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SOUTH DAKOTA GEOLOGICAL SURVEY
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Circular 38

SAND AND GRAVEL DEPOSITS IN CAMPBELL COUNTY, SOUTH DAKOTA

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INTRODUCTION

This circular is designed to aid in the exploration and development of the sand and gravel resources in Campbell County, South Dakota. A publication entitled, "Glacial Aquifers in Campbell County, South Dakota, South Dakota Geological Survey, Water Information Circular 2," describes the ground water possibilities in the County. A comprehensive report on the technical aspects of the geology, hydrology, and the basic data will be published as Bulletin 20, Parts I, II, and III, respectively at a later date.

The purpose of this report is two-fold: (1) to disseminate data quickly, and (2) to portray the technical data in a non-technical map and vocabulary so that it will be useful to the lay reader. All of the pertinent geologic data used in compiling the technical reports has been used in preparing the accompanying maps showing the sand and gravel potential in Campbell County.

It is recommended that in addition to this circular, the following publications be used as companion references:

(a) Evaluation of exploration methods for coarse aggregate in eastern South Dakota, S. Dak. Geol. Survey Report of Investigations No. 95 ..... Price $1.50
(b) Geology and water resources of Campbell County, South Dakota, Part III, Basic Data, S. Dak. Geol. Survey Bulletin 20 ..... Price $2.00
(not available until 1970)

The first of the above publications explains how aggregate resource maps are prepared from geologic data and maps. The second publication contains all the test hole data which was used in compiling the maps in this circular.

GEOLOGIC TERMS

The following brief discussion of geologic terms is presented as an aid in understanding the discussion of sand and gravel deposits, and in the use of the accompanying maps.

Outwash

Glacial outwash is a general term which refers to any deposit of clay, silt, sand, gravel, or boulders that has been washed and sorted, and subsequently deposited by water from melting glacial ice. Depending on the amount of washing and sorting action, the material may be mostly silt and clay-size, or in the other extreme, glacial outwash may consist mostly of boulders. Most glacial outwash is a mixture of material between the two extremes. A mixture of material between the two extremes is normally referred to as outwash sand and gravel deposits.

In this report when the term "glacial outwash" is used it refers to any size material ranging from clay to boulders which has been deposited by glacial meltwater. Thus, on figure 1 which is a geologic material map, those areas which are shown as glacial outwash may contain material of any size from silt and clay to boulders. Outwash deposits which are comprised of extremes in size of glacial outwash material are commonly found adjacent to each other and intermixed with each other.

Till

Glacial till is a term which refers to the unsorted and unstratified material let down by glaciers as the ice slowly melted away. This material has not been subjected to the action of running water and therefore is a mixture of clay and silt-size particles containing a random mixture of sand, gravel, and boulders. This material is locally called "boulder clay" or "blue clay."

The general distribution of the "boulder clay" is shown on figure 1. Within the large area of "boulder clay" there may be small isolated hills and lenses of glacial outwash material.

Often these small areas of glacial outwash material consist of sand and gravel which may be suitable for aggregate. The size of these small areas of outwash material ranges from less than an acre to several acres. The thickness of the lenses may range from a thin veneer of one to two feet to as much as 50 feet.

Due to complexities in the mechanics of deposition from the glacier ice these small hills and lenses of glacial outwash have a very erratic occurrence. Their presence generally cannot be determined unless the outwash material is exposed or unless its presence is known from hand auger holes, test holes, or other actual sampling procedures.

In summary, throughout the broad expanse of "boulder clay" areas almost every square foot of land may be a potential source of outwash material. On-site investigation of each area is therefore required to absolutely determine the presence or absence of an aggregate source.

Bedrock Deposits

Bedrock deposits refer to the consolidated sedimentary rocks underlying the glacial deposits. In Campbell County the bedrock consists predominantly of shale, which is mostly clay, and some small isolated deposits of unconsolidated sand and sandstone. The shale is present in a strip one to three miles wide along the Missouri River (fig. 1) and underlies the glacial deposits throughout the rest of the county. The sand and sandstone associated with the shale is present primarily along the northern border of the county in a strip about one to two miles wide extending from the Missouri River to about 6 miles east of Pollock.

None of the bedrock deposits are considered a source of aggregate at the present time.

