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SIPRE ICE-CORER FOR OBTAINING SAMPLES FROM PERMANENTLY FROZEN BOGS

The Geological Survey of Canada is currently making studies of the surficial geology in several arctic and subarctic areas, which are supported by palynological investigations. These are difficult because of the necessity of sampling permanently frozen bogs. Preliminary tests indicated that the SIPRE ice-corer is the most promising of the readily available sampling devices and its effectiveness has been demonstrated subsequently in the field and in a field laboratory.

In the 1962 field season O. L. Hughes, assisted by V. N. Rampton used a hand-operated SIPRE ice-corer in northern Yukon Territory to obtain continuous cores through a variety of materials (moss peat, sedge peat, gyttja, and woody peat) to depths of down to 94 inches. Much of the organic material contained minor amounts of silt and sand with occasional pebbles, and one hole was drilled 4 inches into stony clay below the bog. Hand drilling produced excellent cores, which after

Fig.1. SIPRE ice-corer with McCulloch chain-saw motor.

light scraping with a sharp knife showed clearly the component organic layers, interstitial ice, and ice segregations. Since the cored material was frozen, only little care was required to obtain uncontaminated samples for pollen studies and radiocarbon dating. Samples were placed in plastic bags until thawed, after which surplus water was decanted.

Two deficiencies were found in the ice-corer as used: (1) mineral matter in the deposits dulled the cutting teeth so that after drilling about 20 ft. of hole they had to be sharpened or replaced; (2) it took 3 hours or more to drill holes 7 to 8 ft. deep, which meant an unacceptably long idle time for the helicopter used for transport in the field, or alternatively two round trips to each sampling site.

To remedy the first trouble it is intended to use "Carboloy" teeth, which are to be tested by Weston Blake, Jr. during the field season of 1963, and which should prove more durable than those used in ice coring. Furthermore, it is planned to design special cutting heads for use in organic deposits with high mineral content.

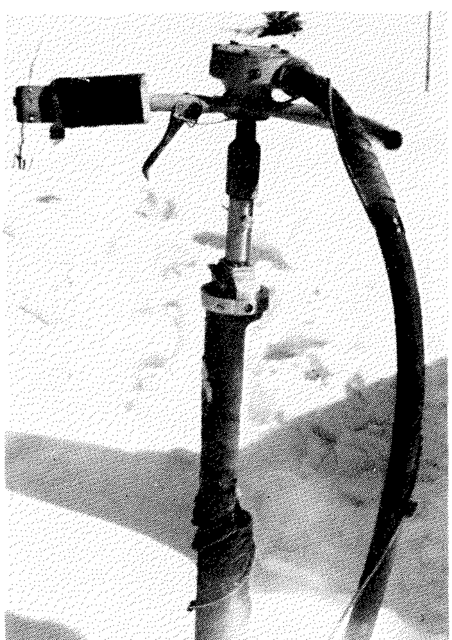

Fig. 2. SIPRE ice-corer with drive head and flexible shaft for use with Haynes Earth Drill.

As regards the second drawback, tests with power drives carried out in the winter 1962-3 in the Mer Bleue bog near Ottawa indicate that the drilling can be speeded up sufficiently to avoid excessive idle time for supporting aircraft.

Since the frost depth in the Mer Bleue under natural conditions is only a few inches a 10- by 12-foot tent was erected over the test spot before the first snowfall in late 1962 and by March 4, 1963 the frost had penetrated 18 inches in the centre of the snow-free area. Deeper penetration had been hoped for but 18 inches was sufficient to test the power-driven SIPRE ice-corer. Two power units were tested: (1) a McCulloch chain-saw motor (Fig. 1), and (2) a Haynes Earth Drill (Figs. 2 and 3) for which details are given below. Both units had been acquired by the Department of Mines and Technical Surveys to operate other drilling equipment and were chosen for testing because being readily available.

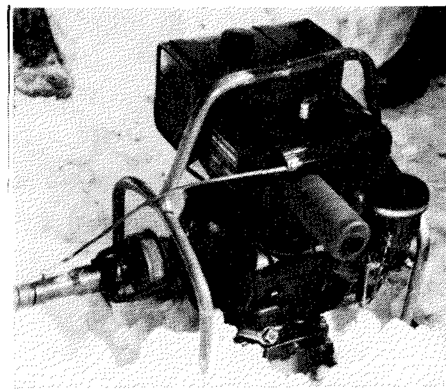

Fig. 3. Motor Assembly of Haynes Earth Drill.

