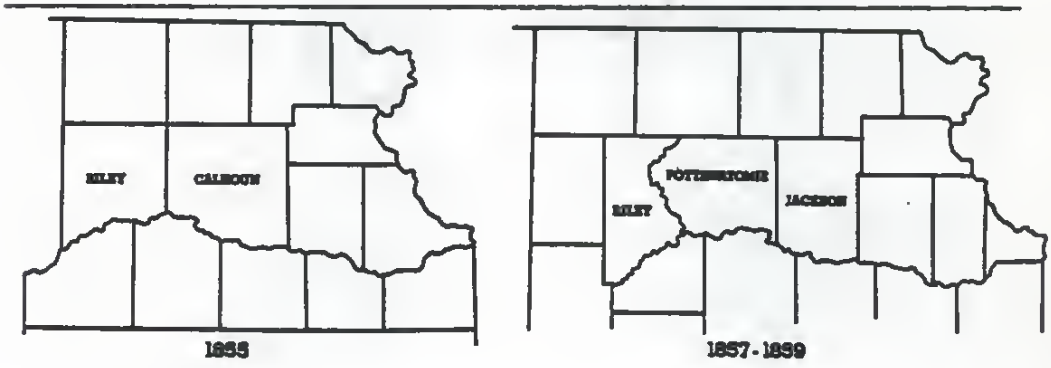


Figure 7. Boundary Changes in Kansas Counties, 1855-59. Source: Riley County Genealogical Society, 1976.

In that same year, surveying of public lands was started and completed in 1868. The office of Surveyor General for the Kansas-Nebraska Territory reported surveys totaling almost three million acres, including military and Indian reservations north of the Kaw River, had been completed by 1858 (Socolofsky 1956). Once these lands were surveyed, persons could apply for legal occupancy on public lands outside Indian territory. Consequently, more settlements occurred and more communities began to appear with the emergence of Webster, Timber City, and Pittsburgh,

none of which exist today. Moreover, by 1860 the population of the county reached 1,529 (Table 5), (Census of Population 1860).

In the following years settlement greatly increased with the enactment of the Homestead Act of 1862 and land grants given to railroads. The Homestead Act provided much of the same provisions as the Preemption Act of 1841 except the 160 acres were free. Only a filing fee was required; however, each tenant was to live on the homestead for five years and make general improvements before title was approved. The first reported claim under this act at the Atchison Land Office was located in Pottawatomie County and dated January 2, 1863 (Socolofsky 1956). Claims escalated in the following years with peak periods in 1871, 1879, 1886, and 1893 for the state of Kansas. Census figures (Table 5) indicate that between 1860 and 1870 the population in Pottawatomie County increased from 1,529 to 7,848, primarily due to migration of settlers into the county. By 1900 the population had doubled as immigration continued to escalate. Population figures steadily rose until 1890 and then began to decrease throughout most of the twentieth century. As of 1980 the population was 14,782, increasing by 25 percent in the last decade.

Railroads also played an important role in the settlement of the county. Two railroads were given land under the provisons of the Pacific Railway Act of 1862. The Kansas Pacific Railroad was granted land when track was laid along the Kansas River valley in 1866. This company

received twenty sections per mile of track on alternate sections (all with odd numbera in the township survey) in the western half of the county (Figure 8), (Self 1978, Socolofsky and Self 1972). As a result, more settlement occurred in thia portion of the county, including the existing city of Wamego. Land was also given to the Union Pacific (Central Branch) in the upper third of the county (Figure 8). Ten sections per mile of track on alternate sections were consented; however, aome land was lost due to prior settlement.

Table 5. Population of Pottawatomie County, 1860-1890.

Year	Population	Percent Change
1860	1,529	---
1870	7,848	513
1880	16,350	208
1890	18,470	104

Source: U.S. Census of Population, 1860-1890.

In addition to land grants, railroada were alao allowed to buy portions of Indian lands. The Atchison, Topeka, and Santa Fe Railroad Company (A.T.S.F.) purchased 333,767 acres of the Pottawatomie Reserve Area in 1868. This included parts of Wabaunsee, Jackson, Shawnee, and nearly all of the southeastern segment of Pottawatomie County (Figure 8). Although the railroad company received a aubstantial portion of the reserve, Indiana were allowed to keep separate tracts of land. Many chose to do so; however, by 1872, 209 sales were made by Indians on the reserve lands

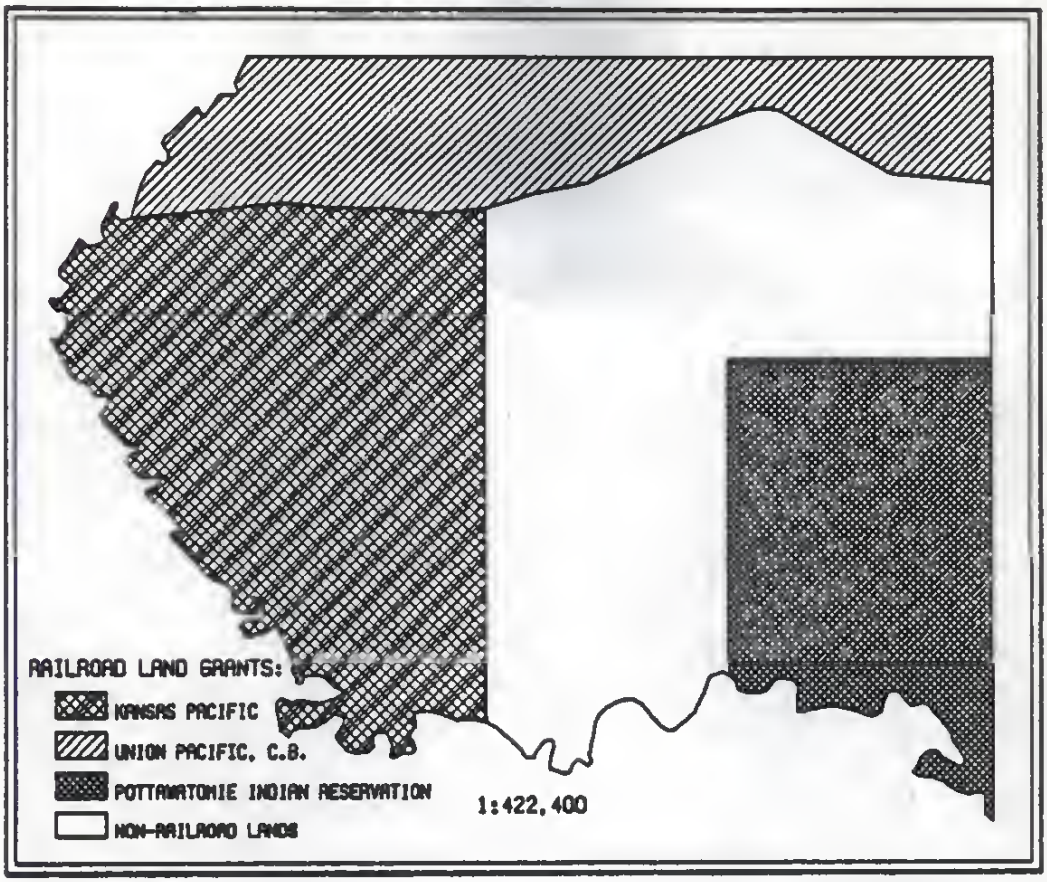


FIGURE 8. Railroad Land Grants in Pottawatomie County, Kansas, 1860-70. Source: Davis, 1950, and Self, 1978.

totaling 17,819 acres (Davis 1950). In the same time period, the A.T.S.F. only made 17 sales amounting to 2,710 acres. It should be pointed out though, that the railroad companies often held out to sell prime bottom lands in smaller acreages at later dates.

In all, settlement was fairly rapid, but not all early claims were finalized. Fertile river valleys were generally claimed earlier while much of the upland areas drew little attention from those wishing to break the sod. This is evident in Table 6 as well as Figures 9 through 13 since townships with the majority of cultivatable lands were settled more rapidly than surrounding townships consisting

primarily of rugged uplands. Even when settlers did stake claims to these more rugged lands, many of them were abandoned in the early years since homestead provisions

Table 6. Population by Township in Pottawatomie County, Kansas, 1860-1900, and 1980.

Township	Year					
	1860	1870	1880	1890	1900	1980
Belvue			734	784	863	353
Blue		544	742	730	687	1402
Blue Valley			681	882	814	243
Center			509	427	458	126
Clear Creek			657	844	581	152
Emmet			522	344	381	377
Grant				750	989	365
Green			594	635	662	153
Lincoln			459	433	400	122
Lone Tree			576	530	749	231
Louisville		2,409	1,110	980	973	591
Mill Creek			1,679	1,078	1,221	1,000
Pottawatomie		1,155	1,105	955	915	399
Rock Creek			1,123	938	1,098	701
St. Clere				339	347	82
St. George		435	762	544	561	1,697
St. Mary		1,205	1,418	2,163	2,155	1,989
Shannon		812	921	520	670	196
Sherman				540	504	156
Spring Creek				427	366	72
Union			634	428	596	161
Vienna		1,288	336	346	369	120
Wamego			1,788	1,905	2,111	3,882
County Total	1,529	7,848	16,350	17,722	18,470	14,782

Source: U.S. Census of Population, 1860-1900 and 1980.

basically required 'plowing up' the land. Much of this land could not be effectively tilled, and in general claims were not sufficient in size to make a living from the available land; thus many moved on, leaving behind unbroken grassland. The result left land open for speculation in which investors, not living on the property or even in the general area, were able to buy abandoned acreage.

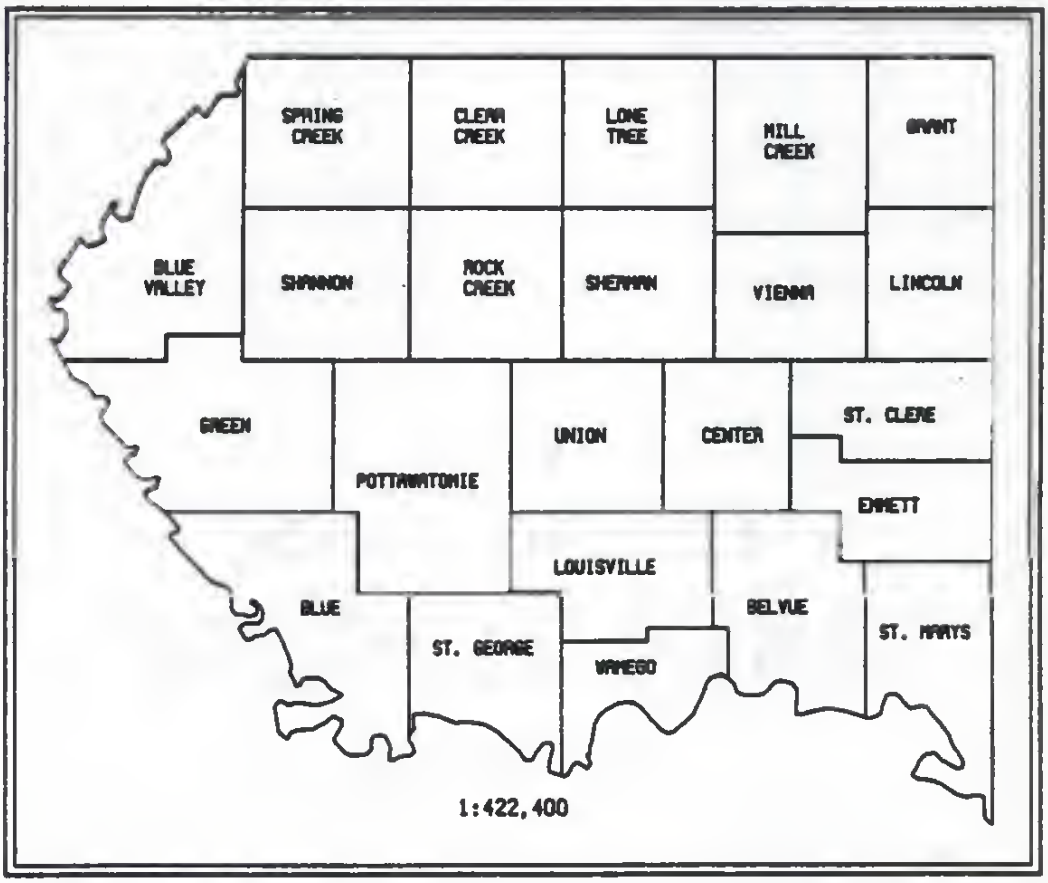


FIGURE 9. Townships in Pottawatomie County, Kansas

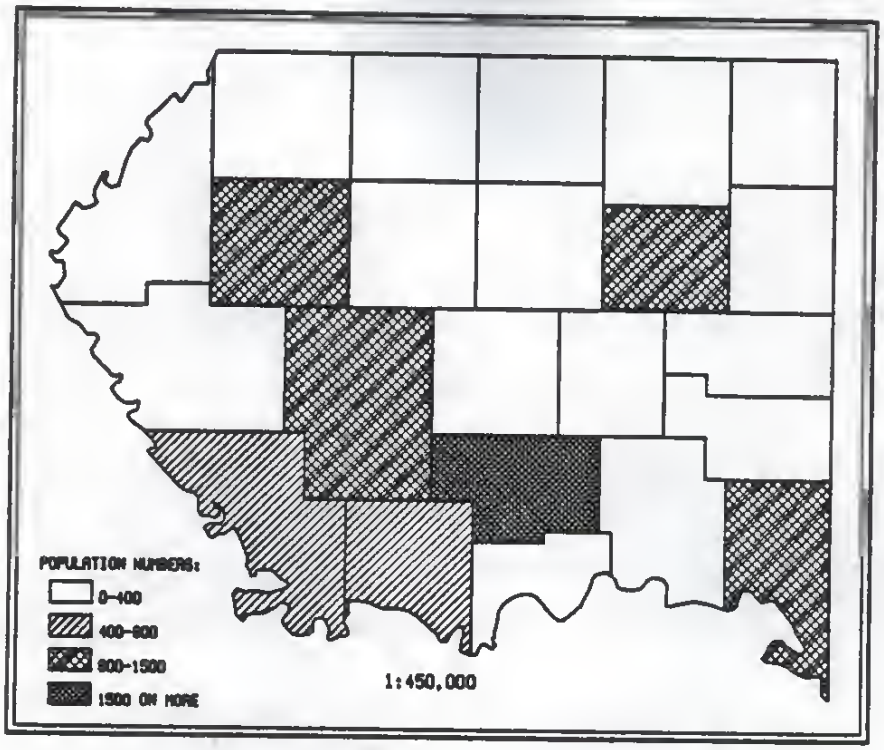


FIGURE 10. Population by Township in Pottawatomie County, Kansas, 1870. U.S. Census of Population.

