RESEARCH COUNCIL OF ALBERTA

Preliminary Report 56-3

A RADIOCARBON DATE from Smoky Lake, Alberta

by

C. P. GRAVENOR AND B. ELLWOOD

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Research Council of Alberta
University of Alberta
Edmonton, Alberta
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FIGURE

A RADIOCARBON DATE FROM SMOKY LAKE, ALBERTA

INTRODUCTION

While digging a well in November 1954, Mr. J. Kachmar of Smoky Lake, Alberta, struck a log at the 24-foot level. The log was lying in an east-west direction and obstructed Mr. Kachmar's excavation. He chopped out the log and in April 1955 submitted pieces of the wood to the University of Alberta for identification and age-dating. As no radiocarbon age-dating equipment is available in Alberta, the wood was sent to the Physics Department at the University of Manitoba where it was found to be 21,600±900 years B.P.

After the dating a drilling program was carried out by the Research Council of Alberta to verify the stratigraphic sequence given by Mr. Kachmar. Some 34 holes were drilled around the site, using a power-driven auger type drill.

Acknowledgments

The writers are indebted to Mr. J. Kachmar of Smoky Lake, Alberta, for supplying the original wood samples and for granting permission to drill on his property. Thanks are extended to Dr. W. Turchinetz, Physics Department, University of Manitoba, for dating the wood. Mr. S. J. Groot, draftsman-compiler for the Research Council of Alberta, prepared the accompanying figure.

Location of Site

Smoky Lake is located about 60 miles northeast of Edmonton and the farm of Mr. Kachmar is located about 3 miles east of Smoky

Lake in Lsd. 1, Sec. 13, Tp. 59, R. 17, W. of 4th Meridian. The well in which the log was found, is located about 60 feet southeast of Mr. Kachmar's farmhouse.

General Geologic Setting

The area around Smoky Lake, including the site from which the log was taken, is a gently undulating till plain. Just to the northeast of Smoky Lake there is a morainic system, which, according to Bretz (1943) is the Altamont moraine. Warren (1944), Rutherford (1941), and Bayrock (1955), however, place the Altamont moraine some 20 to 30 miles east of the position marked by Bretz. Warren (1944) and Rutherford (1941) have mapped the moraine just northeast of Smoky Lake as the Viking moraine. Whichever interpretation is correct, it is certain that the Smoky Lake site lies to the west of the Altamont moraine which possibly marks the western limit of Mankato ice (Alden, 1932; Johnston and Wickenden, 1931; Bretz, 1943).

Description of Wood and Dating

The wood found at the Smoky Lake site is in an excellent state of preservation due to the fact that it is found in a non-oxidized, relatively impermeable, blue-grey till. The wood has been identified as spruce by J. Campbell, Paleobotanist, Research Council of Alberta. Dr. Campbell informs the writers that the wood shows evidence of strain, probably caused by twisting during ice transport. There was no bark on the wood.

The dating was performed by a liquid scintillation technique (Pringle, Turchinetz and Funt, 1955) and the average value for two determinations was 21,600±900 years. The method used in dating

this particular sample was a slight modification of the technique outlined by Pringle, Turchinetz and Funt (1955) and involved the use of tri-methyl borate as the labelled compound, dissolved in a host solution of xylene, naphthalene and P.P.O (Turchinetz, personal communication).

STRATIGRAPHY

The stratigraphy of the district around the site was obtained by drilling with a Mobile auger type drill. Logs were made during the drilling and samples were taken at 1-foot intervals around Mr. Kachmar's well (Nos. 13, 14, 15 and 16, Appendix). One hole, drilled beside Mr. Kachmar's water well, showed bedrock to be at 79 feet below the surface.

No samples were taken from this bedrock test hole as caving and occurrence of water-saturated materials in the lower part of the hole made accurate sampling impossible. At the other locations logs were made during drilling and samples were taken at 5-foot intervals. In general, drilling was concluded when water-saturated material was encountered. Location of drill holes is shown on Figure 1, page 10.

The results of the drilling program (see Appendix) show that there is a surface brown till underlain at variable depths by a grey to blue-grey, generally more clayey till. This change in color from brown to grey is usually gradual, but in some cases quite abrupt. A few lenses of sand and gravel are found within the upper brown till. These lenses of stratified material cannot be traced from one hole to the next, nor do they appear to have any stratigraphic significance.