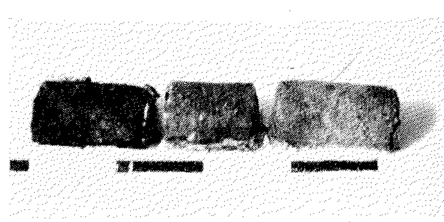

Fig. 4. Samples of cores. Divisions of scale 1 decimetre.

Both units proved adequate for coring frozen woody peat at the rate of 20 to 30 seconds for an 18-inch length of core. Some tendency was noted for the cores to break into lengths of 6 to 12 inches along subhorizontal ice segregations (Fig. 4). This in no way decreases the usefulness of the cores for our purposes. Under field conditions the corer would be lifted from the hole after drilling each 18-inch increment, and after removal of the core a 36-inch extension rod would be added before drilling the next two increments. It is estimated that with one man operating the drill and a second logging the cores and selecting palynological and radiocarbon samples a two-man team could core a frozen bog 8 ft. deep in 30 to 45 minutes.

Probably several different power units would prove satisfactory in operating the SIPRE ice-corer, so that choice may be based on availability and individual preferences. In choosing between the two units tested, weight and ease of operation are the important considerations. With the Haynes Earth Drill only the driving head at the end of a flexible shaft drive is mounted on the corer and operation is more convenient than with the McCulloch motor, which is mounted directly on top of the coring column. However, the comparatively light weight of the McCulloch motor would be a decided advantage in airborne operations.

Details of power units tested

McCulloch chain-saw motor. Model 35 C/W, 3.5 H.P., 2-cycle, with 20:1 worm drive attachment, fitted with special handles according to specifications of Pacific Naval Laboratory, Esquimault (DRB/P-4749, September 27, 1960), and an adapter to connect drive shaft to SIPRE corer extension rods. Weight with fuel tank empty 26 lbs. Manufactured by McCulloch Company of Canada, Rexdale, Ont.; modifications by Coast Power Machines, Ltd., Victoria, B.C.

Haynes Earth Drill. Model 450, Briggs and Stratton 4.5 H.P., 4-cycle gasoline motor, Model 141332, with adapter for SIPRE corer extension rods. Weight with fuel tank empty 85 lbs. Manufactured by Haynes Manufacturing Company, Livingstone, Texas.

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LANDFORM STUDIES IN THE MIDDLE HAMILTON RIVER AREA, LABRADOR

Introduction

During the summers of 1961 and 1962 landform studies were carried out in the area around the Grand Falls of the Hamilton River, Labrador. The chief aim was to determine, as far as possible, the sequence of events that led to the development of the system of canyons occupied by the middle part of the Hamilton River and many of its tributaries.

During the summer of 1961 field work was carried out by the writer alone, using simple methods. In 1962, with the aid of a field assistant, N. Oesterreich, and using more elaborate techniques, it was almost possible to complete the field work. Most time was spent in the relatively accessible areas around Twin Falls and Grand Falls, but visits were also made by float plane to two areas 18 and 40 miles due east of Grand Falls, and a traverse was made by canoe along the Hamilton River from below Grand Falls to Goose Bay. Austin Montague of Northwest River was canoe man.

Methods

Ground checking of airphoto interpretation of landforms and surface geology, and general investigation on the ground was the basic technique employed. Generally this showed that wherever there is a local relief of more than about 100 feet, the minor landforms can usually be resolved into a sequence of erosional or depositional forms or a combination of both, produced under conditions of lowering of the level of the ice surface, lowering of the watertable within the ice, and an increasing ratio of water to ice.

Soil samples were collected where appropriate, chiefly for analysis of particle size. Those from the banks of the lower Hamilton River are to be examined for microfossils.

Striations and associated marks on bedrock indicating direction of ice movement were found only occasionally. The majority indicated the previously recorded movement in the area, which was from the northwest.