The Minnesota River Lowland: An Area Study

Ronald R. Crawford

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THE MINNESOTA RIVER LOWLAND:

AN AREA STUDY

BY

RONALD R. CRAWFORD

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

1977

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THE MINNESOTA RIVER LOWLAND:

AN AREA STUDY

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Adviser          Date

Head, Geography Dept.   Date
ACKNOWLEDGEMENTS

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RRC
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LIST OF TABLES</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>LIST OF FIGURES</td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>INTRODUCTION</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>II.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>PHYSICAL ENVIRONMENT</strong></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Terrain</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Geomorphology</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Climate</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Soils</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Natural Vegetation,</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Animal Life</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>III.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>HUMAN OCCUPANCE</strong></td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>IV.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>CULTURAL ENVIRONMENT</strong></td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Agriculture</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Mining</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Industry</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Recreation</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Power and Utilities</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Cities and Towns</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>V.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>CONCLUSION</strong></td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>BIBLIOGRAPHY</td>
<td>106</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Summary of Rock Units Found in the Minnesota River Lowland</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Selected Climatic Data for the Minnesota River Lowland</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Lakes of the Minnesota River Lowland</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Manufacturers and Processors of the Minnesota River Lowland</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>Average Annual Hunter Activity in the Minnesota River Lowland</td>
<td>92</td>
</tr>
<tr>
<td>6</td>
<td>Towns of the Minnesota River Lowland and their Populations</td>
<td>97</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Physical Divisions of South Dakota</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Map of the Minnesota River Lowland</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Road Over a Lake Agassiz Beach Ridge</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Lake Agassiz Beach Ridge on Horizon</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Mt. Tom on Horizon</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Coteau des Prairie in the Distance</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>Pre-Pleistocene Rocks</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>Average January Temperature (°F)</td>
<td>23</td>
</tr>
<tr>
<td>9</td>
<td>Average July Temperature (°F)</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>Average Annual Precipitation in Inches</td>
<td>27</td>
</tr>
<tr>
<td>11</td>
<td>Soil Parent Materials of the Minnesota River Lowland</td>
<td>29</td>
</tr>
<tr>
<td>12</td>
<td>Soil Associations of the Minnesota River Lowland</td>
<td>31</td>
</tr>
<tr>
<td>13</td>
<td>Major Vegetation Types of Minnesota River Lowland</td>
<td>33</td>
</tr>
<tr>
<td>14</td>
<td>Area of Natural Vegetation in White Rock Township</td>
<td>34</td>
</tr>
<tr>
<td>15</td>
<td>Potential Carrying Capacity for Pheasants</td>
<td>39</td>
</tr>
<tr>
<td>16</td>
<td>Potential Carrying Capacity for Deer</td>
<td>40</td>
</tr>
<tr>
<td>17</td>
<td>Potential Carrying Capacity for Antelope</td>
<td>41</td>
</tr>
<tr>
<td>18</td>
<td>Lake Traverse</td>
<td>45</td>
</tr>
<tr>
<td>19</td>
<td>Bois de Sioux River North of White Rock Dam</td>
<td>45</td>
</tr>
<tr>
<td>20</td>
<td>Cottonwood Slough Area</td>
<td>47</td>
</tr>
<tr>
<td>21</td>
<td>Cottonwood Slough North of U.S. 81</td>
<td>48</td>
</tr>
<tr>
<td>Page</td>
<td>Description</td>
<td>Location/Region</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>22</td>
<td>Cottonwood Slough South of U.S. 81</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Big Stone Lake</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Burial Mounds at Hartford Beach State Park</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Burial Mounds at Lake Traverse Headwaters</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Restored Trading Post on Big Stone Lake</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Homestead Site Near Big Stone Lake</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Corn in Bushels per Acre</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>All Hay Harvested in Acres, 1973</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>All Wheat Harvested in Acres, 1973</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Dairy Herd</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Beef Cattle Herd</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Corn Field in Minnesota River Lowland</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Modern Farm in Minnesota River Lowland</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Granite Outcrops East of Milbank</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Granite Block Pile at Milbank Quarries</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Delano Granite Quarry</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Sawing House at Delano Granite</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Cheese Factory in Milbank</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Highways of the Minnesota River Lowland</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Milbank Depot</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Camping at Hartford Beach State Park</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Canoeing on Big Stone Lake</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Fishing at Lake Traverse</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Big Stone Power Plant</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Towns of the Minnesota River Lowland</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Courthouse on Milbank's Main Street</td>
<td></td>
</tr>
</tbody>
</table>

VII
CHAPTER I

INTRODUCTION

Geography is the study of the earth as the home of man. However, since the surface of the earth is very large and extremely varied, and the cultures of the people which inhabit the earth are also extremely varied, it is not possible to undertake this sort of study in anything other than a very general fashion. Thus, geographers divide the earth's surface into separate regions and areas for study.

The term region has an almost endless variety of meanings and uses. Webster's New International Dictionary (3rd ed.) devotes 37 lines to its definition. Geographers have struggled hard to overcome the problem of semantics in regards to the true meaning and correct usage of the term.

Geography as a modern subject is usually considered to date only from about the middle of the 19th century. It was during this period of time that Karl Ritter, the German geographer, saw the world as a whole with distinct regions. Ritter's idea of the region suggests something quite unique and separate from its surroundings. He viewed it as the geographer's task to discover these distinct regions.¹

Although German geographers were instrumental in defining a region during the beginnings of the modern period, it is a Frenchman, David Turnock, "The Region in Modern Geography," Geography 52 (November 1967): 376.

¹
Paul Vidal de la Blache, who is often called the "father" of regional geography. He emphasized the human aspect in the study of regions. Man was seen as ultimately shaping the region that nature created.  

In the 1930's and 1940's, Richard Hartshorne represented the mainstream of geographic thought in the United States. Hartshorne viewed the regional concept as the core of all geographic study. Although Hartshorne was influential in promoting regional geography, most regional studies published during this period and the following decades lack any historical depth and have been criticized as being unduly descriptive and unanalytical.  

In 1954 two American geographers, Preston E. James and Clarence F. Jones, edited a book entitled *American Geography, Inventory and Practice*. This large and comprehensive volume contains the thoughts and research of groups of scholars on every major branch of geography over this period. The regional concept is dealt with in some detail in the volume's second chapter. An Hartshornian framework can be seen throughout.  

In the 1950's regional geography came under increasing criticism in favor of a new geography or a scientific geography. The traditional view that the study of regions is the core of all geographic study was criticized for being overly concerned with the

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study of unique aspects of geographic phenomena which prevented geographers from discovering important generalizations or laws. This new geography stressed the use of quantitative analysis and statistical data in the interpretation of areal distributions and associations. Its impetus in the mid-1950's was due particularly to F. K. Schaefer and W. Garrison and later to the work of W. Bunge and B. J. L. Berry.4

The traditional and new concepts in geography should not be viewed as being at opposite ends of the spectrum. Both concepts play an important role in developing the total regional concept. Even as traditional and quantitative views of the region are being sorted out, a new viewpoint is being heard which will certainly add new dimensions to regional geography. As is the case with other disciplines, geography has come under increasing pressure to become more relevant to the realities of the world and more concerned with solving some of its many pressing problems. Geographers, with their traditional concern for the interaction of human groups and their environments and their new concern for quantitative analysis, have much to offer in the way of relevant regional study.5


5McDonald, A Geography of Regions, p. 120.
From the descriptive regionalism of 1920, geography moved strongly toward a quantified regionalism by 1960. Recent trends seem to indicate renewed concern with the human or subjective aspects of regional definition. Geographers will continue to struggle with the nature of regions, and new guidelines for regionalization will continue to emerge in the literature, but the more successful characteristics of both philosophical and mathematical regionalization will be retained. No matter which direction these guidelines take, the region will continue to occupy a central place in geographic study.

With all of the various definitions of the term region taken into account, boundary seems to be the key concept to which all definitions of a uniform region point. The regional geographer studies the relationship between man and the various phenomena that comprise his physical and cultural environments found within certain boundaries. He studies this relationship through the use of selective criteria, such as location, climate, soils, vegetation, animal life, human occupancy and human development. Human development includes agriculture, mining, industry, transportation, recreation, power and utilities, and cities and towns.6

This sum total of a region's physical and cultural environment may be likened to a stage play. The stage is the physical

6Edward Patrick Hogan, "Geography of South Dakota," South Dakota State University, Brookings, South Dakota, 1976. (Mimeographed.)
environment which encompasses the design, shape, strength, surface and conditions of the environment. The set is the cultural environment. Just as a stage play set is comprised of furnishings, props, design and construction, a region's cultural environment is comprised of man-made ways of utilizing its physical environment. Whether it be a stage play or a regional study, man is the actor. The outcome of the performance or the manner in which a region's physical and cultural environment is handled depends on man.\footnote{Ibid.}

A geographical study may be limited to a particular area of a region. An area study differs from a regional study in that the area is determined by only one criteria. It also differs from a regional study in that its boundaries are arbitrarily drawn.

This thesis is a systematic-area geographical study of the extreme northeastern part of South Dakota known as the Minnesota River Lowland (Fig. 1). Most of the Minnesota River Lowland region lies in Minnesota and North Dakota, but this study will be limited to that area of the region within South Dakota. This area study is not limited to one criterion such as location, climate, or human occupancy. Rather, it incorporates the sum total of all the criteria included in a systematic-regional study.

The Department of Geography at South Dakota State University has adopted as a major goal of its graduate program, the completion of a series of masters theses on the geography of South Dakota. Each of these theses will examine the geography of one of the 13
Fig. 1. Physical Divisions of South Dakota
(Source: Flint, Pléistocene Geology, p. 5)
physiographic divisions that exist within the state. This is the first of the studies to be undertaken.

With the establishment of a graduate program in geography, most state institutions attempt to update the geographic knowledge of the state in which they exist. In the case of South Dakota, the last major geography of the state was written by Stephen Sargent Visher in 1917. Another reason the department is attempting to conduct these studies is to provide the people of South Dakota and the nation with a clearer understanding of the geography of South Dakota. For while the state is known as the "Land of Infinite Variety", most people's perception of the state is one of overwhelming sameness.

This study and the other 12 theses have as a major aim the demonstration of the geographic diversity of the state. This theme will run throughout the thesis as it examines the various criteria in the Minnesota River Lowland area.

Included in this South Dakota area of the Minnesota River Lowland are parts of Roberts, Grant, Marshall and Deuel counties (Fig. 2). The area lies on the continental watershed divide. The southern part drains into Big Stone Lake, through the Minnesota River, into the Mississippi Basin. The northern part drains through Lake Traverse, the Boise de Sioux River and the Red River into Hudson Bay. The low and indefinite divide between the two lakes is known as Brown's Valley. During times of high water, Lake Traverse will overflow sending part of its water southward through Big Stone Lake to the Mississippi. The divide between the lakes is only five to
Fig. 2. Map of Minnesota River Lowland
ten feet above the normal water level of Lake Traverse. The normal level of Big Stone Lake is about ten feet below that of Lake Traverse. Therefore, when the high water from Traverse reaches the divide, it can easily flow into Big Stone Lake.8

The area of study is bordered on the west and south by the South Dakota physiographic division Coteau des Prairies, on the north by the North Dakota border, and on the east by the Minnesota border. The lakes Big Stone and Traverse stretch along the northern two-thirds of the eastern border.

