The Coteau des Prairies: An Area Study

Orville E. Gab

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THE COTEAU DES PRAIRIES:
AN AREA STUDY

BY

ORVILLE E. GAB

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Major in
Geography, South Dakota
State University

1979

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["Thesis Advisor"] Date

[Head, Geography Dept.] Date
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OEG
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CHAPTER I
INTRODUCTION

This thesis is a systematic geographical analysis of the Coteau des Prairies of eastern South Dakota. The Coteau is a flatironed-shaped plateau about 200 miles in length pointing in a northerly direction (Fig. 1).

The northern tip of the flatiron-shaped Coteau ends at Sargents Point, North Dakota, about 15 miles north of Marshall County, South Dakota. The heel of the flatiron or the southern edge of the Coteau des Prairies would just about follow the border between Minnehaha and Lincoln Counties of South Dakota.

The eastern edge of the Coteau's extent in South Dakota parallels the Minnesota border. In Deuel County, South Dakota, it veers northwesterly and ends at Sargents Point, North Dakota. The western edge of the Coteau extends through Marshall, Day, Clark, Kingsbury, Miner, Lake, McCook, Minnehaha and northern Lincoln Counties. Like a flatiron, the Coteau widens and its vertical protrusion diminishes as it extends southward. Its maximum width is about 70 miles.

\[1\] Edward Patrick Hogan, Geography of South Dakota, South Dakota State University, Brookings, South Dakota, 1976 (mimeographed).
Fig. 1. The Coteau des Prairies.
Source: Hogan, The Geography of South Dakota, p. 3.

SCALE IN MILES
0 15 30 45
French explorers and fur traders named this massive highland area the Coteau des Prairies (Fig. 2). In 1843, J. N. Nicollet described it as viewed from the low country to the east or west as a looming distant shore. George Catlin, a famous American painter described the Coteau as:

"This wonderful anomaly in nature, which is several hundred miles in length, and varying from fifty to a hundred in width, is undoubtedly the noblest mound of its kind in the world: it gradually and gracefully rises on each side, by swell after swell, without tree or bush, or rocks,...and is everywhere covered with green grass, affording the traveller, from its highest elevations, the most unbounded and sublime views of—nothing at all—save the blue boundless ocean of prairies that lie beneath and all around him, vanishing into azure in the distance, without a speck or spot to break their softness."

Since Catlin's visit to the area, great changes have occurred on the surface of the Coteau. These changes are primarily as a result of the occupancy and development of this region by modern man. Today the land is extensively farmed; numerous communities dot the terrain; and a modern transportation system connects the rural and urban areas. The result is a regional geography quite different from that briefly described by Catlin.

Geographers have been interested in areal units of study since antiquity. The Phoenicians were perhaps the first to recognize differences in the physical environment

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Fig. 2. Remote Sensing Image of the Coteau des Prairies.
and products of various places. They utilized this understanding to exploit the known world of their day.

The human element was omitted from geographic studies until the Nineteenth Century. With the works of Carl Ritter (1779-1859) and to some extent Alexander von Humboldt (1769-1859) came a new modernistic and humanistic view of geography. This German influence beginning in the 1870's provided an emerging concept of regional geography. This was later expanded upon by a Frenchman named Vidal de la Blache (1845-1918). This success in France influenced other regional geographers of that time period, among them Alfred Hettner (1859-1941) in Germany, and A. J. Herbertson (1865-1915) in Great Britain.3

Carl Sauer (1889- ), University of California, Berkely, was credited with bringing the concepts developed in Germany to the United States in the late 1920's and early 1930's. Sauer had a particular influence on the younger American geographers and led them to think of geography in terms of the natural and cultural aspects of regions. German geographers also influenced Americans Ellen Churchill Semple (1863-1932), and Arnold Guyot (1807-1884). The former strongly influenced human geography in America.

for a quarter of a century. The latter taught at Princeton, and was a follower of Carl Ritter's teachings. 4

All regions have a position or location on the earth. In the past, regional geography was focused on, and limited itself to, an empirical philosophy of science. Its character lacked functional relationships, and failed to consider variables involving human influences. It failed to put things into perspective relative to time and place. Geography pursued phenomena relative to the earth's surface. Of primary importance was the description and explanation of occurrences on the earth's surface. 5

When the emphasis began to be placed on the environment and man, new thoughts emerged. Theories developed which looked at causes, not just results. New concepts began replacing the descriptive ideas of the past. Man's effect on the environment was interwoven with the study of spatial aspects of geography. 6

It may be easy to visualize a region, but it can be very difficult to define and delimit it accurately and indisputably. A region has location; it also has area.


6 Ibid.
The hierarchical structure or arrangement distinguishes an area or the definition of an area from that of a region. An area is less complex in its structure being limited to one set of criteria. A region is defined as a homogeneous area determined by two or more criteria. Areal studies pertain to definite physical or cultural boundaries and may be void of the ingredients which can give a collective perception of the world as a regional study does.  

This thesis is a systematic-area study of the geography of the Coteau des Prairies. It systematically applies regional geography criteria to an area determined solely on the basis of its physiographic distinction. The systematic-area study considers all criteria necessary to fully define the physical and cultural environments which together form the geography of the Coteau des Prairies. The criteria that investigates the physical environment are: the terrain, climate, soils, natural vegetation, animal life, and water. The cultural environment examines the human occupancy and human development of the area. The former is basically the historical geography of the area, while the latter studies the agriculture, mining, industry, transportation, recreation, power and utilities, and cities and towns of the area. The result of the study of this magnitude is a general systematic geography of the

---

Coteau des Prairies.\(^8\)

It should be noted that the Department of Geography at South Dakota State University has adopted as one major goal of the graduate program, the completion of a series of Masters Thesis examining the geography of the thirteen physiographic regions of the state (Fig. 3). To date, studies of the Minnesota River Lowland and the Lake Dakota Plain have been conducted. This is then, the third of the thirteen studies in the series.

\(^8\)Hogan, Geography of South Dakota.
Fig. 3. Physiographic Regions of South Dakota.
Source: Hogan, *The Geography of South Dakota*
CHAPTER II
THE PHYSICAL ENVIRONMENT

The Coteau des Prairies, as it was named by the French fur trappers and later described by Catlin, is truly a "wonderful anomaly of nature." Geographically, it is the most conspicuous landform in eastern South Dakota. As such, it provides a unique geographic stage upon which mankind has attempted to utilize available resources within the range of knowledge and habit.

The examination of the physical environment of the Coteau des Prairies is, therefore, a study of the unique stage upon which mankind has acted out the drama of life in a part of eastern South Dakota. Geographically, that environment is comprised of the following criteria: terrain, climate, soils, natural vegetation, animal life, and water. Together these criteria present a detailed view of the physical geography of the Coteau des Prairies.

Terrain

The terrain forms the base of the study. Its diversity is the result of extensive glacial activity in this region. The relatively large area of eastern South Dakota adds to the variety of landform features. The glaciated area constitutes almost the entire eastern half of the
The elevation of the Coteau is greatest in the northeast near Grant and Roberts Counties where elevations reach 2000 feet. Along the western edge of the Coteau, elevations are generally 100 to 200 feet lower indicating that the surface of the entire Coteau slopes westward.¹

The Coteau des Prairies is only a small part of a larger plateau which extends northward through North Dakota into Manitoba and Saskatchewan. The plateau north of South Dakota has a less noticeable escarpment on its west edge in contrast to its eastern side, and in fact, no escarpment is visible within an area 40 miles north of the Coteau.²

The escarpment of the Coteau within the state is striking on its eastern slope. On the northern edge of the east slope, a height of 800 feet is reached with an incline of about 200 feet per mile. The western slope is less noticeable because the bordering lowland has a higher elevation than the lowland on the east. Both the east and west slopes are barely marred by drainage systems which are usually present in topographic features


²Ibid., p. 7.
such as this.³

Most of the geology of the Coteau visible at the surface is of the Pleistocene epoch, that is, of the last Ice Age which ended 10,000 to 15,000 years ago. The most recent deposits are the result of the Wisconsin ice sheet. The older ice sheets to invade the area in order of increasing age are the Illinoian, Kansan, and Nebraskan. Signs of the older ice sheets are limited to isolated areas of the Coteau.⁴

Knolls of sand and gravel are found in random locations in the lower portion of the Big Sioux River valley. These knolls have gentle slopes with relief rarely exceeding eight degrees. The slopes of these knolls are overlain with loess material mantling ice-contact features. The thickness of the windblown material is difficult to measure accurately. This results from the loess slumping and creeping down the slopes of the terrain. In some areas along pronounced slopes, the relief of the land failed to hold loess material and at these points, it is not unusual to find loess-free areas.⁵

³Ibid., p. 6.
⁵Flint, Pleistocene Geology of Eastern South Dakota, pp. 72-37.
The interior of the Coteau des Prairies, like the escarpments, is characterized by roughness. Evidence of this begins in the Roberts and Day County area at the head of the Big Sioux River. Long linear ridges of very rough hills are separated by widely spaced glacial valleys in which the surface is somewhat smoother. On some of these smoother surfaces lie lakes of varying sizes such as Lake Kampskea near Watertown which appears to be situated on a nearly flat plain.

These old glacial valleys are pathways for streams in the southern portion of the Coteau. They account for the ruggedness of the area around Newton Hills near Alcester. These hills, formed from an earlier Kansan drift, are part of the Coteau, although separated from the main part by a broad lowland area. Farther north, however, the old glacial valleys have been partially covered by a veneer of glacial drift. These areas remain as broad, shallow depressions, extending through the Big Sioux drainage basin. The more recent Wisconsin ice sheet fashioned the irregularities of the northernmost region of the Coteau as it retreated in an irregular manner depositing huge piles of drift. Some areas of ground marine left a smoother surface feature.6

Fig. 4. Coteau des Prairies in the distance

Fig. 5. Exposed quartzite near Dell Rapids
Several landform features indicate the direction and extent of glacial advance. Movement of ice was in a southerly or southwesterly direction as is evidenced by the right angles of drift to the direction of ice flow. Other indications are striations on exposed bedrock masses and local erratic rocks which originated from areas to the north and northeast.

Evidence of glacial activity on the bedrock is concealed beneath large deposits of glacial drift. Information of drift thicknesses has been obtained by drilling wells in numerous locations on the Coteau. The results of the drilling show that the buried bedrock slopes in a westerly direction at a greater relief than that of the surface. These test wells show a thickness of till ranging from nearly 400 feet in Day County to just over 100 feet in Kingsbury County. The relief of the bedrock structure is from 400 to 500 feet sloping southward and westward.7

The Coteau des Prairies is a plateau that exists because of stream valleys which have eroded away the land around it. Glacial drift has deposited clusters of hills at the point of its flatiron shape and which disperse to the south. This pattern of drift also reveals the Coteau's ability to impede the movement of the more recent ice sheet advance. An area of end moraines and

7Flint, Pleistocene Geology of South Dakota, pp. 8-9.
stream valleys evidence the Coteau as a barrier between ice lobes of the Wisconsin stage.\textsuperscript{8}

The Wisconsin drift sheet invaded the region in several stages leaving behind moraine deposits of varying compositions. The Wisconsin ice sheet is divisible into four substages of ice advance. Three of these substages affected the Coteau. These subdivisions are based on varying loess deposits, different soil zones, a diverse end moraine and boulder concentration, and differences in the extent of erosion in various areas (Fig. 6). Moraines, such as the Altamont, Bemis, and Cary, exhibit an indelible record as to the extent of ice advance.

The Altamont moraine, an end moraine associated with the Mankato lobe, is characterized by high massive deposits. The Bemis moraine of the Des Moines lobe is a continuous single end moraine resulting in linear features. The Cary moraine, found at the extremities of Cary lobe, are smooth and broad and less rugged than the newer Altamont moraine. These moraine deposits characterize the northeast edge of the Coteau marking ice advance from the northeast.\textsuperscript{9}

The distribution of Sioux quartzite in the drift supports the theory that the ice flow was almost due

\textsuperscript{8}Ibid., p. 7.