It is assumed that they are local lenses of stratified materials which are commonly found in the ground moraine of central Alberta.

The grey till contains local pockets of brown till and in some cases layers of lignite-bearing material. The pockets of brown till are found in the more sandy phases of the grey till, and they are believed to represent oxidized phases of the grey. The lignite-bearing bands are local accumulations in the till of Upper Cretaceous coal. Coal flecks are found throughout the grey and brown tills, and the carbonaceous or lignite bands represent heavy accumulations of coal in the till; these bands have no apparent stratigraphic significance. The wood taken from Mr. Kachmar's well was found in grey till.

The Pleistocene sequence in central Alberta is given by Warren(1954) as follows:

Silt till
Strathcona sands and silts

Brown till
Tofield sands and gravels

Grey till
Underlying strata, Saskatchewan gravels and sands, or Paskapoo or Cretaceous

No evidence of the silt till has been found in the Smoky Lake district. The problem arises: Is the underlying grey till found at Smoky Lake an unoxidized phase of the upper brown till or is the underlying grey till a separate and older till? The writers believe that the grey till represents an unoxidized phase of the brown, and hence the brown and the grey are the same till and belong to a single glaciation. This conclusion is based upon several observations:

(a) There is no evidence of the Tofield sands and gravels, soil development, or stratigraphic discontinuity, between the brown and grey color change.

(b) There is no apparent lithologic difference between the two tills.

(c) In most cases the color change is gradual and pockets of brown till appear in the grey.

(d) A similar color change has been noted in outcrop sections and in drill holes in other parts of Alberta where upper brown till is only an oxidized phase of the lower grey (Gravenor and Bayrock, 1955).

If the above conclusion is correct, then the wood found at Smoky Lake is enclosed in the surface till.

Conclusions

Evidence from other areas (Flint and Rubin, 1955) suggests that logs which are found in till represent forests which were destroyed by an advancing ice sheet. Hence the dates on such logs are the dates when the forest was actually destroyed by the oncoming ice. It is also significant to note that such logs were apparently deposited soon after they were incorporated in the ice (Flint and Rubin, 1955, p. 3). Consequently, the time-break between the destruction of the forest and deposition of the log is apparently short.

On the basis of this single date it would be hazardous to correlate the surface till of the Smoky Lake district with the tills of eastern North America. The suggestion is, however, that the surface

till of central Alberta belongs to the "middle group" of Flint and Rubin (1955) and perhaps is Tazewell in age.

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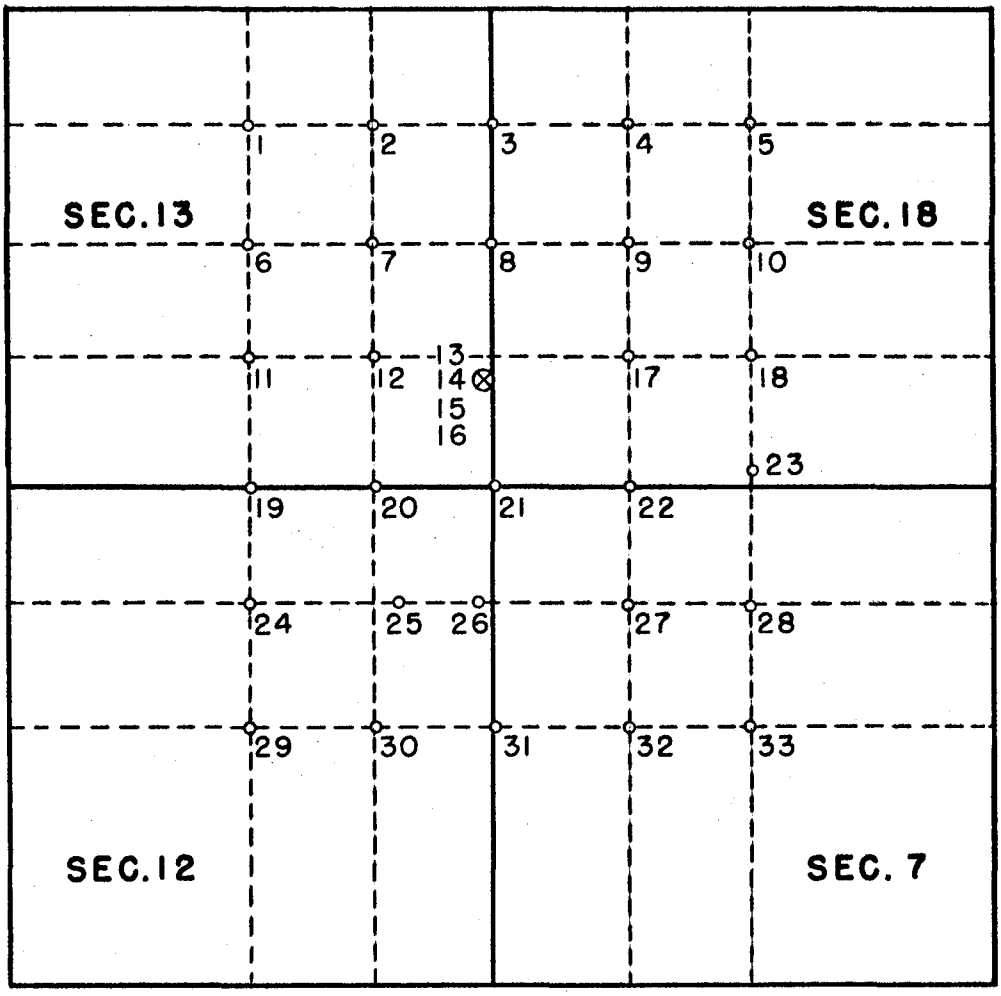