The Minnesota River Lowland is 50 miles in width. Near the point at which the states of South Dakota, North Dakota, and Minnesota meet, the lake floor narrows forming a trench about 100 feet deep and from less than a mile to more than two miles in width.9 This trench within which the lakes Big Stone and Traverse lie, forms the eastern boundary of the study area of this thesis. The trench was cut into the lowlands by a channel fed by overflow from Lake Agassiz, a glacial lake which covered the valley of the Red River of the North during the retreat of the Wisconsin or last ice sheet.

Lake Agassiz, which was more than one and one-half times as large as South Dakota and covered an area as large as all the Great


Fig. 3. Road Over a Lake Agassiz Beach Ridge

Fig. 4. Lake Agassiz Beach Ridge on Horizon
Lakes combined, was the largest temporary lake on the North American Continent. Some of the beaches and part of the floor of the extinct glacial lake Agassiz can still be seen in the extreme northeastern corner of the lowland. They are in White Rock Township (T128N, R28W), Roberts County near the end of Lake Traverse.

This study deals with the approximately 1,600 square miles of the Minnesota River Lowland lying within South Dakota. The area resembles an irregular right triangle. The hypotenuse of the triangle is the Coteau des Prairies or western boundary. The northern and eastern side of the triangle has a great bite taken from it by Minnesota's western boundary line.

This study concerns itself with the physical environment -- the stage, the human occupancy -- the actors, the cultural environment -- the set, and a critical evaluation of the future prospects of the described area.

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\(^{10}\) South Dakota Department of Game, Fish and Parks, "Hartford Beach Hiking Trail Guide," Pierre, South Dakota, n.d. (Mimeoographed.)

\(^{11}\) Rothrock, *Geology of South Dakota*, part I, p. 22.
CHAPTER II

PHYSICAL ENVIRONMENT

An area's physical environment presents a stage for its human occupants or actors. A geographic study of an area's physical environment encompasses its terrain, geomorphology, climate, soils, natural vegetation, animal life and water.

Terrain

The terrain of the Minnesota River Lowland forms the floor of the stage, and its diversity makes it a unique area within the state. The eastern border of the area is formed by Big Stone Lake and Lake Traverse, two of the largest lakes in the state of South Dakota. The central portion of the lowland is a glacial basin, generally with a relief of less than 20 feet per mile. The western portion of the Minnesota River Lowland is formed by the slopes of the Coteau des Prairies.

The waters from Lake Traverse and Big Stone Lake cover a large portion of the floor of the glacial lowland. These lakes are large, long, shallow, and low in elevation. Lake Traverse is about 15 miles long with an average depth of only ten feet. Big Stone Lake, the larger of the two, is 25 miles long and from 15 feet to 18 feet in depth. Both lakes are narrow, being only one to one and one-half miles wide. These lakes are unique in that they occupy the lowest
elevation in the state. Big Stone Lake is only 965 feet above sea level.¹

West of the lake beds is approximately 1,600 square miles of basin land shaped by the glaciers which attacked eastern South Dakota in the geologic past. The surface is comprised of ground moraine and small ridges of end moraine. Relief is faint and in most places changes are hardly noticeable.

A notable feature in the lowlands is Mount Tom or the Mount Tom Range. It's located in Grant County (T120N R47W) and can be seen from old U.S. 12 between Milbank and Big Stone City.² It is about one-half mile wide at its base and 100 feet high. It is steep sided and composed of medium to coarse gravel. When viewed from a distance, it has the appearance of an overturned bowl on a table. The range begins four miles south of Lake Albert at the bend of the Yellow Bank River and runs southeast. It crosses over into Minnesota's Lac Qui Parle County where it is known as the Antelope Hills.³

The most striking feature of the western part of the Minnesota River Lowland is the eastern escarpment of the Coteau des Prairies. The slopes of the Coteau are rough, rugged and steep. They represent the steepest change in elevation in the eastern portion of South Dakota.

²Flint, Pleistocene Geology, p. 6.
³Rothrock, Geology of South Dakota, part I, p. 22.
Fig. 5. Mt. Tom on Horizon

Fig. 6. Coteau des Prairies in the Distance
Dakota rising from 600 feet to 1,000 feet in elevation from the glacial basin below. The escarpment is riddled with gullies and creeks radiating into the lower elevations.4

Atop the escarpment is the Coteau des Prairies proper. Its highest point in elevation is 11 miles southwest of Sisseton where it reaches an elevation of approximately 2,110 feet above sea level. At that point, one is about 1,145 feet above Big Stone Lake some 15 miles to the east. Thus, one can visualize the unique changes in elevation that exist in this small area of eastern South Dakota.5

Geomorphology

Basic knowledge of the geomorphology of the Minnesota River Lowland aids in understanding the resources of the area. The arrangement of bedrock units exposed at the surface underlying the glacial drift is shown in Figure 7.

The underlying rock of the lowlands is Pre-Cambrian granite. Granite outcrops are found a few miles southeast of Milbank and are estimated to be several thousand feet thick. This is the only area in South Dakota where this quantity of quality granite is found. A large quantity of granite is found in the Black Hills, but it is of lower commercial quality than the Milbank granite. This granite is very economically important to the Minnesota River Lowland. It is

4South Dakota Department of Natural Resources, Division of Resources Management, South Dakota Water Plan, vol. II-B, section 12: Resource Inventory of the Minnesota River Basin (Pierre, South Dakota: Department of Natural Resources, 1976), p. 3.

5Ibid.
Fig. 7. Pre-Pleistocene Rocks  
quarried and used for building stone and monuments.

The next rock units in ascending order are of the Cretaceous Period. They are Dakota sandstone, Graneros shale, Greenhorn limestone, Carlile shale, Niobrara formation and Pierre shale. These units are noted in Table 1.\(^6\)

The surface rocks in the Minnesota River Lowland were left by glaciers during the Pleistocene Epoch. The four glaciers that left their deposits were from oldest to youngest, the Nebraskan, Kansan, Illinoian, and Wisconsin. The Wisconsin Age glacier is the main glacier which covered the Minnesota River Lowland, but there is evidence of older glacial activity in the area.

The glaciers left two moraines in the Minnesota River Lowland. They are the Big Stone Moraine and the Gary-Altamont Moraine. The Big Stone Moraine begins at the south end of Big Stone Lake and runs northwest. The Gary-Altamont Moraine runs along the east edge of the Coteau des Prairies.\(^7\)

During the Wisconsin Glacier, the ice blocked the northward drainage of rivers and formed Lake Agassiz. Agassiz drained southward through Lake Traverse and Big Stone Lake. As Agassiz was drained, it left some interesting features called beach ridges in the northeast tip of the Minnesota River Lowland. The beach ridges were formed from temporary stops in the draining of Lake Agassiz. The


\(^7\)Ibid., p. 20.
**TABLE 1**

**SUMMARY OF ROCK UNITS FOUND IN THE MINNESOTA RIVER LOWLAND**

<table>
<thead>
<tr>
<th>Age</th>
<th>Unit</th>
<th>Lithology</th>
<th>Thickness in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Rocks</td>
<td>Alluvium, Colluvium</td>
<td>Sand, silt, and clay.</td>
<td>0 - 30</td>
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<tr>
<td>Quaternary</td>
<td>Glacial Deposits</td>
<td>Till and outwash sediments, stratified and non-stratified stagnation deposits, including perched lake plains, etc.</td>
<td>0 - 540</td>
</tr>
<tr>
<td>Pleistocene</td>
<td>Pierre Shale</td>
<td>Gray siliceous shale.</td>
<td>0 - 250</td>
</tr>
<tr>
<td>Holocene</td>
<td>Niobrara Formation</td>
<td>Gray marl, chalk, and shale</td>
<td>0 - 150</td>
</tr>
<tr>
<td></td>
<td>Carlile Shale</td>
<td>Gray siliceous shale</td>
<td>0 - 260</td>
</tr>
<tr>
<td></td>
<td>Greenhorn Limestone</td>
<td>Gray limestone, and limey shale</td>
<td>0 - 75</td>
</tr>
<tr>
<td>Subsurface Rocks</td>
<td>Graneros Shale</td>
<td>Gray shale mixed with silt, sand, limestone</td>
<td>0 - 215</td>
</tr>
<tr>
<td>Cretaceous</td>
<td>Dakota Sandstone</td>
<td>Gray sandstone with shale layers</td>
<td>0 - 300</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Age</th>
<th>Unit</th>
<th>Lithology</th>
<th>Thickness in feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Cambrian</td>
<td>Igneous Rocks</td>
<td>Granite; only in the subsurface</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

ridges form a ten mile band at the North and South Dakota state line and disappear into the valley of Lake Traverse and Big Stone Lake. Some ridges are barely noticeable, while others are up to 100 feet wide. The old floor of Lake Agassiz is very flat and is covered partially by Mud Lake.8

The Minnesota River Lowland covers a relatively small area in South Dakota, but its geomorphology is interesting and varied. The Wisconsin Ice Sheet and Lake Agassiz left some interesting features found only in the Minnesota River Lowland portion of South Dakota which contribute to the diversity that exists in the state. 

Climate

The climate of the Minnesota River Lowland is Humid Continental, "B" type with large seasonal and daily variations in temperature and precipitation. The Humid Continental, "B" type climate has medium length summers. The average monthly temperature drops below 32°F more than three months of the year.9

Winter is the dominant season, and winters vary from year to year in degree of coldness and amount of snowfall. The winters are cold, and at least one blizzard can be expected. However, the dry air during the winter months makes the cold temperatures easier to


9S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 22.
TABLE 2
SELECTED CLIMATIC DATA FOR THE MINNESOTA RIVER LOWLAND

Temperature Data

<table>
<thead>
<tr>
<th>Station</th>
<th>Average January Temperature</th>
<th>Average July Temperature</th>
<th>Days 90°F or Over</th>
<th>Growing Season Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sisseton</td>
<td>11.6°F</td>
<td>72.5°F</td>
<td>22</td>
<td>140</td>
</tr>
<tr>
<td>Watertown</td>
<td>10.7°F</td>
<td>70.4°F</td>
<td>14</td>
<td>133</td>
</tr>
<tr>
<td>Milbank*</td>
<td>12.5°F</td>
<td>72.0°F</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Precipitation Data

<table>
<thead>
<tr>
<th>Station</th>
<th>Average Annual Precipitation</th>
<th>% in Growing Season</th>
<th>Average Snowfall</th>
<th>Days with 1&quot; or more Snow Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sisseton</td>
<td>21.76&quot;</td>
<td>78</td>
<td>33&quot;</td>
<td>65</td>
</tr>
<tr>
<td>Watertown</td>
<td>20.80&quot;</td>
<td>78</td>
<td>21&quot;</td>
<td>68</td>
</tr>
<tr>
<td>Milbank*</td>
<td>22.12&quot;</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

tolerate. January temperatures average 12°F (Fig. 8). Occasional strong winds and temperatures of 20°F to 25°F below zero create a wind chill factor of about 70°F below zero. Snowfall will vary from year to year. The annual snowfall in the Minnesota River Lowland is approximately 25 to 35 inches. The average wind speed is 12 mph. Sometimes winds reach speeds in excess of 50 mph. This high wind speed combined with snowfall or blowing ground snow normally causes blizzard conditions.\textsuperscript{10}

Spring is a short transitional season in South Dakota. Its arrival is normally indicated by a marked increase in the amount of precipitation. Generally about 40 per cent of the Minnesota River Lowland’s total annual precipitation falls in the months of April, May and June. The last freeze of the winter season occurs during this period.