\textsuperscript{9}Ibid., pp. 94-105.
Fig. 6. Stratigraphy of the Wisconsin Deposits
Source: Flint, Pleistocene Geology
south. This inference is made because of like fragments of quartzite which appear on the western edge of the limit of both the Cary and the Mankato drifts. In the vicinity of Dell Rapids in Minnehaha County, the relief features of the quartzite are relatively gentle on the upstream slope, compared to the steep slopes which face downstream. The rock preserves the striated and polished surfaces indicating that the overlying drift was very rapidly eroded away. These exposed quartzite formations lend a very rugged landscape to the southeastern edge of the Coteau.

The Coteau is drained in a southerly direction by one of the major rivers in eastern South Dakota, the Big Sioux. The Big Sioux River has its origin in southwestern Roberts County, and flows almost directly through the center of the Coteau draining lakes as well as being fed by tributaries which flow into the Big Sioux along it's entire route. Most of its' tributaries enter the main stream from the east and reflect the general slope of the land and the advance of ice on the Coteau. The lakes, for the most part, are located on the west side of the Big Sioux River and occupy former valleys that have been blocked by glacial drift. These lakes are large and more numerous than water bodies found anywhere else in the state.¹⁰

¹⁰Ibid., pp. 6-7.
Fig. 7. Big Sioux River at Sioux Falls

Fig. 8. Big Sioux River near Dell Rapids
Pierre shale is the most dominant bedrock formation extending through all but the southern edge of the Coteau. This includes the southeast corner of Moody County, most of Minnehaha County, and the northern portion of Lincoln County, which is composed of Sioux quartzite.

Pierre shale is very firm and compact when it is dry. Protection from water which causes its decomposition is often provided by the root system of grasses. The ease by which the shale can be decomposed explains the deflation basins in the region. Most of the top soil in western South Dakota is Pierre shale combined with loess deposits, signifying the expanse of this type of bedrock.

Pierre shale is composed of a large portion of clay, a small portion of quartz and imbedded within this rock is a layer of bentonite giving the formation poor consolidation and making it highly erodeable. The bentonite within the shale readily absorbs water causing the shale to be highly plastic. Constant swelling when water is absorbed causes the material to decompose and form flaky particles which can easily be transported by wind and water.\(^{11}\)

**Climate**

The most important environmental factor with respect

\(^{11}\)Ibid., pp. 22-28.
to physical conditions of any area is the climate. The components of climate greatly affect the environment. Included are radiation, winds, heat, barometric pressure, humidity, cloud cover, precipitation, evaporation, transpiration, and passages of frontal systems. In an area the size of the Coteau des Prairies, the extent of variation in climate is limited and the differences are slight. Seasonal extremities are common with respect to both temperature and precipitation.

The extreme southern portion of the Coteau falls into the category of Humid Continental "A" which has temperature variations of 18 degrees fahrenheit to 26 degrees fahrenheit during the winter, and from 71 degrees fahrenheit to 75 degrees fahrenheit during the summer. The remainder and greatest portion of the Coteau is in the category of Humid Continental "B" where the temperatures are somewhat lower and the growing season is shorter. Temperatures vary from 13 degrees fahrenheit to 19 degrees fahrenheit during the winter months, and from 68 degrees fahrenheit to 72 degrees fahrenheit during the summer.

Frequent and pronounced changes in the weather are common in the area. This adds to the importance of a


13 Hogan, Geography of South Dakota, p. 6.
Fig. 9. Summer Fun

Fig. 10. Winter Fun
knowledge of the weather in determining the types of crops which are grown in the area. The climate is generally regarded as marginal for most crops. These limitations have to be continually considered by persons engaged in agriculture.  

Humid Continental climates are located in a middle latitude region in the central and eastern portion within a continent. These climates are within the polar front zones and at a point where polar and tropical air masses meet. There is an adequate amount of precipitation throughout the year reaching its peak during the summer months. This is triggered by encroaching maritime tropical air masses. Variation and contrasts in the weather are high. Cold winters are dominated by continental polar air masses stemming from northern source regions.  

Temperature differences can exceed 140 degrees fahrenheit from one season to another. There are also approximately 140 days each year when temperatures fall below freezing. Temperatures vary from south to north as they become increasingly cooler in that direction. The coldest month is January when temperatures average 9.7 degrees


15 Strahler, Physical Geography, p. 249.
fahrenheit at Watertown. The warmest month is July when
temperatures average 73.3 degrees fahrenheit at Sioux
Falls (Table 1).

The average annual total precipitation in the Coteau
des Prairies varies only slightly, becoming increasingly
greater toward the south. Within the area's reporting
stations, the difference in amounts of precipitation
is less than one inch (Table 2).

Most of the precipitation occurs during the growing
season in the form of thunderstorms. These can be expected
40 to 45 times a year with occasional hail. The hail
is spotty and isolated, but can be very destructive. 16

Severe summer weather is associated with strong
winds in the form of tornadoes which occur along with
thunderstorms. The tornado is the most violent of all
known storms with wind speeds of over 500 miles per hour.
Frequent sightings are reported each year, but the damage
that is caused has been minor, as not all tornadoes touch
down. When tornadoes do touch, it is quite often in
an isolated, sparsely populated area.

A large variation in the amount of seasonal snowfall
can occur from year to year. Amounts of snowfall vary
only slightly from a high of 33.0 inches in Sioux Falls

16U. S. Department of Commerce, Climatological Data
Annual Summary South Dakota, 1976, pp. 3-4.
### TABLE 1

Selected temperature data for the Coteau des Prairies

<table>
<thead>
<tr>
<th>Station</th>
<th>Average January Temperature</th>
<th>Average July Temperature</th>
<th>Average Seasonal Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fahrenheit</td>
<td>Celsius</td>
<td>Fahrenheit</td>
</tr>
<tr>
<td>Brookings</td>
<td>12.0</td>
<td>-11.1</td>
<td>71.1</td>
</tr>
<tr>
<td>DeSmet</td>
<td>12.8</td>
<td>-10.7</td>
<td>72.7</td>
</tr>
<tr>
<td>Flandreau</td>
<td>13.1</td>
<td>-10.5</td>
<td>72.1</td>
</tr>
<tr>
<td>Madison</td>
<td>Not Available</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>Sioux Falls</td>
<td>14.2</td>
<td>-9.9</td>
<td>73.3</td>
</tr>
<tr>
<td>Watertown</td>
<td>9.7</td>
<td>-12.4</td>
<td>70.7</td>
</tr>
<tr>
<td>Webster</td>
<td>10.0</td>
<td>-12.2</td>
<td>70.4</td>
</tr>
</tbody>
</table>

TABLE 2

Selected precipitation data for the Coteau des Prairies

<table>
<thead>
<tr>
<th>Station</th>
<th>Total Annual Precip.</th>
<th>Highest Monthly Month</th>
<th>Highest Monthly Amount</th>
<th>Lowest Monthly Month</th>
<th>Lowest Monthly Amount</th>
<th>Snowfall Highest Monthly Month</th>
<th>Snowfall Highest Monthly Amount</th>
<th>Seasonal Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brookings</td>
<td>21.11*</td>
<td>June 3.97*</td>
<td>January .42</td>
<td>March 7.5*</td>
<td>29.3*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DeSmet</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flandreau</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madison</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sioux Falls</td>
<td>21.76</td>
<td>June 4.06</td>
<td>January .53</td>
<td>March 7.3</td>
<td>33.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watertown</td>
<td>20.85</td>
<td>June 3.72</td>
<td>January .51</td>
<td>March 5.8</td>
<td>27.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Webster</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Precipitation given in inches

Source: U.S. Department of Commerce, National Climatic Center, Climatological Data Annual Summary: South Dakota, 1976, pp. 4-5.
to 27.3 inches in Watertown. Snow that falls early in
the season usually melts within a few days. The same
can be said for late seasonal snowfall. This limits
the length of time during which the entire ground is
covered by snow.

Strong gusty winds accompany cold fronts moving
into the area causing heavy drifting which blocks roads
and restricts travel. These winds and the presence of
snow on the ground increase the intensity of the cold,
and are very often responsible for loss of life.

Prevailing winds are from the south or southeast
during the summer months, and from the north or northwest
during the winter. Strong winds are most frequent during
periods of thunderstorm activity, or the passage of a
strong frontal system during the winter. The average
annual wind speed is approximately 11 miles per hour.

Sunshine and clear air are common in the area due
to considerable air movement which occurs throughout
the year. Summer sunshine coupled with high humidity,
especially in the early part of the day, causes conditions
to be uncomfortable. The high humidity usually lessens
in the afternoon.\textsuperscript{17}

\textbf{Soils}

The soil structure of any area plays an extremely

\textsuperscript{17}Ibid., pp. 4-5.
important part with respect to settlement, population, density, economy, et cetera. Climate plays an important part in the composition of soils. The depth of carbonate leaching is greater when temperatures are higher and moisture is greater. A greater depth of carbonate leaching is found in the southern part of the Coteau des Prairies where the temperature-precipitation relationship is such that warm, moist conditions accommodate greater leaching. The leaching process filtrates the carbonate products deeper resulting in a thicker fertile soil.

Soil formations are the result of a series of various changes which gradually progress to the climax stage in the evolution cycle of soil formation. The parent rock material is the basis which determines soil types. Through the process of weathering, simple compounds are released which serve as food for fungi and bacteria. Gradually higher, more advanced forms of plant life evolve, and are supported by the soil as it accumulates more organic matter.

The eastern part of South Dakota, including the Coteau, is composed of a soil type called chernozem. Chernozem is in that group of soils which is dark in color at the surface becoming gradually lighter at a deeper level. At its extreme depth, a layer of carbonate accumulation is found. This soil developed under tall
and mixed grasses in a temperate to cool subhumid climate. \(^{18}\) (Fig. 11).

Geographic areas with chernozem soils are often described as the breadbaskets of the world being famous for small grain crop production. \(^{19}\) The Coteau area does produce a variety of grain crops. The chernozem soil type is not unique to South Dakota or even the United States. This particular soil is also found in eastern Australia, southeastern South America, and a substantial portion of southwest Russia in the heart of the agricultural district of that country. Chernozem in Russian means black earth. \(^{20}\)

Chernozem soils appear in layers or horizons and the darkness of color is determined by the amount of organic matter found in the soil, and the decomposition of that material. Most climates form a favorable environment to accumulate organic matter and the temperature dictates its destruction. Cooler temperatures tend to prolong their destruction. The northeastern section of the Coteau with its cool, moist climate, has conditions

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\(^{18}\) Fred C. Westin, Leo F. Puhr, and George J. Buntley, Soils of South Dakota, South Dakota State University Agricultural Experiment Station Soil Survey Series No. 3 (Brookings, South Dakota: Agricultural Experiment Station), pp. 2-3.

\(^{19}\) Strahler, Physical Geography, p. 311.

Fig. 11. Soil Regions of South Dakota
Source: Westin, Puhr, and Buntley, Soils of South Dakota
most favorable to sustain a dark surface horizon. Moist soil conditions are favorable in collecting organic material. The cooler temperature of the northeast has a negative effect on the destruction process causing darker layering in that area. In addition to the organic effect causing darker soils, is a deeper lying accumulation of carbonate and salt, and a higher content of nitrogen in the surface area. The southeast has a higher humidity, and greater amounts of precipitation which promote a more vigorous growth of tall grasses encouraging organic destruction which emits nitrogen at a higher rate, and leaching chemical materials deeper into the surface. This gives the soil a browner appearance.

The development of a type of soil is the result of five factors and their interaction, namely: climate, vegetation or organisms, parent material, relief, and time. The influence that each of these factors has on soil varies, but each one contributes to the development of a soil type.

The type and distribution of vegetation is determined by climate. The combined factors of climate and vegetation most greatly influence the formation of soil. The Coteau with its inland position has a continental climate with tremendous fluctuations in temperatures of extreme winter cold and summer heat.

The composition of glacial deposits are determined
by structure and character of preglacial materials. The Coteau soils were formed by glacial deposits called till. Till is a heterogeneous mixture of rock fragments in varying sizes that are deposited from the under part of a glacier. Another form of deposition which occurs in layers or veneers is referred to as loess. Loess is windblown silt material which in eastern South Dakota was accumulated by the combination of nonglacial silt of the west with silt of outwash bodies or till itself. These depositional features vary in depth up to 30 feet or more. Stream-laid deposits of gravel, silt and clay generally mixed, and most loamy in texture, are the alluvium deposits of the Coteau.