Figure 1. Diagram to show location of drill holes (°17)
⊗ Kachmar farm, Lsd. 1, Sec. 13, Tp. 59, R. 17, W. 4 th.

APPENDIX

Drill Holes

The location of drill holes is shown in Figure 1.

Drill hole No.	Depth below surface, feet	Description of material
1	0 - 3	Grey-green clayey till
	3 - 5	Grey and brown clayey till
	5 - 10	Light-brown very sandy till
	10 - 19	Grey-brown sandy till
	19 - 21	Blue clayey till
	21 - 33	Blue-brown sandy till
2	0 - 5	Grey-brown clayey till
	5 - 14	Light-brown sandy till
	14 - 20	Blue-brown clayey till
	20 - 25	Light-brown clayey till
	25 - 38	Blue-brown clayey till
3	0 - 5	Light-brown sand
	5 - 15	Light-brown sandy clay till
	15 - 16	Dark brown clayey till
	16 - 38	Blue-grey clayey till
	38 - 40	Brown sandy till
	40 - 41	Lignite-bearing till; contains fragments of local bedrock
	41 - 42	Blue clayey till
	42 - 45	Brown clay till
	45 - 51	Blue clayey till
4	0 - 3	Yellow coarse clean sand
	3 - 5.5	Brown sandy till
	5.5 - 6.5	Coarse yellow sand
	6.5 - 14	Brown sandy till
	14 - 20	Blue-grey clayey till
	20 - 21	Lignite-bearing till
	21 - 36	Blue-grey clayey till
5	0 - 5	Light-brown coarse sand
	5 - 8	Sand mixed with clayey till
	8 - 15	Brown sandy till
	15 - 17	Dark brown sandy till
	17+	Water-saturated zone

Drill hole No.	Depth below surface, feet	Description of material
6	0 - 2	Light-grey till
	2 - 3	Yellow sandy till
	3 - 5	Yellow coarse sand
	5 - 10	Yellow sandy till
	10 - 11.5	Grey clayey till
	11.5- 14	Brown clayey till
	14 - 43	Blue-brown clayey till
7	0 - 2	Grey-brown clayey till
	2 - 5	Yellow-brown clayey till
	5 - 14	Brown clayey till
	14 - 32	Blue-grey clayey till
	32+	Water-saturated gravel (glacial)
8	0 - 5	Light-yellow sandy till
	5 - 10	Light-brown sandy till
	10 - 15	Dark brown sandy till
	15 - 17	Light-brown sandy till
	17 - 20	Dark brown sandy till
	20 - 24	Pale brown sandy till
	24 - 27	Blue-brown sandy till
	27 - 38	Dark blue clayey till
9	0 - 5	Loose earth in ditch
	5 - 10	Light-brown sandy till
	10 - 14	Brown sandy till; contains sand lenses
	14 - 17	Yellow-brown very sandy till; water-saturated
	17 - 21	Grey clayey till
	21 - 26	Yellow-brown sandy till
	26 - 27	Lignite-bearing zone
	27 - 32	Brown carbonaceous till
	32 - 33	Lignite-bearing zone
	33 - 43	Blue-grey clayey till
10	0 - 3	Sandy clay
	3 - 5	Brown clean sand
	5 - 11	Brown sandy-clay till
	11 - 15	Brown clayey till
	15 - 18	Blue-grey clayey till
	18 - 20	Brown sandy till
	20 - 23	Dark blue clayey till
	23 - 25	Brown sandy till
	25 - 23	Dark blue clayey till
	33 - 40	Brown sandy till