Summers in the Minnesota River Lowland range from warm to hot and generally have cool nights. Summer can have from 15 to 18 hours of daylight, while midwinter has only six to nine hours of daylight. The growing season is about four months long. This growing season is short, but for certain crops this is compensated by the longer day length.\textsuperscript{11}

Temperatures during the summer months in the Minnesota River

\textsuperscript{10}Ibid.

Fig. 8. Average January Temperature (°F)
(Source: U.S.D.A., Yearbook of Agriculture, 1941, p. 1109.)
Lowland sometimes reach 100°F. The high summer temperatures usually occur during periods of low humidity which makes the extreme high temperatures more tolerable. As indicated in Figure 9, the average July temperature for the lowland is approximately 72°F.

Thunderstorms occur frequently in the Minnesota River Lowland, as they do in the other areas of South Dakota. The storms occur in the spring and summer with their most frequent occurrence in June and July. The prime time for a thunderstorm is between 2 o'clock and 5 o'clock in the morning and late afternoon and evening. Some severe thunderstorms occur as cold fronts or as squall lines and move southeastward or eastward across the area. During these severe thunderstorms, conditions are usually favorable for tornadoes. If a tornado occurs, the destruction is almost complete within the narrow limits of its path. Fortunately, tornadoes are not common to the area, and the total danger is relatively small.

Fall in the Minnesota River Lowland often begins with the first frost which generally occurs in September. It is marked by a decline in the amount of precipitation and an increase in mild days and cool nights. Frost may occur around mid-September and as early as late August. By mid-October, temperatures average 20°F or lower.

The area's weather is dominated by cold air masses from the north in winters and warm air masses from the south in summer. These air masses are dominant, but frequent weather changes are caused by

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Fig. 9. Average July Temperature (°F)  
(Source: U.S.D.A., Yearbook of Agriculture, 1941, p. 1109)
high and low pressure systems especially in the spring and fall. Most of these frontal systems are connected with the area's precipitation.\textsuperscript{13}

Three quarters of the annual rainfall in the Minnesota River Lowland comes during April to September. Half of this falls during May, June, and July. Within a 24 hour period, occasional storms may bring from three to four inches or more of rain. Average annual precipitation for the area is approximately 22 to 24 inches (Fig. 10).\textsuperscript{14}

The climate and weather in the Minnesota River Lowland is similar to that of surrounding areas of eastern South Dakota and western Minnesota with the exception that farther east, precipitation is higher and to the north, the growing season is shorter. However, the climate of the Minnesota River Lowland is unique in that it is quite different from the Humid Continental "A" type found in southeastern South Dakota, and it is, of course, more humid than the Dry Continental type climate of western South Dakota.

The climate of the Minnesota River Lowland is variable, as is the climate of most sections of the northern United States. Because of the inconsistent rainfall in the area, drought remains a significant concern. The hot, dry summer of 1976 was a rude reminder of the area's variable climatic conditions.

\textsuperscript{13}S.D. Dept. of Natural Resources, \textit{Minnesota Tributaries River Basin}, p. 22.

\textsuperscript{14}Flint, \textit{Pleistocene Geology}, p. 18.
Fig. 10. Average Annual Precipitation in Inches (30 year average, 1941-1970)
(Source: South Dakota State Planning Bureau, South Dakota Facts, p. 24.)
Soils

The type of soil that developed in the Minnesota River Lowland is due to the soil forming factors of climate, parent material, relief, vegetation or organisms and time.15 As seen in the previous section, the climate of the Minnesota River Lowland has extreme seasonal temperature changes. The soils are frozen up to 20 days a year. This has caused the development of organic matter and dark color in topsoils.

As indicated in Figure 11, the parent materials of the Minnesota River Lowland consist of silts, clays, sands and loam till. These parent materials determine the soils texture and composition.

The degree of drainage in the Minnesota River Lowland depends on the relief. While steep slopes are well drained, they have poorer soils. Flat or poorly drained areas have thicker soils.16

In the Minnesota River Lowland, the prairie grasses have greatly determined the type of soil formation. This type of vegetation gives the soil its topsoil color, organic matter and nutrient content.17

The time factor also influences a soil's horizons. Soils with well defined horizons are mature, while those with undefined horizons are immature. A soil horizon is a layer of soil that is different

15Fred 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), p. 5.

16Ibid.

17S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 28.
Fig. 11. Soil Parent Materials of the Minnesota River Lowland
(Source: Westin and Puhar, Soils of South Dakota, p. 6.)
from an adjacent layer in that it has different properties such as color and composition. A soil which receives deposits of alluvium over a period of time is considered mature. A soil which does not receive deposits is immature. The soil of the Minnesota River Lowland ranges from immature to mature.\textsuperscript{18}

In South Dakota there are three major soil regions. These regions are Gray Wooded, Chestnut and Chernozem. The Minnesota River Lowland is located in the Chernozem region. The Chernozem soil grades into the Chestnut brown type of soil further west on the Missouri Plateau. The Minnesota River Lowland is included in the part of northeast South Dakota that has the darkest soils. These dark soils of the mid and tall grass prairie are unique in that they have the highest organic matter and nitrogen content of all soils in South Dakota.\textsuperscript{19}

This Chernozem region of the study area can be broken down into several soil associations. Soil associations are units of soils that occur together in patterns. These associations are important to farming in that their arrangement determines the type of farming for which the area is suited. The Minnesota River Lowland consists of three soil associations (Fig. 12). These associations are the Forman-Aastad-Cavour, the Great Bend-Glyndon-Hecla, and the Sisseton.

Studies indicate that these soil associations are best suited

\textsuperscript{18} Westin, Puhr, and Buntley, \textit{Soils of South Dakota}, p. 15.

\textsuperscript{19} Ibid., p. 2.
Fig. 12. Soil Associations of the Minnesota River Lowland
(Source: Westin and Puhr, Soils of South Dakota, pp. 16-17.)
for growing crops such as corn, flax, and soybeans. They are also suitable for pasture land and general crops. The soil colors vary in the Minnesota River Lowland from a dark color to a white-black patchwork appearance.\(^{20}\) The state of South Dakota depends heavily upon agriculture for its livelihood, and the productive soils of the Minnesota River Lowland contribute much to this livelihood.

The climate in the Minnesota River Lowland has influenced the development of soils in the area. The climate combined with the area's soils have influenced the type of natural vegetation found. The direct link between the area's climate, soils and natural vegetation plays a vital part in determining the characteristics of the stage set and the type of play which will be presented.

**Natural Vegetation**

Before the 1800's much of South Dakota was composed of natural vegetation. Today 75 per cent of the land in eastern South Dakota is farmed thus altering the natural vegetation of the area. Uncultivated land has also been altered due to livestock grazing. Native vegetation can still be found in isolated tracts, but the amount has been greatly reduced.\(^{21}\)

As indicated on the map in Figure 13, the Minnesota River Lowland lies in the region consisting primarily of tall grass prairie.

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\(^{20}\)Ibid., pp. 20-21.

Fig. 13. Major Vegetation Types of the Minnesota River Lowland
(Source: Johnson and Nichols, Plants of South Dakota Grasslands, p. 7)
Fig. 14. Area of Natural Vegetation in White Rock Township
A unique development in the vegetation occurs along a small stretch in the eastern part of Roberts County along Big Stone Lake and Lake Traverse. This area consists of wooded type vegetation.

Tall grass prairie land is characterized by sparseness of trees. The amount of precipitation received has played an important role in the development of the tall grass prairie vegetation of the Minnesota River Lowland. During periods of drought, tree growth is restricted. The natural prairie vegetation is somewhat drought resistant. This hardy prairie vegetation has developed the capability of becoming dormant in the dry summer season.

The Minnesota River Lowland is largely prairie, however along Big Stone Lake, Lake Traverse and in most meadows or valleys, there are fairly dense groves of deciduous and coniferous trees. Major species of trees found in the lowlands area include ponderosa pine, cedar, cottonwood, willow, elm, white birch, quaking aspen, prickley ash, bur oak, hackberry, mulberry, hazelnut, June berry, wild red plum, wild and choke cherry, box elder, dogwood, red ash, and the soft, silver, and sugar maples.22

Tall grass prairie is high in agricultural productivity, and most of the prairie region in the Minnesota River Lowland is now devoted to agriculture. Remote tracts of prairie may be found in old cemeteries, railroad right-of-ways, roadside ditches or other

plots of undisturbed land.

True prairie vegetation in its natural condition includes many species. The major grasses include big bluestem, little bluestem, indiangrass, switchgrass, porcupine grass, prairie dropseed, and tall dropseed. True prairie vegetation also includes many forbs or herbaceous plants that are not grasses. Some of the principal forbs are leadplant, groundplum, milkvetch, American licorice, white and purple prairie clover, the scurfpeas, onions, pussytoes, blacksampson, perennial sunflowers, false boneset, and prairie rose.23

Some grasses increase in quantity when the land has been disturbed. These grasses are not as productive as the native tall grass prairie vegetation. These grasses include Kentucky bluegrass, western wheatgrass, sideoats grama, blue grama, hairy grama, buffalo-grass, and panic grasses. Some of the non-grasses or forbs that increase are yarrow, cudwee, sage, wherled milkweed, many-flowered aster, skeletonweed, and goldenrods.24

When the land deteriorates further, plants called invaders take over. Some of the major ones are cheatgrass, prairie threeawn, foxtail barley, Canada bluegrass, and sand dropseed. Weedy forbs include ragweeds, perennial thistles, and curlycup gumweed.25

The farmer vastly changed the native prairie vegetational scene

23Johnson and Nichols, Plants of South Dakota Grasslands, pp. 5-7.

24Ibid., p. 6.

