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Wilson M. Laird, State Geologist

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# GUIDEBOOK FOR GEOLOGIC FIELD TRIP

# GRAND FORKS TO PARK RIVER

by
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Grand Forks, North Dakota, 1957

# GRAND FORKS TO PARK RIVER ROAD LOG

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## INTRODUCTION

### Purpose

This guidebook is one of a series prepared specifically for use by Boy Scouts of America during the month of October, 1957, which has been designated "Geology Month in Scouting". This guidebook series provides guides to field tours to points of geological interest around various cities in North Dakota. They will be useful not only to Boy Scouts but to other individuals who are interested in the geology of the particular area in which they live and to tourists who may be interested in some of the most interesting geological features in the state. These guides cover in a general way the geological processes important in landscape formation in the area. For obvious reasons no extensive discussion of geological principles is included in the reports. This road log is prepared especially for residents of Grand Forks and vicinity as a guide to the geology along U. S. highway 2 west of Grand Forks thence north on N. D. highway 18, Walsh County highway 19 and Walsh County highway A12 to Park River. There the trip joins a previously prepared field trip in northeastern North Dakota and this road log should be used in conjunction with North Dakota Geological Survey Bulletin 30, "Guide for Geologic Field Trip in Northeastern North Dakota". The trip to Park River is about 69 miles and the northeastern North Dakota trip covers about 80 miles.

### What is Geology?

The word "geology" is taken from two Greek words which mean literally "earth study". One might ask the reason for this study.

In the first place, everybody should be interested in geology simply because of the fact that it concerns the earth on which we dwell. Therefore, if we are intelligent human beings, we should wish to know as much as we possibly can about the planet on which we live. One of the really interesting things about geology is that it shows man's adaptation to his environment as clearly or more clearly than any other subject available to him.

Secondly, there is also the possibility of interest in geology from the professional standpoint. Geologists are employed by State and Federal Surveys and in teaching as well as by oil and mining companies. Although the profession of geology is not a large one compared to other professions, it is an extremely important one, as it is the geologists who locate for us the basic raw materials on which our civilization rests.

## Geology of the Area

In the Pleistocene, a great continental glacier advanced from the north and dammed many north-flowing rivers. As it pushed forward it destroyed the lakes created by the dammed rivers and deposited till in the valleys. However, during retreat of the glacier, great lakes were again formed in the dammed river valleys in front of the melting ice sheet.

Since the Red River flowed north before Pleistocene times just as it does today, a vast lake, known as Glacial Lake Agassiz, formed behind the shrinking Pleistocene ice sheet.

Marginal lakes developed as soon as the ice front began to retreat and lay bare the north-sloping surface. The lakes expanded into new areas as the ice front retreated further forming, eventually, Glacial Lake Agassiz at the highest stage. At one time Lake Agassiz flooded an area of 110,000 square miles, which is greater than the combined area of the present Great Lakes. It lay mainly within Canada, but covered 15,000 square miles of Minnesota and 6,800 square miles of North Dakota and rose more than 650 feet above the level of Lake Winnipeg. Lakes Winnipeg, Manitoba, and Winnipegosis are remnants of former Lake Agassiz in Canada, as are Rainey Lake, Lake of the Woods, and Red Lake in the United States.

In a lake waves beat upon the shore piling sand and gravel into beach ridges. The highest beach ridge of Lake Agassiz has been named the Herman beach. With each major retreat of the ice, the water area so greatly expanded in the north that the level of the lake fell. At each level where the lake stood for any time a new beach with local sand bars and spits was formed. In order, down from the highest or Herman stage, the major beaches are called the Norcross, Tintah, Campbell, and McCauleyville shorelines which were formed while the lake drained southward. Below these is a series of lesser beaches formed during the period of time when Lake Agassiz drained to the northeast along the ice front. These lower beaches are, in order from the highest down, the Blanchard, Hillsboro, Emerado, Ojata, and Gladstone shorelines. The beaches of Lake Agassiz rise in orderly succession as one goes east or west from Grand Forks. On this trip we will cross the Gladstone beach ridge about 7 miles west of the airport.

From the Herman to the McCauleyville stage, Glacial Lake Agassiz drained southeastward through Lake Traverse and Big Stone Lake into the Minnesota River. Following the McCauleyville stage the ice retreated far enough to allow the lakesto drain along the ice front east to the Mississippi and later through the Great Lakes to the Hudson River or the St. Lawrence River. Eventually the ice receded enough to uncover the northward drainage through the Nelson River to Hudson Bay leaving only the lakes mentioned above.