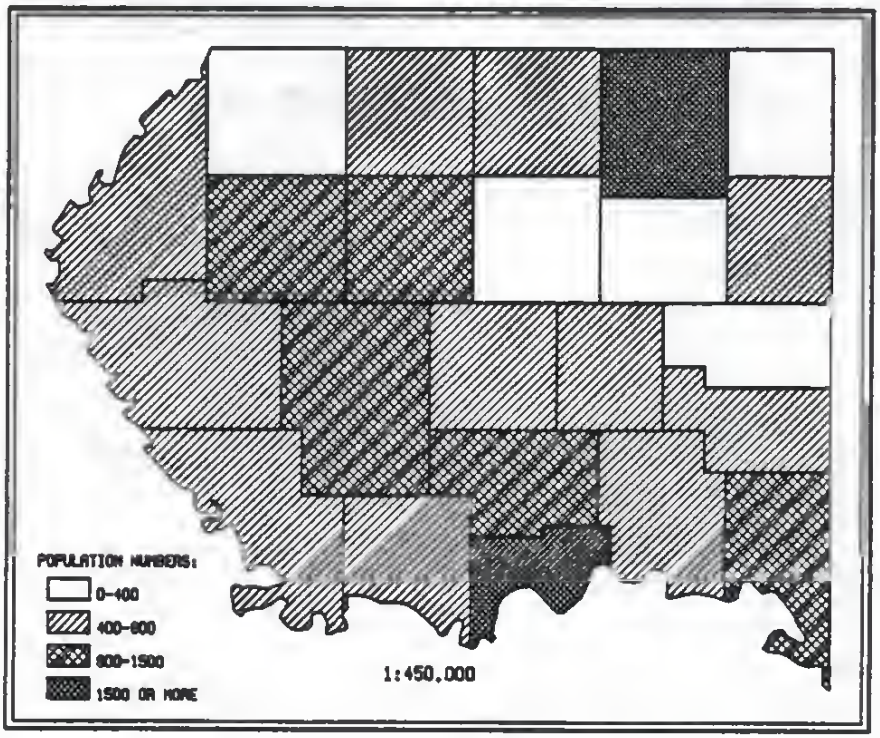


Figure 11. Population by Township in Pottawatomie County, Kansas, 1880. U.S. Census of Population.

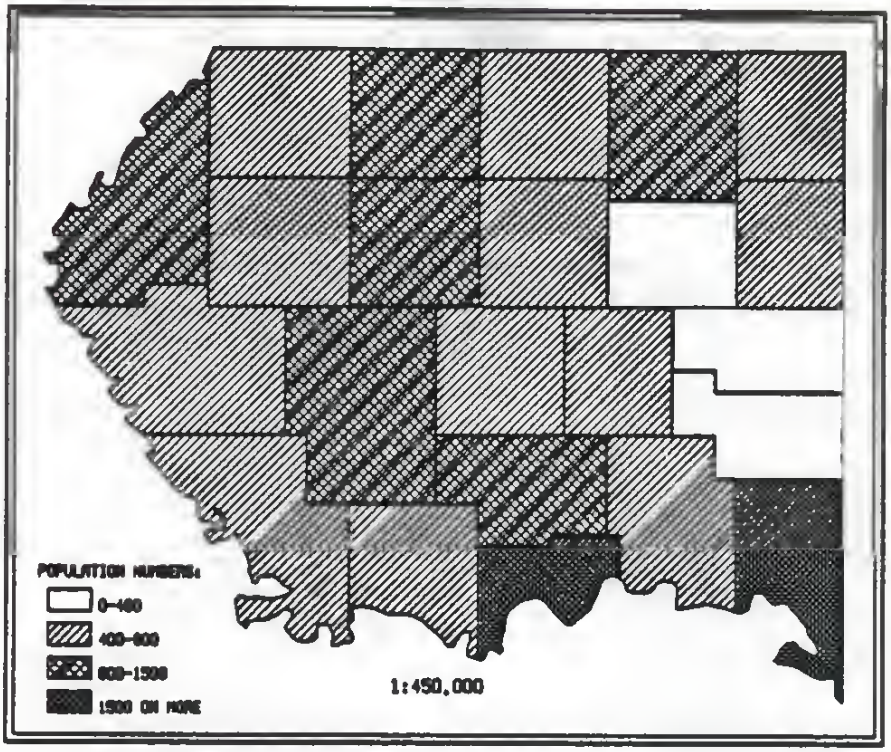


FIGURE 12. Population by Township in Pottawatomie County, Kansas, 1890. U.S. Census of Population.

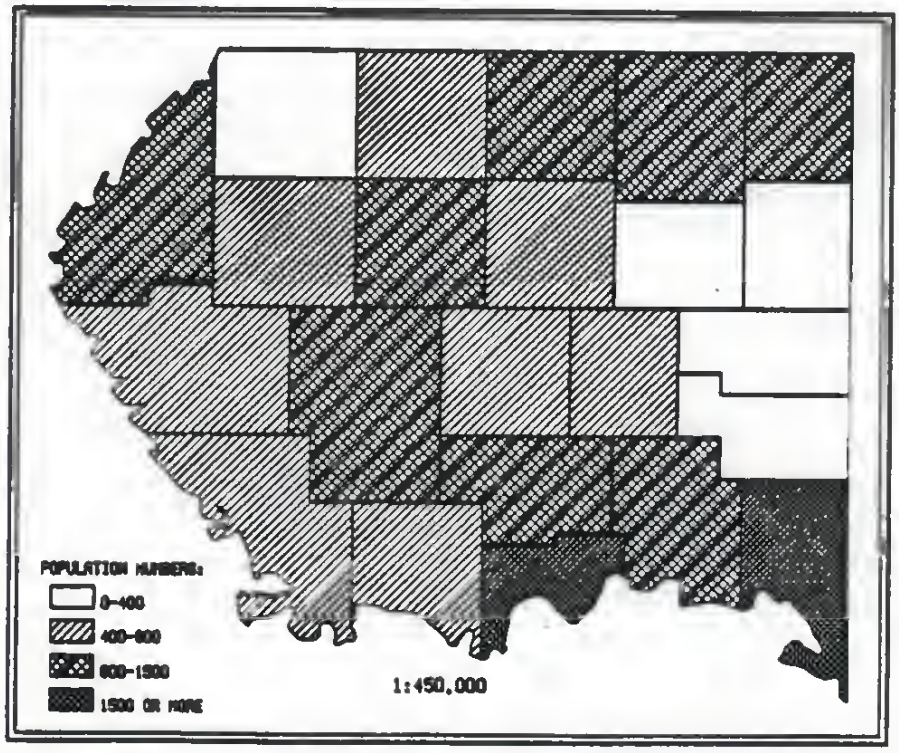


FIGURE 13. Population by Township in Pottawatomie County, Kansas, 1900. U.S. Census of Population.

It is evident that the land alienation laws provided by the federal government were directed towards small land holdings for family farms (Webb 1931). Concerning the Homestead Act of 1862, Clawson stated: 'The residence requirement had been imposed in an effort to promote land ownership by tillers of the soil, to reduce tenancy, and to promote a large number of relatively small land owners.' This discouraged a ranching economy trying to push its way into the central plains from Texas and Mexico (Kollmorgan 1969). Consequently, Pottawatomie County contains a multitude of small land holdings in which many land owners have title to fragmented tracts generally ranging from 40 to 320 acres each. This arrangement is not favorable to ranching conditions even though the majority of the land area in the county consists of rangeland. As a result, agriculturalists have adjusted to these conditions by incorporating a variety of farming and ranching practices.

THE IMPACT of the UNITED STATES SURVEY SYSTEM

The rectangular system of surveying of all public lands, except those surveyed by a different system, was decided upon under the provisions of the Northwest Ordinance of 1785 (Clawson 1951). This system has had great impact on the physical arrangement of land holdings in the northern Kansas Flint Hills. Although the land act policies greatly influenced the size of individual parcels, the rectangular system of survey has in general dictated the shape of these tracts. The importance this has had on the agricultural setting in Pottawatomie County cannot be overlooked;

therefore, an examination of this system and its influence on ranching operations is in order.

The initiation of the Rectangular Survey in Kansas began with estsblishing the fortieth parallel (Kansas-Nebrsska border) and the sixth principsl meridian as the starting lines for the creation of an initial point to which all surveys in the stste would be referred. Once these lines were surveyed and an initial point wss fixed, much of eastern Kansas was surveyed. As was mentioned in the preceding material, Pottawatomie County was surveyed between 1855 and 1858. From the base line (fortieth parallel) township tiers six miles wide north to south were surveyed. Correction lines were established every thirty miles to compensate for the curvature of the earth's surface.

The township was designated as the standard unit consisting of an area six by six miles with thirty-six square miles or thirty-six sections of land. Each section contained 640 acres of land and was further divided into quarter sections composed of 160 acres (Figure 14). This latter division becsme the standard unit of land given to settlers during the Homestead Period starting in 1862. In addition, these parcels were generally square or at least in rectilinear form. Thus the county was disposed of primarily in square or rectangular 160- or 80- acre parcels of lsnd . Although not all legal descriptions found in the county today follow this format, the oversll layout of legal boundaries still follows this configuration.

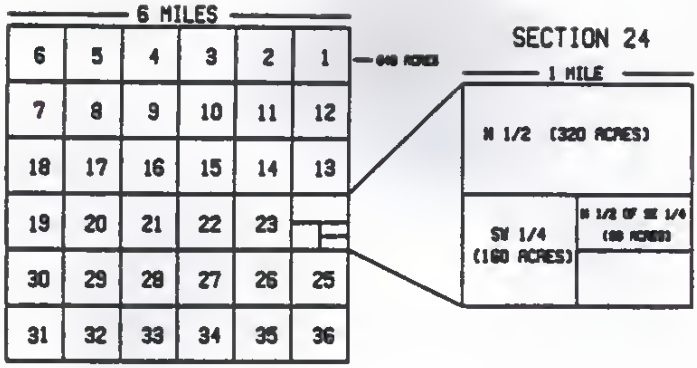


FIGURE 14. A Detailed Grid of the United States Survey System. This illustrates one township containing 36 sections. Each section contains 640 acres divided into 80, 160, or 320 acre tracts.

The result of superimposing a rectangular system on the natural landscape in this area along with relatively small land holdings has created a challenging situation for the rancher. Since boundary lines do not follow the natural topography, except along streams, range sites are often divided. This creates a problem of not being able to fully utilize a pasture without putting pressure on certain range sites. For example, a pasture may contain a number of range sites but may be dominated by clay upland sites since boundary lines do not follow natural breaks. When a rancher does not recognize that clay upland sites produce less forage than more productive range sites, undo stress on the pasture can be the result. If, over time, the same practices persist, range conditions can become even more damaged.

Small pastures that do not follow natural boundaries can also create problems for those burning native rangeland.

Where fence lines cut through rangesites, the likelihood of a fire crossing over into neighboring pastures is greater than for those along streams or natural breaks. Burning a number of small non-contiguous pastures is more time-consuming and requires more precautions than do larger contiguous tracts. In addition, cropland often borders small pastures; this can be a hazard if fires get out of control and destroy crops. Wheat fields are especially vulnerable since burning usually occurs while wheat is in its early stages of maturity. Furthermore, burning is not an easy task under any condition; however, the inconvenience of extra obstacles often discourages burning all together. Since burning is considered an accepted practice when used properly, the lack of fire can reduce forage production and grazing distribution, and it can damage the overall integrity of the range.

The end result of small fragmented and poorly situated native pastures is less favorable economically to the rancher. He is faced with extra expenses of moving cattle and himself between non-contiguous pastures. Facilitating pasture improvement, such as pond development and mending fence requires additional capital and labor. Moreover, when favorable management practices are difficult to incorporate in small pastures, a manager can be faced with reductions in animal productivity and the range systems integrity. This not only leads to poorer range conditions but to less capital gain for an operation.

Consequently, the settlement land polices and the rectangular aurvey system have helped to create the type of agricultural setting found in the northern Kansaa Flint Hills. It is not surprising to see individuals incorporating intenaive farming schemes with extensive grazing practices. Considering that ownership of rangeland is often in small tracts, many individuals can not rely totally on these pastures as a aole source of income. In general the only individuals able to austain their livelihood on ranching are large land owners and those who are able to rent or lease large acreages each grazing season. The remaining operators involved with ranching also grow crops as cash grains or to supply their herds with additional forage. In light of this, operators are faced with many management decisiona, which will inevitably vary from one ranch to the next.

CLASSIFICATION OF LAND OWNERSHIP GROUPS

The aftermath of aettlement in Pottawatomie County and following years has left hundreds of legal tracts of land owned by varioua individuala. These tracts vary in size from mere five acre parcels to continuous land holdings of over 5,000 acres. The land owners also vary in that many owners live on their holdings while others reside hundreds of miles away. It is the intent of this section to examine the existing land ownership of agricultural land in Pottawatomie County. Within thia context a classification of land ownership groups is determined to better underatand

the variety of land ownership types, parcel size, and size of farm operation throughout the county.

Land Ownership Groups. Two basic categories of land ownership groups are examined in this section. The first group contrasts local versus absentee ownership. The second classification is operation size, which differs from ownership type since many land owners do not directly manage their land. Land owners do, however, have the final input on the use of their land. Moreover, the two groups are closely linked since many land owners are the actual operators of their own tracts as well as the operator for other land owners. This section also indicates the contrasting differences of parcel size since many land owners only tend their own land holdings.

The type of land ownership and its relationship to range management, touched upon in Chapter 1, was examined by Kollmorgan and Simonett.

> Land-use and management programs as well as size of operations obviously relate in varying degrees to type of land ownership. This is certainly true in the bluestem area where many informants attributed a variety of situations and practices to absentee-urban ownership of land, particularly grassland (Kollmorgan, Simonett 1965, 274).