25Ibid.
of the Minnesota River Lowland. Not only have the grasses and small plant life been altered, but trees found in the area are also not all native to the Minnesota River Lowland. New varieties were brought in by the settlers and planted in groves and shelterbelts. Now the once natural vegetation exists only in a few locations in the study area.

**Animal Life**

Most of the Minnesota River Lowland has some value as wildlife habitat. The area's water bodies also support some type of life.

Most fishing in the Minnesota River Lowland is done in Big Stone Lake and Lake Traverse. Major species of fish available in the lakes are perch, walleye, northern pike, crappies, bluegill, largemouth bass, and many rough fish such as bullheads and carp. These lakes are considered to be among the best for fishing in eastern South Dakota, although fishing activity has declined in the last few years. Eutrophication is the main reason for the decline in fishing success. This process of natural aging of the lakes is taking place at a rapid pace.

The Minnesota River Lowland provides sufficient cover for various types of animal life. The many lakes, marshes, and sloughs found in the area furnish a favorable waterfowl habitat. Both resident and migratory ducks and geese take advantage of the habitat.

The Minnesota River Lowland has some of the best waterfowl

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nesting habitat in the country. Major species of ducks found in the lowlands are the Redhead, Canvasback, Mallard, and Blue Winged Teal. All species of ducks common to South Dakota are found. Geese are not found year around in the Minnesota River Lowland. Giant Canadian Geese pass through the lowlands on their migrations during the spring and fall.27

Pheasants are fairly numerous in the area, but the population is not as high as other areas of the state (Fig. 15). Grouse and partridge are found in the lowlands but only in isolated areas.

Major resident birds of the area include the quail, screech owl, chickadee, gray ruffled grouse, jay, and downy woodpecker.28 There is a considerable variety of bird life in the lowlands during various times of the year. These species include mourning dove, bobwhite, northern and Batchelder's downy, red-headed woodpecker, common and redshafted flicker, sparrow hawk, crow, blue jay, bronzed grackle, eastern and Arkansas kingbird, alder flycatcher, common and arctic townees, goldfinch, rose breasted grosbeak, black-headed grosbeak or western blue grosbeak, sparrow, white-rumped shrilse, yellow warbler, yellow breasted and long tailed chat, western wren, catbird, brown thrasher, robin, meadow lark, and blackbirds.29

27Ibid., p. 48.


29Visher, The Geography of South Dakota, p. 100.
Pheasants per square mile

- 0 to 34.99
- 35 to 69.99

Fig. 15. Potential Carrying Capacity for Pheasants Based on County Data
(Source: South Dakota State Planning Bureau, South Dakota Facts, p. 34.)
Fig. 16. Potential Carrying Capacity for Deer Based on County Data (Source: South Dakota State Planning Bureau, South Dakota Facts, p. 32.)
Fig. 17. Potential Carrying Capacity for Antelope
Based on County Data
(Source: South Dakota State Planning Bureau, South Dakota Facts, p. 33.)
The largest of the mammals found in the lowlands area is the white tailed deer with the exception of an occasional mule deer. (Fig. 16). A few antelope may be found in Grant County, but the potential carrying capacity of the area is small (Fig. 17). Other smaller mammals common to the area include the fox, coyote, muskrat, skunk, raccoon, rabbit, weasels, mink, badger, mice, gopher, rat, squirrel, chipmunk, beaver, and muskrat.31

The climate, soils and natural vegetation are major factors in determining the amount and diversity of wildlife found in the Minnesota River Lowland. Abundant precipitation, poorly drained soils and marshy vegetation are the ingredients which provide good waterfowl habitat. Unfortunately, wildlife found in the Minnesota River Lowland has diminished as the amount of cultivated land has increased. Cultivation has removed much of the natural habitat of the area. The number of fish has also diminished due to eutrophication and recent drought conditions. However, despite these factors, the Minnesota River Lowland continues to support a variety of wildlife and fish.

Water

Surface Water

The physiographic region of the Minnesota River Lowland lies within two drainage basins. The northernmost part is in the Red

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30 S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 48.

31 William H. Over and Edward P. Churchill, Mammals of South Dakota, (Vermillion, South Dakota: The University of South Dakota, Museum and Department of Zoology, 1941), p. 3.
River Tributaries Basin, and the remainder lies in the Minnesota Tributaries Basin. Lake Traverse is considered to be in the Red River Basin, while Big Stone Lake is considered to be in the Minnesota River Basin. Water in streams, lakes, sloughs, potholes, stockdams, and man-made reservoirs compose the surface water of the Minnesota River Lowland.32

Streamflow in the northernmost part of the Minnesota River Lowland, which lies in the Red River Basin, is somewhat limited. Streamflow in this area is made up of spring snowmelt runoff and runoff from summer storms. These northernmost streams are not large enough, nor do they have enough ground water discharge to flow through late summer, fall and winter of most years.33

Farther south in the Minnesota Drainage Basin, the Little Minnesota River begins in the Sisseton Hills. Its gradient drops steeply for the first three miles then decreases to about 32 feet per mile. Twenty one miles later the Little Minnesota River merges with its only major tributary, the Jorgenson River. It then flows gently for three miles until it enters the north end of Big Stone Lake.34

The Whetstone River has a north and south fork and drains the

32S.D., Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 59.

33S.D., Dept. of Natural Resources, Red River Tributaries, p. 88.

The southern section of the Minnesota River Lowland. The forks begin in the Sisseton Hills on the Coteau des Prairies and have an average gradient of 30 feet per mile until they merge. The Whetstone River then flows ten miles until it merges with the Minnesota River at the southern end of Big Stone Lake.  

Lake Traverse and Big Stone Lake are the two largest water bodies in the Minnesota River Lowland. As mentioned earlier, Lake Traverse is about ten feet deep, 15 miles long, and has a surface area of 12,000 acres. Total water in Lake Traverse and Mud Lake is estimated at 60,000 acre-feet. On each side of the lake are bluffs. These bluffs disappear at the North Dakota border and become close and very steep on the south end of Lake Traverse.  

A rare occurrence presents itself when looking at Big Stone Lake and Lake Traverse. These lakes are separated by a continental watershed divide on which the town of Brown's Valley, Minnesota is situated. Drainage for Lake Traverse is north through the Bois de Sioux River and eventually into the Hudson Bay. Big Stone Lake drains into the Minnesota River then into the Mississippi River and finally into the Gulf of Mexico. Many people would speculate that a drainage system of this sort would only be found in the Rocky Mountains. Another interesting fact is that the streams flowing from these two lakes of the Minnesota River Lowland are the only rivers...

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35 Ibid., p. 15.

Fig. 18. Lake Traverse

Fig. 19. Bois de Sioux River North of White Rock Dam
South Dakota that do not drain into the Missouri River.

The Bois de Sioux River begins at the Lake Traverse outlet and flows into North Dakota. It flows through a three mile wide valley which is composed mainly of slough areas. Mud Lake covers the upper portion of the river valley. Downstream from Mud Lake and north of White Rock Dam, the Bois de Sioux is channelized. In dry seasons very little water flows north of White Rock Dam.37

Mud Lake, which covers approximately 2,000 acres, was created in 1948 when White Rock Dam was completed. It is a shallow marshy lake that averages only three feet in depth.38

Big Slough, Cottonwood Slough, and Clubhouse Slough collect most of the surface runoff in the vicinity. Big Slough runs down from North Dakota and merges with the north end of Cottonwood Slough. It then flows eastward and meets the Bois de Sioux River north of White Rock Dam.

Cottonwood slough is considered to be the southern part of the slough network. From its beginning to its end, Cottonwood Slough covers an area of about 17 miles. This slough begins at the point of merger with Big Slough and ends at the south end of Lake Traverse. Cottonwood Slough lies in a valley about one mile wide and from 50 to 150 feet below the encompassing land surface (Fig. 20). The slough has virtually no gradient until it nears the outlet at the

37Ibid., p. 7.
38Ibid., p. 6.
Fig. 20. Cottonwood Slough Area
(Source: South Dakota Department of Natural Resources, South Dakota Water Plan, Resources Inventory of the Red River Tributaries, p. 5.)
Fig. 21. Cottonwood Slough North of U.S. 81

Fig. 22. Cottonwood Slough South of U.S. 81
southern end of Lake Traverse. At this point the gradient is about seven feet per mile.\textsuperscript{39}

Water in the northern part of this slough system may either drain into Lake Traverse or into the Bois de Sioux River. Aquatic life in these slough systems tend to pond the water. In the hot summer months this causes a large loss of water due to evapotranspiration.\textsuperscript{40}

Near the town of Big Stone City, south of Lake Traverse, lies Big Stone Lake. It is a 12,356 acre lake with a maximum depth of 18 feet and an average depth of 11 feet. The lake receives drainage from the Whetstone River and from other lakes and tributaries for a total drainage area of 917 miles.\textsuperscript{41}

There are 13 lakes in the Minnesota River Lowland area which comprise approximately 30,000 surface acres. Most of this is made up of Lake Traverse and Big Stone Lake which together comprise 24,356 surface acres (Table 3).

Big Stone Lake is having some sedimentation and eutrophication problems, but the surface water quality of the area is generally good. Unlike some adjacent areas in South Dakota, the Minnesota


\textsuperscript{40}Ibid.

\textsuperscript{41}S.D. Dept. of Natural Resources, \textit{Minnesota Tributaries River Basin}, p. 6.
## TABLE 3

**LAKES OF THE MINNESOTA RIVER LOWLAND**

<table>
<thead>
<tr>
<th>Name of Lake</th>
<th>Sec</th>
<th>Location</th>
<th>Approximate Surface Acres</th>
<th>Approximate Acre Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roberts County:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Cottonwood</td>
<td>20, 29, 32, 33</td>
<td>128</td>
<td>49</td>
<td>987</td>
</tr>
<tr>
<td>Mud</td>
<td>24, 25, 26</td>
<td>128</td>
<td>47</td>
<td>600</td>
</tr>
<tr>
<td>Traverse</td>
<td>126</td>
<td>48</td>
<td>12,000</td>
<td>---</td>
</tr>
<tr>
<td>White Rock (Clubhouse Slough)</td>
<td>1, 12, 36</td>
<td>128, 129</td>
<td>48</td>
<td>1,600</td>
</tr>
<tr>
<td>Lien</td>
<td>6</td>
<td>128</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Hammer</td>
<td>10, 11, 14</td>
<td>128</td>
<td>51</td>
<td>160</td>
</tr>
<tr>
<td>South Hammer</td>
<td>25, 26</td>
<td>128</td>
<td>51</td>
<td>120</td>
</tr>
<tr>
<td>Twin Hammer</td>
<td>1, 2, 35, 36</td>
<td>128, 129</td>
<td>51</td>
<td>142</td>
</tr>
<tr>
<td>Beda Suka</td>
<td>1, 12, 13</td>
<td>126</td>
<td>50</td>
<td>448</td>
</tr>
<tr>
<td>Big Stone</td>
<td>123</td>
<td>47</td>
<td>12,356</td>
<td>136,000</td>
</tr>
<tr>
<td>Bullhead</td>
<td>27, 34, 35</td>
<td>123</td>
<td>49</td>
<td>1,222</td>
</tr>
<tr>
<td>Grant County:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albert</td>
<td>1, 6, 34, 35</td>
<td>120, 121</td>
<td>47</td>
<td>205</td>
</tr>
<tr>
<td>Farley</td>
<td>1</td>
<td>120</td>
<td>48</td>
<td>75</td>
</tr>
</tbody>
</table>