These and other geological features in connection with Lake Agassiz are discussed in more detail in Bulletin 30 mentioned above. Today we owe the fertile soil of the Red River Valley to the rich glacial material brought into Glacial Lake Agassiz by streams around the edge and spread by currents within this vast lake. Sand and gravel of the beach ridges is used in construction material and as road gravel. Water is obtained from sand spits and bars formed within the lake.

## REFERENCES FOR ADDITIONAL READING

### General References


Emmons, W. H., Thiel, G. A., Stauffer, C. R., and Allison, I. S., 1955, Geology, Principles and Processes (Fourth Edition): McGraw-Hill Book Co., Inc., New York. (General text on physical geology).

Dunbar, C. O., 1949, Historical Geology: John Wiley & Sons, Inc., New York. (General text on historical geology).

Flint, R. F., 1957, Glacial and Pleistocene Geology: John Wiley & Sons, New York, (Advanced college text, which, however, contains a wealth of readable information on glacial geology).

Hainer, J. L., 1956, The Geology of North Dakota: North Dakota Geol. Survey, Bull. 31. (General Booklet on the geology of the state).

Longwell, C. R., and Flint, R. F., 1955, Introduction to Physical Geology: John Wiley & Sons, Inc., New York. (General text on physical geology).

Stovall, J. W., and Brown, H. E., 1954, The Principles of Historical Geology: Ginn and Co., Boston. (General text on historical geology).

Willard, D. E., 1921, The Story of the Prairies: Ihling Bros. Everard Co., Kalamazoo, Michigan. (Although out of date this book contains the geological story behind landscape formation in North Dakota).


Publications on the geology of North Dakota are available from the North Dakota Geological Survey, Campus Station, Grand Forks. A list of these publications and their price is available on request.

Topographic maps of certain areas in North Dakota are available from the U. S. Geological Survey, Denver Federal Center, Denver, Colorado. A map index to the areas mapped is available from this address on request.

### Specific References on this Area


Laird, W. M., 1944, The Geology of the Turtle River State Park: North Dakota Geological Surv., Bull. 16.

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Leverett, Frank, 1913, Early Stages and Outlets of Lake Agassiz: North Dakota Agricultural College Survey, 6th Bienn. Rept., p. 17-28.

_____________, 1932, Quaternary Geology of Minnesota and Parts of Adjacent States: U. S. Geol. Survey, Prof. Paper 161.

Nikiforoff, C. C., 1947, The Life History of Lake Agassiz: Alternative Interpretation: American Jour. Sci., v. 245, p. 205-239.

Tyrrell, J. B., 1896, The Genesis of Lake Agassiz: Jour. Geology, v. 4, p. 811-815.

Upham, Warren, 1895, The Glacial Lake Agassiz: U. S. Geol. Survey, Monograph 25.

# ROAD LOG

0.00 Assemble on North Fourth Street and Eleventh Avenue North west of Wilder School.

.10 Turn left (west ) on Skidmore Avenue.

.20 Junction of U. S. highways 2 and 81. Proceed west on U. S. highway 2.

1.10 Bridge over English Coulee.

.30 Bridge.

.50 Railroad tracks and northeast corner of Grand Forks International Airport. Elevation 832 feet.
For the next few miles west observe the level lake plain formed by Glacial Lake Agassiz sediments. In this area the lake plain is so "flat" that, as on the high seas, the curvature of the earth can be observed by noting that the distant trees and buildings sink below the horizon.

6.70 Note the sandy soil visible in the low cuts. The lake sediments were principally of three kinds depending on the relation of the area to streams emptying into Glacial Lake Agassiz and the sorting of the material by currents within the lake. These types are clay, silt, and sand. In the Grand Forks area most of the soil is silty with minor amounts of sand included. Note that there are almost no boulders in the fields. Along the beach ridges numerous boulders which became consentrated at the shore plague the farmers. In some places along the route scattered boulders are to be seen in the fields; these were probably rafted to their resting place by icebergs in Lake Agassiz.

.50 Bridge over Freshwater Coulee. This is about the position where the highway should cross the Gladstone beach ridge, but the coulee has here cut away the beach so that it is not visible.

1.20 Bridge over Saltwater Coulee.

2.70 Entering flat bottomed slough which is an extension of Saltwater Coulee to the south. This coulee has been eroded in the lake plain and was not a feature of the old lake bottom in Pleistocene time.

.80 Out of slough.