They divided land owners in Chase County, Kansas into four separate land ownership categories: 1) local-rural, 2) local-urban, 3) absentee-rural, 4) absentee-urban. Local land owners lived within the county boundaries, while absentee owners lived outside the county limits. Their findings indicated that absentee-urban land owners, although

small in numbers, owned the moat agricultural land as a group (51 percent) and controlled the majority of rangeland (57 percent) found in Chase County (Kollmorgan, Simonett 1965). Although the study emphasized the role the absentee land owner had in management of rangeland, it also pointed out that local operators were an important link in the overall management picture. Furthermore, they suggested that management practices of the absentee owner often varied from those incorporated by local residents.

The groups aelected here only separate local from absentee owners. The distinction of local and abaentee separates the two in that local owners live within the county boundaries while abaentee land ownera live outside the county limits. Thus in general it ia asaumed that local land owners are within closer proximity to their land. They are also more likely to be influenced by others in the local area on range management practicea they incorporate. In addition, their operations are more likely to incorporate more intenaive cultivation practices with livestock operationa.

These categories do not separate rural and urban land owners. Rural and urban land owners in the county have similar situations in that their proximity and knowledge of the use of rangelands in the area are very similar. Often the urban dweller has chosen to live in town or has retired but still has close direct ties to the land holding. Absentee ownera on the other hand are often the beneficiaries of the land holdings because of inheritance or

for investment purposes. Thus they may be far removed from the use of the land except that they own it; therefore, they have the final input on the management of the rangeland. This is not to say however, that absentee owners as a group are not good managers or are totally removed from management. On the contrary, many have gained title to enhance their livestock operations elsewhere. Others were once locals who have sought professions or retired outside the county but still retain ranching operations within its borders. Moreover, the distinction between local and absentee does not separate good managers from poor ones.

To explore the relationship of agricultural land ownership in the northern Kansas Flint Hills, data were needed to provide information on ownership and acres of cropland and rangeland in Pottawatomie County. Possible sources included tax records, agricultural census data, and local farm record data from the local A.S.C.S. office. Tax records did not include acreage figures; however, they provided the most current ownership. Although agricultural census data contained acreage figures, no ownership information was available. Furthermore, census data are gathered on a macro scale and in the author's opinion are too vague and incomplete or inaccurate for a study at this scale.

Farm records from the Pottawatomie County A.S.C.S. office were thus chosen for this study. These records included information on ownership, addresses of owners, and acreage figures for farmland and cropland. Rangeland

figures were not available; however, the difference in acreage between fsrmland and croplsnd proved to be quite accurate. Most land that is not cropped is fenced off for grazing purposes; therefore, even if pastures contain brush or mature trees, they are by definition rangeland. The only sreas with grass cover that are included in cropland figures are those planted to brome. By A.S.C.S. standards these are still cropland. Brome is not a native grass or not permanent ground cover; thus this lsnd is subject to planting of annual forages at a future dste. Moreover, all agricultural land in the county thst is not considered croplsnd is listed as rangeland since the majority of this land is fenced off for grazing.

Results of farm records show that there are 2,001 ownership tracts in Pottawatomie County (Table 7). Ownership tracts indicate contiguous legsl units of land (owned by the same person[s]) including those separated by roads, fences, and natural barriers; however, they must be connected at some point along the tract boundary. This does not mean that there are exactly 2,001 owners since some persons own more than one tract. Farm records are set up so that each farm csn contain multiple owners with one current operator. Also, an owner can own land on more than one farm. Likewise, an operator csn farm more than one farm, depending on the ownership. Furthermore, this breakdown explains more accurately the relationship between owners and operators, since both are involved in the management process.

Local owners control 73 percent of all farmlsnd, cropland, and rangeland (Tsble 7). Their sverage acres per unit of lsnd is slightly higher than for absentee owners since they amount to only 69 percent of total owners. This would indicate thst there are fewer local owners controlling the land holdings relstive to the totsl scres in their cstegory. Croplsnd and rangeland percentsges per fsrming unit were identics1 for both ownership types (Table 7). Rangelsnd, as expected, dominated (73 percent); however, it was surprising to find that sbsentee owners did not control more rangelsnd per unit of land since absentee ownership of rsngeland is wide spread throughout the Kansas Flint Hills.

In order to examine the distribution of ownership types throughout the county, farm records were compiled by farming communities. Fsrm communities A through H are arrsnged, ss shown in Figure 15, by the A.S.C.S. to facilitste farm programs in the county. They sre bssed on the srrangement of cropland/rsngelsnd ratio snd number of farm operations. Thus, all the communities are fairly evenly proportioned in respect to the number of acres and operators. On the other hsnd, cropland/rangelsnd ratios are not evenly distributed throughout.

Table 7. Local and Absentee Agricultural Land Ownership in Pottawatomie County, Kansas 1984.

Type of ownership	Owners in type class		Amount of land owned				Average land per owner		
	Number	Per cent	Number of acres	Percent of county total			Acres per unit	Percent in rangeland	Percent in cropland
				All acres	Rangeland	Cropland			
Absentee	629	31	130,583	27	27	27	207	73	27
Local	1,372	69	348,944	73	73	73	254	73	27
Total	2,001	100	479,527	100	100	100	231	73	27

Source: Pottawatomie County A.S.C.S. records, 1984.

Table 8. Agricultural Land Ownership by Farm Community in Pottawatomie County, Kansas 1984.

Community			Amount of land owned				Average land per owner		
Alpha	Ownership	Per cent	Number of acres	Per cent of county total			Acres per unit	Percent in rangeland	Percent in cropland
				All acres	Rangeland	Cropland			
A	221	11	65,843	14	15	9	298	83	17
B	220	11	61,476	13	14	9	279	82	18
C	261	13	73,203	15	16	13	281	77	23
D	209	11	49,190	10	11	8	258	79	21
E	240	12	61,438	13	13	14	256	72	28
F	223	11	52,976	11	11	10	238	76	24
G	326	16	42,207	9	8	12	130	65	35
H	301	15	73,194	15	12	25	258	57	43
Total	2,001	100	479,527	100	100	100	244	73	27

Source: Pottawatomie County A.S.C.S. records, 1984.

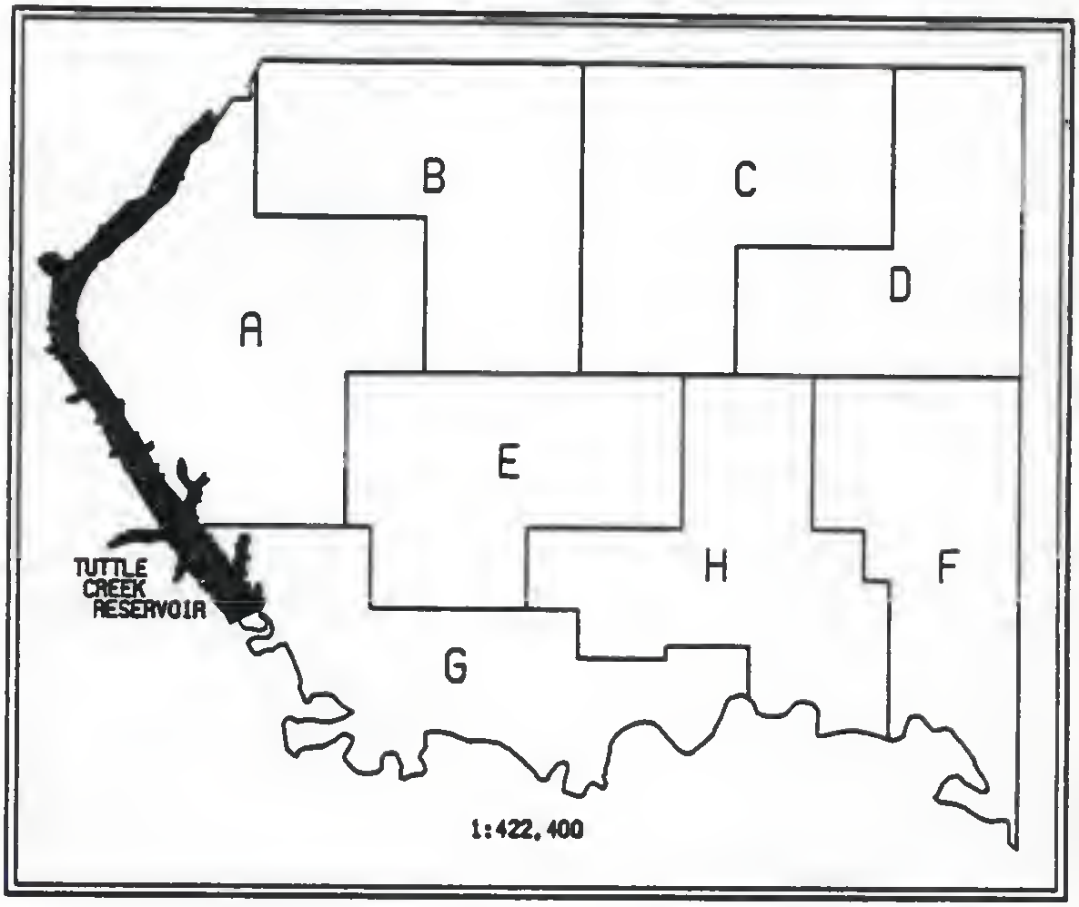


FIGURE 15. Agricultural Stabilization Conservation Service Farm Communities in Pottawatomie County, Kansas, 1984.

As shown in Table 8 by farm community, the number of acres owned and the number of owners ranged from 9 to 15 percent and 11 to 15 percent respectively of the county as a whole. The average acreage per unit varied little with the exception of Community G which contained the least amount of land and the highest number of land ownership tracts. Consequently, this community was well below the county average (244 acres) for acres per unit of land (130 acres).

Although all the communities have sizeable portions of rangeland, the percentage varied (Figure 16). It ranged from 57 percent in Community H to 83 percent in Community A (Table 8). Conversely, these communities also had the highest and lowest percentages for cropland. The northern segment clearly dominates in total acres of rangeland with Communities A, B, and C combining for 45 percent of the county total. This area of the county is dominated by upland topography with cultivation restricted to valley bottoms and to glacially influenced soils. Communities D, E, and F also rank high; however, the latter two have increased amounts of cultivation due to major stream valleys. Furthermore, the last two communities, G and H, have the lowest percentage with nearly the entire land area of the Kansas River Valley under cultivation. Both do contain notable amounts of range towards their northern flanks.

As would be expected, cropland figures are in general the opposite to those for rangeland. Figure 17 shows that communities in the southern portion of the county have the highest percentage of land in cultivation. In addition, the central areas have somewhat higher amounts than those to the west and east. Moreover, the combination of Communities E, G, and H, all of which lie in the southern segment of the county, make up over 50 percent of the total cropland.

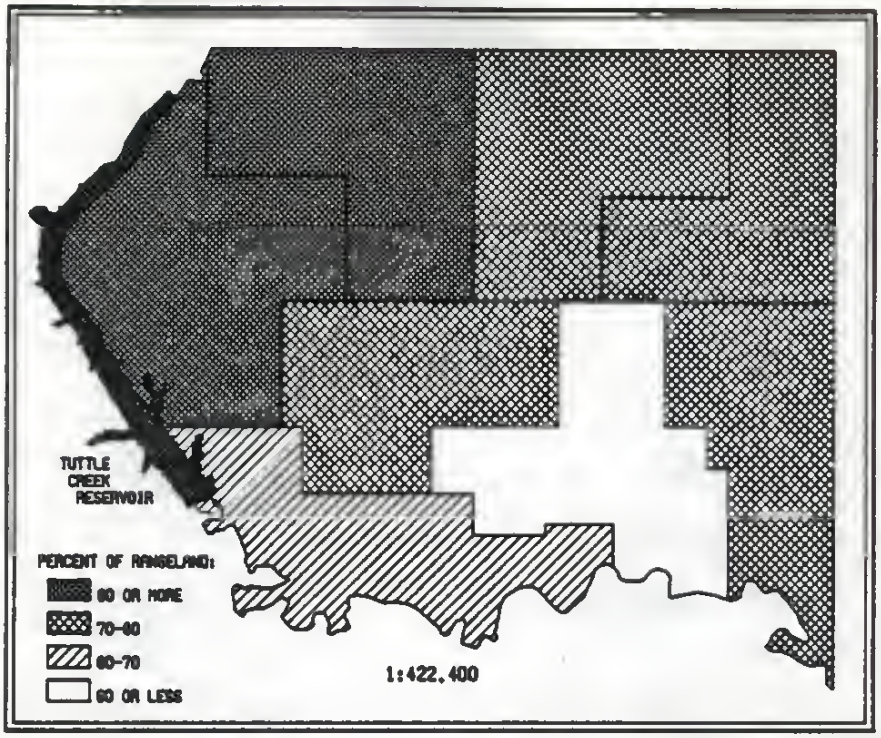


FIGURE 16. Percentage of Total Land Area in Rangeland by Farm Community in Pottawatomie County, Kansas, 1984.

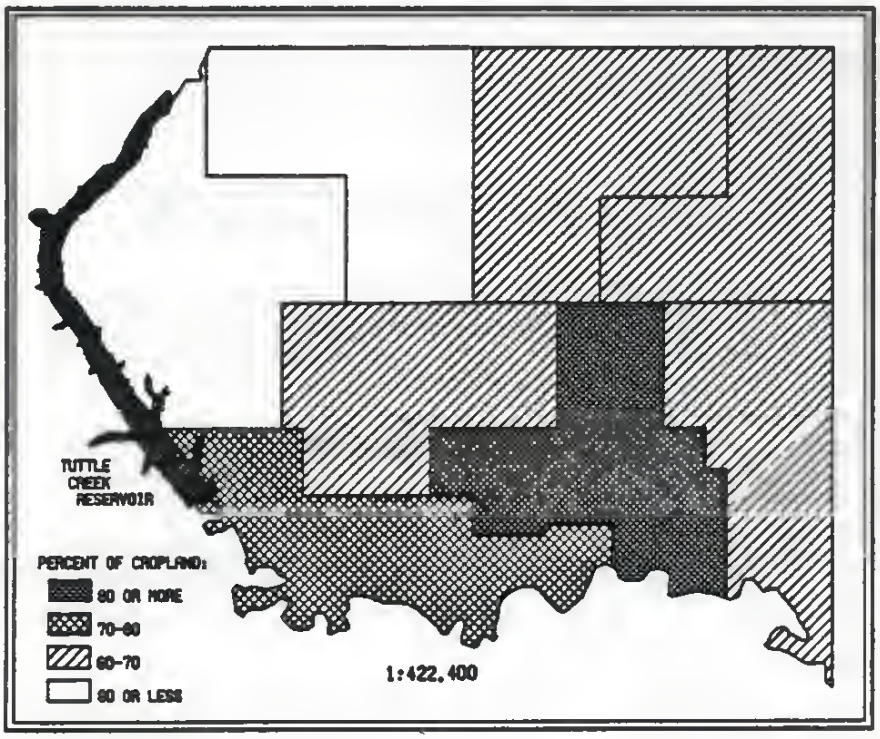


FIGURE 17. Percent of Total Land Area in Cropland by Farm Community in Pottawatomie County, Kansas 1984.