*Source: S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 128, and S.D. Dept. of Natural Resources, Red River Tributaries, suppl. C.*
Fig. 23. Big Stone Lake
River Lowland has no significant polluters. The lowland’s surface waters do have small amounts of dissolved constituents in them. The amount and type of these constituents depends upon the type of surrounding terrain.42

**Ground Water**

Of all the sediment layers in the Cretaceous Era, the Dakota Sandstone is the best water producer. This bedrock aquifer which underlies most of the Minnesota River Lowland is under artesian pressure. The disadvantage of this formation is that it has a low water quality, and deeper wells are needed to obtain water from it than from the glacial deposits. Water in other bedrock aquifers is generally of very poor quality or unobtainable. Shallow aquifers provide the largest amount of ground water in the area. Both city and rural water in the area is obtained from this source.43

The best material for aquifers and wells is outwash composed of stratified sand and gravel. This material was left by streams that flowed from glaciers. A well sunk in this material has a potential yield of 500 gallons per minute. This type of glacial deposit is scattered throughout the Minnesota River Lowland.44

Ground water information on the Minnesota River Lowland is not

42 Ibid., p. 90.


44 Ibid.
complete. The available data on ground water indicates overall good quality, but some towns do have problems with high concentrations of solids. The water is suitable for drinking but usually requires softening for use by man. This is because here, like in adjacent areas, the water is high in dissolved constituents.45

From the preceding discussion, it appears that the Minnesota River Lowland has a plentiful supply of water. In comparison with some other physiographic regions in South Dakota, this may be so. However, due to lack of any extensive agricultural, municipal, or industrial demand, the true water capacity of the study area is not actually known. Significant changes in the utilization of water supplies in the area for agricultural or industrial use would necessitate further investigation of the water resources.

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45S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 90.
CHAPTER III

HUMAN OCCUPANCE

It is only by examining the human occupants in their social and environmental contexts that an adequate comprehension of their activities on the land can be obtained. No stage play is complete without actors.

The Minnesota River Lowland has a rich historical heritage. There are archaeological dig sites that prove occupation by Paleo-Indians 10,000 to 15,000 years ago, soon after the retreat of the glaciers. The Mound Builders, Mandan, Arikara and the Dakota were among other Indian groups to bring their culture to the area. White settlement in the Minnesota River Lowland brought many changes. Each of these peoples left signs of their culture in the Minnesota River Lowland, and each has added to the richness of the area's history.

Life for the Paleo-Indian consisted of hunting and gathering. On the bluffs overlooking Big Stone Lake, there is a site which is a suspected prehistoric Paleo-Indian village. No domesticated animals such as the dog or horse were unearthed at the dig sites. The Indians survived on the vegetation of the land and on the now extinct long horned Folsom bison, plains elephant, elk, giant beaver, antelope, musk ox and mastodon.¹

¹James L. 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, n.d.), p. 5.
After the Paleo-Indians, the next culture to inhabit the Minnesota River Lowland was the Mound Builders. Anthropologists estimate that the Mound Builders arrived about 1,000 A.D. The Mound Builders were farmers, hunters, and gatherers. Corn, beans and squash were their main crops. They raised them in the low fertile areas of the Minnesota River Lowland. Housing, which consisted of earthen lodges, was more permanent than for the earlier Indians.

The most notable feature left by these Mound Builders was the burial mound. The mounds served as tombs for humans, as well as caches for food and weapons. The mounds were 60 to 120 feet in diameter and five to 15 feet high at the crest. These mounds provide many clues as to what life was like for these Indians. The Mound Builders left during the drought which overcame the Plains in the 1400's. The dendochronological analysis of tree rings indicates that this drought lasted into the early sixteenth century. After the retreat of the Mound Builders, came the migration to the Plains by villagers known as the Hidatca, Mandan, Arikara, and Pawnee.²

Following the migration of these villagers to the Plains, were those Indians known as the Dakota. As their predecessors, they spoke the Siouan language. These Indians were pushed into the western Great Lakes region by the Chippewa Indian Tribe. As the pressure from the east grew, the Dakota moved into the area now known as Minnesota and eastern South Dakota.

²Ibid., pp. 6-7.
Fig. 24. Burial Mounds at Hartford Beach State Park

Fig. 25. Burial Mounds at Lake Traverse Headwaters
The Dakota Nation was organized into three major tribes; the Teton, Santee, and Yankton. The Teton took up residence in the Lake Traverse area of the Minnesota River Lowland. The Santee located near Mille Lacs Lake in north central Minnesota, and the Yankton settled further south. During this time, these Siouan Indians lived mostly in villages scattered throughout the lake woodlands. Many of the groups made seasonal hunting trips to the adjacent prairie lands for buffalo.

By the year 1700, the Dakota were divided into the "Sioux of the East" (Santee) and the "Sioux of the West" (Yankton and Teton). The Teton moved west from the Big Stone Lake and Lake Traverse area and occupied the grasslands along and west of the Missouri River. The Yankton traveled south to the South Dakota and Nebraska border by the James River and settled. The Santee remained in Minnesota and were eventually pushed westward by the Chippewa Indians. Finally, by 1783, the Santee were located in the Old Teton country in the Minnesota River Lowland near Lake Traverse.

In 1851, all the land in Minnesota and Iowa was ceded to the whites at six cents per acre. The government failed to honor its part of the treaty. The Indians never saw the government food rations and money for their land ended up in the hands of the trading companies who had claims of debt against the Santee.³

In 1862, some bands of Santee Sioux living along the

³Ibid., pp. 11-12.
Minnesota River rebelled at the unfair trading practices, unkept treaty promises and settlers homesteading on their lands. The uprising was led by Chief Little Crow and lasted for five months. Many people lost all of their property, and there were about 1,000 casualties. Many settlements were abandoned until the military could arrive and protect the area. The uprising ended with the capture and trial of the leaders with the exception of Little Crow, who was never caught. Many Indians left the area in fear, whether or not they had participated. They fled farther west into Dakota Territory.4

The commander of the military department of the northwest proposed a series of forts, with patrols between these forts as the best defense against these repeated skirmishes on the frontier. Henry Sibley, a former trader with experience in the west was assigned to locate and set up the forts. Sibley recommended a fort at the head of the Coteau des Prairies. He thought the location would control the access to Lake Traverse, Big Stone Lake and the Minnesota River Valley. On August 1, 1864, Major John Clowney under Sibley's command located Fort Wadsworth. This fort later became known as Fort Sisseton.5

The Indian bands that had participated in the uprising of 1862

4South Dakota Department of Game, Fish and Parks, "Fort Sisseton State Park; History and Tour Guide," Pierre, South Dakota, n.d. (Mimeographed.)

5Ibid.
were divided and placed on U.S. Government reservations. Some were placed on the Crow Creek Reservation on the Niobrara River in Nebraska. Others were placed on the Sisseton-Wahpeton Reservation. The Sisseton-Wahpeton Reservation contained about 82,000 acres, and a portion of it was located in the north half of the Minnesota River Lowland.

Big Stone Lake and Lake Traverse were natural routes of travel for the Indians as well as the fur traders. With the exception of the short strip of land between Big Stone and Traverse, there existed an uninterrupted waterway to the Hudson Bay to the north and the Gulf of Mexico to the south. In order to cross the strip of land between Big Stone Lake and Lake Traverse, boats were put on log rollers and pushed across.

In 1792, the Hudson Bay Company built a trading post at Lake Traverse. After the influence of the British traders diminished, the post was bought by the Columbia and American fur companies. They consolidated and became known as the American Fur Company. By 1823, there was a regular freighting business by cart between the Red River colonies and Big Stone Lake. All together there were four trading posts located along Big Stone Lake.⁶

The role of the fur trader was to offer the Dakota Indians goods which supposedly were to enrich their native economy through

Fig. 26. Restored Trading Post on Big Stone Lake

Fig. 27. Homestead Site Near Big Stone Lake
material comforts. Goods such as steel knives, kettles, and guns were obtained through barter. The introduction of guns and the acquisition of horses made the tribes prosperous. Trade required peaceful conditions, and after the war of 1812, trade prospered in the area.

A large part of the trading was done by Frenchmen who were friendly with the Dakota Indians. The French fur traders freely intermarried with the Dakotas. The Dakota family whose daughter was married to a French fur trader was looked upon with respect.7

The fur traders also had a negative influence on the Indian people. Despite the ban on selling liquor to the Indians, it flowed freely and had a demoralizing effect. White traders frequently took advantage of the Indians. The fur trader offered the Indians goods which later became necessary for their survival. This lessened the amount of independence which was had by the Indians.8

There was no great rush of settlers into the Minnesota River Lowland. The nation's preoccupation with the Civil War and occasional Indian disturbances slowed down any potential land boom. The migration into the Minnesota River Lowland followed the customary pattern of movement into the frontier. Most of the settlers came from the surrounding states of Minnesota, Wisconsin, and Iowa.

7Herbert S. Schell, History of South Dakota (Lincoln, Nebraska: The University of Nebraska Press, 1961), p. 60.

8Ibid., pp. 60-61.
These people communicated with friends and relatives back home telling of opportunities in this new land. The result was increased immigration.

In 1885, the territorial government established the Office of Commissioner of Immigration. The purpose of this office was to promote immigration not only into the Minnesota River Lowland, but into all of Dakota Territory. Before this office was created, immigration was encouraged mainly by the land speculators and the railroads. 9

Various ethnic groups settled in the Minnesota River Lowland. The area was settled predominately by German immigrants who left their homeland for better agricultural opportunities. Their country's long history of war was another factor that led many Germans to migrate. The level terrain and climate on the eastern side of the state of South Dakota most closely resembled that of their homeland. The Germans have a strong settlement pattern throughout the state, but it is concentrated in this eastern portion. The Germans, unlike many of the other immigrants, didn't come to South Dakota in groups. Rather, they came continuously to the state over a long period of time. They came not only from Germany, but from Russia, Czechoslovakia, and other countries where they had sought a better life prior to immigrating to America. It is not difficult

to see why today the dominant ethnic background in South Dakota and especially in the area of the Minnesota River Lowland is German.10

Other ethnic groups to settle in the area were the Swedes, Norwegians and Dutch. A growing population and little available farm land in Sweden and Norway brought many of these Scandinavians to South Dakota. They came to the Minnesota River Lowland in the 1870's and 1880's. Social class difficulties in the Netherlands led many of the Dutch to emigrate to America. They generally settled in compact bodies such as the group that settled near Milbank in 1878.11

The Indian uprising of 1862 caused a temporary abandonment of most of the settlements in the Minnesota River Lowland. Many of the settlers fled from the area never to return. It is estimated that the Dakota Territory lost at least half of its farm population during the Santee uprising. Settlers who stayed in the area didn't have an easy life. Droughts and grasshopper infestations caused many people to leave. Others had to look for extra work in the settlements or wherever it was available. Federal government money for military operations in the Minnesota River Lowland helped many of the settlements in the area to survive.12

In the Lake Traverse Treaty of 1851, the Sioux ceded everything west of the southern end of Lake Traverse, in a line to the junction

10Ibid., pp. 104-106.
11Ibid., pp. 118-144.
12Schell, History of South Dakota, pp. 80-81.
of Lake Kampska and the Sioux River, then from the Sioux River to the northern boundary of Iowa. Parts of the present Roberts County and Grant County are located on the Sioux Indian land.\textsuperscript{13} This area was opened for settlement in 1868. It is about 19 years older in settlement than the northernmost part, which was included in the Sisseton-Wahpeton Indian Reservation Treaty of 1867.