SAND AND GRAVEL PROBABILITY MAP

Definition of Sand and Gravel

As pointed out in the previous section of this paper, glacial outwash, a source of aggregate, may consist of material ranging in size from clay to boulders. For the purposes of discussion in this section of the circular the use of the term "sand and gravel" as a potential aggregate source is restricted to the following definition:

> "Sand and gravel is a deposit consisting primarily of sand, or of gravel, or a mixture of both, in which the predominant material size is medium sand or coarser."

Thus, when the term "glacial outwash" is used it refers to a general geologic deposit of clay to boulder-sized material. When the term "sand and gravel" is used it refers to any deposit falling within the above definition of sand and gravel.

Use of Sand and Gravel Probability Map

The sand and gravel probability map (fig. 2) is designed to serve two fundamental purposes:

(1) The first purpose is to portray general information pertaining to the probability of finding a sand and gravel deposit in one area of the county as opposed to any other area of the county. This has been done by dividing the county up into probability regions (H, G, F, P, and N). (See fig. 2.) Those areas marked (H) have the highest probability of containing a sand and gravel deposit. Those areas marked (N) do not contain sand and gravel deposits. Thus, all areas except area (N) contain known sand and gravel deposits.

The value of the divisions on the map showing the probability ratings is derived from their usefulness in broad-scale planning for the exploration of sand and gravel deposits. Using this information in conjunction with the other information portrayed on the map will allow more effort to be spent in those areas which have the highest probability of containing sand and gravel deposits of the desired quality and quantity.