The texture and mineral composition of soil is determined principally by the parent material. This determines the series of a soil type. Chernozem soils from glacial till are classed in the Vienna series, while chernozem soils developed in thin loess material overlying glacial till are classed in the Kranzburg series. This paper will not take an indepth look at all of the soil associations of the chernozem soil type. Instead, it should be noted that all associations are deep, black, and fertile varying only slightly with respect to organic material present, texture, permability, and drainage.

21 Westin, Puhr, and Buntley, Soils of South Dakota, pp. 5-23.
The time factor is extremely important in soil formation. When soil is easily eroded by wind or water, especially on undulating topography, a reasonable length of time is necessary for the top soil to reach a point of permancy through the establishment of root systems. Finer or lighter materials are transported to areas less susceptible to erosion forming a thicker or heavier layer of soil.

The pattern of soils for the Coteau des Prairies is a mixture of two or more soil types. The soil changes locally with a change in relief or parent material. It is also influenced on a regional basis by climate and vegetation. These characteristic soil patterns are referred to as soil associations. The importance of classifying soil in this manner allows it to be used to raise crops which will best adapt to that particular association.

The northernmost portion of the Coteau includes the silty prairie series (Fig.12). Forman-Buse-Poinsett, hilly to rolling, is the soil association found in the northern and eastern escarpment of the Coteau. The Forman soils are clay loams which occupy convex slopes. The Buse soils are thin, hilly loams. The Poinsett soils are permeable, deep, silty, and nearly black soils. The terrain usually found with this soil association is commonly rugged as is the terrain of the escarpment
SOIL ASSOCIATION MAP

LEGEND

A FORMAN-BUSE-POINSETT
Hilly To Rolling

B POINSETT-PARNELL-BUSE-SINAI
Undulating

C KRANZBURG-VIENNA
Sloping

D SINGSAAS-OAKLAKE
Undulating

E WENTWORTH-EGAN-BALTIC
Undulating

F MOODY-TRENT-CROFTON
Sloping

G EGAN-VIBORG-BADUS
Nearly Level To Undulating
Fig. 12. Soil Association Map
Source: Westin, Puhr, and Buntley, Soils of South Dakota
of the north and east. The soil is used primarily as pasture and there does exist the problem of runoff and erosion.

The Kranzburg-Vienna, sloping soils are located in approximately the middle of the Coteau. The Kranzburg soils are formed by the deposition of loess material over glacial till. They are a deep friable silty clay loess that is nearly black in color. The Vienna soils are also deep friable loams but formed directly from glacial till. These soils occur on sloping terrains with an adequate surface drainage system. This soil is primarily used for the production of corn, oats and flax.

On the western edge of the Coteau, soils are of the Poinsett-Parness-Buse-Sinai undulating association. The Poinsett soils are nearly black, deep, friable, well drained silty clay loams of convex areas. The Parnell soils are formed under conditions of poor drainage of closed depressions. The Buse soils are thin and are found in hilly areas. Sinai soils are deep finely textured, silty clay loams or silty clays of flat-topped, steep-sided hills. This soil has a variety of uses from the production of corn, oats, flax and potatoes, to being used for pasture.

Cutting through the center of Deuel County and extending into eastern Codington County lies an undulating
soil association called Singsaas-Oaklake. Both of these soils have thick black horizons near the surface due to the abundance of worms and other soil fauna. The only difference between the two is that the Singsaas are better drained than are the Oaklake soils. This soil association is used in raising corn, flax, oats, and pasture.

In the southern portion of the Coteau lies an area of soils of the Moody Silty Prairie variety. The first association of this group is located on the eastern side of the southern tip of the Coteau called the Moody-Trant-Crofton sloping soil. The Moody soils are deep, permeable, well drained silty, clay loams found at the top of ridges and along the gentle side slopes. The Trent soils are fairly well drained compared to the Moody soils. The Crofton soils for the most part occupy the steeper slopes. This area has a well developed drainage system and is found to produce corn, soybeans and oats.

On the western side of the southern tip, the undulating Wentworth-Egan-Baltic soil association is found. The Wentworth soils are deep, friable, well drained silty clay loams. The Egan soils are like the Wentworth but have been formed in a silt cap over glacial till. The Baltic soils are found in closed depressions with poor drainage. This soil is used for the production of corn, oats, and soybeans, as well as being used for pasture.
Soil erosion and management practices can be greatly improved by using available data concerning soil types. Wind and water run-off are the most critical preventive practices that should be considered in land use conservation.  

**Natural Vegetation**

Between the eastern and western forest regions of North America lies a vast expanse of grassland. South Dakota lies nearly in the center of this region, and except for a few isolated areas, grass is the dominant natural form of vegetation.  

The vegetation of the area is directly and positively influenced by the soil and climate. These variables are what determine the type of vegetation that can survive and prosper. The soils associated with the true prairie region are black, deep and extremely fertile. This corresponds closely with the state's Corn Belt. Because of its high agriculture productivity, just a few of the natural vegetation tracts of land remain.  

The entire Coteau des Prairies lies within the Tall Grass Prairie Region, sometimes referred to as the true

22 Ibid., pp. 20-27.
23 Ibid., p. 2.
prairie. This true prairie region extends westward until it gives way to the mixed grass prairie with its variety of less palatable plants. This type of vegetation is highly drought resistant. Trees are scarce except in a few isolated wet areas. Trees are thought to be absent because of fires and the usual limited amount of precipitation in the area (Fig.13).

Depletion of grasses is caused by over-grazing, fire, or drought. Over-grazing occurred when large herds of buffalo or other large mammals occupied the area for extended periods of time. Later, as settlers moved into grazing areas, the areas were depleted by intense or confined grazing. This changed the carrying capacity resulting in a more diversified natural vegetation. This change had an effect on the human and animal life that inhabited the area.

When the land becomes less productive as a result of fire, over-grazing or drought, a less desirable type of grass becomes dominant. These undesirable grass types include Kentucky bluegrass, western wheatgrass, blue sideoats and hairy grama, buffalograss, and panic grasses. Forbs which become more numerous under adverse conditions are yarrow, goldenrod, aster, skeletonweed, whorled milkweed, and cudweed sage. Further deterioration leads to an abundance of such plants as cheatgrass, prairie threeun, foxtail barley, Canada bluegrass, and sand dropseed.
Fig. 13. Flora and Fauna Regions
Source: Hogan, *The Geography of South Dakota*
Forbs which become more plentiful are ragweed, perennial thistles, and curlycup gumweed.  

Various and numerous species comprise the vegetation in a true prairie. These natural grasses are highly palatable and nutritious. Some of the grasses of major importance include big bluestem, little bluestem, Indian-grass, switchgrass, procupine grass, and prairie dropseed. Primary forms of forbs include leadplant, groundplum, milkvetch, American licorice, purple and white prairie clover, onions, pussytoes, perennial sunflowers, prairie roses, and false boneset.

Big bluestem is a large plant which has stalks reaching heights of three to eight feet. It is bluish in color and its seedheads branch in three parts resembling a turkey's foot. It is among the best of the prairie grasses which respect to quality and quantity. This is the most palatable grass in South Dakota. Little bluestem resembles big bluestem except for its shorter height, flattened leaf sheaths, and folded leaves.

Switchgrass is a coarse stemmed plant which grows to a height of from three to six feet. It is easily identified by v-shaped patches of hair on the upper surface of the leaf blade near the stem. It is not as palatable as the bluestem but is readily consumed by livestock.

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25 Ibid.
as long as the stem remains green.

Indian grass ranges from four to eight feet tall, and has golden-yellowish lance-shaped, dense panicles. This grass is associated with the bluestem grasses, and the two are similar to quantity of production. Indian grass is an excellent feed and relished by cattle. The preceding grasses are most commonly associated with tall grass prairies.\(^{26}\)

The Coteau is one of the leading areas in which Kentucky bluegrass is found. Kentucky bluegrass is described as having the broadest distribution of any grass within the temperate portion of the northern hemisphere. It has numerous basal leaves and open pyramid-shaped panicles with heights of about two feet. Kentucky bluegrass is not only one of the original grasses associated with tall grass prairies, but is the most common replacement grass in the Coteau.

Among the more common forbs or shrubs is the yarrow. The yarrow has a fern-like appearance with fine silvery hair covering the leaves and skins giving the plant a grayish hue. Milkweed is a plant which contains milky juices which are poisonous. Milkweed has whorled leaf arrangements clustered with flowers and elongated pods which contain seeds. Although the milkweed is poisonous,

\(^{26}\)Ibid.
it has been used as medicine for centuries. Another forb common to the area is the sunflower. With its yellow flowers, the stem heights range up to fifteen feet. The sunflower is easily recognized. It prefers wet soils and can infest tilled fields.

As man progressed in the struggle to control nature, colonizing of previously uninhabited areas occurred. He modified the natural structure to make it more adaptable to his needs and desires. Changing the environment allowed man to grow plants other than those that were naturally present. This was a type of change which occurred in the area of the Coteau in the late 19th Century.

About 75 percent of the land of the Coteau des Prairies is under cultivation today, as compared to approximately 25 percent in West River South Dakota. There is then, less natural vegetation in this area than in the west which retains its natural setting and has undergone changes through the process of evolution. As farming here became more intensified, grazing had a pronounced effect on plant life so that very little of the original vegetation common with the Tall Grass Prairie Region remains.27

Animal Life

The influence of the White man's arrival in the

27 Ibid.
area is obvious by the limited number of animal species present today. Many of the species have become extinct as a result of intensified farming. Prior to the more recent destruction of wildlife, the slaughter of large, wild animals by the White man for reasons of greed had left the area void of such animals as the elk, mule deer, and buffalo. 28

The elk is the largest member of the deer family ever to inhabit the Coteau area. These animals occupied areas along rivers and near lakes. As the settlers arrived, those animals which survived moved to a more wooded and isolated region to the north and west.

The mule deer was reported to have inhabited the area as late as 1880. It is the largest member of the "common deer." It roamed the open country, but like all of the other animals, moved to the wooded and more remote regions. The white-tail deer once roamed the entire state, but is now restricted for the most part to the Black Hills area. The white-tail deer was the most important animal economically to the early pioneers because of the use of the hides which were tanned into buckskin.

The antelope roamed the area in large numbers, and

supplied the early settlers and explorers with food. The meat was of particular value, but the hide and fur were not. Antelope are present today, but only in small numbers.

The buffalo are the most famous animals to be associated with the prairie or plains states. Their numbers today are limited, and they are confined in various ranches and parks across the nation. They did, however, occupy the Coteau area and were an important source of meat to the Indians.

The more common smaller animals in the area are the rabbit, gopher and mouse. Rabbits are very common and measures have been taken in recent years to control this prolific breeder. Rabbits raise two or three litters each year. They live in thickets or brush and burrow holes for protection and shelter. They are vegetarian and destroy numerous plants. The gopher occupies the area in large numbers, and is responsible for destruction of land by digging holes. Gophers feed entirely on vegetable matter such as the roots and stems of plants. The mouse is the most common rodent found in the area. These animals have no fixed habitat, and can easily live anywhere on the prairie. The bulk of the mouse's diet consists of insects, such as grasshoppers and crickets. The mouse hibernates during the coldest part of the winter.29

29Ibid.
There are other mammals occupying the area, but
the above mentioned are the most common.

The birds play an invaluable role for the control
of insects and other pests that are not only a nuisance,
but a menace to the environment. Birds, like swallows
and warblers, feed on small insects on or near trees
and bushes. Larger birds, such as the orioles and bluebirds,
live on caterpillars which destroy fruit trees. Large
birds, such as the hawk and owl, feed on mice, gophers,
and other rodents.  

With an abundance of lakes within
the Coteau, waterfowl is also present in large numbers.
The Mallard duck and the Canadian goose are the most
popular waterfowl game in the area.

The bird family of Odontophoridae which include
as its members grouse, quail, prairie chickens, and pheasants,
are small game birds hunted in the area. During the
winter, these birds feed on grain which has been wasted
during harvesting.