On the Sisseton Reservation, tracts of 160 acres were allotted to each of the 1,800 Indians. In 1892 the government purchased the rest of the reservation land and opened it for white settlement. Homesteaders were supposed to pay $2.50 per acre after living on the land for five years. This cash payment clause was later dropped.\textsuperscript{14}

Homesteading was a very important factor in the development of the Dakota Territory. As the settlement boom increased, townsites promoters, stage lines, and railroad companies added their power to the movement. More settlers meant more business and more profits. Homesteading experiences varied from area to area, but as the frontier was tamed, the hardships lessened.

From this brief settlement history of the Minnesota River Lowland, it is evident that many groups of people played a part in the development of the area. The role of the Indian was somewhat a paradox. They were not eager to have the white man settle their

\textsuperscript{13} Roberts County Centennial Committee, \textit{Roberts County History} (Sisseton, South Dakota: Courier Print, 1961), p. 41.

\textsuperscript{14} Ibid.
lands, yet they contributed in several ways to this very development. The first white inhabitants of the area were the fur traders. These traders brought new economic life to the Minnesota River Lowland. The last to settle in the area was the pioneer farmer. These immigrants brought new attitudes, values, ideas, and technologies from their homelands to the Minnesota River Lowland.

The physical environment of the Minnesota River Lowland played a key role in determining the role of its human occupants. Inexpensive and readily available farm land which often resembled the immigrant's homeland attracted human settlement to the area. The settlers constructed a set and acted out the drama of life within the confines of their new physical environment and their cultural heritage. Their performance in the new land was closely tied to their performance in the Old Country which can be demonstrated by the major crop first raised in the Minnesota River Lowland. It is not surprising that this crop was wheat which was also the major crop grown in Europe at that time. All of the area's human occupants have added to its uniqueness. Chapter four demonstrates how the performance of the area's present inhabitants continues to add to this uniqueness.
An area's cultural environment encompasses the set and the way in which man has utilized the area's physical environment, his stage. The cultural environment of the Minnesota River Lowland may be interpreted through an overview of the area's agriculture, mining, transportation, recreation, power and utilities, and cities and towns.

**Agriculture**

Approximately 94 per cent of the Minnesota River Lowland is farm land. Agriculture is the principal industry, and dairying is the main agricultural enterprise. By virtue of the environmental influences, agriculture in the Minnesota River Lowland has been a story of adjustments and modifications in farming methods and land use.

During the early period of settlement in the area, wheat was the only crop grown to any extent. This reflected the European cultural background of the homesteaders, for wheat was also Europe's major crop. Later, the need for diversified farming was recognized, and a variety of crops were planted. Now, the major crops include corn, oats, wheat, barley, rye, flaxseed, soybeans, sorghum, and alfalfa. Some sweet corn is also grown for canning and shipped to Minnesota for processing. In the southern part of the Minnesota River Lowland, milk production is important. A cheese plant and a
meat processing plant are in operation in Milbank as direct spinoffs of the area's agricultural activity.¹

Field crops make up about 33 per cent of the total cash farm income in the Minnesota River Lowland. The major crop grown in the area is corn which accounts for about 31 per cent of all the farm crops grown. Hay ranks second with 20 per cent of the total value followed by flax and oats each accounting for 16 per cent. Wheat, soybeans, rye and barley make up the remaining 17 per cent of the crop production (Figs. 28, 29, 30).²

The area's climate and soil types influence the types of crops grown. The summers are warm, and the precipitation is generally adequate to produce economic crop yields. The growing season is also a major contributor to the type of crops grown in the area. The Minnesota River Lowland growing season averages 134 days between the months of April and September. The temperatures during this season average above 32°F. Approximately 155 days are over 28°F. The Minnesota River Lowland growing season's average precipitation is 16 inches.³ West of the Minnesota River Lowland there is a decline in the amount of precipitation received. Therefore, the


²Ibid., p. 34.

Fig. 28. Corn in Bushels per Acre
Based on County Data
(Five year average, 1970-1974) (Source: South Dakota State Planning Bureau, South Dakota Facts, p. 297.)
Fig. 29. All Hay Harvested in Acres, 1973. Based on County Data.
(Source: South Dakota State Planning Bureau, South Dakota Facts, p. 290.)
Fig. 30. All Wheat Harvested in Acres, 1973 Based on County Data
(Source: South Dakota State Planning Bureau, South Dakota Facts, p. 300.)

- 15,000 to 49,999 acres
- 50,000 to 200,000 acres
major crop grown in the South Dakota counties to the west is wheat.

The type of soil and the amount of precipitation received in the Minnesota River Lowland contribute to making corn the major crop. Corn yields two, three or more times as much per acre as wheat. Corn usually has the largest dollar per bushel return of any of the other major crops. Other crops are grown mainly to provide balanced feed for livestock, and to provide a means of improving the soil through rotation. The most widely used rotation consists of a tilled crop such as corn, followed by a small grain like oats, and a legume or grass crop; all grown in this order. With the recent increased use of commercial fertilizers, corn is grown for more than one year at a time before rotation.4

Corn is also a meat-producing feed, and much of it is used to fatten beef cattle and hogs. Sale of fat cattle provides one of the main sources of farm income. The kind of livestock raised on a farm depends in part on the farm size. Usually the larger farms that produce much roughage will fatten cattle, while smaller farms raise hogs.

Beef and dairy cattle are the most important livestock raised in the Minnesota River Lowland. One reason for this is because the climate and terrain of the area are suitable for dairy cattle operations. Also, dairying is reflected in the cultural heritage of

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Fig. 31. Dairy Herd

Fig. 32. Beef Cattle Herd
the settlers of the area. The European dairy farmer continued to practice his livelihood after he emigrated. Cattle accounted for approximately half of the farm income in 1975. The area has had an increase in cattle numbers since 1940 with fluctuations due to prices, droughts and import-export prices. These increased cattle numbers are a result of farmers shifting from the stock cow-calf type operations to feedlot operations.5

The Minnesota River Lowland has produced relatively few sheep, hogs, and poultry products. Sheep and hogs together accounted for only ten per cent of the area's farm income in 1975. This is because prices have had more effect on this type of livestock than they have had on cattle. Sheep and hog numbers have had wide fluctuations in the last 40 years, and the trend seems to be reduction in numbers.6

Farming in the Minnesota River Lowland is becoming more intensive. Higher yields per acre through the use of commercial fertilizers and hybrid seeds are quite common. The flat topography of the area favors the use of large labor saving machines, and this has contributed to the formation of larger farms. By using a number of different machines, a larger acreage can be farmed without the

5S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 81.

Fig. 33. Corn Field in Minnesota River Lowland

Fig. 34. Modern Farm in Minnesota River Lowland
hiring of additional labor. The average farm size in the Minnesota River Lowland in 1975 was about 470 acres. The farm size is somewhat smaller than that of the surrounding counties. This is due partly to the fact that there is a high amount of dairying in the Minnesota River Lowland. Less land is required for dairy farming. The cash grain farmer must devote a larger amount of land to crops than the dairy farmer since the dairy man need only raise enough for his own herd.\(^7\)

Farming in the Minnesota River Lowland has undergone significant changes in the last few years. Each farmer has traditionally owned most of the equipment needed for his own farm. Joint ownership has existed for quite some time, but with the advancement of larger, more expensive machines, custom work has increased. Farm neighbors may each have a different piece of equipment. They exchange equipment work and spread the use of their machines over a large area. Farmers with these machines also hire out for custom work in the surrounding area to help pay for the cost of their equipment. Thus, they are able to take advantage of the larger and more efficient equipment and keep costs down.\(^8\)

The type of agriculture practiced in the Minnesota River


\(^8\)S.D. Dept. of Natural Resources, Minnesota Tributaries River Basin, p. 9.
Lowland is dependent upon the area's climate, terrain, soils and human occupants. The preceding shows that each of these factors contribute to making agriculture the principal industry of the area.

Mining

Stone has been important to man since the beginning of civilization. The history of many early cultures is preserved in stone remains. The early settlers of the Minnesota River Lowland recognized their rock as a unique and valuable resource for local building needs and monuments. From the rather small demand of early settlement days, a significant granite industry developed in the Milbank community from the area southwest of Big Stone Lake.

Mining in the Minnesota River Lowland consists of granite and small amounts of sand and gravel, all in the vicinity of the town of Milbank. The quarries east of Milbank yield 70 per cent of South Dakota's stone production. In 1969, 44,000 tons of granite were quarried from the area for a value of $7,620,000. The granite is shipped throughout the nation and used mainly for ornamental purposes.9

Stone is not used in the area for building as much as it was a few years ago because of the competition from concrete construction. There is still a demand for stone especially if it has ornamental value. To be useful, rock must have a fairly high crushing strength and be uniform in grain and color. The granite

9Ibid., p. 52.
in the Milbank area meets these requirements.

Granite has the highest crushing strength of any rock, resists weathering, and takes a polish well. This Milbank granite has a crushing strength of 15,000 pounds per square inch. The color of granite may range from pure white to very dark gray. The outcrops in the Milbank area are a rich dark red color and carry the trade name of "Mahogany Granite". The deeper red granite has the name "Royal Mahogany". This allows the quarrying and marketing of two types of granite in the Minnesota River Lowland.¹⁰

Milbank is underlain by approximately 30 square miles of granite. Quarries up to 100 feet deep have been dug with no changes in the rock. From this evidence, it is assumed that the granite occurs in a batholith, one of the largest volcanic rock masses. Therefore, the supply is virtually unlimited.¹¹ The westernmost outcrop is five miles east and one and one-half miles south of Milbank in Section 13, Township 120N, Range 48W. Six quarries have been opened in this area. Another outcrop occurs at the Whetstone Creek Valley bottom, a mile southwest of Big Stone City. Outcrops also are found in Minnesota a mile east of the state line.¹²

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¹²Rothrock, Geology of South Dakota, part III, p. 144.
Fig. 35. Granite Outcrops East of Milbank

Fig. 36. Granite Block Pile at Milbank Quarries
Milbank granite is quarried mainly for ornamental purposes, although it serves equally well as building block, rip rap or concrete aggregate. Some of the notable memorials it has been used in are the Statue of Patriotism in Duluth, Minnesota and the large columns in the National Catholic Shrine in Washington, D.C. In 1908 Robert Hunter opened a commercial quarry. Stone from this quarry was used in the capitol building at Pierre in 1912. Hunter's original company is still operating quarries and a finishing plant at Milbank. Four other granite companies are now in operation in the Milbank area. They include Cold Spring Granite, Dakota Granite Company, Delano Granite, Inc., and the Steiner-Rausch Granite Company.