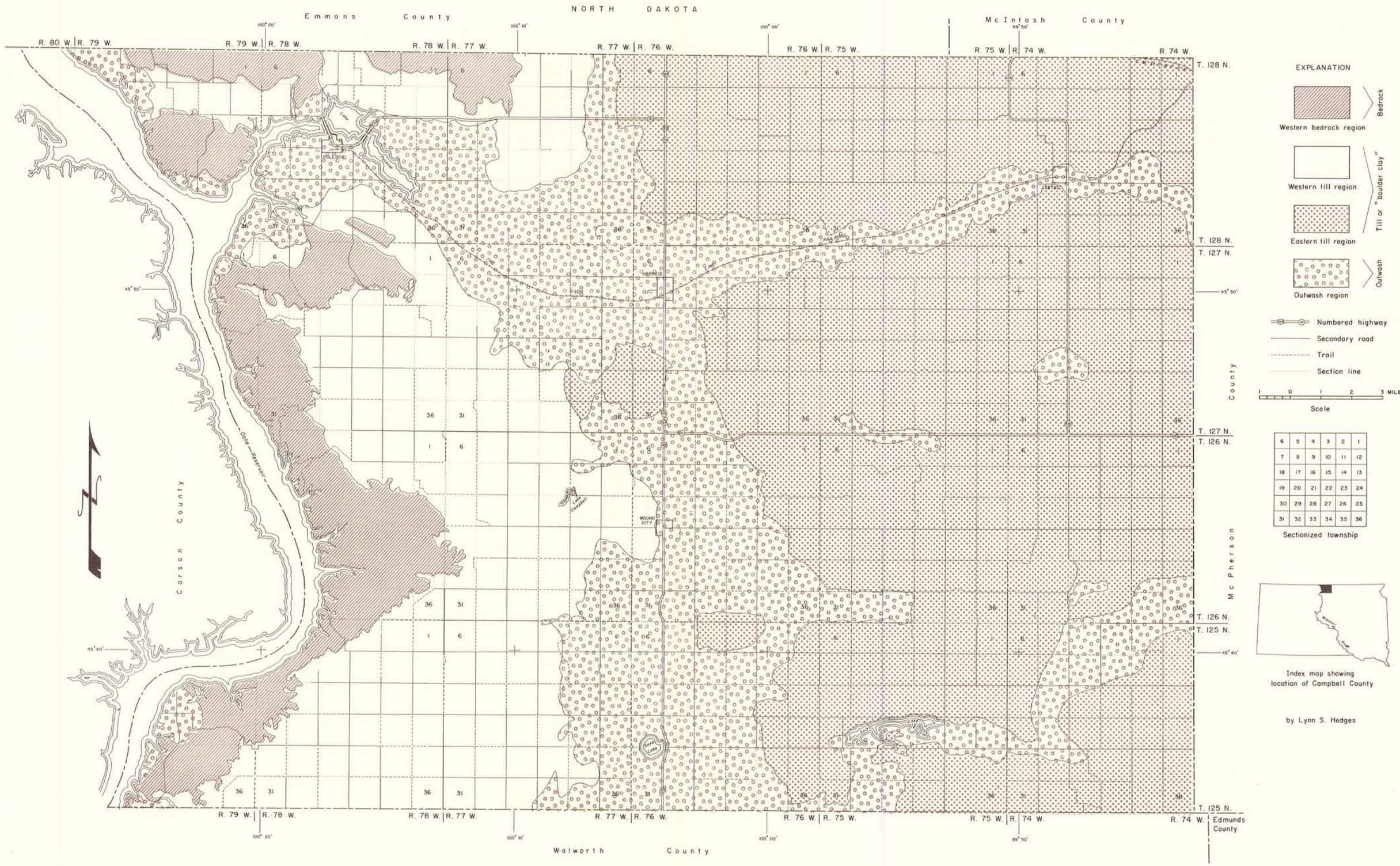

Figure 1. Geologic materials map of Campbell County, South Dakota.