The pigeon, dove, lark, crow, blue jay, sparrow,
finch, robin, swallow, warbler, wren, oriole, and blue
bird are some of the smaller birds found throughout the
area. Hawks and owls are the two most common scavenger
birds.  

30 South Dakota State Geological Survey, Birds of
South Dakota, by William H. Over and Craig S. Thoms,
Bulletin No. 9 (1920), pp. 22-23.

31 Ibid.
**Water**

Surface water is found in various forms across the Coteau region. The most dominant body of water is the Big Sioux River with its source a few miles east of Waubay in Roberts County. It flows south in a line that is parallel to the state's eastern border for approximately 390 miles until it enters the Missouri River at the southeast tip of Union County. The name "Sioux" comes from the Indian tribe of the same name which occupied the region prior to White settlement. The Big Sioux formed an early boundary for Dakota and served as an artery for the early settlements.32

The majority of the lakes found on the Coteau are located on the west side of the Big Sioux River. The Big Sioux has its origin in southwestern Roberts County about 40 miles south of the point of the flatiron. The Big Sioux flows southward and enters the Missouri River near Sioux City, Iowa (Fig. 14). The Big Sioux was formed between two lobes of ice during the last glacial period, and flows through the center and drains the entire prairie Coteau area.33

The Big Sioux River in the southern portion of the

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33 Flint, Pleistocene Geology of Eastern South Dakota, p. 9.
Fig. 14. Major Surface Water Features
Source: South Dakota Road Map
Coteau has created some beautiful features along its path. The Dells near Dell Rapids is an example of scenic beauty along the river's course. In the city of Sioux Falls is located a falls--Sioux Falls--named for the river on which it is located. 34

The only other river located within the area is the East Fork of the Vermillion River. East Fork of Vermillion with its source near Lake Thompson in the south central portion of Kingsbury County flows south for 68 miles until it joins the Vermillion River in Turner County. 35

The lakes that can be found in the Coteau almost entirely comprise an area referred to as the "Glacial Lakes Region." Many of the lakes are artificial, and are of varying sizes and shapes, and in depth, which for the most part determine the permanency of these lakes. The greatest majority of these lakes are situated on the west side of the Big Sioux River. Glacial deposition at particular locations within a heavily undulating terrain trapped the waters and formed the lakes.

Artificial lakes are primarily the result of federal relief projects during the drought years of the 1930's.

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34South Dakota Department of Natural Resources, South Dakota Water Plan.
These artificial lakes comprise the minority of the lakes in the area, and are relatively small in size. There are over 30 lakes with areas of 1000 acres or more (Table 3). Some of these larger lakes have been developed into some of the finest recreation areas in the upper Midwest.

Names given these lakes are derived from a variety of sources. Most of the lakes are named after landowners near which the lakes are located. Statewide inconsistencies in naming process have led to several lakes being named the same. For example, there are six "Clear Lakes", and five "Long Lakes" in the state. 36

Numerous creeks are also common in the region. A problem of classification of the creeks exists because of varying amounts of precipitation occurring at various times of the year. Many of these "dry creeks" contain water only during the spring thaw and heavy rains. Naming the creeks resulted in various classifications. The largest class comprises those creeks which were identified with the landowners. 37

There is a wide distribution of springs across the entire state, the most numerous found in the Black Hills area. There are approximately a dozen springs located

36 Ibid.
37 Ibid.
# TABLE 3

## Lakes over 1000 acres in size

<table>
<thead>
<tr>
<th>Lake</th>
<th>Size (acres)</th>
<th>County (located in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice Lake</td>
<td>1,100</td>
<td>Deuel</td>
</tr>
<tr>
<td>Bitter Lake</td>
<td>6,400</td>
<td>Day</td>
</tr>
<tr>
<td>Blue Dog</td>
<td>1,900</td>
<td>Day</td>
</tr>
<tr>
<td>Buffalo</td>
<td>2,500</td>
<td>Marshall</td>
</tr>
<tr>
<td>Clear Lake</td>
<td>1,500</td>
<td>Marshall</td>
</tr>
<tr>
<td>Dry Lake</td>
<td>1,300</td>
<td>Codiington</td>
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<tr>
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<td>1,600</td>
<td>Hamlin</td>
</tr>
<tr>
<td>Drywood</td>
<td>1,200</td>
<td>Roberts</td>
</tr>
<tr>
<td>Enemy Swim</td>
<td>4,000</td>
<td>Day</td>
</tr>
<tr>
<td>Fort</td>
<td>3,500</td>
<td>Marshall</td>
</tr>
<tr>
<td>Hendricks</td>
<td>1,700</td>
<td>Brookings</td>
</tr>
<tr>
<td>Herman</td>
<td>1,280</td>
<td>Lake</td>
</tr>
<tr>
<td>John</td>
<td>1,000</td>
<td>Hamlin</td>
</tr>
<tr>
<td>Kampeska</td>
<td>6,000</td>
<td>Codiington</td>
</tr>
<tr>
<td>Long</td>
<td>1,000</td>
<td>Codiington</td>
</tr>
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<td>Lake</td>
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<tr>
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<td>Hamlin</td>
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<td>Whitewood</td>
<td>5,760</td>
<td>Kingsbury</td>
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in the Coteau des Prairies. Minnehaha County is the site of the most prominent springs of the Coteau. Drake Springs in the eastern part of Sioux Falls for 42 years has had a water flowage of over one million gallons per day.\(^{38}\)

The largest glacial aquifers are located in the valley and terrace outwash deposits along the Big Sioux River and some of its tributaries. Other aquifers are found near towns of Volga and Aurora, which are situated on an outwash plain. There are other outwash plains scattered through the area containing plentiful water reserves (Fig.15). Till and loess deposits which comprise the bulk of the glacial drift are considered to be low yielding areas with just enough water to sustain farms and other small users.

Available information is limited, but detailed studies have been done on glacial aquifers along the Big Sioux River from Watertown to Sioux Falls. Other special studies have been conducted on the potential of water supplies close to certain municipalities. The area which has been the focal point regarding the availability of water is the Big Sioux aquifer which extends from Sioux Falls north to Dell Rapids.

Some aquifers are not economically feasible for

\(^{38}\)Ibid.
Fig. 15. Aquifers
Source: Hogan, The Geography of South Dakota

SCALE IN MILES
0 15 30 45
use in large amounts. The permeability of the sand and gravel of an aquifer restricts the flow of water to a well making yields inadequate for sustained or heavy consumption. Permeability is generally high in an outwash aquifer.

Large amounts of ground water are unevenly distributed throughout the area, and the size and quality vary considerably. Outwash aquifers tend to be irregular in size, shape and thickness, therefore making predictability of the potential difficult. This ground water can be found in deep bedrock aquifers or in the more shallow glacial aquifers. Bedrock aquifers cover greater areas than glacial aquifers, and consequently more wells are dug into these bedrock areas.

Recharge of an aquifer has to be considered with respect to use or potential use. Most of the recharge water comes in the form of precipitation that is directly percolated from the surface. Other means of recharge are percolation from bodies of water at the surface or lateral flow of underground water into an aquifer. The amount of recharge depends on the amount of water available and the extent to which an aquifer has been depleted. These levels of hydrology are commonly referred to as water tables.

When the water level of an aquifer is observed on a long-term basis, no significant change is noted. The
amount of discharge is approximately that of recharge. Discharge occurs through wells, springs, seepage, evapotranspiration by plants, and direct evaporation from points where the water reaches the surface.

Bedrock aquifers are found in abundance throughout the area in the sedimentary rocks of the Cretaceous age. The Dakota sandstone is the most widely used bedrock aquifer. Depths of wells range from 200 feet in the southern part of the Coteau to 1300 feet in Codington County. When wells are dug into the bedrock, artesian pressure forces the water up the well casings nearer to the surface.

Water obtained from the bedrock aquifers are high in mineral content and dissolved salts which make it highly unacceptable for irrigation purposes and undesirable for human consumption without treatment. In many instances this is the only water supply available. 39

Both surface water and ground water add to the sociological and economical importance of the Coteau des Prairies. Water is used for consumption as well as recreation and so the quality of these waters is a necessity. The use of the water determines what qualities of the water need to be considered. Classifications of water quality are physical, chemical, and biological. Physical characteristics

39 Ibid.
include temperatures, color, turbidity, and odor. Chemical characteristics deal with the amount of chemical ions in the water. Biological characteristics are indications of the amount of bacteria found in the water. The natural condition of water can be affected by pollution. Pollution in the form of sewage, livestock feedlot runoff, and pesticide and herbicide usage can lower the water quality extensively. 40

Flooding is a definite hazard, particularly in the southern part of the Coteau. The greatest threat occurs in the spring after heavy snows begin to melt and ice on the rivers and streams begin to break up. Heavy rains also present the possibility of localized flooding and widespread rainfall may cause flooding throughout the lowlands. At the same time, the Big Sioux River can dry up during a dry year as far south as Brookings.

A precise inventory of the area's total water resources is not available. Consideration is ordinarily given to domestic use before an alternative use such as irrigation. Generally the water supply and quality is relatively stable along the Big Sioux River, and should remain so for the foreseeable future. 41

40 Department of Natural Resources, South Dakota Water Plan, pp. 110-119.

41 Ibid.
CHAPTER III
HUMAN OCCUPANCE

In order to understand the geography of any area, it is essential that one examines the human element in a proper perspective. Historical, economic, and demographic influences are as important to the geography of an area as the physiographic features. Human effect on the environment, whether planned or accidental, alters or modifies the natural setting.

The human occupancy of any political unit has to be considered with respect to that whole unit, and cannot be restricted to a specified or limited region. The history of the entire state has to be regarded as the basic influence to the history of any of its divisions.

Indian Occupation

Nomadic Indian tribes occupied the Coteau des Prairies area for thousands of years. These Indians did not record their history, so exact dates are only assumptions for most of the historical research done in the area. It was hard to distinguish one tribal group from another because of similarities as the result of thousands of generations of interbreeding. 1

About 500 A.D., Mound Builders appeared in the Coteau area and remained there until about 800 A.D. when they were either annihilated or assimilated by other Indian groups. These peoples were found primarily along the Big Sioux River.²

Mound Builders were agriculturists and used tools consisting of bone awls, fishhooks and needles. Hoes were made of bones from bison. With these tools, they raised such items as corn, squash and beans. Their weapons consisted of the bow and arrow, grooved stone hammers, axe heads and bone knives. These tools were just a part of a growing and complex arsenal.

As the name of the tribe implies, burial mounds were the most distinguishing feature associated with the tribe. These chambers varied in size from 60-120 feet in diameter and 5-15 feet in height. These mounds were used to hide food and weapons as well as being human burial chambers. Villages consisted of about ten earthen rectangular structures about 25 feet long. These contained fireplaces and pits where food was stored. The end of the 15th century marked the end of the Mound Builders in the area.³

²Hogan, Geography of South Dakota, p. 12.
³James Satterlee and Vernon D. Malan, History and Acculturation of the Dakota Indians, South Dakota State University Agricultural Experiment Station Bulletin No. 613 (Brookings, South Dakota: Agricultural Experiment Station), pp. 6-8.
Fig. 16. Indian Mounds near Oakwood Lake

Fig. 17. Rugged Terrain near Garretson
Not until about 200 years after the departure of the Mound Builders, did the Dakota or Sioux Indians move into the area. The Dakota Nation of "Seven Council Fires" represented seven tribes speaking one basic language with several distinct dialects. Dakota by their own language meant "friend." The name of Sioux was derived from a French corruption of a word meaning "snake" or "enemy." With the progression of time, the word Sioux lost its derogatory meaning.

The Dakota were forced out of the Ohio River Valley by the more dominant Iroquois into the Minnesota and Wisconsin regions. From there, the Chippewas armed with French weapons forced them west into today's eastern South Dakota.  

Of the seven Dakota tribes to invade eastern South Dakota, the Yankton, Yanktonia, and the Santee settled in the area of the Coteau des Prairies. Their migration into the area was not a mass effort, but a generally slow trickling over a period of years. Boundaries for these tribes were not fixed, and they moved about freely.