When the communities are examined in regard to land ownership type, again the results differ. Absentee owner tract sizes range from 125 acres per unit in Community G to 376 acres in Community F (Table 9). Local owners in Community G also have the lowest average acreage per unit; however, Community C reached the highest plateau in this ownership category (321 acres). This community also has the highest percent of local owners in proportion to absentee owners (85 percent), whereas Communities A and G have nearly 35 percent of their owners being absentee (Table 9). The greatest concentration of local land owners in proportion to absentee owners is found in the north central part of the county (Figure 18). Conversely, communities along the perimeter report the greatest percentage of absentee owners as a result of high ownership in surrounding counties.

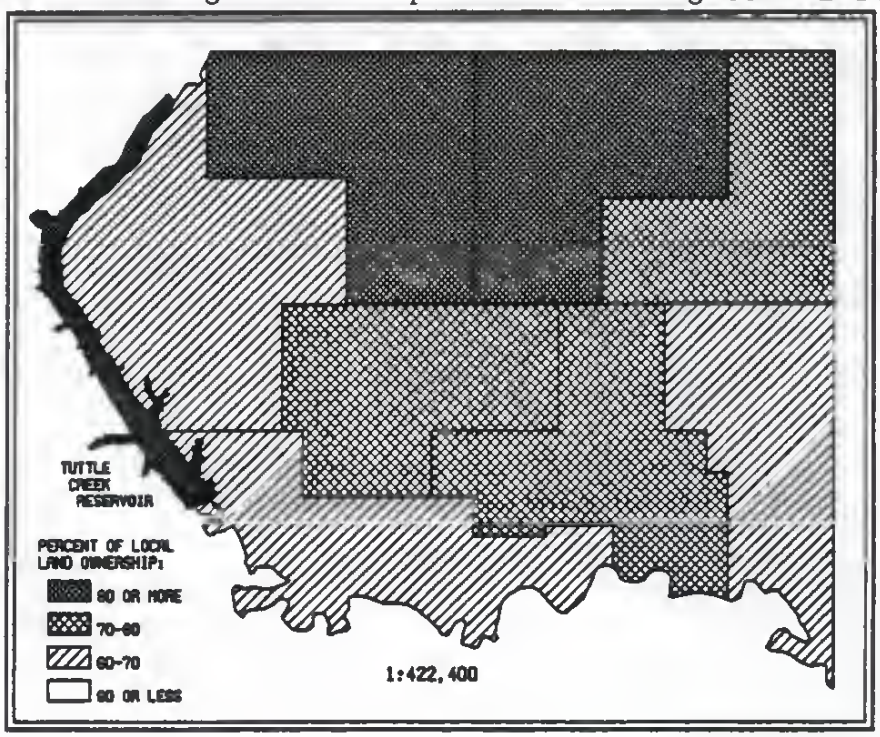


FIGURE 18. Percent of Local Land Ownership by Farm Community in Pottawatomie County, Kansas, 1984

Table 9. Absentee and Local Agricultural Land Ownership in Pottawatomie County, Kansas, 1984.

Type of ownership	Community ownership			Amount of land owned		Average land per owner		
	Alphe	Ownership	Per cent	Number of acres	Per cent community total	Acres per unit	Per cent in rangeland	Per cent in cropland
Absentee	A	89	14	22,421	36	252	85	15
	B	51	8	11,796	19	231	85	15
	C	57	9	10,246	14	180	71	29
	D	84	13	12,340	25	187	80	20
	E	62	10	13,605	22	219	75	25
	F	71	13	26,710	31	376	80	20
	G	116	20	14,515	36	125	59	41
	H	99	13	18,950	26	231	56	44
Total		629	100	130,583	27	208	73	27
Local	A	132	10	40,621	64	308	81	19
	B	169	12	52,063	81	308	79	21
	C	204	15	65,548	86	321	78	22
	D	125	9	36,532	75	292	78	22
	E	178	13	47,533	78	267	83	17
	F	152	11	27,250	69	179	67	33
	G	210	15	26,120	64	124	60	40
	H	202	15	53,277	74	264	42	58
Total		1,372	100	348,944	73			

Rangeland figures were also quite different between communities when comparing local and absentee owners. Communities A and B have the highest percentages for absentee owners while Communities A and E rank high for local owners (Table 9). Figure 19 shows that the greatest concentration of absentee owners with rangeland is in the northwest and northeast sections of the county. Locals tend

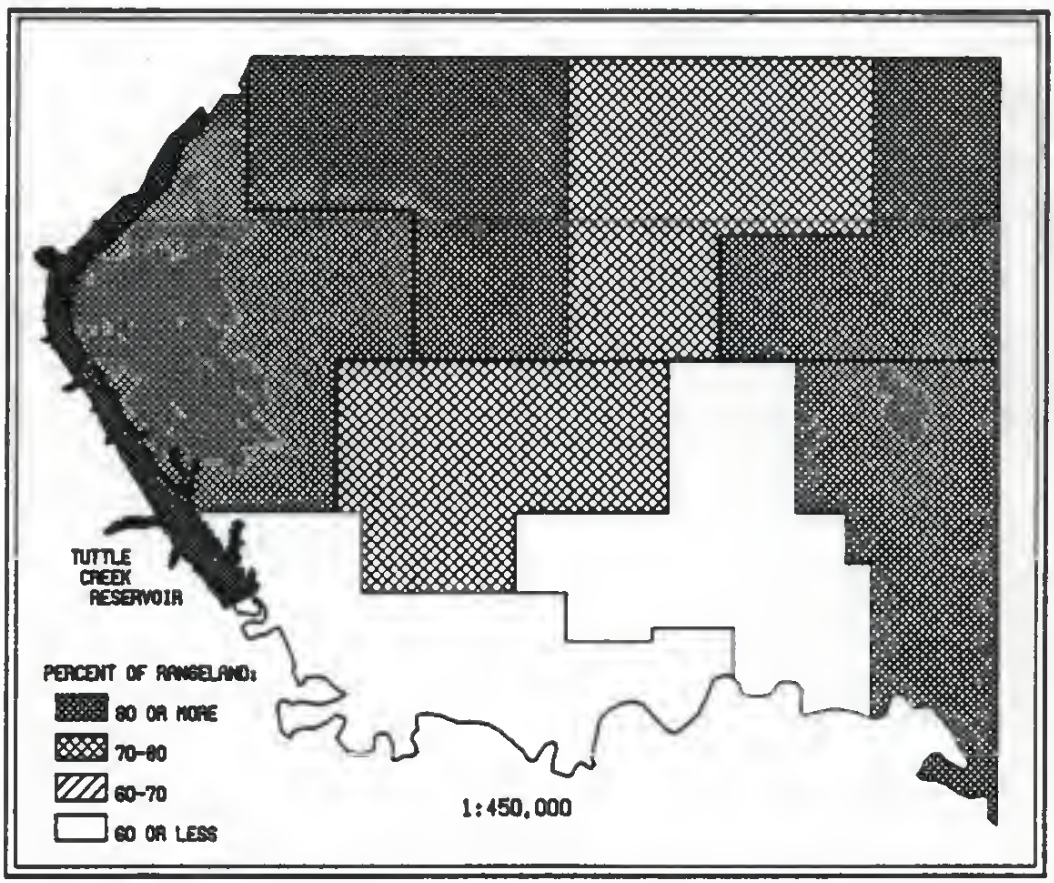


FIGURE 19. Percent of Rangeland in Absentee Land Ownership by Farm Community in Pottawatomie County, Kansas, 1984.

to retain more rangeland near the central and northwesterly parts as seen in Figure 20. Therefore, cropland is found to be most abundant in the southern portion of the county for both types of land owners; however, cropland figures for

absentee owners in Community C were much higher than in surrounding communities.

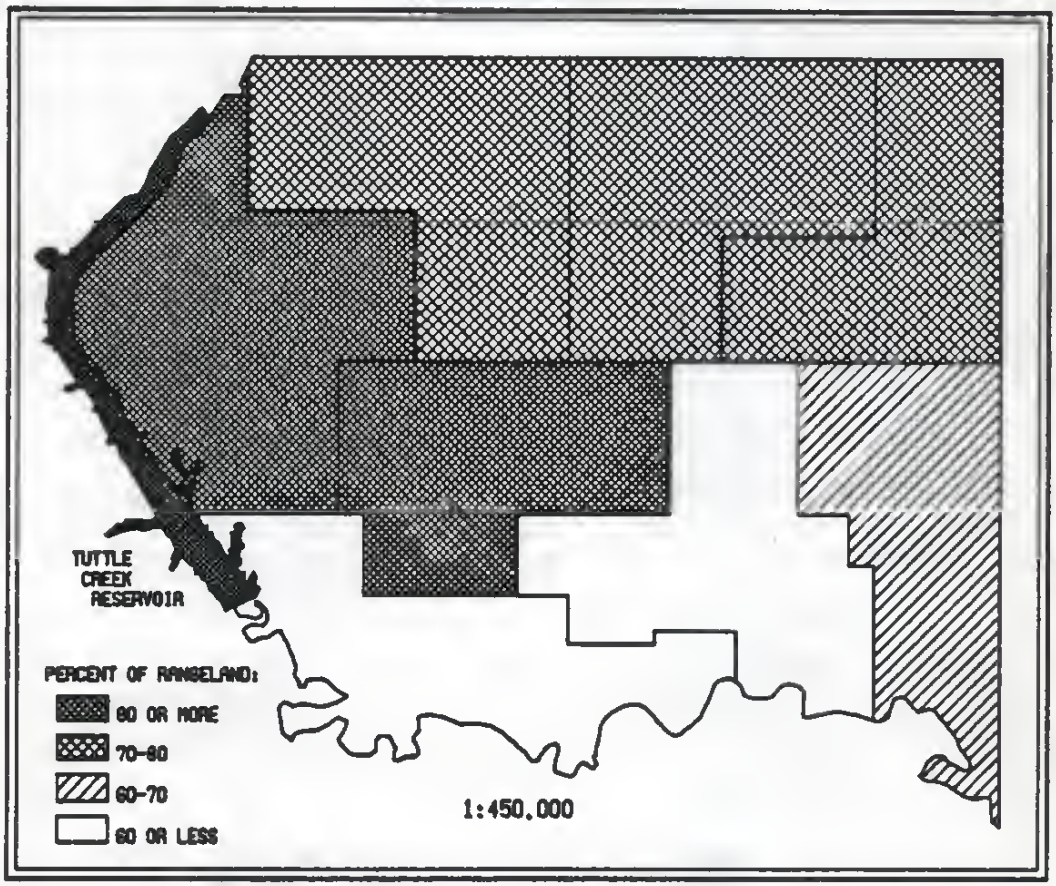


FIGURE 20. Percent of Rangeland in Local Land Ownership by Farm Community in Pottawatomie County, Kansas, 1984.

Size-of-Operation Categories. Since not all land owners actually operate their agricultural land, data pertaining to the number and size of operations were examined. Again, the data were collected from A.S.C.S. farm records. Each farm operation was categorized into one of six size-of-operation categories: 0-159 acres, 160-319 acres, 320-479 acres, 480-959 acres, 960-1279 acres, and 1280 or more acres; in which

a total of 1,044 operations were recorded in the county (Table 10). The number of operators in the 0-159 acre category had 30 percent of the total operators (318). The combination of this category with the 160-319 and 320-479 acre categories, represents 68 percent of all operators. These groups only represent, however, 26 percent of the total agricultural acreage and barely one-quarter of all rangeland. Even though these categories represent a minority of the total acres in rangeland, groups two and three only rank lower than the largest size category in percent of rangeland per unit of land (Table 10). Many depict the operator who relies on the ranching business as a supplemental means of income, working only part time at this occupation.

The intermediate category of 480 to 959 acres has 20 percent of all operations and 29 percent of all agricultural acreage. This group is a dominant force in the percentage of rangeland and cropland. A large portion of the acreage is in tracts of 160 acres or less and is often fragmented. Moreover, this group represents the average farmer/rancher who most commonly incorporates extensive grazing activities with intensive cultivation practices as a full time business.

The two largest groups represent only 12 percent of the total operators; however, they include 45 percent of the total agricultural land (Table 10). The smaller of these two has far less total acreage and a lower percentage of

Table 10. Rangeland and Cropland Comparisons by Size Categories of Operations, Pottawatomie County, Kansas 1984.

Size category (acre)	Operations in category		Total acres in category		Per cent of county total acreage		Average unit		
	Number	Per cent	Number	Per cent	Rangeland	Cropland	Size (acres)	Per cent acreage	
								Rangeland	Cropland
0-159	318	30	22,270	5	4	6	70	68	32
160-319	266	25	52,800	11	11	11	199	75	25
320-479	132	13	50,024	10	11	10	379	75	25
480-959	204	20	137,479	29	28	30	674	72	28
960-1279	52	5	57,599	12	12	13	1,108	71	29
1280 and over	72	7	159,355	33	34	30	2,213	76	24
Total	1,044	100	479,527	100	100	100	459	73	27

Source: Pottawatomie County A.S.C.S. records, 1984.

rangeland per unit of land. In the largest category, 76 percent of the agricultural land is rangeland, ranking this category the highest in rangeland percentage for all aix categories (Table 11). The commonality between these two groupa is that a large portion of the operators are either farmers or ranchers. A number of ranchers in the

Table 11. Percent of Rangeland by Size Categories in Farm Communities, Pottawatomie County, Kansas, 1984.