Drill hole No.	Depth below surface, feet	Description of material
11	0 - 6	Light-brown sandy till
	6 - 19	Brown sandy till
	19 - 21	Blue-brown clayey till
	21 - 29	Brown and yellow sandy till
	29 - 31	Blue sandy till
	31 - 35	Brown sandy till
12	0 - 12	Yellow-brown sandy till
	12 - 14	Brown sandy till
	14 - 22	Blue-grey clayey till
	22 - 35	Brown clayey till
13	0 - 21	Yellow sandy till; contains sand lenses at 8 feet
	21 - 24	Brown sandy till; contains lignite-bearing zone at 22 feet
	24 - 31	Grey clayey till; contains lignite-bearing zone at 25 feet and 30 feet
	31 - 38	Brown clayey till; contains lignite-bearing zone at 32 feet and a sand lens at 36 feet
14	0 - 6	Brown sandy clay till
	6 - 18	Dark brown sandy clay till
	18 - 25	Grey clayey till
	25 - 28	Light-brown sandy till
	28 - 30	Dark brown sandy till
	30 - 31	Blue-grey clayey till
	31 - 32	Brown clayey till
	32 - 34	Dark blue clayey till
	34 - 35	Brown clayey till
	35 - 39	Dark blue clayey till
	39 - 40	Brown clayey till
	40 - 43	Blue clayey till
15	0 - 19	Brown sandy clay till
	19 - 25	Blue-grey till; lignite-bearing zone at 23 feet
	25 - 26	Light-brown sandy till
	26 - 34	Dark blue clayey till
	34 - 35	Lignite-bearing zone
	35 - 36	Blue-grey clayey till
	36 - 39	Brown lignite-bearing till
	39 - 40	Brown-blue clayey till
	40 - 41	Brown clayey till
	41 - 52	Blue-grey clayey till

Drill hole No.	Depth below surface, feet	Description of material
16	0 - 5	Yellow-brown sandy till; contains layers of pebbles
	5 - 20	Yellow-brown sandy till
	20 - 21.5	Dark blue clayey till
	21.5- 26	Brown clayey till
	26 - 30	Dark brown clayey till
	30 - 31	Brown clayey till
	31 - 39	Blue clayey till
	39 - 40.5	Dark brown clayey till
	40.5- 52	Blue-grey clayey till
17	0 - 2	Yellow coarse sand
	2 - 12	Yellow-brown sandy till
	12 - 14	Brown sandy till
	14 - 17	Blue-grey clayey till
	17 - 20	Brown sandy till; contains coal fragments
	20 - 26	Blue-grey clayey till
	26 - 30	Yellow sand lens
	30 - 32	Dark blue clayey till
	32 - 34	Brown sandy till
	34 - 36	Blue clayey till
	36 - 39	Brown sandy till
	39 - 41	Blue clayey till
	41 - 43	Brown sandy till; water-saturated
18	0 - 3.5	Yellow coarse sand; contains pebbles
	3.5- 5	Brown clayey sand
	5 - 9	Coarse yellow sand; clay matrix
	9 - 15	Brown sandy clay till
	15 - 17	Blue-grey clayey till
	17 - 19	Blue-brown clayey till; contains sand lenses
	19 - 28	Blue clayey till; contains coal fragments
	28 - 39	Brown sandy till
	39 - 43	Blue-grey clayey till
19	0 - 2	Yellow sandy clay till
	2 - 15	Yellow-brown clayey till
	15 - 19	Brown clayey till
	19 - 21	Blue-grey clayey till
	21 - 28	Brown clayey till; gravel zone at base of hole