In addition to granite production, the Minnesota River Lowland also produces a small amount of sand and gravel. The gravel pits in the area produced about 145,000 tons of gravel in 1973 for a value of $134,000.

The Milbank granite is a unique and valuable addition to the natural resources of the Minnesota River Lowland as well as to

13Ibid.
South Dakota as a whole. The appearance of granite of this quality and quantity is not a common occurrence in South Dakota, and the industry of the area continues to utilize this valuable resource.

**Industry**

In the sections on agriculture and mining, the products of the Minnesota River Lowland were emphasized. Equally important is the processing of these resources into finished products for the consumer by the area's industry. The industry found in the Minnesota River Lowland area closely reflects the area's climate, terrain, human occupancy, agriculture and natural resources.

As Table 4 indicates, the industry of the Minnesota River Lowland is concentrated in and around Milbank, the center of population and transportation of the area. The major industries of the Milbank area are granite quarrying and cheese processing. As the table indicates, the only industries not related to the agriculture and natural resources are Or-Land, Dakotah Crafts, Lake Traverse Manufacturing Company and the various print shops. In addition to this information, a general idea of the number of employees of each industry can be determined by the table.

The payroll of these industries is somewhat more difficult to determine. The total manufacturing payroll for Grant County in 1974 was $4,245,000. The total manufacturing payroll for both Grant County and Roberts County is $4,531,000. A further breakdown into payroll by dairy products and mining products is not available due to figures which have been withheld to avoid disclosure of operations.
<table>
<thead>
<tr>
<th>City</th>
<th>Industry</th>
<th>No. of Employees</th>
<th>Description of Product</th>
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<tr>
<td>Big Stone City</td>
<td>Big Stone Cheese Factory, Inc.</td>
<td>C</td>
<td>Italian varieties of cheese, butter</td>
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<tr>
<td>Corona</td>
<td>Corona Grain &amp; Feed Co.</td>
<td>A</td>
<td>Feed</td>
</tr>
<tr>
<td>Milbank</td>
<td>Cold Spring Granite</td>
<td>B</td>
<td>Granite quarrying, cut stone, stone slices</td>
</tr>
<tr>
<td></td>
<td>Dakota Granite Co.</td>
<td>B</td>
<td>Granite quarrying, cut stone, stone slices</td>
</tr>
<tr>
<td></td>
<td>Delano Granite, Inc.</td>
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<td>Granite sawing plant</td>
</tr>
<tr>
<td></td>
<td>Hunter Granite Co.</td>
<td>B</td>
<td>Granite quarrying, memorials</td>
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<tr>
<td></td>
<td>Steiner-Rausch Granite Co.</td>
<td>A</td>
<td>Granite quarrying</td>
</tr>
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<td>A</td>
<td>Newspapers, commercial printing</td>
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<td>B</td>
<td>Sausage and meats</td>
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<td>A</td>
<td>Newspaper, Commercial printing</td>
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<td></td>
<td>O- Land</td>
<td>A</td>
<td>Small recreational vehicles, dune buggies</td>
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<tr>
<td></td>
<td>Routson Product Manufacturing</td>
<td>A</td>
<td>Straight and gooseneck trailers, generator carts, custom gas tanks</td>
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<tr>
<td></td>
<td>Valley Queen Cheese Factory</td>
<td>C</td>
<td>Cheese, butter</td>
</tr>
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<td>Sisseton</td>
<td>Courier Publishing</td>
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<td>Newspaper, Commercial printing</td>
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<td></td>
<td>Dakotah Crafts</td>
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<td>Indian beadwork</td>
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<td></td>
<td>Lake Traverse Manufacturing Co.</td>
<td>B</td>
<td>Electronic components</td>
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<td>Landsberger Creamery &amp; Produce</td>
<td>B</td>
<td>Butter, eggs, poultry</td>
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<td>Twin Brooks</td>
<td>Twin Brooks Alfalfa Pelleting Plant</td>
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<td>Alfalfa pellets (feed)</td>
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<td>Honey</td>
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<td>H &amp; W Manufacturing</td>
<td>A</td>
<td>Farm tractor loaders</td>
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<tr>
<td></td>
<td>Elsingar Manufacturing</td>
<td>A</td>
<td>Precast feed bunks, bunker silos,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>agricultural items and specialties</td>
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</table>

*Size of industry is indicated in a general way by the following codes: A - less than 25 employees; B - 25-99 employees; C - 100 or more employees.

Fig. 37. Delano Granite Quarry

Fig. 38. Sawing House at Delano Granite
of individual establishments. However, the preceding figures do denote that the industry in the Minnesota River Lowland, especially in Grant County, plays a vital role in the area.16

Most of the industry in the Minnesota River Lowland is directly connected with the area's available resources. Industries such as newspaper and printing offices and cheese factories which are traditional to the settlement of the area are also found. Modernization has brought about the establishment of industries that manufacture items such as recreational vehicles, electronic components, and custom made trailers and gas tanks. These industries plus the granite quarrying and processing all contribute to the diversity and uniqueness of the area's cultural environment.

Transportation

No area can advance far economically without transportation. During the days of settlement, transportation in the Minnesota River Lowland consisted of ox or horse cart and water traffic on Big Stone Lake and Lake Traverse. Later, railroads were built across the area connecting centers of commercial activity.

The railroad presently serving the Minnesota River Lowland is the Chicago, Minneapolis, St. Paul and Pacific. Tracks run between Sisseton and Milbank serving as the area's north, south link. Out of Milbank, the line runs east and west connecting larger commercial

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centers throughout the Great Plains. The Burlington Northern has a line that runs through the southern tip of the Minnesota River Lowland serving Albee and Labolt. The Chicago, Minneapolis, St. Paul and Pacific between Sisseton and Milbank also services the towns of Peever, Wilmot and Corona. In the northernmost part of the Minnesota River Lowland, the Burlington Northern had a line between Veblen and Wahpeton, North Dakota which serviced the towns of Claire City, Hammer, New Effington, Victor and Rosholt. This line has recently been abandoned. The town of White Rock, located at the northeast corner of the area, was serviced by the Chicago, Minneapolis, St. Paul and Pacific. This line ran south from North Dakota and along the Minnesota, South Dakota border. White Rock was the only South Dakota town this line served.

The major highways that serve the Minnesota River Lowland are U.S. Highway 81, U.S. 12 and U.S. 77. The major state highways in the area are S.D. 25, S.D. 10, S.D. 15, S.D. 109 and S.D. 20 (Fig. 40). Future plans are for Interstate 29 to serve the Minnesota River Lowland, connecting it with major trade centers in the north and south.

There is virtually no commercial air service in the Minnesota River Lowland. The nearest South Dakota commercial air service centers are Watertown and Aberdeen. Milbank and Sisseton have small airstrips used primarily by privately owned planes.

The major mode of transportation in the area, whether it be moving people or goods, is the motor vehicle. The industry of the
Fig. 41. Milbank Depot
area relies heavily upon this type of transportation. Total motor vehicle registrations for 1974 for Roberts County and Grant County was 15,610. Over one-third of these registrations was for trucks which reflects the agricultural orientation in the area.\textsuperscript{17}

The industries in the Minnesota River Lowland ship their products primarily by truck. Valley Queen Cheese of Milbank ships by truck and rail. The granite industries of the area use some rail transportation for shipment of the large rough blocks to other companies for finishing. The pieces that they finish in their own plants are shipped by truck.

The major user of rail transportation in the Minnesota River Lowland is the Big Stone Power Plant near Big Stone City. Each day the plant requires an average of eighty, 100-ton cars of North Dakota lignite for an annual total of over two million tons. Two trains consisting of 105 cars each, serve the Big Stone Plant exclusively.\textsuperscript{18}

Bus transportation throughout the Minnesota River Lowland is also limited. The Jackrabbit Bus Line serves the towns of Milbank and Sisseton. In these towns, a bus arrives or departs once a day. The smaller towns in the area have either no bus service or are flag stops.

\textsuperscript{17}S.D. State Planning Bureau, \textit{South Dakota Facts}, pp. 240-41.

\textsuperscript{18}Montana-Dakota Utilities Company, Northwestern Public Service Company, and Otter Tail Power Company, "This is Big Stone Plant." (Mimeographed.)
Good quality highways are a major asset to the transportation in the Minnesota River Lowland. Because the area's industry relies heavily on truck transportation, the area's highway surfaces are kept in good condition.

Recreation

An important aspect of the cultural environment of any area is its recreation. Major outdoor recreational activities in the Minnesota River Lowland consist of hunting, fishing, camping, swimming, boating, hiking and picnicking.

Almost every town in the Minnesota River Lowland has some type of outdoor recreational area such as a city park or a roadside area. Grant County maintains some county roadside parks in the vicinity of Milbank. The only state park developed in the area is Hartford Beach State Park. It is located 15 miles north of Milbank along Big Stone Lake. Facilities in the park include swimming, boating, fishing, hiking trails, playgrounds and camping. Visitations in 1974 were 149,900, and campers totaled 10,660. This is the largest and best kept park in the area.\(^{19}\)

Hunting plays a major role in the area's recreation, especially the hunting of waterfowl. A 1960 estimate of the duck production of the Cottonwood Slough network was between 2,500 and 3,000 ducks annually. There are numerous small lakes, marshes and wetland areas

\(^{19}\)S.D. Dept. of Natural Resources, *Minnesota Tributaries River Basin*, p. 43.
Fig. 42. Camping at Hartford Beach State Park
in the Minnesota River Lowland which provide excellent duck hunting.20

<table>
<thead>
<tr>
<th>Species</th>
<th>Hunter Days</th>
<th>Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td>2,170</td>
<td>676</td>
</tr>
<tr>
<td>Pheasant</td>
<td>15,410</td>
<td>11,520</td>
</tr>
<tr>
<td>Ducks</td>
<td>11,990</td>
<td>17,585</td>
</tr>
<tr>
<td>Geese</td>
<td>10,130</td>
<td>6,090</td>
</tr>
<tr>
<td>Totals</td>
<td>39,700</td>
<td>35,871</td>
</tr>
</tbody>
</table>


The Department of Game, Fish and Parks owns approximately 9,000 acres in the Minnesota River Lowland. These lands are devoted to state parks, game production areas or public shooting areas.21

Fishing in the Minnesota River Lowland is concentrated in Big

20S.D. Dept. of Natural Resources, *Red River Tributaries*, p. 75.