Size categories	Farm Communitiea								Total Percent
	A	B	C	D	E	F	G	H	
0-159	89	71	81	79	70	57	69	40	68
160-319	78	88	76	78	76	80	66	50	75
320-479	82	78	78	80	69	88	67	50	75
480-959	81	84	77	81	63	65	62	56	72
960-1279	83	81	75	74	70	65	71	34	71
1280 and over	84	80	89	78	76	86	34	42	76

Source: Pottawatomie County A.S.C.S. farm records 1984.

northweatern and eastern parts of the county have very little involvement with intensive cropping practices. Likewise, many farmera in the southern portion do not incorporate livestock operations involving extensive grazing activities.

Overall, local owners have been shown to dominate agricultural lands in Pottawatomie County. This is a striking difference from the findings of Kollmorgan and Simonett in Chase County. Settlement in Pottawatomie County was earlier than in Chase County, and local owners were able to establiah themaelvea much easier since a higher portion of the land area could be plowed. Thua local land owners

were more likely to retain their homesteada instead of moving on. Settlement in Chase County was slow and railroada controlled much of the land area throughout much of the nineteenth century. A great deal of this land was sold in large parcels to absentee owners who were interested only in aummer grazing. Therefore, the ranching economy that developed in the northern Kansas Flint Hills developed around a year-round aystem which included intensive cultivation practices along with grazing activities , while areas to the south became domiciles for transient cattle during the spring and summer months of each year.

Local owners also control a large part of rangeland which per unit of farmland ia the aame as for absentee owners. The ratio of local to absentee ownerahip is the highest in the north central section of the county while absentee owners were found in the greatest percentage along the county's western edge.

Operation size varied from extremely small operations to those with thousands of acres. Of the operations, generally those ranging from 480 to 960 acres made up the core of fragmented farmer/ranchers operating land throughout the county. Thoae with relatively low acreage figures were not involved with ranching as a full-time occupation. Moreover, the largest operations generally singled out either farming or ranching but rarely incorported the two.

Literature Cited

Clawson, M. 1951. Uncle Sam's Acres. New York: Dodd, Mead and Company.

Davis, W.D. 1950. Valuation Study of the Pottawatomie Reserve Lands, Part I. Kansas City: Farm Management Associates, Inc.

Hibbard, B.H. 1924. A History of the Public Land Policies. New York: The Macmillan Company.

Kollmorgen, W.M. 1969. "The Woodsman's Assault on the Domain of the Cattleman", Annals, The Association of American Geographers. 59/2: 215-239.

_____ and D.S. Simonett. 1965. "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kanaaa", Annals, The Association of American Geographers. 55/2: 260-290.

Riley County Genealogical Society 1975. Pioneers of the Bluestem Prairie. Manhattan: Riley County Genealogical Society.

Self, H. 1978. Environment and Man in Kansaa: A Geographical Analysis. Lawrence: The Regents Press of Kansas.

Socolofsky, H.E. 1956. "How We Took the Land", Kansas: The First Century. ed. J.D. Bright, 1: 281-306. New York: Lewia Historical Publishing Company.

_____ and H. Self. 1972. Historical Atlas of Kanaas. Norman: Oklahoma University Press.

United Statea Censua of Population for Kanaas, 1860-1890 and 1980. Washington D.C.: U.S. Department of Commerce, Bureau of Cenaus.

Webb, W.P. 1931. The Great Plains. Boston: Ginn and Company.

Chapter 4

RANGE MANAGEMENT PRACTICES IN THE NORTHERN KANSAS FLINT HILLS

A REVIEW of RANGE MANAGEMENT PRACTICES

In Chapter 3, land ownerahip in the northern Kansas Flint Hills was reviewed in detail. This chapter examines the relationship that land ownership has with range management practices. In order to analyze thia relationship, the results of management strategies by a aample of land ownera in Pottawatomie County were statisticly analyzed. The management approaches investigated included burning practices, stocking rates, and grazing systems. Futhermore, the following commences with a comprehensive overview of these range management practices.

Influence of Fire. Perhaps the most important and controveraial practice used in the Flint Hills Region has been the use of fire. Early fires were natural and caused by lightning during the initial development of the prairie (Komarek 1966). Primitive man also aet fires for various reasons, and later aboriginal man burned so that buffalo would be attracted to regrowth caused by fire (Catlin 1973). Although climatic controls dictated the early

development of the prairie; fire has most likely been the sustaining factor in the stability of this type of system. Sauer (1950) noted that fire was a major controlling factor in the development of grassland climax and that the supression of fire resulted in re-colonization by woody species. Since man became the primary agent inducing fire, without his influence grasslands may not have evolved into the type of ecosystems found today. Thus, Sauer's and other's recognition of man's active role with fire in the ecological balance of natural systems is of great importance in the realm of range management.

The use of fire in the northern Kansas Flint Hills has been investigated quite extensively. Anderson (1967) noted that spring burning was a very common practice to rid all old top growth before the new grazing season began. Animal gains were greater and more rapid on burned range. Although burning occurs primarily in the spring, the timing is very critical. Burning should occur when the dominant species reach a height of one to two inches (Ohlenbusch 1983). Early (March 20), mid (April 10), and late (May 1) spring burnings have different results on forage production, livestock gains, soil moisture, and the suppression of weed and woody species (Anderson et. al. 1970, Launchbaugh and Owensby 1978). Late spring burning, the optimum date, has shown no major effects on soil moisture, consistently producing a more desirable plant-species composition, increased livestock performance, and controlled eastern

redcedar, buckbrush, and moat other undesirable woody plants (Launchbaugh and Owensby 1978). Moreover, the trend for the time of burning in the Flint Hills Region has steadily become later over the past twenty to thirty years, since burning in January and February is less favored today than in late March and early April which is the most common time that burning occurs. Surprisingly though, there has been no indication that thia trend is moving toward the optimum date of May 1.

Climatic conditions play a major role in the time burning occurs. Spring thunderstorms often inhibit burning during the few weeks a rancher would normally burn. This may influence the operator to burn earlier or later than usual. If local weather conditions are such that spring rains continue on a regular basis, burning in certain areas may not occur.

How often a person burns also variea, depending on individual management preferences and knowledge, the type of grazing ayatem one incorporatea, and the local weather conditions. Many choose to burn annually to cause quick regrowth of dominant species for yearling grazing. Animals at this age will fatten quickly through the early summer months if aucculent forage ia available, thus creating a higher return for the producer. A study by Anderson et. al. (1970), northweat of Manhattan, Kansaa, indicated that annual burning over a ten year period did not depreciate forage yields and increased animal gains. Earlier burning

dates however, do impact the overall range system's integrity since the bare ground is susceptible to soil loss for a longer period.

Grazing Systems. Since individuals have various types of operations, grazing systems also differ. Crops and livestock are typically produced together throughout the midwestern United States. The production of both crops and livestock in the same area and even on the same farm undoubtedly are more common than the raising of either crops or livestock alone (Weaver, et.al. 1956, 237). This is common in the northern Kansas Flint Hills; thus, operators of this kind can employ the use of crop supplementation for their livestock. Their use of supplemental forage affords more stable herds especially during the winter months. In this type of system, continuous grazing year-round or a deferred grazing approach is common.

Continuous grazing incorporates the use of a pasture each year throughout the entire grazing season. Usually cattle are grazed between May 1 and October 1 and are not removed from the pasture during this grazing period. This is the most common type of grazing system used this region.

Deferred grazing uses a combination of pastures, native and introduced, throughout the year. Deferring in this case involves grazing introduced pastures in the late winter and spring months so that native forages can produce sufficient leaf area to store food reserves. Common introduced pastures include smooth brome, Kentucky

bluegrass, and tall fescue, all cool-aeason grasses. Livestock ia then placed on native forage in early to mid June and remains there until the end of the grazing season. Cool-aeason pastures can be uaed again after August 1, depending on the rancher's own needs. Moreover, forage and animal productivity in deferred aystems vary under different conditions. However, comparisons with continuous grazing show that theae grazing systems are less productive for animal gains and calving, but that they bring increased forage yields on depleted ranges (Launchbaugh and Owensby 1978, Anderaon 1940, McIlvain and Shoop 1971).

Deferred-rotation grazing is also used in the northern Kansas Flint Hills where a combination of pastures is used in the same grazing system. One pasture is deferred or not grazed through part of the growing season. The deferment ia rotated from pasture to pasture in succeeding years. This type of system has been tested throughout the Great Plains, incorporating a number of paatures where results have indicated increases in forage production; however, animal gaina are generally lower using this type of grazing system (Owensby et.al. 1973, McIlvain and Shoop 1951, Launchbaugh and Owensby 1978).

Where crops are not a factor, seasonal grazing is more likely to be employed. Stocker operations are common in seasonal grazing, the majority of which involve grazing throughout the season until the first of October. Many of the tranaient cattle are grazed in this type of system.

Intensive-early stocking is a continuous grazing practice that is used to some extent in stocker operations; however, research is relatively recent ,and ranchers are somewhat reluctant to use this type of system. Cattle are stocked at much heavier rates than normal; however, grazing is restricted to only half of the summer grazing season (Smith and Owensby 1978). This type of system produces higher gains per animal and does not deplete forage yields (Launchbaugh et.al. 1983).

Stocking Rates. From the time controlled grazing began in the northern Kansas Flint Hills, a result of fencing the prairie, stocking rates have varied. They were rather high near the turn of the century, when a report by Hitchcock and Westgate (1901) indicated rates of 1.5 to 3.0 acres per animal unit. From reports by the Kansas Board of Agriculture, Anderson (1967) noted that stocking rates have gradually declined since that early time and today range from 3.8 acres per yearling to 6.5 acres per cow/calf unit. Moreover, stocking rates are generally moderate thoughout the region; however, many individuals still stock over suggested intensities.

The importance of stocking rates can not be overlooked; however, the impact of heavy compared to light stocking has all too often been over exaggerated. Since more forage is removed under heavy stocking conditions, there is less mulch build-up, which reduces the nutrients available to the plant. In turn, available forage for the

animal has also been decreased. In general then, heavy or over-stocking reduces animal gains and depletes the range system's integrity. As a result, undesirable species will tend to increase while dominant species decrease in importance. In areas where weed and woody species have flourished, over-stocking has been pointed out as the culprit. Owensby, et. al. (1970), however, indicate that red cedar populations were actually decreased in pastures that had been heavily stocked. On the other hand, pastures lightly stocked, or not stocked at all, often bring on increases of undesirable species since the grazers will normally graze these plants under heavy stocked conditions.

Animal gains do not decrease under these circumstances as long as the timing of heavy stocking is regulated. Double stocking between May 1 and July 15 for stocker (usually steers) cattle can produce compsrable gains per animal compared with season-long grazing st moderate stocking (Launchbaugh et. al. 1983). Since gains per acre are higher and individual animal gains are not reduced, a higher return from the range can be expected along with no sppreciable decline in the range system's forage content. Heavy grazing does reduce gains per animal on season-long stocking and can impact the range by changing botanical composition and reducing the available forage in following yesrs (Launchbaugh and Owensby 1978).

If over-stocking occurs for a number of years, substantial reduction in herbage yields can be expected in

addition to greater amounts of soil erosion. In contrast, if stocking rates are reduced from heavy to light stocking, the range in a ahort period of time can recover so that dominant species composition increasea along with increases in forage production (Launchbaugh 1967). This exemplifies the resistive forces that the rangelands have in dealing with heavier stocking rates. This is especially the case in a region such as the Kansas Flint Hills, where precipitation is in high enough amounts most years to bring on substantial regrowth.

Moderate stocking of pastures generally produces the most favored results for a grazing operation under most grazing conditiona. Dominant species content is not reduced while forage yields remain stable over time. The integrity of the range in most inatances is preserved, and individual animal gains per unit of land are at their maximum. Therefore, this is the most economically efficient grazing intensity while conserving the range's productivity (Lauchbaugh 1969).

MANAGEMENT PRACTICES in the NORTHERN KANSAS FLINT HILLS.

In order to examine actual range management practices in the northern Kansas Flint Hills, data were collected from questionnaires that were completed by land owners throughout Pottawatomie County. A sample of land owners was produced from a current land ownership map of the

county (Appendix A). The sample consisted of 160 potential respondents to whom questionnaires were sent in the months of August and September in 1984. A total of sixty land owners completed and returned the questionnaire.

The questionnaire concentrated on determining common range management practices in the northern Kansas Flint Hills Region (Appendix B). Five sections of questions were provided to get land owners' approaches to different range management practices. Section A consisted of data pertaining to the age and occupation of the respondent, amount in acres of rangeland owned and managed, involvement with management, and whether the respondent leased out rangeland or had ever managed rangeland outside the region.

Ownership Groups. The results of Section A were categorized into ownership groups (Table 12). The majority of respondents (67 percent) consisted of local land owners, and most were directly involved in farming operations. Thus it was not surprising to see a majority indicating a full time involvement in the management of their rangeland. Parcel size ranged from less than 160 acres to over 4000 acres, but the highest percentage of respondents owned between 320 and 960 acres of rangeland. Likewise, operation size was dominated by the same category (320-960 acres); however, a few exceeded 10,000 acres per operation. In many of those cases leased land as well as owned land was involved. In addition, a number of respondents indicated they leased out

portions of their rangeland; however, only a small percentage have never leased land outside of the region.

Table 12. Questionnaire Land Ownership Categories.

Ownership categories:	Frequencies	Percent
Land ownership type:		
Absentee	19	33
Local	39	67
Occupation group:		
Farmer/Rancher	41	72
Other	16	28
Land ownership parcel size group:		
0-320 acres	16	27
321-958 acres	29	49
960 acres or more	14	24
Range management operation size:		
0-320 acres	13	22
321-958 acres	31	53
960 acres or more	15	25
Length of time in range management:		
0-15 years	12	25
16-30 years	18	37
31 years or more	19	39
Age of respondent:		
0-30 yeara	6	10
31-59 years	27	45
60 years or more	27	45
Involvement with management of rangeland:		
Full time	33	61
Part time	21	39
Respondents lease rangeland out to another operator:		
Yes	24	40
No	36	60
Respondents lease rangeland outside the Flint Hills:		
Yes	4	7
No	53	93

Ninety percent of the respondenta were over 31 years of age while nearly half of the total exceeded the age of sixty. Respondents were more evenly distributed in the length of time in rangeland management with a quarter of them having fifteen years or less experience in management.