The Santee tribe occupied the northern portion of the Coteau, and the Yankton, the southern part. The

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4 Karolevitz, *Challenge the South Dakota Story*, pp. 8-11.

Santee in the north were agriculturists while the Yankton tribe in the south was nomadic and relied on hunting and gathering for their supply of food.  

American Occupation

The Treaty of Fontainsbleau in 1762 transferred all of the territory west of the Mississippi River from France to Spain. France, at the time, was at war with England, and feared losing the territory called Louisiana. At the time of the treaty, the inhabitants of the Coteau des Prairies were not directly affected by it or any successive treaties which followed, but their destiny had been and would be decided.

In 1802 France regained possession of the Louisiana territory through the Treaty of San Ildefonso. In 1803 the United States purchased the Louisiana Territory from Napoleon. As a result, change for the Indians living on the Coteau was inevitable. To this point in time, most of the White man's activity centered around the Missouri River but with the new acquisition, the United States was soon to open the territory for settlement.

As the White settlements moved west, new territories were established. The region east of the Missouri became

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7 Karolevitz, *Challenge the South Dakota Story*, pp. 18-21.
part of the Minnesota Territory in 1849. When Minnesota became a state in 1857, its western boundary was just east of the Big Sioux River.

The Santee tribes agreed in 1851 to relinquish lands as far west as the Big Sioux River in exchange for a reservation farther north along the Minnesota River. In 1858 the Yankton Tribe of the south agreed to leave that area for a reservation in what is today Charles Mix County.  

White settlements first occurred just over the present day eastern border along rivers. The settlers from the east and south stopped and settled along the Big Sioux River. The first town settled by the Whites in the state was Sioux Falls in the spring of 1857. During that same year, town sites were established at Medary and Flandreau by a group of people from St. Paul, Minnesota. Medary was later burned and was never rebuilt. At the same time, wood-cutters lived at the mouth of the Big Sioux.

The promoters of these town sites were speculating on land within these town sites in the hope of selling the property to new settlers. These men were members of two land companies, one in St. Paul and the other in Dubuque, Iowa, and were referred to as "boom ers."
Sioux Falls settlers were driven out by the Indians during the summer of 1857, but returned that fall. The next summer Medary and Flandreau were burned, and the people from these settlements moved to Sioux Falls and constructed "Fort Sod."  

In 1861 the Dakota Territory was created. The census that summer showed a population of 2400 White people in the entire territory. Yankton was the first capital of Dakota Territory with William Jayne as Governor. That same year, the Civil War broke out, and most of the regular Army of the territory was called east to fight the war. This left the area virtually unprotected. The settlers organized a militia to guard the settlements and man the forts.  

The Santee Indians of Minnesota went on the warpath in 1862. They came from the east and chased out the White settlers. Most of the people of the Sioux Valley moved to Sioux City, Iowa. The militia manned the military post at Sioux Falls and aided in the evacuation. 

In the Spring of 1863 the settlers returned. The crops were good in 1864. After the Civil War ended, its veterans went west to homestead in the area. The homesteading was slowed when the drought and grasshoppers

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9 Ibid., pp. 78-79.
10 Ibid., p. 85.
came in 1865. Settlements were confined to the southeast portion of the Coteau area.  

By 1868 times were better for settlers in the territory. Pacification of the Indians, more favorable weather conditions, and an end to the grasshopper plague contributed to the increase of settlements. The major cause for increased homesteading was the construction of a railroad to the Iowa border at Sioux City.

Settlements for several years were slowed by the discovery of gold in the Black Hills, as settlers hurried to that region. After the glamour of the gold rush had worn off and economic conditions halting railroad construction improved, the land boom reached its peak. From 1878 to 1886 is generally considered as the Great Dakota Boom when east river counties saw an increase of population from 80,000 to 300,000.  

The two railroad companies which had the greatest effect on settlement were the Chicago and North Western Railway Company which built its tracks from Minnesota west through unsettled country to Pierre on the Missouri. The Chicago, Milwaukee and St. Paul Company extended its tracks west from Canton to Chamberlain. This extension

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11 Ibid., pp. 35-86.

of tracks greatly affected settlement in the southern portion of the Coteau.13

Homesteading

When the pioneers left the settlements to homestead, they often did not construct a house the first year. Their first winter was spent in a dug-out scooped out of hillsides with the roofs covered with sod. Livestock often shared these dug-outs with the settlers. Water was the most important item to a pioneer. Water was often used from a nearby river or stream, but in many cases wells had to be dug.

The types of houses that the pioneers eventually constructed depended largely on the location of their homesteads. Sod houses were common on the open prairie, but for those fortunate enough to live near a wooded area, trees were used to build log cabins.

Life on the prairie was far from being luxurious. The pioneers gradually improved the houses as their budgets could afford it. They depended on the burning of buffalo and cow chips, corn cobs, and twisted hay for their sources of heat. Furniture consisted of boxes and crates for those who did not bring furniture with them.

Food for a pioneer family consisted of those things which could be raised. Each family usually had a cow that supplied them with milk. The women and children

13 Ibid., p. 17.
were responsible for milking the cows and raising vegetable gardens. The type of vegetables raised were corn, potatoes, carrots, cucumbers, cabbage, and onions because these items could be stored and used during the winter. Beef and pork were put in brine or dried. The cream was skimmed off the milk and made into butter. Milk that was not used for drinking was made into cheese. Even eggs were greased and stored in grain to use during the winter when the chickens wouldn't lay.14

After the wheat was threshed, it was hauled to a mill where it was ground into flour. Women in the early frontier did their own baking. Some of the produce they raised was used as barter to obtain other supplies. Only the bare necessities or things that could not be made at home were bought.15

Ethnic Origins

South Dakota is referred to as the "Land of Infinite Variety." This refers not only to the scenic splendor of the state, but also to its people. To appreciate and understand any aspect of the state's history, it is necessary to know about its people. The cultural aspect is diverse with a mixture of native Americans


15Ibid., pp. 82-84.
and immigrants from a wide variety of European nationali-
ties. \(^{16}\)

South Dakota is one of the more recently settled
areas in the United States. Interest in the territory
was originally concerned with fur trapping concentrated,
except for a few areas, along the Missouri River west
of the Coteau. When the Homestead Act was enacted, it
had an immediate effect on the settlement in the area.
Dakota Territory had been considered to be in or near
a desert region. Trouble with the Indians, a series
of bad crops, grasshoppers, and the absence of railroads
prompted the pioneers to be cautious of settling the
area. \(^{17}\)

The Norwegians were the earliest and largest group
of immigrants to settle in the state. They settled in
almost every county along the Minnesota state line.
Their settlement was not concentrated in one small area,
but was uniquely widespread.

The German people today represent the largest portion
of the state's population. Their numbers are widespread
over the entire Coteau area. The Germans did not come
to the state in groups. They came in a continuous stream
over a long period of time.

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\(^{16}\) Jennewein and Boorman, *Dakota Panorama*, p. 89.

\(^{17}\) Ibid., pp. 91-93.
The Swedes settled in the area in the late 1860's and 1870's, somewhat later than Norwegian settlement. The Swedes settled approximately in the same area as the Norwegians, except in lesser numbers. The largest number of Swedes are located in Minnehaha County.

The Norwegians, Germans and Swedes comprise the largest nationality groups in the Coteau area. The Finns, Danes and Irish make up the greater portion of the remaining foreign stock. American Indians are also located in the southeast and northeast areas.\(^{18}\)

Ethnic groups had a great influence on the culture of the area. Families in general settled in localities where others of the same nationality had settled. A desire to retain old world cultures led to this type of settlement. It gave the new inhabitants of a wilderness a sense of security.\(^{19}\)

**Transportation**

Railroad construction coincided not only with good weather, but with an increased rate of settlement generated in an east to west pattern. The railroads provided a link between outposts in eastern South Dakota and Minnesota and Iowa.

The Milwaukee Railroad Company built a line from

\(^{18}\)Ibid., pp. 104-145.

\(^{19}\)Karolevitz, *Challenge the South Dakota Story*, p. 156.
Ortonville, Minnesota, across the northern portion of the Coteau to Aberdeen, and this linked an extension of the North Western from Lake Kampeska northwest to Redfield on the James River.

The Dakota division of the Chicago North Western became a leading access route into eastern South Dakota. Towns were established along its route as the railroad moved westward. These towns provided a home for railroad construction workers as well as a "jumping off" place for homesteaders.\(^{20}\)

The railroads provided transportation for the settlers which allowed shipment of goods to eastern markets. This stimulated the economy and provided the citizens of the area with a degree of self-sufficiency. As they began depending less frequently on the federal government for financial support, the area achieved more independence politically also. Conflicts over county governments were characteristic of the problems encountered by the new territory. Location of county seats caused confrontations, litigation, embitterment, and near violence. County seats were chosen by popular vote within each county.\(^{21}\)


\(^{21}\)Ibid., pp. 203-204.
To the Turn of the Century

After the "Dakota Boom" period, farm prices began to drop. Added to this were several years of drought beginning in 1887, and extending into the mid-nineties which caused unrest among the settlers. These circumstances led to the establishment of a wing of the farmers' alliance which appeared in the southern portion of the Coteau area and spread throughout the state. Regionally, this organization became known as the Northern Farmers' Alliance.22

Statehood movements began as early as 1877. Plans to stimulate public interest were begun shortly after. When Bismarck, North Dakota, became the capital of Dakota Territory, people in the southern section became more determined to secure a division of the territory. A Constitutional convention was held in Sioux Falls in 1885 as authorized by the Legislature. In the election that followed the Constitution received an overwhelming majority. After much dispute in Congress, President Grover Cleveland finally signed the Enabling Act in 1889 creating two separate states.23

In 1889 Arthur Mellette was elected Governor of the newly formed South Dakota. Pierre was chosen as

22 Ibid., pp. 224-225.

the temporary capital. Dissatisfaction over the site of the capital continued. In 1890 a special election to choose between Pierre and Huron was held and Pierre was successful. Another election in 1904 between Pierre and Mitchell was held, and Pierre was again successful.24

Education was also an important part of the settlers' way of life. The public school system was started in 1864. There were several schools privately maintained by parents prior to 1864. There was no compulsory attendance law until 1883, and children very often attended school for only three months of the year. They were kept busy at home on the farm and had little time to attend school. Schools were often built of sod. Equipment was scarce and so were books. Children were mainly taught how to read and write.

The territorial Legislature, in 1881, named Brookings as the location for an agricultural college, but did not provide any money for building until 1883. Other institutions of higher learning in the area were Augustana and Sioux Falls College at Sioux Falls.25

The first newspaper in the area was the Dakota Democrat, printed in Sioux Falls in 1859. Public libraries were

24 Ibid., pp. 143-145.
25 Ibid., pp. 312-322.
established as early as 1887, again in Sioux Falls. The State School for the Deaf and the State Penitentiary are also located in Sioux Falls.  

Twentieth Century

The morale of the citizens of the state was hard pressed during its infancy. In the beginning of the 20th century, economic unrest prevailed. Fair prices for farm commodities were the issue of many of the political parties as they campaigned for election to the new government offices. These politicians were being influenced by the railroads which controlled most of the economic wealth, rather than the citizens of the state. Times were bad due largely to the dry years and depression of the 1890's, and when the good weather returned, conditions improved.

As it usually does, war provided economic growth to the country. World War I caused larger food demands which increased prices of farm products. Greater government support in areas of transportation also added to the demand put upon the farmers of the area.

An adverse effect brought directly on the area was the war dead as some estimated 210 South Dakotans were killed. This also brought about the animosity of some citizens.

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26 Ibid., pp. 320-344.

27 Karolevitz, Challenge the South Dakota Story, pp. 220-225.
Fig. 18. South Dakota State University, Brookings

Fig. 19. State Penitentiary, Sioux Falls
against German-Americans which were one of the largest ethnic groups to settle in the Coteau des Prairies region. Many of the German settlers were suspected of treason because of their ethnic backgrounds. These feelings of hatred soon subsided after the war ended in 1918.  

After war-time demands lessened, farmers who had overextended themselves by inflated prices found themselves with mortgages worth much less than they had invested in them. Farm prices dropped as economic conditions worsened. Even though moisture was adequate, many farmers folded. After this came the "dirty thirties," a time which severely tested the will and endurance of the people of the region.  