Fig. 43. Canoeing on Big Stone Lake

Fig. 44. Fishing at Lake Traverse
Stone Lake and Lake Traverse. The major fish species in the lakes are northern pike and walleye, with various sunfish and roughfish also available. These two lakes were once the most heavily fished areas in South Dakota. In the past few years, fishing pressure has dropped due to smaller catches. Fishing is still considered to be good despite these smaller catches.

Due to the area's climate and snowfall received during the winter, winter outdoor recreation in the Minnesota River Lowland consists mainly of ice fishing, skiing and snowmobiling. Some hunting of small game animals is also done in the winter months.

Outdoor recreation in the Minnesota River Lowland is unique in that it can be considered a transitional zone. It provides a transition from the recreation found in northern Minnesota and that found on the prairies of South Dakota. Thus, the area offers a wider variety of recreational activities than its adjacent areas. It's an ideal area for the person who wants a combination of prairie and water-fowl hunting, and big lake fishing.

**Power and Utilities**

Electrical power for the Minnesota River Lowland is provided by the Big Stone Plant near Big Stone City. This huge plant is a primary power source for three utilities that serve the Dakotas and Minnesota. An unique feature of the Big Stone Plant is that it is jointly owned by Montana-Dakota Utilities Company, Northwestern Public Service Company and Otter Tail Power Company.

Adjacent to the plant which generates 415,000 kilowatts of
Fig. 45. Big Stone Power Plant
CITIES AND TOWNS

As indicated in Table 6, the majority of towns in the Minnesota River Lowland have a population of less than 1,000. Sisseton and Milbank are the only towns that have populations above 1,000, and these towns are the county seats of Roberts and Grant counties (Fig. 46).

The small towns in the Minnesota River Lowland serve as convenience centers to the surrounding agricultural communities. The majority of towns in the area with populations of less than 1,000 may have a church, small grocery, gas station or garage, post office, bank, bar or liquor store, and one or two more small stores are usually a feed store, creamery, implement dealer, or hardware store. The towns below 1,000 population that have agriculturally related industry are Big Stone City, Corona, Veblen, and Wilmot. This is illustrated in Table 4.

Milbank, with eleven industrial companies, is considered the center of commerce and industry in the Minnesota River Lowland. The town of Milbank is a major supplier of goods and services for the southern half of the Minnesota River Lowland. It is also the home of Milbank Mutual Life Insurance which is a major employer in the

\[22\text{"This is Big Stone Plant."} \]
<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albee</td>
<td>26</td>
</tr>
<tr>
<td>Big Stone City</td>
<td>631</td>
</tr>
<tr>
<td>Claire City</td>
<td>100</td>
</tr>
<tr>
<td>Corona</td>
<td>133</td>
</tr>
<tr>
<td>Labolt</td>
<td>90</td>
</tr>
<tr>
<td>Marvin</td>
<td>65</td>
</tr>
<tr>
<td>Milbank</td>
<td>3,727</td>
</tr>
<tr>
<td>New Effington</td>
<td>258</td>
</tr>
<tr>
<td>Peever</td>
<td>202</td>
</tr>
<tr>
<td>Revillo</td>
<td>142</td>
</tr>
<tr>
<td>Rosholt</td>
<td>456</td>
</tr>
<tr>
<td>Sisseton</td>
<td>3,094</td>
</tr>
<tr>
<td>Twin Brooks</td>
<td>122</td>
</tr>
<tr>
<td>Weblen</td>
<td>377</td>
</tr>
<tr>
<td>White Rock</td>
<td>35</td>
</tr>
<tr>
<td>Wilmot</td>
<td>518</td>
</tr>
</tbody>
</table>

Fig. 46. Towns of the Minnesota River Lowland  
(Source: S.D. Road Map, 1977.)
Fig. 47. Courthouse on Milbank's Main Street
area with 250 employees on its payroll. Sisseton is a major supplier for goods and services for the northern half of the area.

The rural town plays an essential role in the modern rural community. Former isolation of the rural community is gone, and most families have frequent contact with a larger town such as the county seat. These towns with the larger populations can support a wider range of services than the local small town. Commercial agriculture and rising standards of living have made farmers dependent upon the goods and services offered by these larger communities. These communities composed of farm families will probably remain characteristic of the Minnesota River Lowland and other areas of South Dakota for years to come.
CHAPTER V
CONCLUSION

The stage play of the Minnesota River Lowland has been in progress for many years. The complexity of the area's actors or human society is recognized as it is reflected in the diversity of the area's physical and cultural landscape or its stage and set.

The area's physical environment is marked by a gently sloping terrain which awards this small physiographic area in South Dakota a diversity not found in adjacent areas. The floors of Lake Traverse and Big Stone Lake mark the lowest elevation in the state, and the slopes of the Coteau des Prairies on the area's western border represents the steepest change in elevation in eastern South Dakota.

The geomorphology of the area provides the Minnesota River Lowland with characteristics not found elsewhere in South Dakota. The quality and quantity of the area's granite in addition to the glacial moraines and rock deposits and the beach ridges left by Lake Agassiz all demonstrate the uniqueness of the area's geomorphology.

The humid Continental, "B" type climate of the Minnesota River Lowland is not found only in this area of South Dakota. However, it presents a marked difference from the dry climate in western South Dakota and the more humid, milder climate in southeastern South Dakota.

The area's climate was an important factor in developing the rich soils in the Minnesota River Lowland. These soils have the
highest organic matter and nitrogen content of all soils in South Dakota. The area's climate and soils determined the type of natural vegetation which developed in the area. The area's prairie vegetation plus the wooded river vegetation found in the eastern part of the study area presents the Minnesota River Lowland with a vegetational diversity not found in other areas of the state. This natural vegetation and the climate, soils and water of the area supports a wide variety of animal life. The area is especially favorable for waterfowl and many species of fish.

In contrast to many areas of South Dakota, the Minnesota River Lowland is marked by streams, lakes, sloughs and potholes. From this study it appears that the area has abundant surface and ground water. However, the true water capacity will not be realized until there is a more extensive demand by the area's industries, municipalities and agriculture.

Because of its abundant water and waterways and its other physical characteristics, the Minnesota River Lowland offered a natural attraction for many groups of people. The Paleo-Indians, Mound Builders and Sioux Indians provide the area with a heritage rich in Indian culture. The area's unique physical characteristics also attracted furtraders and white settlement in the 1800's. The Minnesota River Lowland became a new home for various ethnic groups of German, Scandinavian and Dutch descent who came to the area to escape unfavorable conditions in the Old Country. The cultural heritage provided by these various groups of people contributes to
the unique cultural environment employed by the area today.

The cultural environment of the Minnesota River Lowland closely reflects the area's climate, terrain, human occupancy, and natural resources. The European background of the area's homesteaders together with the area's physical environment influenced the type of agriculture practiced. New technologies have brought change to the area's agricultural activity, but it remains the major industry in the Minnesota River Lowland.

The area's uncommon geomorphology and early human occupants provided the area with a very productive mining industry. As noted previously, the appearance of granite of this quality and quantity is not a common occurrence in South Dakota. There is some manufacturing in the Minnesota River Lowland, but the area's industry and major modes of transportation are primarily dependent on the mining and agricultural activity.

The study area's physical environment furnishes the area with a wide variety of recreational activity not found in all areas of South Dakota. This transitional zone provides abundant summer and winter recreational opportunities.

As in other areas of South Dakota where agriculture is the main livelihood, the cities and towns of the Minnesota River Lowland are small and serve as convenience centers to the farm population. The larger communities of Milbank and Sisseton furnish the occupants with additional goods and services.

The physical and cultural environments and the people of the
Minnesota River Lowland all contribute to making it an inviting area in South Dakota. As one looks over the sloping terrain, it becomes apparent that this area of the earth is not only productive but has a natural beauty composed of patchwork fields, rows of shelterbelts, river vegetation and bodies of water. It is an area which has much to offer its inhabitants and visitors.

**Future**

There will no doubt be little population growth in the Minnesota River Lowland in the immediate future. Smaller towns in the area will probably have some decrease in population due to young people leaving the area for more lucrative employment opportunities elsewhere. The towns of Sisseton and Milbank may see some population increase from industrial expansion. However, the Minnesota River Lowland as a whole could possibly experience a population decrease because of the expanding farm size, the breaking up of small family farms, and big machine farming which requires fewer laborers per acre for operation. Current land values and probable future land value increases are making it more difficult for the young family to make a start at farming. This may also cause a decrease in the number of farms in the area. These factors might be offset by industrial expansion and growth which could absorb the farm labor loss.

Recreational development in the Minnesota River Lowland has much potential. With the exception of Hartford Beach State Park and a number of smaller private camping areas, the recreational opportunities of the area have been largely unexplored. The main
location of development could be along Big Stone Lake and Lake Traverse. The need for further development of recreational areas along these lakes may present itself with the completion of Interstate 29. Due to increased accessibility, along with the nation's expanding recreational demands, the development of the Minnesota River Lowland's recreational potential may become economically feasible.

Industry and agriculture might also benefit from the area's water supply. Presently, the only industry utilizing the waters of Big Stone Lake or Lake Traverse is the Big Stone Plant. There is also much irrigation potential for the area. At present, only a small portion of private land in the area is irrigated. Increased use of the area's water supply for irrigation depends on the continuation of a favorable economic climate and the willingness of farmers to engage in the activity.

The Minnesota River Lowland will continue to experience change. There will be new actors who will utilize their physical environment in different ways. The stage play continues.
BIBLIOGRAPHY

Books


James, Preston E. and Jones, Clarence F., eds. *American Geography, Inventory and Practice*. Syracuse, N.Y.: Syracuse University.


Morris, H.S. *Historical Stories, Legends and Traditions; Roberts County and Northeastern South Dakota*. Sisseton, South Dakota: The Sisseton Courier, n.d.


**Public Documents**


Journals


Agricultural Experiment Station Publications


Westin, Fred C.; Puhr, Leo F.; and Buntley, George J. Soils of South Dakota. South Dakota State University Agricultural Experiment Station Soil Survey Series No. 3. Brookings, South Dakota: Agricultural Experiment Station, 1967.

Miscellaneous

Hogan, Edward Patrick. "Geography of South Dakota." South Dakota State University, Brookings, South Dakota, 1976. (Mimeographed)
Montana-Dakota Utilities Company, Northwestern Public Service Company, and Ottertail Power Company. "This is Big Stone Plant." (Mimeographed.)


Westin, Frederick C. Professor of Plant Science, South Dakota State University, Brookings, South Dakota. Interview, 11 July 1977.