.70 Low ridge of the Ojata beach of Lake Agassiz. Approximate elevation 875 feet. This is the first such ridge which is to be clearly seen west of Grand Forks. We will cross higher and more prominent beaches to the west.

1.10 Road south to Emerado.

.70 Emerado beach. Approximate elevation 900 feet. Note old sand and gravel pits to south.

.35

Railroad tracks.

.10

Entrance to airbase north of highway.

2.50

Hillsboro beach ridge. Approximate elevation 930 feet. Gravel is currently being removed along this ridge for construction purposes.

.80

The Blanchard beach is triple and this is the easternmost of three ridges marking the Blanchard stage of Lake Agassiz. The three beaches were created during minor pauses in the fall of the lake. Approximate elevation 940 feet.

.20

Blanchard beach ridge. Approximate elevation 950 feet.

.40

Blanchard beach ridge. Approximate elevation 960 feet.

.80

Road curves south.

.10

The road crosses the McCauleyville beach. Approximate elevation 980 feet. Because of grading along the highway the McCauleyville beach ridge is not well seen here. However this is normally a well defined beach and it can be well seen in Turtle River State Park and also to the south of the highway. The McCauleyville beach is the lowest formed while Glacial Lake Agassiz drained to the south. The other lower beaches we have crossed were formed while Lake Agassiz drained to the northeast.

.20

Grand Forks Co. highway 2 south to Arvilla. Continue west on U. S. highway 2.

.20

Campbell beach with old gravel pits to the north of the highway. Approximate elevation 1,000 feet.

.70

Entrance to Turtle River State Park.

.40

Bridge over Turtle River.

.30

Note terrace in Turtle River Valley to the south of the highway. The silt and sand of this terrace was deposited at this level by the Turtle River when it carried more material during the moister time of the Pleistocene.

.30

Note the numerous erratic boulders cleared from the fields in this area.

1.70

Highway curves due west. The sand pit to the northeast is in the offshore edge of the Tintah beach.

.30

Tintah beach ridge. Approximate elevation 1,050 feet. Note the boulders concentrated along the ridge to the north.

.90

Second or lower Norcross beach. Approximate elevation 1,080 feet.

.30

Bridge over Turtle River.

.60

First or upper Norcross beach, (approximate elevation 1,090 feet) scarcely visible because it is here cut out by the Turtle River.

.80

Lower Herman beach. The Lower Herman beach is here a bread area that is quite hilly and very pronounced. Approximate elevation 1,120 feet.

.40

Highway curves north.

.30

Junction with N. D. highway 18 from the south.

.80

Crossing Lower Herman beach which is here rather wide and vague. Since the beaches in North Dakota trend in a northwesterly direction we will cross several of them again.

2.10

Highway curves west.

.10

Turn right (north) on N. D. highway 18. U. S. highway 2 continues west. Six miles west of here is the Upper Herman beach (approximate elevation 1,150 feet) which is the highest and most pronounced shoreline of Glacial Lake Agassiz.

.20

Crossing Turtle River again. Bluish gray glacial till is exposed in the ditch west of the highway on the north bank of the river. Till is stiff clay full of rocks varying in size up to boulders, which is deposited under the bottom of the glacier. The Turtle River has cut down through the lake sediment to expose the underlying till.

.80

Norcross beach.

1.40

Surveying correction line; jog east.

1.30

The road crosses the Tintah beach at about this point, but it is very indistinct here.

5.10

Going down off Campbell beach level. The beach ridge is especially well seen running nearly parallel to the road to the west.

1.70

Gravel pit in McCauleyville beach east of road.

.20

Crest of McCauleyville beach ridge. The Campbell beach is plainly visible to the west.

1.20

Inkster one mile to west.

2.20
Bridge over Forest River.
3.20
Turn left (west) on Walsh Co. highway 19. The higher ground visible to the west is the McCauleyville and Campbell beaches.
1.10
Small iron bridge.
1.30
Great Northern Railroad tracks; Conway to the north.
.10
McCauleyville beach.
.50
Campbell beach.
.20
Turn right (north) on Walsh Co. highway A12.
1.10
Cemetary east of road.
.10
The road starts down off the Campbell beach.
.40
Minneapolis, St. Paul, and Sault Ste. Marie railroad track.
.30
Down off McCauleyville beach.
.90
Great Northern railroad track.
2.50
Road turns left (west).
.80
Road turns right (north).
1.20
Village of Pisek.
6.40
Turn left (west) on N. D. highway 17.
1.30
Park River city limits.

End of this part of road log. Pick up trip at mileage 16.0 on p. 17 of North Dakota Geological Survey Bulletin 30.