Economic recovery followed with the advent of World War II. The state played an important part in the war effort. Sioux Falls was the location of the largest training center in the state. The state also experienced some of the inconvenience of the war as a result of rationing and price freezes. This time of war contributed to a high level of agricultural production and more intensive farming.  

Postwar prosperity followed as the state experienced a technological revolution. Improved transportation

\[28\text{Ibid., pp. 243-245.}\]
\[29\text{Ibid., pp. 248-251.}\]
\[30\text{Hogan, Geography of South Dakota, pp. 34-35.}\]
and communication facilities provided for a more mobile and independent populace.\textsuperscript{31}

\textsuperscript{31}Ibid., p. 34.
CHAPTER IV
CULTURAL ENVIRONMENT

In regional study, the importance of the cultural environment cannot be overemphasized. Culture pertains not only to the refinement of man, but also to the refinement of the physical element. The human effect regarding agriculture, mining, transportation, recreation, power and utilities, and cities and towns is a positive one. It is this cultural environment influenced by the human element which creates the human development of the area.

Agriculture

Economically, agriculture is the most important industry in South Dakota. From a subsistence type of farming in the beginning, to the vast acreages now under cultivation, South Dakota has relied on its crop production for a livelihood. The agricultural land use within the Coteau des Prairies concentrates on crop production, while in most other areas of the state, it is more livestock oriented.

The southeastern portion of the Coteau was the locale where farming began in the state. Settlers raised a variety of crops in the 1860's primarily as a food supply to sustain themselves on the frontier. Corn, squash and
wheat were raised on a small scale. Except for wheat, these products required little processing. When flour mills became more abundant, farmers began raising more wheat, not just for their own use, but for sale. In the 1870's as the railroads expanded westward, settlers began raising more and more wheat. The railroad, of course, provided them with a means of getting this cash crop to market.¹

The topographical and climatic characteristics of the entire Northern Plains or Great Plains region had long been misunderstood. Early explorers proclaimed the entire area unfit for cultivation and thus uninhabitable by Caucasians. The reports these explorers released created a myth of the "Great American Desert." The entire present day state of South Dakota lies within this "desert" region.²

Early settlers of the Coteau soon realized that the area was in fact not a desert. They also recognized that the length and precipitation of the growing season was sufficient to support the production of corn. As corn became more prevalent, it was accompanied by increased production of oats. These two grains encouraged dairying and hog raising, and as a result, farming became more


diversified.  

Even though the Coteau des Prairies is not in a desert region, droughts can and do occur. In about 1890, a severe drought engulfed the area and farmers focused their attention on methods of increasing rainfall. Professional rainmakers were called upon, but their use of explosives and various gases accomplished nothing. As these attempts failed, irrigation possibilities were considered. The only source of water for irrigation were artesian wells and they proved inadequate. After rainfall became normal again in 1896, interest in irrigation declined in the area.

As a result of these droughts, State Experiment Stations began research to find crops and grasses more resistant to drought. Research began in the early 20th century.  

In the 1920's, farmers shifted from the use of horses to tractors. The development of mechanized farm equipment had a tremendous impact on the area adding to acreage under cultivation, as well as manhours needed. Initially, production dropped in yield per acre because of less fertile land being brought under cultivation by new machinery.

After hybrid corn was introduced in the late 1930's

4 Ibid.
and early 1940's, area yields increased. Soybeans were also introduced into the area in 1939 and are grown mostly in the southern Coteau des Prairies area.

The biggest stimulus for increased farm production was war. In both World War I and World War II, increased demands were placed on farmers. They were asked to produce more goods for a higher price. This caused many area farmers to overextend themselves and when prices dropped and droughts came, many farmers lost their lands. The Great Depression of the Thirties saw numerous examples of this resulting in frequent farm foreclosures.5

Grain and cash crops are important sources of farm income. However, crop income ranks far behind the value of livestock and livestock products.6 Income statistics can be misleading since many of the livestock and livestock products are the result of the use of grains and cash crops which otherwise would have been sold.

South Dakota ranks high in production of crops and livestock among agricultural states. It ranks near the top in production of oats, rye, wheat, flaxseed, hay and cattle and sheep production.7

5Ibid., p. 8.
6Ibid.
7Ibid., pp. 25-61.
Fig. 20. Dairy Farm near Watertown

Fig. 21. Grain Farm near Brookings
The first settlers into the state brought with them cattle, hogs, sheep and chickens which provided them with meat, milk, poultry and eggs. Cattle production was limited to small herds in contrast to the large ranches west of the Missouri River. Livestock feeding, dairying, and poultry production were the most common types of farms.

As technological advancements were made in livestock production, the agriculture industry continued to grow.\(^8\) Agricultural production increased sharply since settlement, without adding to acreages under cultivation.

Cash receipts from the sale of crops and livestock represent today's greatest single source of revenue in the area. Government payments are another significant source of income for farmers in the form of subsidies and transfer payments. The substantial amount of revenue involved is reflected in determining the policies of area farmers.\(^9\)

The greatest share of direct government payments are provided to those farmers who are wheat and feed grain growers. The only government payments to livestock producers are those payments to wool growers.\(^10\) This program is not significant to the Coteau area where limited herds of

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8Ibid., p. 51.


10Ibid., p. 44.
sheep are raised.

Farm sizes within the Coteau area range from 275 acres in Lincoln County to 745 acres in Marshall County. The number of farms and acres under cultivation also change in a north to south direction but statistics do not accurately portray that pattern because of differences in county sizes (Table 4). The average farm size has become increasingly larger since 1931. In that year the average size of a farmstead was 434 acres, while today farm sizes have grown to 1058 acres. These figures are an average statewide but are nevertheless indicative of the trend in the Coteau area.

Real estate value has spiraled in the last few years increasing the amount of money invested in each farm unit drastically. In 1940 the total value per operation unit in the state was $7,000, and in 1975 that investment had risen to $172,800. These, again, are statewide statistics but do reflect the trend in the Coteau area.

Corn is the leading crop produced in the region (Fig. 22). Its popularity is especially clear in the southern portion of the Coteau (Fig. 23). The northern section of the Coteau shows a trend away from corn and to wheat

12 Ibid., p. 91.
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<td>670</td>
<td>745</td>
<td>267,000</td>
</tr>
<tr>
<td>McCook</td>
<td>900</td>
<td>390</td>
<td>258,000</td>
</tr>
<tr>
<td>Miner</td>
<td>650</td>
<td>515</td>
<td>169,000</td>
</tr>
<tr>
<td>Minnehaha</td>
<td>1,580</td>
<td>305</td>
<td>330,000</td>
</tr>
<tr>
<td>Moody</td>
<td>900</td>
<td>350</td>
<td>220,000</td>
</tr>
<tr>
<td>Roberts</td>
<td>1,320</td>
<td>490</td>
<td>359,000</td>
</tr>
</tbody>
</table>

*In acres

Fig. 22. Principal Agricultural Crops

Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
Fig. 23. Acres of Harvested Cropland in Corn, 1975

Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
production (Fig. 24). The principal crop in Grant and Miner Counties is hay (Fig. 25). These crops are the three most valuable crops for each county within the Coteau. Although it is not ranked first in any of the counties, oats does play an important part in agricultural production complimenting corn. Those counties which produce corn in great quantities produce oats as an alternate annual crop (Fig. 26).¹³

Potato production in the area is concentrated in Clark County which accounts for 81 percent of the state's total.¹⁴ Although acreages in potatoes are substantially less than that of other crops, it is interesting to note concentrated production taking place in the area.

In an attempt to standardize their earnings, farmers are again turning to irrigation as one solution to the problem of fluctuating income. Statewide, alfalfa is the leading crop under irrigation. However, on the Coteau des Prairies area, corn is the largest irrigated crop. Moody County had 1,900 acres of corn under irrigation leading the area in that department.¹⁵

Also important in modern agricultural production is

¹³Ibid., pp. 26-42.
¹⁴Ibid., p. 45.
¹⁵Ibid., pp. 46-47.
Fig. 24. Acres of Harvested Cropland in Wheat, 1975
Fig. 25. Acres of Harvested Hay, 1975
Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
Fig. 26. Acres of Harvested Cropland in Oats
Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975

SCALE IN MILES
the use of commercial fertilizers. Ammonium nitrate is the most popular fertilizer for direct application.\textsuperscript{16} Increased prices and methodology regarding various types of fertilizers which increase production are being used more extensively.

Livestock production is the center of the agricultural economy in the state. The cattle industry comprises the largest number of livestock on the Coteau area farms (Fig. 27). The disbursement of cattle is fairly even throughout the area. The number of cattle in each county corresponded closely with the size of that particular county.

In dairying, there is a definite concentration along the eastern portion of the area (Fig. 28). Grant County had the largest number of dairy cows in the state with a total of 8,000 head.\textsuperscript{17} Dairy units are primarily located in more populated areas.

Hog raisers are primarily found in regions where corn and oats are raised (Fig. 29). This is quite obvious in the southeast where large numbers of hogs are raised. Minnehaha County leads the state in hog production with a total of 70,300. This contrasts the northern portion where approximately one-fourth as many hogs are raised per county.

\textsuperscript{16}Ibid., p. 50.

\textsuperscript{17}Ibid., p. 63.

\textsuperscript{18}Ibid.
Fig. 27. Number of all Cattle, 1975
Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
Fig. 28. Number of Dairy Cows and Heifers, 1975

Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975

SCALE IN MILES
0 15 30 45
Fig. 29. Number of Hogs, 1975

Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
Sheep, lambs and chickens also play an important role in agriculture in the region (Fig. 30). However, very few farm units depend on these as the main source of income. Farmers learned to diversify their operations, and income derived from products such as eggs only supplement incomes to a small degree.

Diversification with respect to livestock or crop production enhance the chances for a more stable income. Not only factors such as precipitation and yield effect farm income, but so do prices. As a result, farms with a variety of commodities to be marketed benefit from more diverse operations.

**Mining**

Mineral resources of the Coteau des Prairies are limited to non-metallic minerals such as sand, gravel and rock. Sand and gravel are common in areas of glacial erosion and deposition. Consequently, most of eastern South Dakota has some gravel or sand deposits. These deposits are used locally, especially in construction of highways, and very rarely are distributed outside the region (Fig. 31).