Nearly 40 percent, though, had over 30 years of involvement, which would indicate that differences in the knowledge and thus in the potential use of rangelands may vary.

Burning Practices. The third section (Section C) of the questionnaire consisted of questions dealing with burning practices (Table 13). Questions dealt with whether respondents burned their pastures and if so , how often, the percentage, frequency, time of year, and for what reasons.

Over 75 percent of the respondents indicated they burned their rangeland; however, frequency and timing varied considerably. Less than 20 percent burned annually while over a third only burned every fourth year or even less often. In addition, the time of year rangeland is burned varied from 21 percent in the early spring (before April first) to a surprising 42 percent burning in the late spring (after April 25). Even though only a few weeks separates these burning periods, the results these dates have on the range system and animal productivity vary considerably as discussed earlier in this chapter. As to why they burned, land owners' responses most often noted, thay they did so to reduce weed and woody species invasion. Over half indicated they burned to increase forage production as well as for weed and brush control. This would suggest that some owners may not realize the importance of the time of burning since a number of those using fire in the early spring indicated increasing forage production. Conversely, some late spring burners did not indicate they burned for this reason.

Table 13. Results of Burning Practices.

Burning Practices Categories:	Frequencies	Percent
Land owner/operator burning rangeland:		
Yes	46	77
No	14	23
Number of years rangeland has been burned:		
0-15 years	20	52
16-30 years	12	32
31 years or more	6	16
Percent of rangelands burned:		
0-50 percent	6	14
51-75 percent	1	2
76-100 percent	36	84
Frequency rangelands are burned:		
Annually	8	18
2-3 years	21	48
4 years or more	15	34
Time of year rangeland is burned:		
Early spring	9	21
Mid spring	16	37
Late spring	18	42
Reasons for burning range:		
Increase forage production	1	2
Weed and brush control	21	46
Combination	24	52
Burn at the same time interval:		
Yes	24	67
No	14	33
Amount of range burned is more or less than in the past:		
More	13	30
Less	4	9
No change	26	61

Although most claimed to burn the majority of their pastures, a high percentage had only been burning their rangeland for fifteen years or less. This would suggest that burning has not always been a popular practice since a majority of the respondents have managed rangeland more than 15 years. Most, though, have not changed the amount of range they burn and continue to burn at the same frequency.

Grazing Systems. Continuous grazing systems (including intensive early stocking) were used more than deferred and deferred-rotation systems (Table 14), (Section B of the Questionnaire). This could be expected since this type of system has been the most popular over time. It requires less input from the operator and has greater acceptance from the scientific community as well as the public. In addition, over 50 percent of the land owners had cow/calf operations which under continuous grazing are generally more productive for the average operator than are deferred approaches. Deferred grazing though, did make up 34 percent of all operations. A number of these respondents had a combination of operation types, incorporating both cow/calf and stocker cattle. The introduced grass (cool-season) used most often by deferred grazers was smooth brome, although some operators noted the use of tall fescue. Futhermore,

Table 14. Questionnaire Grazing System Practices.

Grazing System Categories:	Frequencies	Percent
Grazing system type:		
Continuous	30	54
Deferred	19	34
Deferred-rotation	7	12
Grazing system cattle operation type:		
Cow/calf	30	56
Stocker	6	11
Combination	18	33
Types of cropland used to pasture livestock:		
Wheat stubble	4	9
Milo-corn stubble	14	30
Alfalfa	1	2
Combination	6	13
None	21	46

grazing cropland was not that common; however, milo and/or corn atubble were the most commonly used cropland cover to paature livestock.

Stocking Rates. Moderate stocking rates prevailed; however, differencea between cow/calf and stocker operations were noticeable (Table 15), (Section B of the Queationnaire). Cow/calf operations were nearly split in half between heavy and moderate stocking. Although heavy stocking rates were a high percentage, the rate may be somewhat misleading aince a number of operators use deferred grazing approaches which most often put less streas on the range. Nevertheless, depending on range conditions and length of the grazing period, both atocking rates could affect range and animal production over time. Moreover, results indicate the majority of heavy and moderate stocking rates were at the lighter end of each group.

Table 15. Questionnaire Stocking Rate Practices.

Stocking Rate Categories:	Frequencies	Percent
Stocking rates of respondents:		
Heavy	19	36
Moderate	29	55
Light	5	9
Stocking rates of cow/calf operations:		
0-6.5 acres	21	47
6.6-10.0 acres	22	49
10.1 acres or more	2	4
Stocking rates of atocker operations:		
0-2.5 acres	1	5
2.6-5.0 acres	16	76
5.1 acres or more	4	19

Stocking rates of stocker cattle varied from those on cow/calf operations. The majority of operators

incorporated moderate stocking while heavy stocking rates were nearly absent. A higher percentage of light stocking rates was also recorded in this group. This would not necessarily imply that stocker operations always stock at lighter rates than cow/calf operators. Stocking rate variations are more likely since stocker cattle are marketed soon after the grazing season ends. Therefore, beef price fluctuations from year to year no doubt have an impact on the number of stocker cattle bought and grazed on pastures in the summer months.

Additional Management Practices. Two other groups of questions were asked relating to rangeland fertilization and weed and brush control in sections D and E of the questionnaire. The overwhelming majority indicated they did not fertilize their pastures. This can be very time consuming and quite costly for an operator. Conversely, most respondents did perform some type of weed and brush control. The most common methods included a combination of herbicides, burning, and mowing. Those who did not burn their rangeland singled out herbicides as their only control measure more often while respondents who burned their rangeland used herbicides less often. Moreover, herbicides, like fertilizers, can be rather costly to apply and are normally recommended to be used as secondary measures of control.

Table 16. Additional Range Management Practices.

Ownership categories:	Frequencies	Percent
Respondent uses fertilizers on rangeland:		
Yes	4	7
No	56	93
Types of weed and brush control used on rangeland:		
Herbicides	9	16
Mowing and/or burning	10	17
Combination	38	67

ANALYSIS of LAND OWNERSHIP and RANGE MANAGEMENT PRACTICES

Methodology. The data presented in the previous section were adjuated to analyze the relationship between land ownership and range management practices in the northern Kansaa Flint Hills. Respondents were arranged into six land ownerahip groupa:

1) Land ownership type
2) Land ownership parcel size
3) Land ownership operation size
4) Land owners time in range management
5) Land ownership occupation
6) Age of land owner

Each group was then tested by meana of contingency tables in which two nominal-scale variables were cross-clasaified (Blalock 1979). For example, land ownership type is separated into absentee and local owners where data on management practices were croas-tabulated by this group. Whether an absentee or local owner burna, for instance, waa

analyzed in a 2 x 2 contingency table:

Land ownership Type	Land owner burns rangeland Yes	No	Row total
Local			
Frequency	26	13	39
Row percent	(67)	(33)	(67)
Column percent	(61)	(87)	
Absentee			
Frequency	17	2	19
Row percent	(90)	(10)	(33)
Column percent	(39)	(13)	
Column total	43	15	58
	(74)	(26)	(100)

The frequencies were converted into percentages showing the differences between absentee and local land owners. In addition, this analysis was taken one step further to see if the differences were statistically significant. The chi-squared test was used to evaluate whether or not the frequencies were in fact significantly different from those expected under the theoretical conditions that no difference exists. Thus, for the example above, the null hypothesis assumes there are no differences among absentee and local owners in terms of burning rangeland.

The approximation of this test is computed by the formula

$$x^2 = \frac{(fo-fe)^2}{fe}$$

where fo and fe refer respectively to the observed and expected frequencies for each cell (Blalock 1979, 281). Thus, the square of the difference between the observed and expected frequencies in each cell is computed, and then divided by the expected number of cases in each cell. In

addition, all the non-negative values from all the cells are summed, resulting in the value of chi-squared. In the example chi-squared (x) equals 3.47 at one degree of freedom. The degrees of freedom depend on the number of cells in the table which can be computed by

$$\text{degrees of freedom} = (\text{row} - 1)(\text{column} - 1)$$
$$\text{d.f.} = (2-1)(2-1)$$
$$\text{d.f.} = 1$$

Having determined 1 degree of freedom for the 2x2 table, a probability level of .05 percent was selected for the level of significance. The .05 level at 1 degree of freedom suggests there is a 95 percent probability that a difference exists. Thus, if the chi-squared value derived from the example is larger than the chi-aquared value corresponding to the .05 probability, the null-hypothesis can be rejected, aince it is seldom that the differences between observed and expected frequencies will yield a chi-squared value greater than the value at the .05 probability level. In this example, chi-squared equals 3.841 at .05 probability with 1 degree of freedom (Referring to Blalock 1979, under Table I, page 613). Therefore, the null-hypothesis can not be rejected; however, a .10 probability equals 2.706 in which at a 90 percent significance the null-hypothesis could be rejected, suggesting a aignificant difference at this probability level.

Due to the small sample size, two basic problems arise. The aampling distribution approximates the true distribution given in the chi-squared table only if the

sample is large (Blalock 1979). Even though only a few categoriea showed significant differencea in management strategies, many categoriea had high percentage differences. This would suggest that if a larger sample were used, the possibility of yielding more aignificant results is highly probable. Thus, a sample size that would be large enough to approximate the true distribution given in the chi-squared table would more than likely indicate a greater significance among land ownership categories in each ownership group. Alao, since the aample is small, many of the expected frequencies in each cell fell below five, which is generally accepted as the minimum number of frequencies per cell. Corrections had to be made by the computer formulated SPSS CROSSTABS to make these chi-aquared values more meaningful.

Analysis Results. The percentages in Tablea 17 through 21 present the differences among the range management categories within each of the aix land ownership groups. Significant differences in management practices by ownership groupa were a small portion of the total. Some groups had no significant differences at the .05 probability level. Of the six groups, those dealing with parcel size and size of operation indicated the greatest differences between categories. Occupation groups had the least differences where farmer/ranchers and other occupationa varied little in the range management decision process.

Land ownership categories varied considerably by percentage on a number of management practices, although no

significant differences were indicated beyond the .10 probability level due to the small sample size (Table 17). Absentee owners had a high percentage rate of burning (reaching 90 percent). They had also burned rangeland longer as a group and tended to burn more often than did local owners. In addition, the time of burning was later for this category, as 41 percent burned in the late spring.

Table 17. Range Management Practices by Land Ownership Type

Range Management Practice	Land Ownership Type	
Categories and adjustments:	Absentee	Local
Burning Practice:		
*Land owner/operator burns rangeland. . . .	90	67
Land owner has burned rangeland more than 20 years.	44	22
Percent of rangeland burned exceeds 75 percent	94	73
Rangeland is burned annually or every two years	59	42
Rangeland is burned in the late spring . .	41	36
*Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	35	53
Stocking Rate Practice:		
*Stocking rate exceeds moderate grazing . .	19	46
Cow/calf stocking rate exceeds moderate grazing	27	49
Stocker cattle stocking rate exceeds moderate grazing	0	8
Grazing System Practice:		
*Grazing system only consists of a cow/calf operation	44	58
Continuous grazing is used on the cattle operation	62	53
Weed and Brush Control Practice:		
Burning, Mowing, and herbicides are used to control weeds and brush species	67	65

* Indicates a significant difference among the groups at the .10 probability level.
** Indicates a significant difference among the groups at the .05 probability level.

On the other hand, they noted increasing forage production as a reason for burning less than local owners, even though they preferred more late spring fires.

Continuous grazing was preferred more by absentee owners while they had fewer cow/calf operations. This was expected since continuous grazing systems and stocker operations require less time and supplemental inputs compared to deferred grazing systems and cow/calf operations. Local owners in contrast preferred a higher percent of deferred grazing systems which are more complementary to cow/calf operations. Moreover, locals grazed at heavier stocking rates, primarilly on this type of operation. Stocking rates for stocker cattle rarely exceeded moderate rates for both categories, which partially explains why absentee owners in general stock their pastures at lighter rates.

As previously mentioned, occupation categories varied the least towards management practices (Table 18). The percent of rangeland burned had the highest variability where occupations other than farmer/ranchers were higher. They tended not to burn for a variety of reasons and primarily did so to control weed and woody species content. Neither category, however, differed much in grazing system or stocking rate practices.

Size relationships did indicate considerable differences concerning management (Table 19). Land ownership parcel size indicated significant differences in

burning practices between owners with large tracts and small parcel owners. Burning had greater popularity among owners with large parcels of land who burned more often and indicated a higher percentage of late spring fires. In addition, they burned for a combination of reasons while those owning small units of land primarily burned to control

Table 18. Range Management Practices by Land Owners' Occupation Groups.

Range Management Practice	Occupation Groups	
Categories and adjustments:	Farmer/ Rancher	Other
Burning Practice:		
Land owner/operator burns rangeland.	76	80
Land owner has burned rangeland more than 20 years.	32	22
Percent of rangeland burned exceeds 75 percent	77	100
Rangeland is burned annually or every two years	48	42
Rangeland is burned in the late spring	42	40
Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	59	33
Stocking Rate Practice:		
Stocking rate exceeds moderate grazing	38	40
Cow/calf stocking rate exceeds moderate grazing	42	50
Stocker cattle stocking rate exceeds moderate grazing	6	0
Grazing System Practice:		
Grazing system only consists of a cow/calf operation	53	60
Continuous grazing is used on the cattle operation	57	62
Weed and Brush Control Practice:		
Burning, mowing, and herbicides are used to control weeds and brush species	66	64

* Indicates a significant difference among the groups at the .10 probability level.
** Indicates a significant difference among the groups at .05 probability level.

Table 19. Range Management Practices by Land Ownership Parcel Size.

Range Management Practice	Management Size (Acres)	
Categories and adjustments:	0-640	640 and more
Burning Practice:		
**Land owner/operator burns rangeland. . . .	67	89
Land owner has burned rangeland more than 20 years.	29	32
Percent of rangeland burned exceeds 75 percent	79	83
Rangeland is burned annually or every two years	33	58
Rangeland is burned in the late spring . .	37	42
**Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	36	67
Stocking Rate Practice:		
**Stocking rate exceeds moderate grazing . .	58	20
Cow/calf stocking rate exceeds moderate grazing	68	25
Stocker cattle stocking rate exceeds moderate grazing	0	7
Grazing System Practice:		
Grazing system only consists of a cow/calf operation	61	46
*Continuous grazing is used on the cattle operation	68	44
Weed and Brush Control Practice:		
Burning, mowing, and herbicides are used to contol weeds and brush species	58	73

*Indicates a significant difference among the groups at the .10 probability level.
**Indicates a significant difference among the groups at the .05 probability level.

weed and brush species.