Drill hole No.	Depth below surface, feet	Description of material
20	0 - 2.5	Brown sandy till
	2.5- 8	Light-brown sandy till
	8 - 11	Brown sandy till
	11 - 14	Dark brown sandy till
	14 - 18	Blue-grey clayey till
	18 - 20	Brown clayey till
	20 - 25	Blue-grey clayey till
	25 - 29	Brown clayey till
	29 - 33	Blue clayey till; water-saturated
21	0 - 3.5	Brown sandy clay till
	3.5- 15	Brown clayey till
	15 - 18	Blue-brown clayey till
	18 - 20	Brown sandy clay till
	20 - 24	Blue-grey clayey till
	24 - 30	Brown clayey till
	30 - 40	Blue-grey clayey till
	40 - 50	Dark blue clayey till
22	0 - 4.5	Yellow-brown sandy till
	4.5- 17	Brown sandy till
	17 - 18	Gravel and coarse yellow sand
23	0 - 3	Yellow coarse sand
	3 - 6	Brown sandy clay till
	6 - 11	Light-brown sandy till
	11 - 20	Brown sandy till
	20 - 23	Blue clayey till
	23 - 24	Brown sandy till
	24 - 40	Blue clayey till
	40 - 44	Brown sandy till
	44 - 48	Blue clayey till; contains coal fragments
24	0 - 2	Yellow-brown sandy till
	2 - 10	Mixture of coarse yellow sand and brown clayey till
	10 - 20	Brown sandy till
	20 - 25	Blue-brown sandy till
	25 - 38	Blue-grey clayey till
25	0 - 5	Coarse yellow sand
	5 - 10	Brown sandy till
	10 - 12	Coarse sand and fine gravel
	12 - 18	Yellow-brown sandy till
	18+	Yellow-brown till; saturated

Drill hole No.	Depth below surface, feet	Description of material
26	0 - 16	Yellow-brown sandy till
	16 - 18	Brown sandy till
	18 - 28	Blue-grey clayey till
	28 - 30	Brown clayey till
	30 - 32	Blue clayey till
	32 - 40	Blue-brown clayey till
	40 - 48	Blue-grey clayey till; water-saturated
27	0 - 19	Brown sandy till
	19 - 21	Blue clayey till
	21 - 24	Brown sandy till
	24 - 26	Dark blue clayey till
	26 - 38	Blue clayey till; gradually changes to a brown sandy till, water-saturated, near base of hole
28	0 - 3	Yellow coarse sand
	3 - 6	Brown sandy clay till
	6 - 19	Brown sandy till
	19 - 20	Blue clayey till
	20 - 23	Brown sandy till; water-saturated
29	0 - 2	Brown coarse sand
	2 - 3	Dark brown sandy till
	3 - 14	Brown sandy till
	14 - 18	Dark brown sandy till
	18 - 24	Grey-brown sandy till
	24 - 26	Dark brown sandy till
	26 - 27	Lignite zone
	27 - 29	Brown sandy till
	29 - 34	Dark brown clayey till
	34 - 36	Blue-brown clayey till
	36 - 43	Brown clayey till
30	0 - 2	Yellow coarse sand
	2 - 3	Dark brown sandy till
	3 - 10	Yellow-brown sandy till
	10 - 21	Dark brown sandy till
	21 - 38	Blue clayey till
31	0 - 11	Yellow-brown sandy till
	11 - 17	Grey-brown sandy till
	17 - 20	Brown sandy till
	20 - 48	Blue clayey till
32	0 - 11	Brown sandy till
	11 - 18	Dark brown sandy till
	18 - 21	Grey-brown sandy till
	21 - 24	Brown sandy till
	24 - 27	Blue-grey clayey till
	27 - 29	Grey-brown clayey till
	29 - 38	Blue-grey clayey till

Drill hole No.	Depth below surface, feet	Description of material
33	0 - 2	Yellow coarse sand
	2 - 10	Brown sandy till
	10 - 16	Brown sandy clay till
	16 - 20	Blue-brown clayey till
	20 - 29	Blue-grey clayey till
	29 - 38	Blue-brown sandy till