Sand and gravel have become such an essential part of the economy that they are produced in greater volumes than any other mineral product. The production of sand and gravel ranks second only to gold in total value of
Fig. 30. Number of Sheep and Lambs, 1975
Source: South Dakota Crop and Livestock Reporting Service, South Dakota Agricultural Statistics, 1975
Fig. 31. Sand and Gravel Deposits
Source: Hogan, The Geography of South Dakota

SCALE IN MILES

0 15 30 45
all minerals produced in South Dakota. Since gold production is confined to the Black Hills area, sand and gravel rank first in the total mineral value in the Coteau des Prairies.\textsuperscript{19}

In more recent reports, production of minerals by dollar value has been withheld by some counties to avoid disclosing individual company's confidential data. Most counties do, however, list production of these minerals by dollar value.\textsuperscript{20} The most important mineral or minerals produced by each individual county is indicated (Table 5). Minnehaha County is one of these counties presently withholding dollar value of minerals produced, but in a report of 1961, a $2 Million production was achieved.\textsuperscript{21}

Of the six counties leading in production of sand and gravel, three are located in the Coteau des Prairies. These three counties are Minnehaha, Brookings, and Codington, and account for 40 percent of the total production of the state.\textsuperscript{22}


**TABLE 5**

Value of Mineral Production in the Coteau des Prairies, by county  
(Thousands)

<table>
<thead>
<tr>
<th>County</th>
<th>1974</th>
<th>1975</th>
<th>Minerals produced in 1975 in order of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brookings</td>
<td>Withheld</td>
<td>$488</td>
<td>sand and gravel</td>
</tr>
<tr>
<td>Clark</td>
<td>$47</td>
<td>23</td>
<td>Do.</td>
</tr>
<tr>
<td>Codington</td>
<td>555</td>
<td>1,054</td>
<td>Do.</td>
</tr>
<tr>
<td>Day</td>
<td>118</td>
<td>74</td>
<td>Do.</td>
</tr>
<tr>
<td>Deuel</td>
<td>554</td>
<td>644</td>
<td>Do.</td>
</tr>
<tr>
<td>Grant</td>
<td>8,981</td>
<td>Withheld</td>
<td>stone, sand and gravel</td>
</tr>
<tr>
<td>Hamlin</td>
<td>109</td>
<td>47</td>
<td>sand and gravel</td>
</tr>
<tr>
<td>Kingsbury</td>
<td>85</td>
<td>34</td>
<td>Do.</td>
</tr>
<tr>
<td>Lake</td>
<td>110</td>
<td>145</td>
<td>Do.</td>
</tr>
<tr>
<td>Lincoln</td>
<td>82</td>
<td>112</td>
<td>Do.</td>
</tr>
<tr>
<td>McCook</td>
<td>55</td>
<td>39</td>
<td>Do.</td>
</tr>
<tr>
<td>Marshall</td>
<td>102</td>
<td>60</td>
<td>Do.</td>
</tr>
<tr>
<td>Miner</td>
<td>22</td>
<td>22</td>
<td>Do.</td>
</tr>
<tr>
<td>Minnehaha</td>
<td>Withheld</td>
<td>Withheld</td>
<td>stone, sand and gravel</td>
</tr>
<tr>
<td>Moody</td>
<td>110</td>
<td>102</td>
<td>sand and gravel</td>
</tr>
<tr>
<td>Roberts</td>
<td>333</td>
<td>302</td>
<td>Do.</td>
</tr>
</tbody>
</table>

Fig. 32. Gravel Operation near Dell Rapids

Fig. 33. Sioux Quartzite also used for construction
Sioux Quartzite, the primary stone produced, was deposited during the Precambrian era in an irregular manner (Fig. 34). Thickness of quartzite deposits are known to extend to depths of 3,800 feet. The Sioux Quartzite is exposed in areas of Minnehaha County at elevations of more than 1,500 feet. This rock mass slopes gently downward in a westward direction where it is buried beneath younger sedimentary rock. 23

Stone production for the state declined by 11 percent in quantity, but rose 8 percent in value in 1975, compared to the previous year. Crushed and broken stone was used principally for concrete, bituminous aggregate, cement, roadbed material, and railroad ballast. 24

Sand, gravel and stone play an important part of the economy of an area, especially in the construction business. There are also numerous companies or individuals whose mineral operations are so small that they do not appear on all reports listing mineral producers (Table 6).

Other minerals are present in the area in small quantities. Drillings have revealed small amounts of iron in the southeastern section of the Coteau. Water, which can also be considered a mineral, was discussed in a previous chapter.

Fig. 34. Stone Deposits
Source: South Dakota State Geological Survey, Mineral and Water Resources of South Dakota, Bulletin No. 16 (1964)
## TABLE 6

**Principal Mineral Producers of the Coteau des Prairies**

<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Type of Activity</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Materials Co.</td>
<td>Sioux Falls</td>
<td>Quarry and plant gravel and sand pit</td>
<td>Minnehaha</td>
</tr>
<tr>
<td>F.J. McLaughlin Co.</td>
<td>Watertown</td>
<td>gravel and sand pit</td>
<td>Codington</td>
</tr>
<tr>
<td>L.G. Everist, Inc.</td>
<td>Sioux Falls</td>
<td>gravel and sand pit and plant</td>
<td>various</td>
</tr>
<tr>
<td>Mannerud, Inc.</td>
<td>Brookings</td>
<td>plant</td>
<td>Brookings</td>
</tr>
<tr>
<td>Weelborg Bros., Inc.</td>
<td>Dell Rapids</td>
<td>pits and mill</td>
<td>various</td>
</tr>
</tbody>
</table>

Industry

Historically, agriculture has been and is today, the economic base of the Coteau des Prairies area. While still heavily dependent on agriculture, economic diversification is needed to sustain any economy which can and has been affected by severe droughts. With this realization, the region has recently experienced an industrial expansion of significant importance. The Coteau des Prairies is the area of greatest industrial growth in the state. Sioux Falls alone became the site of eight new industries in 1976.25

Industrial development has flourished because of community involvement throughout the area. Most of the communities of the Coteau area developed industrial development corporations on the local level. These groups emphasized the attractiveness of a more rural area, with an abundant labor supply. Also, stressed are such locational advantages as: the availability of large tracts of land, adequate soil structure, low building costs, and an access to a wealth of natural resources.26

Industries are diversified and include products

25 Department of Economic and Tourism Development, South Dakota, Vol. 9 No. 1 (Sioux Falls, South Dakota: Industrial Division, Department of Economic and Tourism Development, 1977).

26 Ibid.
Fig. 35. John Morrell & Company, Sioux Falls

Fig. 36. 3M Company, Brookings
ranging from the paper industry to specialty industries such as medical supplies manufacturers (Table 7). The majority of industry is agriculture related. These industries include not only the processing of agriculturally produced items, but also the manufacture of farm machinery.27

The three largest cities in the area, Sioux Falls, Brookings, and Watertown, are the locations of some of the larger industries in the state. Sioux Falls is the industrial center of the state. Two major industries located in Sioux Falls are John Morrell & Company, which is a meat processor, and Litton Industries which produces microwave ovens. Brookings is the site of 3M Company which manufactures medical tapes and surgical products, and Coast to Coast Stores, which is a distribution center. The Quadee Rubber Company, producer of custom molded rubber and plastics, is located in Watertown.28

Businesses looking for new sites or expansion opportunities do not necessarily congregate in the larger cities of the area. Their decisions to locate in smaller communities reaffirms their confidence that a good labor force need not come from a metropolitan area. The economic effect that an industry has on a small community has a greater impact than that of a larger city.


28Ibid.
### TABLE 7

Industrial classification of Industries of the Coteau des Prairies 1977-78.

<table>
<thead>
<tr>
<th>Industrial Classification</th>
<th>Number of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspapers; printers and publishers and paper products</td>
<td>48</td>
</tr>
<tr>
<td>Farm machinery; tools, welding supplies, etc.</td>
<td>43</td>
</tr>
<tr>
<td>Lumber and lumber products</td>
<td>22</td>
</tr>
<tr>
<td>Food processors (includes poultry)</td>
<td>17</td>
</tr>
<tr>
<td>Feed; grain, fertilizers, etc.</td>
<td>16</td>
</tr>
<tr>
<td>Signs</td>
<td>12</td>
</tr>
<tr>
<td>Trailers, campers and supplies</td>
<td>12</td>
</tr>
<tr>
<td>Concrete and gravel</td>
<td>12</td>
</tr>
<tr>
<td>Chemical, medical</td>
<td>11</td>
</tr>
<tr>
<td>Electrical</td>
<td>9</td>
</tr>
<tr>
<td>Dairy</td>
<td>8</td>
</tr>
<tr>
<td>Rubber and plastics</td>
<td>7</td>
</tr>
<tr>
<td>Miscellaneous; soft drinks, handicrafts, clothing, toys, insulation, ice, photo, appliances.</td>
<td>29</td>
</tr>
</tbody>
</table>

Fig. 37. Quadee Rubber Company, Watertown

Fig. 38. Coast to Coast Distribution Center, Brookings
Tourism on a statewide basis is the second largest industry of South Dakota. Most of this activity is confined to the Black Hills area, but eastern South Dakota has an increasing number of tourists who visit or travel through the area. Those who travel from the eastern United States pass through the Coteau des Prairies on their way to the Black Hills or other points west. The largest number of out-of-state visitors come from neighboring states--Minnesota, Iowa, and Nebraska.29

A diverse base of industry will provide a more stable state economy. This industrial influence will continue its direct relationship with agriculture, but will provide a better economy for its people.

**Transportation**

South Dakotans are among the most mobile people in the country. This mobility is due to both the convenience of the transportation system, and the necessity of travel which a rural community often demands. The mode of transportation used most often is the automobile. Transportation by other methods is virtually nonexistent due to the lack of mass transit systems.

South Dakota's per capita expenditure for highway construction was $79.22 in 1974, compared to the national

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29 Hogan, *Geography of South Dakota*, p. 53.
Fig. 39. Interstate 29

Fig. 40. Railroad Depot, Brookings
average of $46.86. There are two Interstate highway systems which pass through the state and both of these, I90 and I29, pass through the Coteau. Other major state and federal highways also dissect the Coteau (Fig. 41).

The railroad was the single most important factor in the pattern of settlement in the area. In 1878 two railway companies, the Chicago and North Western Company and the Chicago, Milwaukee, and St. Paul Company, began construction westward from the Minnesota border across the Coteau. Later as settlements became more numerous, railroads expanded (Fig. 42).

Financial difficulties have prompted most railroad companies to abandon some of their tracks. These abandonments have been limited to branch lines. A general curtailing of services in general has become common. By 1969, there was no passenger service in any of the railroad companies. Transportation via railroad is limited to heavy bulk commodities.

Railroad abandonment and limited service stimulated air transportation (Fig. 43). Three regular scheduled

\[ \text{30 South Dakota Department of Economic and Tourism Development, South Dakota Welcomes You with Open Lands, (Pierre: South Dakota Department of Economic and Tourism Development).} \]

\[ \text{31 Schell, History of South Dakota, p. 17.} \]

\[ \text{32 Ibid., p. 37.} \]
Fig. 41. Major Highways
Source: South Dakota Road Map, 1977
Fig. 42. Railroads
Source: South Dakota Road Map, 1977
Fig. 43. Airlines
Source: South Dakota Road Map, 1977
airlines, Ozark, North Central, and Western serve the major cities of the Coteau, Sioux Falls, Watertown, and Brookings. These scheduled flights carry air freight, express, first class mail, and passengers.\textsuperscript{33}

Buses provide services for both passengers and freight. Trucks provide freight services formerly provided by rail. These trucks are provided an increasingly more efficient and elaborate interstate and bituminous highway system.

\underline{Recreation}

The Coteau des Prairies' recreational and scenic attractions have become a source of enjoyment for many people. Numerous facilities are available for sight-seeing and camping. Another recreational resource is gratifying to fishermen and hunters. The numerous lakes provide a natural habitat for fish and wildlife.

The Trail of the Spirits at Sica Hollow State Park near Lake City is recognized as a national recreational hiking trail. Miles of other unmarked hiking trails are found in areas such as Oakwood Lake State Park and other parks throughout the area.

For those who enjoy water, fine beaches are within short driving distances from any point in the region. Natural lakes formed by glaciers have created scenic

\textsuperscript{33} South Dakota Department of Economic and Tourism Development, \textit{South Dakota Welcomes You With Open Lands}. 
shorelines which offer ideal conditions for fishing, sailing and water skiing. Other recreational activities include swimming, picnicking, camping, and other outdoor recreation that whole families can enjoy and participate in. 34

Hunting is an important activity in the area. Pheasant hunting provides most hunters with an adequate supply of birds. Although most of the pheasants are found in the central part of the state, the southeastern corner of the Coteau des Prairies offers good hunting. Kingsbury Brookings, and Hamlin Counties rank high in the potential carrying capacity for pheasants. There is less emphasis placed on other small game for the area. Deer and antelope herds are generally more abundant in the western part of the state. 35

Waterfowl hunting is the most popular form of hunting. The abundant supply of large, fresh water lakes makes the Coteau des Prairies a paradise for waterfowl hunters. The Game, Fish and Parks Department has maintained an efficient wildlife management.

An increasing number of license registrations in

34 Hogan, Geography of South Dakota, p. 55.

motorcycles has occurred over the last few years.\textsuperscript{36} This increase reflects the summer trend in recreational vehicle use. The ever increasing use of the snowmobiles during the winter months indicates that South Dakotans are active outdoors in cold weather also.

As people begin to have more free time because of mechanizations, recreation is becoming increasingly important. This, plus the fact that recreation involves whole families, makes it very popular.