Land owners of small units had a higher proportion of continuous grazing practices and cow/calf operations. Their stocking rates were significantly higher as a group; 64 percent of them exceeded moderate stocking rates on cow/calf operations. Conversely, only 10 percent of all

large trsct owners exceeded moderate stocking rates and only 17 percent on cow/calf rates.

Differing management decisions among size categories would suggest the importance of pasture size. The problems associated with burning small pastures, such as moving cattle while burning and the containment of fire in a small ares, are more restrictive to one who owns small parcels of land. Since a majority incorporate continuous grazing practices with stable cattle herds, they are less likely to burn because they often do not have additional pastures for their livestock during the burning period. Deferred grazing approaches are also less likely, for the creation of more psstures on small operations reduces the amount of available forage from any given pasture. Therefore, in order to sustain larger cattle herds, the owner of small tracts must increase stocking rates, possibly at inopportune times.

The operstion size category increased the number of large operators as compared to the land ownership size category; however, the results varied little (Table 20). In fact, this category further pointed out the differences of burning practices among size categories. In addition, as more larger operations were represented, the gap increased among stocking rstes as even a smaller percentage of larger operators exceeded moderate stocking rates.

Table 20. Range Management Practices by Operation Size.

Range Management Practice	Operation Size (Acres)	
Categories and adjustments:	0-640	640 and over
Burning Practice:		
*Land owner/operator burns rangeland. . . .	69	90
Land owner has burned rangeland more than 20 years.	27	35
Percent of rangeland burned exceeds 75 percent	76	89
**Rangeland is burned annually or every two years	33	67
Rangeland is burned in the late spring . .	60	61
Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	46	61
Stocking Rate Practice:		
Stocking rate exceeds moderate grazing . .	58	10
**Cow/calf stocking rate exceeds moderate grazing	64	17
Stocker cattle stocking rate exceeds moderate grazing	8	0
Grazing System Practice:		
Grazing system only consists of a cow/calf operation	58	45
Continuous grazing is used on the cattle operation	65	42
Weed and Brush Control Practice:		
Burning, Mowing, and herbicides are used to control weeds and brush species	60	75

* Indicates a significant difference among the groups at the .10 probability level.
** Indicates a significant difference among the groups at .05 probability level.

The time of involvement in range management and the age of land owners presented, in general, similar results (Tables 22 and 23). Burning practices showed that younger land owners, and those whose involvement in range management was less than 20 years, burned more frequently and to some degree at a later date. As expected, though, older owners and those in management longer had burned for a longer

period of time. Thus, the use of fire has been recognized by land owners for quite some time. Stocking rates were also similar in that those in the higher categories had slightly heavier stocking rates. Furthermore, managers of 20 years or less significantly differed in the type of operation where they typically incorporated only cow/calf operations (Table 21).

Table 21. Range Management Practices in Time of Management.

Range Management Practice	Time of Management (Years)	
Categories and adjustments:	0-20	21 or more
Burning Practice:		
Land owner/operator burns rangeland.	86	71
**Land owner has burned rangeland more than 20 years.	6	48
Percent of rangeland burned exceeds 75 percent	88	70
Rangeland is burned annually or every two years	56	40
Rangeland is burned in the late spring	47	35
Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	56	62
Stocking Rate Practice:		
Stocking rate exceeds moderate grazing	30	44
Cow/calf stocking rate exceeds moderate grazing	32	52
Stocker cattle stocking rate exceeds moderate grazing	0	7
Grazing System Practice:		
**Grazing system only consists of a cow/calf operation	80	37
Continuous grazing is used on the cattle operation	52	59
Weed and Brush Control Practice:		
Burning, Mowing, and herbicides are used to control weeds and brush species	81	65

*Indicates a significant difference among the groups at the .10 probability level.
**Indicates a significant difference among the groups at the .05 probability level.

Table 22. Range Management Practices by Age of Land Owner.

Range Management Practice	Age of Land owner (Years)	
Categories and adjustments:	0-59	60 or more
Burning Practice:		
Land owner/operator burns rangeland. . . .	84	66
**Land owner has burned rangeland more than 20 years.	9	56
Percent of rangeland burned exceeds 75 percent	91	71
Rangeland is burned annually or every two years	48	45
Rangeland is burned in the late spring . .	50	26
Rangeland is burned to control weeds and brush, increase forage production, and improve grazing distribution	54	50
Stocking Rate Practice:		
Stocking rate exceeds moderate grazing . .	36	42
Cow/calf stocking rate exceeds moderate grazing	39	52
Stocker cattle stocking rate exceeds moderate grazing	0	8
Grazing System Practice:		
Grazing system only consists of a cow/calf operation	59	48
Continuous grazing is used on the cattle operation	63	50
Weed and Brush Control Practice:		
Burning, Mowing, and herbicides are used to control weeds and brush species	63	49

*Indicates a significant difference among the groups at the .10 probability level.
**Indicates a significant difference among the groups at the .05 probability level.

It would appear that the variables of land ownership parcel size and operation size play the most important role among those examined in this study in range managment decisions. The contrasts of burning practices among owners of small and large land holdings varied considerably. In addition, grazing system approaches along with stocking rates differed to a high degree among cow/calf operations.

It was expected that land ownership type would have yielded more significant results. The importance of sample size is evident in this case, since the percentages of management practices varied considerably among local and absentee owners. Therefore, when local and absentee owners were compared, the outcome would have been more meaningful had the sample size been larger.

Literature Cited

Anderson, K.L. 1940. Deferred Grazing of Bluestem Pastures. Manhattan: Kansas Experiment Station, Bullletin 291.

_____ 1967. "Grazing Management and Fire in the Flint Hills," Transactions of the Kansas Academy of Science. 70/2: 171-177.

_____and others 1970. "Burning Bluestem Range," Journal of Range Management. 23/2: 81-92.

Blalock, H.M. 1979. Social Statistics: Revised Second Edition. New York.

Catlin, G. 1973. Letters and Notes on the Manners, Customs, and Conditions of the North American Indians. (Written during eight year's travel [1832-1839] amongst the Wildest Tribes of Indians in North America). New York: Dover Publishing, Inc.

Komarek, E.V. 1966. "The Meteorological Basis for Fire Ecology," Proc. 5th Tall Timbers Fire Ecol. Conf. 5: 85-126.

Lauchbaugh, J.L. 1967. Vegetation Relationships Associated with Intensity of Summer Grazing on a Clay Upland Range Site in the Kansas 20-to-24 Inch Precipitation Zone. Manhattan: Kansas Agricultural Experiment Station, Bulletin 154.

_____ 1969. "Range Condition Classification Based on Regressions of Herbage Yields on Summer Stocking Rates," Journal of Range Management. 22: 97-101.

_____ and C.E. Owensby 1978. Kansas Rangelands: Their Management Based on a Half Century of Research. Manhattan: Kansas State Experiment Station, Bulletin 690.

_____ and others. 1983. Intensive-Early Stocking Studies on Kansas Ranges. Manhattan: Agricultural Experiment Station, Kansas State University.

McIlvain, E.H. and M.C. Shoop. 1951. "Eight-Year Comparisons of Continuous and Rotational Grazing on Southern Plains Experimental Range," Journal of Range Management. 4: 42-47.

_____ and M.C. Shoop. 1971. "Moving and Mixing Range Steers," Journal of Range Management. 24: 270-272.

Ohlenbush, P.D. and E.P. Hodges 1983. Fire as a Management Tool. Manhattan: Cooperative Extension Service, Kansas State University.

Owensby, C.E. and others. 1970. "Effect of Burning and Clipping on Big Bluestem Reserve Carbohydrates," Journal of Range Management. 23/5: 358-362.

_____ and others. 1973. "Evaluation of Eastern Redcedar Infestations in the Northern Flint Hills," Journal of Range Management. 26/4: 256-260.

Sauer, C.O. 1950. "Grassland Climax, Fire, and Man," Journal of Range Management. 3/1: 16-21.

Smith, E.F. and C.E. Owensby. 1978. "Intensive-Early Stocking of Kansas Flint Hills Range," Journal of Range Management. 31/1: 14-17.

Weaver, J.C. and others 1956. "Livestock Units and Combination Regions in the Middle West," Economic Geography. 32/3: 237-259.

Chapter 5

CONCLUSION

The conservation and uae of rangeland in the northern Kansas Flint Hills today and in the coming years obviously lie in the handa of private land owners. Management decisions and strategies these owners make concerning the productivity of this rangeland, as well as preserving ita integrity, will no doubt be of great importance for its continued use. In order for future generationa to enjoy and make use of the range, those decisions made throughout the northern Kansas Flint Hills region will have to benefit both input and output sources.

This study has examined one part of the northern Kanaas Flint Hills, Pottawatomie County, Kansas. Thia portion of the greater Kanaas Flint Hills is somewhat unique in regard to its physical make-up since part of the land surface ia covered with glacial drift and loess deposits. Consequently, the plow has been more active on theae deeper and aoils with reduced slope than on surrounding ahallow and steep upland soils. Still, the majority of the land area consists of rangeland, although invasion of woody plants has

been quite significant in many areas throughout the region. Aa a result, the agricultural network throughout this area has been and remains a mixture of ranching and cultivated farming practices. Moreover, the majority of land owners incorporate both aystems into their operations.

A review of the public land policies during the settlement period in Pottawatomie County, Kansas revealed the influence these policies had on current ownership. The Homestead Act of 1862 and land grants given to railroad companines greatly influenced the eventual land ownership in the county. Since these policies were designed to facilitate the small family farm, land was primarily divided into small parcels even though a majority of the land area was either never cultivated or remained so for only a short period of time. Currently, the land ownership consists of many ownership tracts where individuals own fragmented land units. Aa a result, much of the rangeland is in amall units which creates a different situation for these land owners as compared to those who have large contiguous pastures. Therefore, owners of small land holdings have different obstacles confronting them in terms of rangeland management.

Land ownership also varied among the type of land owner. Local ownership was clearly dominant, consisting of seventy-three percent of the total owners in the county. These owners were found thoughout the county; however, the north central segment had the highest concentration of local owners. Absentee owners held title to land holdings in the

most abundance along the western edge of the county, consisting highly of rangeland. For the entire county though, local owners involvement in grazing activities was equally as important. Moreover, locals clearly controlled the ownership of rangeland having title to seventy-three percent of the total land area in range.

The influence land ownership had on management strategies relates to land ownership parcel size as the most influencing variable examined in this study. The greatest differences in burning prsctices, stocking rates, and types of grazing systems were found among different parcel size categories. This is most evident in burning practices where owners of small land holdings as a group were less likely to use fire and had longer intervals between burning periods. Furthermore, these owners did not have the luxury of changing grszing systems or stocking rates as easily as those owning large units due to the lack of sdditional range resources available to them. Thus, they were more susceptible to over extending the use of the range since they had less alternatives to choose from.

These results were expected since owners of small parcels do not have the same resource base as those owning large tracts of rangeland. Surprisingly though, the type of land ownership did not produce highly significant results. This is s methodological problem inherent in the sample size used for the study. Local snd absentee owners had percentage differences up to thirty percent; however, few

showed any signigicance because the sample aize did not appoximate the true diatribution of chi-squared. In order for a true distribution to be achieved, the aurvey most likely would have needed to be at least two timea larger. Thua, significant levela of 95 percent would have been expected among ownership type categories if the sample size had been increased.

Perhaps aa important, is that the study showed that the type of land ownership varies in the greater Kansas Flint Hills. Aa Kollmorgan and Simonett (1965) pointed out, rangeland in Chase County, Kansas was controlled by absentee ownership even though they only consisted of a small percentage of the land owners in the county. The majority of the absentee owned rangeland was in large land holdings. Conversely, land ownership in Pottawatomie County was primarily in the hands of local owners who owned amall fragmented parcela and controlled the majority of range in the county. Moreover, this can be partially explained by the countys' contrasting phyaical characterists; however, cultural, political, and economical considerations are of great importance in explaining these differences.

In all, it is hoped that this study has raised some points on the importance of the private land owner's role in managing the rangelanda in the northern Kansas Flint Hills. Questions concerning the management throughout the region still remain unresolved, such as the influence of land ownership in other portions of the Kansas Flint Hills and

why the type of ownership varies in the region. Moreover, the inputs of this study have provided insight into the different strategies that land owners incorporate, in particular what variables of ownership influence these decisions.

Literature Cited

Kollmorgen, W.M. and D.S. Simonett. 1965. "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas," Annals, The Association of American Geographers. 55/2: 260-290.

APPENDICES

APPENDIX A. SAMPLING PROCEDURE

A systematic system of sampling was used to select individual land owners for the aurvey. Thia was accomplished by creating a grid overlay on top of a current landownership map of Pottawatomie County prepared by the Pottawatomie County Abstract Company. Every fifth square was selected moving horizontally from left to right across the map. The owner's name of the land parcel in the center of each fifth square was then recorded. If the land owner was recorded more than once, another land owner inside the square waa selected. Moreover, if the entire square was covered by only one ownership tract and that land owner had already been selected, the adjacent square to the right was uaed following the same procedure.

This type of system was used so that an even distribution of land owners throughout the county would be selected. Since land ownera of rangeland were targeted, some areas in the county were deleted from the sampling. The extreme southern portion of the county was one such area, which is being developed extensively for residential and commercial development and was not representative of the existing agricultural setting. In addition, the lower portions of Rock and Vermillion Creeks and the Kansas River Valleys were deleted because rangeland is not present in these areas. Moreover, it was not known if landowners in these areas owned rangeland.