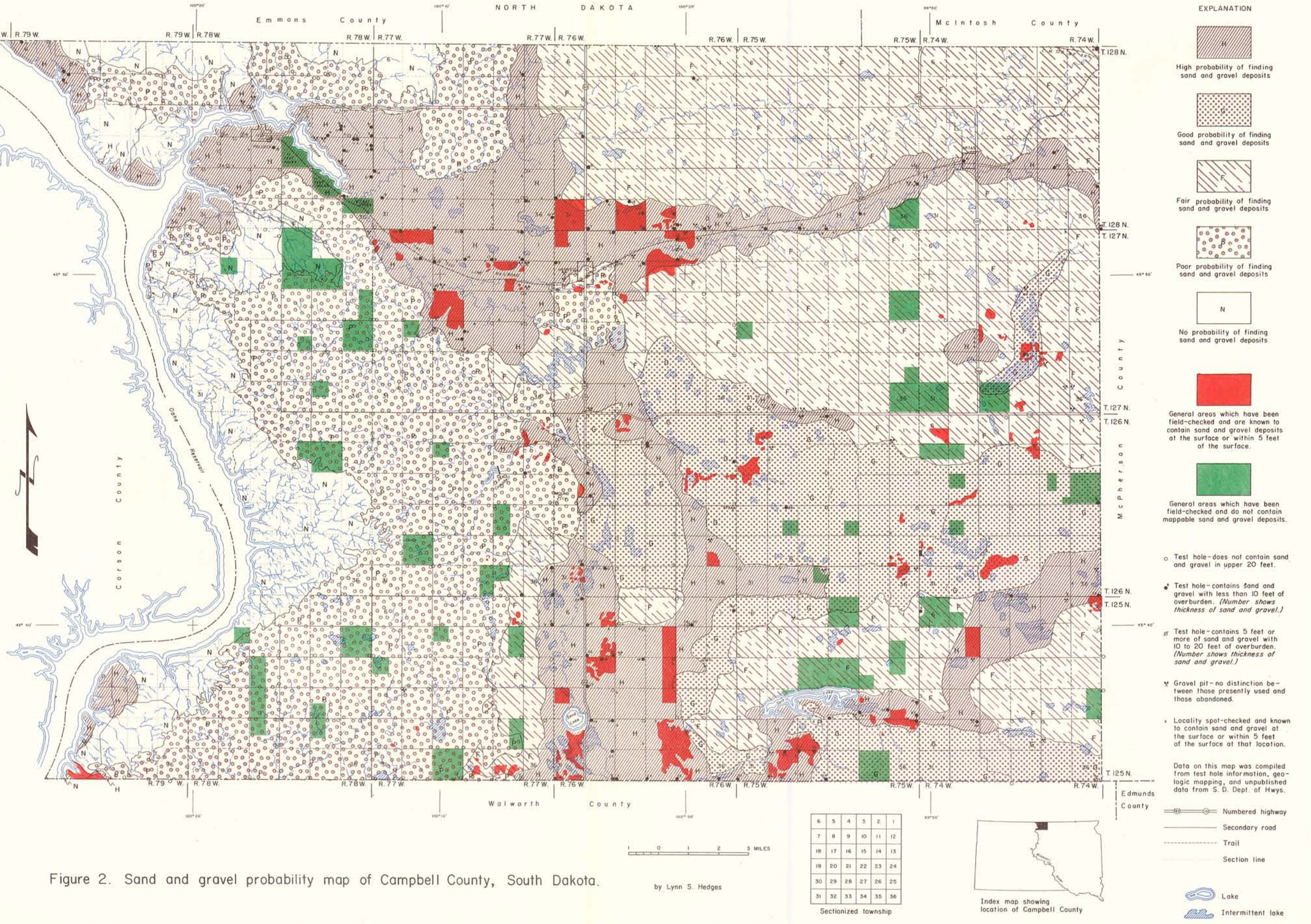

Figure 2. Sand and gravel probability map of Campbell County, South Dakota.

by Lynn S. Hedges

(2) The second purpose of this map is to show the location of all the known sand and gravel deposits in Campbell County. This is done by using a series of symbols and colors to represent field data of various types which pertain to sand and gravel deposits (see fig. 2).

For instance, one set of symbols, the dots and open circles, indicates that a test hole is present at that particular location. The type of dot or circle and the accompanying number shows whether any sand or gravel was present, shows the thickness of sand and gravel present, and gives an indication of the amount of overburden present.

A (⚒) shows the location of sand and gravel quarries within the county.

An (x) represents a location where a spot field check was made and shows sand and gravel within five feet of the surface. The total thickness of the sand and gravel is unknown at that location.

A red color pattern shows an area that was observed to contain sand and gravel. A green color pattern shows an area that was observed to contain no sand and gravel. Within these colored areas spot sampling could show an absence of sand and gravel in the red areas and the presence of sand and gravel in green areas (see fig. 2); thus, the colored areas serve only as guides rather than as areas which have been 100 percent checked for the presence of sand and gravel.

It should be pointed out and emphasized that this map is a general map to be used only as a guideline for further exploration and development of sand and gravel resources. The development of any specific site would depend upon materials specifications for the desired use, and the economics of further exploration and testing as opposed to the use of known sources of sand and gravel.

GENERAL HINTS FOR EXPLORATORY PURPOSES

The geologic materials map illustrated on figure 1 shows the distribution of the major types of deposits in Campbell County. If the materials map on figure 1 is compared to figure 2 it is apparent that areas comprised of similar geologic materials may have a different probability rating for containing sand and gravel deposits. Likewise, the general topographic occurrence of sand and gravel deposits may also vary in these different areas. Thus figure 1 has been constructed so that it also divides the county into different regions. In each region the sand and gravel deposits are more likely to occur in certain types of topographic settings. The various regions are listed below along with general instructions as to where to look for sand and gravel deposits in each general region.

Western Bedrock Region

The western bedrock region has only bedrock material at the surface, and does not contain sand and gravel deposits. Therefore exploration for sand and gravel deposits in this region is unwarranted.

Western Till Region

In the western till region the sand and gravel deposits most often occur as small benches or terraces along the small streams and ravines, or are exposed in the walls of the small streams and ravines underlying various types of material.

Eastern Till Region

In the eastern till region the individual hills or ridges, or a series of hills and ridges, generally are more likely to contain sand and gravel deposits than the low-lying areas between the hills and ridges. Thus, in any one square mile there may be several tens of hills and ridges which potentially may contain sand and gravel deposits. This is particularly true for the area rated as (G) on the probability map (fig. 2).

In the areas rated (F) on the probability map the individual hills and ridges are generally less pronounced and are less likely to contain sand and gravel deposits.

Outwash Regions

As previously pointed out in this Circular the occurrence of sand and gravel in outwash deposits is quite erratic. Thus the following generalizations for sand and gravel in outwash regions should be understood to be only generalizations which must be used as a guide along with the other data shown on figure 2. These generalizations also apply only to the broad expanses of outwash and not to the small isolated outwash bodies ranging in size from several hundred acres to two square miles in size. The following areas and topographic settings are pointed out as being more favorable exploration areas in the outwash regions.

(1) Along Spring Creek from the eastern border of the county to Herreid.
(2) Along Spring Creek and within one mile of Spring Creek from Herreid to the southeast extent of Lake Pocasse.
(3) The more undulating outwash areas, especially where they are adjacent to the eastern till regions.