\textbf{Power and Utilities}

South Dakota has not experienced any significant power shortage and none are imminent. Power plants are run by four different sources of fuels. Water, coal, gas and diesel power plants are located throughout the state. Electrical energy is available from three marketing sources: private, investor-owned utility companies, cooperative systems financed by the Rural Electrification Administration, and in a few cases, municipally-owned plants.\textsuperscript{37}

The eastern half of the state is supplied by East River Electric Power. This wholesaler serves 21 members, many of which are situated in the Coteau des Prairies area.

\textsuperscript{36} Ibid., pp. 242-243.

\textsuperscript{37} Hogan, \textit{Geography of South Dakota}, p. 50.
Fig. 44. Golf Course in Brookings

Fig. 45. Municipal Utilities Building, Brookings
Natural gas service is also furnished for most portions of the Coteau. Several gas distributors serve communities of the Coteau. Iowa Public Service Company provides service to the southwestern portion of the Coteau. Central Telephone and Utilities Corporation serves the southeastern portion. Northwestern Public Service Company provides services for the northern half of the Coteau region.

Rural water systems are providing service to rural areas of the Coteau. Many of these systems are part of the Big Sioux Community Water System which will monitor both drilling and water usage. These water systems provide quality water to their users.38

Cities and Towns

Historically the state's population has been rural. Recently, however, the population has become more urban and presently represents about one-half of the population. This particular trend reflects the decreasing number of farm units and the steady decline of small towns. This migration to larger urban areas is the result of increasing emphasis on expanding industry in the state. The Coteau des Prairies lies in an area of high industrial growth. Relocation of out-of-state industries is quite evident in the larger cities of the Coteau, especially those originating from neighboring Minnesota.

38Sioux Falls (South Dakota) Argus Leader, 7 September 1975.
The distribution of towns is closely related to the placement of railroads in the area. The spacing of the towns is at intervals of approximately ten miles along the tracks. This distribution made it possible for convenient access of trade and services for all settlers.\(^{39}\)

Survival of most of these towns depended on their position along the railroad line, and whether these towns became county seats. County seats had the best survival probability because of the concentration of the political community in those particular towns.\(^{40}\)

Table 8 lists all of the towns within the Coteau des Prairies. These towns or cities range in size from Sioux Falls with a population of 72,488 to Butler and Naples which have populations of 38. Of the 77 towns listed, only three, Sioux Falls, Brookings and Watertown, have populations of more than 10,000, and only eleven have a population of more than 1,000 (Fig. 46).

The small towns serve as minimum convenience centers. They offer such retain businesses as cafes, grocery stores, service stations, bars, banks, post offices, and in some cases, feed stores, hardware stores, implement dealers, variety stores, pharmacies, and meat or fruit markets.\(^{41}\)

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\(^{40}\) Ibid.

\(^{41}\) Ibid., *Geography of South Dakota*, pp. 61-62.
## TABLE 8

CITIES AND TOWNS OF THE COTEAU DES PRAIRIES

<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
<th>Town</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altamont</td>
<td>54</td>
<td>Kranzburg</td>
<td>143</td>
</tr>
<tr>
<td>Arlington</td>
<td>954</td>
<td>Lake City</td>
<td>44</td>
</tr>
<tr>
<td>Astoria</td>
<td>153</td>
<td>Lake Norden</td>
<td>393</td>
</tr>
<tr>
<td>Aurora</td>
<td>237</td>
<td>Lake Preston</td>
<td>812</td>
</tr>
<tr>
<td>Badger</td>
<td>122</td>
<td>Lily</td>
<td>62</td>
</tr>
<tr>
<td>Baltic</td>
<td>364</td>
<td>Madison*</td>
<td>6,315</td>
</tr>
<tr>
<td>Bradley</td>
<td>157</td>
<td>Marvin</td>
<td>65</td>
</tr>
<tr>
<td>Brandon</td>
<td>1,431</td>
<td>Naples</td>
<td>38</td>
</tr>
<tr>
<td>Brandt</td>
<td>132</td>
<td>Nunda</td>
<td>85</td>
</tr>
<tr>
<td>Brookings*</td>
<td>13,717</td>
<td>Oldham</td>
<td>244</td>
</tr>
<tr>
<td>Bruce</td>
<td>217</td>
<td>Ortley</td>
<td>111</td>
</tr>
<tr>
<td>Bryant</td>
<td>502</td>
<td>Ramona</td>
<td>227</td>
</tr>
<tr>
<td>Bushnell</td>
<td>65</td>
<td>Roslyn</td>
<td>250</td>
</tr>
<tr>
<td>Butler</td>
<td>38</td>
<td>Rutland</td>
<td>45</td>
</tr>
<tr>
<td>Castlewood</td>
<td>523</td>
<td>Sherman</td>
<td>82</td>
</tr>
<tr>
<td>Chester</td>
<td>177</td>
<td>Sinai</td>
<td>147</td>
</tr>
<tr>
<td>Clark*</td>
<td>1,356</td>
<td>Sioux Falls*</td>
<td>72,488</td>
</tr>
<tr>
<td>Clear Lake*</td>
<td>1,157</td>
<td>South Shore</td>
<td>199</td>
</tr>
<tr>
<td>Colman</td>
<td>456</td>
<td>Stockholm</td>
<td>116</td>
</tr>
<tr>
<td>Colton</td>
<td>601</td>
<td>Strandberg</td>
<td>98</td>
</tr>
<tr>
<td>Crooks</td>
<td>165</td>
<td>Summit</td>
<td>332</td>
</tr>
<tr>
<td>Dell Rapids</td>
<td>1,991</td>
<td>Toronto</td>
<td>216</td>
</tr>
<tr>
<td>Dempster</td>
<td>84</td>
<td>Trent</td>
<td>177</td>
</tr>
<tr>
<td>DeSmet*</td>
<td>1,336</td>
<td>Valley Springs</td>
<td>566</td>
</tr>
<tr>
<td>Eden</td>
<td>132</td>
<td>Vienna</td>
<td>119</td>
</tr>
<tr>
<td>Egan</td>
<td>281</td>
<td>Volga</td>
<td>982</td>
</tr>
<tr>
<td>Elkton</td>
<td>541</td>
<td>Wallace</td>
<td>95</td>
</tr>
<tr>
<td>Erwin</td>
<td>106</td>
<td>Ward</td>
<td>57</td>
</tr>
<tr>
<td>Estelline</td>
<td>624</td>
<td>Watertown*</td>
<td>13,388</td>
</tr>
<tr>
<td>Flandreau*</td>
<td>2,027</td>
<td>Waubay</td>
<td>696</td>
</tr>
<tr>
<td>Florence</td>
<td>175</td>
<td>Webster*</td>
<td>2,252</td>
</tr>
<tr>
<td>Garden City</td>
<td>126</td>
<td>Wentworth</td>
<td>196</td>
</tr>
<tr>
<td>Garretson</td>
<td>874</td>
<td>White</td>
<td>418</td>
</tr>
<tr>
<td>Gary</td>
<td>366</td>
<td>Willow Lake</td>
<td>353</td>
</tr>
<tr>
<td>Goodwin</td>
<td>114</td>
<td>Winfred</td>
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<td>Hayti*</td>
<td>393</td>
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<td>Hazel</td>
<td>101</td>
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<td>Henry</td>
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<tr>
<td>Hetland</td>
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<tr>
<td>Humboldt</td>
<td>411</td>
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</tbody>
</table>

*Indicates county seat

Source: South Dakota State Highway Map.
Fig. 46. Cities

SCALE in MILES

0 15 30 45
More goods and services can be and are provided by larger towns. The largest city, Sioux Falls, provides extensive wholesale and retail services.

The first town sites in South Dakota were established in 1857 in the Big Sioux Valley. Two of the four original towns, Sioux Falls and Flandreau, remain today. Medary and Emineza were deserted as the threat of Indians persisted.42

Immigration from South Dakota rural areas was the result of trends toward larger and fewer farms as well as from the lack of employment opportunities. This exodus from the small towns is declining as industrial growth continues to inject new resources into the local economy. This, combined with a desire for a rural lifestyle adds new hope for these small rural communities.

42Visher, The Geography of South Dakota, p. 139.
South Dakota is often called the "Land of Infinite Variety", the "Sunshine State", and the "Coyote State." These descriptions reflect the diversity, the climate, and the western atmosphere of the state. The Coteau des Prairies is one of thirteen physiographic regions of South Dakota which contributes to the preceding descriptions.

The Coteau des Prairies is the most eminent single topographic feature of eastern South Dakota. This region is marked by low, rolling hills and numerous glacial lakes. Its edge is rimmed, particularly in the northern portion, by an abrupt escarpment. The Coteau is an erosion remnant irregularly covered with glacial drift whose surface slopes gently to the south and west.

The processes of soil formation include the accumulation of parent material, the addition or organic matter, and the differentiation of a soil profile. These processes have developed soils of high fertility to make the Coteau a major agricultural region. A variety of agricultural goods are produced, including grain crops, livestock and dairy products. Agriculture contributes more to the economy of the region than any other industry.
Industry is expanding at an accelerated rate in the Coteau des Prairies. Some large industries have located in the region to augment the existing economy, as well as to stabilize it. These industries find the region conducive for industrial development due to the cooperation and encouragement they receive from the citizenry.

South Dakota is located far from any large body of water which has a moderation effect on the climate. For this reason, the state experiences extreme temperature ranges, and consequently, a variety of precipitation forms. But, the people adapt and enjoy the various seasons of the year.

The Coteau des Prairies is basically rural. Climatic conditions of the region are precarious. For this reason, a reliable and convenient transportation system is essential. This need is realized as numerous state and interstate highways serve the region.

The Coteau des Prairies is the most populous region of South Dakota. Sioux Falls is the largest city of the state, and is the industrial center of the state. Other larger cities such as Watertown, Brookings, Madison, and Webster, provide services to the smaller communities.

South Dakota had an exciting and adventurous beginning, from the Mound Builders, the earliest inhabitants, to the present day mixture of ethnic groups that occupy the region. The Coteau des Prairies has had its share of history with conflicts between the White and Indian people in the early
period of White settlement in the region. Early settlements were destroyed by Indian tribes that lived in the area. Peace was gradually restored, and the White settlements flourished with the pacification of the Indians. The major contributing factor to the rate of settlement was the coming of the railroads, and the immigration of White settlers reached its peak in the late 1870's and early 1880's.

The White settlers of the region experienced periods of depression as well as prosperity. The dust storms of the 1930's prompted the beginning of government programs to aid farmers during severe drought periods. These programs grew to include conservation and erosion control projects. Times were hard, but eventually through improved weather conditions and the development of other resources, the economy became more stable.

With more leisure time available, people are beginning to use some of the natural features of the Coteau des Prairies for recreational purposes. Water sports are becoming ever more popular in a region of the large natural lakes. Swimming, water skiing, fishing, and boating are some of the popular summer water sports. Winter sports include snowmobiling and cross-country skiing.

The mineral wealth of the Coteau des Prairies is limited to non-metals. Sand, gravel and stone are found in abundant quantities in this glacial drift region. Extensive aquifers
supply water to most of the people in the region. The availability of these large quantities of water is reassuring to the citizens of the Coteau at a time when some parts of the world are experiencing water shortages.

The Sioux Indian word "Dakota" can be interpreted as "friendly people" or "alliance of friends", and also describes the people of the Coteau des Prairies. The people are the region's most important resource.

Future

The population for the Coteau des Prairies should continue to increase at the rate it has experienced over the last few years. The larger cities such as Sioux Falls, Brookings, Watertown and Madison can expect the largest growth rates. These cities can offer more in the way of employment than the smaller towns can, and employment is the major reason for the out-migration of the region's people. The state hopes to halt the departure of young people by stepping up its campaign to broaden the economy, and create more jobs by attracting desirable industries to the area. An expanded industrial base, coupled with an increasing desire for a clean air and rural type of living, will make the entire region more inviting.

The rural environment with an abundance of recreational lakes should make the Coteau des Prairies a vacation spot that will attract out-of-state travelers. This influx of vacationers will help to stimulate the local economy.
Recreation has become an important part of the American life-style. It will become increasingly so as working hours are shortened and more free time is available. Recreational development should become a major factor in the lake areas.

Technological advances in agriculture will continue. As agriculture becomes more mechanized, farm sizes will increase and the number of farms will decrease. The population will become more urban as a result.
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