APPENDIX B. RANGELAND PRACTICES QUESTIONNAIRE

SECTION A

Date_____

1. Sex of the respondent: ___male ___female

2. Age of respondent: ___less than 20 years ___40-50 years
___21-30 years ___51-60 years
___31-40 years ___over 60 yrs

3. Principal occupation group:
Agriculture: ___Manufacturing ___Government
___Rancher ___Services ___Other
___Farmer/Rancher ___Education

	In Pottawatomie County owned	In Pottawatomie County leased	Outside Pottawatomie County owned	Outside Pottawatomie County leased
4. How many acres of rangeland do you own?				
5. How many acres of rangeland do you actually graze?				
6. How many acres of rangeland do you manage?				
7. How long have you managed your rangeland?				

8. What is your involvement with the management of your rangeland in Pottawatomie County? ___Full-time
___Part-time

9. Do you lease or rent out any of your rangeland in Pottawatomie County? ___yes ___no
If yes, how many acres?_____
To whom do you lease or rent_____
(for follow-up questionnaire to land-user)

10. Have you ever managed rangeland outside of the Kansas Flint Hills region? ___yes ___no
If yes, where and for how long? _____

ALL QUESTIONS IN THE FOLLOWING SECTIONS APPLY TO ONLY POTTAWATOMIE COUNTY

SECTION B

1. What kind of animal (s) do you graze on your rangeland?
___cattle ___horses ___combination
___sheep ___other

2. If you graze cattle, what type of operation do you have?
___cow/calf ___stocker ___combination

APPENDIX B. RANGELAND PRACTICES QUESTIONNAIRE (CONTINUED)

3. How many animals do you normally stock per acre?
___cows(calf)___/acre ___steers___/acre
___sheep___/acre ___horses___/acre

4. What type of grazing system do you use on your range?

a.___Continuous grazing (year-long or growing-season long grazing in the same pasture each year).

b.___Intensive-Early stocking (heavy stocking rates begininning near May 1 and stocking until the middle of July [15], then complete removal.

c.___Deferred grazing (deferring the use of the native range early in the growing season, thus using cool-season pasture in the late winter and spring).
If you use the deferred grazing approach, what cool-season grass do you use?
___Tall fescue ___Kentucky bluegrass
___Smooth brome Other_____

d.___Deferred-rotation grazing (combination of pastures used in the same system, where one pasture is not grazed part of the year. The deferment is rotated from pasture to pasture in succeeding years).

e.___Other grazing system_____

5. Do you use cropland to pasture your livestock?
___yes ___no If yes, what is the principal crop, time of year, and acreage used?_____
_____

SECTION C

1. Do you burn your pastures?* ___yes ___no

2. How many years have you been burning your pastures?__

3. What percent of all your pastures do you burn?_____

4. Do you burn more or less of your pastures than you did in the past? ___more ___less ___no change

5. How often do you burn?
___annually ___once every 3 year Other___
___once every 2 yrs ___once every 5 years _____

6. Have you always burned at the same time interval as in question 5? ___yes ___no
If no, what other interval?_____

APPENDIX B. RANGELAND PRACTICES QUESTIONNAIRE (CONTINUED)

7. What month of the year do you normally burn?_____

8. What is the earliest and latest date of the year that you will burn? _____earliest _____latest

9. Is there a particular day(s) of the year that you prefer to burn on? _____

10. For what reason(s) do you burn:
___increase forage production ___brush control
___weed control Other_____

*PASTURE IN THE SECTION C REFERS TO NATIVE RANGELAND.

SECTION D

1. Do you fertilize your rangeland? ___yes ___no

2. How long have you been using fertilizer? _____years.

3. How often do you fertilize?
___annually ___once every 3 years
___once every 2 years Other_____

4. What type(s) of fertilizer do you use?
___nitrogen ___potassium
___phosphorus Other_____

5. On years that you apply nitrogen, do you also burn your rangeland? ___yes ___no

SECTION E

1. What type(s) of weed and brush control do you use on your rangeland?
___none ___mowing and/or cutting ___burning
___herbicides Other_____

2. Are there any other specific range management practices that you readily use that were not mentioned in this questionnaire?_____
_____

BIBLIOGRAPHY

BIBLIOGRAPHY

Adama, G.I. 1903. "Physiographic Divisions of Kansas," Transactions of the Kansas Academy of Science. 17: 207-208.

Anderson, J.R. and others. 1976. A Land Use and Land Cover Classification System For Use With Remote Sensor Data. Washington: Geological Survey Professional Paper 964.

Anderson, K.L. 1940. Deferred Grazing of Bluestem Pastures. Manhattan: Kansas Experiment Station, Bulletin 291.

_____ and C.L. Fly. 1955. "vegetation-Soil Relationships in Flint Hills Bluestem Pastures," Journal of Range Management. 8/4: 163-169.

_____ 1967. "Grazing Management and Fire in the Flint Hills," Transactions of the Kansas Academy of Science. 70/2: 171-177.

_____ and others. 1970. "Burning Bluestem Range," Journal of Range Management. 23/2: 81-92.

Baughman, R.W. 1961. Kansas in Maps. Topeka.

Blalock, H.M. 1979. Social Statistics: Revised Second Edition. New York.

Borchert, J.R. 1950. "The Climate of the Central Northern American Grassland," Annals, The Association of American Geographers. XL/1: 1-38.

Bragg, T.B. 1974. Woody Plant Succession on Varioua Soils of Unburned Bluestem Prairie in Kansas. Manhattan: Diasertation, Kansas State University.

_____ and L.C. Hulbert. 1976. "Woody Plant Invasion of Unburned Kansas Bluestem Prairie," Journal of Range Management. 29/1: 13-24.

BIBLIOGRAPHY (CONTINUED)

Bidwell, O.W. 1966. "Flint Hills Range Sites," Transactions of the Kansas Academy of Science. 69: 205-213.

Catlin, G. 1973. Lettera and Notes on the Manners, Customs, and Conditions of the North American Indiana (Written during eight year's travel [1832-1839] amongst the Wildest Tribes of Indians in North America). New York: Dover Publishing, Inc.

Clawson, M. 1951. Uncle Sam's Acres. New York: Dodd, Mead and Company.

Davis, W.D. 1950. Valuation Study of the Pottawatomie Reserve Lands, Part I. Kansas City: Farm Management Associates, Inc.

Davis, W.D. 1950. Valuation Study of the Pottawatomie Reserve Lands, Part II. Kansas City: Farm Management Associatea, Inc.

Greenwood, D. 1964. Mapping. Chicago: The University of Chicago Press.

Hibbard, B.H. 1924. A History of the Public Land Policies. New York: The Macmillan Company.

Humphrey, R.R. 1962. Range Ecology. New York: The Ronald Press Company.

Isern, T.D. 1983. "Farming in the Flint Hilla: A Photographic Essay," Kansas History: A Journal of the Central Plains. 6/4: 221-236.

Isley, B. and W.M. Richards. 1936. Four Centuries in Kansas. Wichita: The McCormick-Mathers Company.

Kollmorgen, W.M. and D.S. Simonett. 1965. "Grazing Operations in the Flint Hills-Bluestem Pastures of Chase County, Kansas," Annals, The Association of American Geographers. 55/2: 260-290.

BIBLIOGRAPHY (CONTINUED)

_____ 1969. "The Woodsman's Assault on the Domain of the Cattleman," Annals, The Association of American Geographers. 59/2: 215-239.

Komarek, E.V. 1966. "The Meteorological Basis for Fire Ecology," Proc. 5th Tall Timbers Fire Ecol. Conf. 5: 85-126.

Kromm, D.E. and S.E. White. 1981. Public Perception of Groundwater Depletion in Southwestern Kansas. Washington D.C.: Office of Water Research and Technology, U.S. Department of Interior.

Kuchler, A.W. 1969. "The Vegetation Map of Kansas," Transactions of the Kansas Academy of Science. 72: 141-166.

_____ 1975. "The New Vegetation Map of Kansas," Transactions of the Kansas Academy of Science. 77: 57-64.

Lauchbaugh, J.L. 1967. Vegetation Relationships Associated with Intensity of Summer Grazing on a Clay Upland Range Site in the Kansas 20-24 Inch Precipitation Zone. Manhattan: Kansas Agricultural Experiment Station, Bulletin 154.

_____ 1969. "Range Condition Classification Based on Regressions of Herbage Yields on Summer Stocking Rates," Journal of Range Management. 22: 97-101.

_____ and others. 1970. "Burning Bluestem Range," Journal of Range Management. 23/2: 81-92.

_____ and C.E. Owensby. 1978. Kansas Rangelands: Their Management Based on a Half Century of Research. Kansas State Experiment Station, Bulletin 622.

_____ and others. 1983. Intensive-Early Stocking Studies on Kansas Ranges. Manhattan: Agricultural Experiment Station, Kansas State University.

Madson, J. 1982. Where the Sky Began: Land of the Tallgrass Prairie. Boston: Houghton Mifflin Company.

BIBLIOGRAPHY (CONTINUED)

Magnusson, L. 1919. Disposition of the Public Lands of the United States. Washington: Department of Labor.

Malin, J.C. 1942. "An Introduction to the Hiatory of the Bluestem-Pasture Region of Kansas," Kansas Historical Quarterly. 11/1: 3-28.

McIlvain, E.H. and M.C. Shoop. 1951. "Eight-Year Comparisons of Continuous and Rotational Grazing on Southern Plains Experimental Range," Journal of Range Management. 4: 42-47.

_____ and M.C. Shoop. 1971. "Moving and Mixing Range Steers," Journal of Range Management. 24: 270-272.

Meade, J.R. 1901. "The Flint Hills of Kansas," Transactions of the Kansas Academy of Science. 17: 207-208.

Muilenburg, G. 1953. The Kansas Scene. Lawrence: State Geological Survey, University of Kansas.

Nieman, L.N. 1975. "Rangeland," Soil Survey of Riley County and Part of Geary County, Kansas. D.R. Jantz and others, pp. 40-43. Washington D.C.: Soil Conservation Service, United States Department of Agriculture.

Oblinger-Smith Corporation. 1972. Land Use and Open Space Plan for Pottawatomie and Riley Counties. Wichita: Oblinger-Smith Corporation.

Ohlenbush, P.D. 1979. Grazing Distribution: Tips for Managing Rangeland Series. Manhattan: Cooperative Extension Service, Kansas State University.

_____ and E.P. Hodges. 1983. Fire as a Management Tool. Manhattan: Cooperative Extension Service, Kansas State University.

BIBLIOGRAPHY (CONTINUED)

_____ and E.P. Hodges. 1983. Stocking Rates: Tips for Managing Rangeland Series. Manhattan: Kansas State Experiment Station, Bulletin 690.

_____ and others. 1983. Range Grasses of Kansas, Manhattan: Cooperative Extension Service, Kanaas State University.

_____ 1984. Recommendations for Brush and Weed Control on Rangeland and Pastureland. Manhattan: Cooperative Extension Service.

Owenaby, C.E. and others. 1970. "Effect of Burning and Clipping on Big Bluestem Reserve Carbohydrates," Journal of Range Management. 26/4: 256-260.

_____ and others. 1973. "Evaluation of Eastern Redcedar Infestations in the Northern Flint Hills," Journal of Range Management. 26/4: 256-260.

_____ 1983. "Range Management," Manhattan: Unpublished Range Management Notes, Department of Agronomy, Kansas State University.

Pyne, S.J. 1982. Fire In America: A Cultural History of Wildland and Rural Fire. Princeton: Princeton University Press.

Riley County Genealogical Society. 1975. Pioneera of the Bluestem Prairie. Manhattan: Riley County Genealogical Society.

Sauer, C.O. 1950. "Grassland Climax, Fire, and Man," Journal of Range Management. 3/1: 16-21.

Schoewe, W.H. 1949. "The Geography of Kansas," Transactions of the Kansas Academy of Science. 52/3: 261-333.

Self, H. 1978. Environment and Man in Kansas: A Geographical Analysis. Lawrence: The Regents Press of Kanaas.

BIBLIOGRAPHY (CONTINUED)

Schafer, J. 1936. The Social Hiatory of American Agriculture. New York: The Macmillan Company.

Smith, E.G. 1975. "Fragmented Farms in the United States," Annals, The Association of American Geographers. 65/1: 58-70.

Smith, E.F. and C.E. Owensby. 1978. "Intensive-Early Stocking of Kansas Flint Hills Range," Journal of Range Management. 31/1: 14-17.

Socolofsky, H.E. 1947. The Scully Land System in Marion County, Kansas. Manhattan: A Masters Thesis, Department of History, Kansas State University.

_____ 1956. "How We Took the Land," Kansas: The First Century. ed. J.D. Bright, 1: 281-306. New York: Lewis Historical Publishing Company.

_____ and H. Self. 1972. Historical Atlas of Kansas. Norman: Oklahoma University Press.

United States Census of Agriculture for Kansas, 1982. Washington D.C.: U.S. Department of Agriculture.

United States Censua of Population for Kansas, 1860-1890 and 1980. Washington D.C.: U.S. Department of Commerce, Bureau of Censua.

Unpublished Pottawatomie County Soil Survey. 1984. N.p.: n.p.

Weaver, J.C. and others. 1956. "Livestock Units and Combination Regions in the Middle West," Economic Geography. 32/3: 237-259.

Weaver, J.E. and F.W. Albertson. 1956. Grasslands of the Great Plains. Lincoln: Johnson Publishing Co.

Webb, W.P. 1931. The Great Plains. Boston: Ginn and Company.

AN ANALYSIS OF LAND OWNERSHIP AND RANGE MANAGEMENT PRACTICES IN THE NORTHERN KANSAS FLINT HILLS

by

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AN ABSTRACT OF A MASTER'S THESIS

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ABSTRACT

The Kansas Flint Hills contain the largest remaining portion of the Tallgrass prairie. In the northern Kansas Flint Hills, portions of the steep and shallow upland soils are covered by glacial drift and loess deposits, providing a greater abundance of cultivatable soils as compared to surrounding shallow and steep sloped upland soils. This occurrence, in addition to fertile river valleys, has helped to create a mixture of intensive cultivation practices with extensive grazing activities. Land ownership has an important role in the management of rangelands, where local owners control the majority of land area; however, the size of land ownership ranges from extremely small to very large units of rangeland. Landowners have varied their ranching strategies in terms of burning, grazing systems, and stocking rates. These practices varied by the size of land holdings, where land owners of large parcels burned more often, stocked pastures at lighter rates, and incorporated more grazing system approaches than did owners of small land units. Moreover, burning rangeland and stocking rates also varied among land ownership type as absentee owners also burned more frequently and had lighter stocking rates.