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ERRATUM

Page 50: Map - There are two sample areas 'C' shown. The most easterly of the two should be marked 'A'.

Page 57: Penultimate paragraph. The first sentence should read - "The south outlet ditch and the ditch along the west side of the road were cleaned out in 1963 to a depth of 6 feet and a width of 10 feet."

Page 74: Ultimate paragraph. After heading Depth, the first sentence should read - "At the south end of the old diggings referred to above, and immediately east of the road, the bog is 9½ feet deep with a blue clay bottom".

Mines Branch Technical Bulletin TB 65

EVALUATION OF PEAT MOSS IN SOME BOGS OF THE RAINY RIVER DISTRICT, ONTARIO

by

R. Bruce Graham* and T.E. Tibbetts**

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SYNOPSIS

In this report, seventeen peat bogs in the Rainy River District of Ontario are illustrated by aerial photographs and are assessed from the viewpoints of location, access, area, depth, cover, drainage, and nature of the peat material present. The locations of several other bogs in the district are noted.

Analytical procedures and the importance of sampling are emphasized in this demonstration of the methodology of evaluating the potential of peat bogs for commercial development.

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Direction des mines

Bulletin technique TB 65

ÉVALUATION DES SPHAIGNES DE CERTAINES TOURBIÈRES DU DISTRICT DE RAINY RIVER EN ONTARIO

par

R. Bruce Graham* et T.E. Tibbetts**

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RÉSUMÉ

Dans ce rapport, dix-sept tourbières du District de Rainy River, représentées par des photos aériennes, sont étudiées aux points de vue de l'emplacement, l'accessibilité, la superficie, la profondeur, la couverture végétale, le drainage et la qualité de la tourbe. Les auteurs rapportent les emplacements de quelques autres tourbières du district.

Cette démonstration de la méthodologie employée pour évaluer les possibilités de développement commercial des tourbières souligne les techniques de l'analyse et l'importance de l'échantillonnage.

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SUMMARY

An evaluation of peat in some bogs of the Rainy River District, Ontario, was carried out over an area extending from Fort Frances west to Rainy River, and from the international boundary north to the 49th degree of latitude. The use of aerial photographs, supplemented by a study of literature on bogs in this area investigated earlier, allowed the authors to select twenty-three bogs for field and laboratory examination. Seventeen of these bogs were assessed from viewpoints of location, access, area, depth, cover, drainage, and nature of the peat material present.

Peat has long been recognized as a source of fuel, but in Canada the abundant supply of other fuels precludes its economic use at present. The main value of bogs today is for horticultural peat moss or for cultivation. The emphasis in this report is based on these two aspects.

Horticultural peat moss of commercial or near commercial quality, in sufficient depth and area to provide at least moderate production, occurs in several bogs that illustrate potential for development based on the other factors mentioned above — location, access, drainage, etc. In approximate order of importance these are as follows: the western portion of the Carpenter Bog; the Polar Bear section of the Pinewood Bog; the Dobie Township Bog; the Burriss Bog; and the Devlin section of the Crozier Bog. These bogs merit further investigation by commercial interests.

Bogs from which horticultural peat moss could probably be produced on a small scale, and which hence also merit consideration, are the Crozier section of the Crozier Bog, the bog in Sections 24 and 25 of Shenstone township, and the Railway Bog.

Bogs whose location, drainage and open areas suggest their adaptability for cultivation (such as market gardening and blueberry or cranberry cultivation) are the Fort Frances Bog and the Big Fork Bog.

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INTRODUCTION

In Canada there are estimated to be more than 37,000 square miles of workable peat deposits, of which more than 350 square miles (250,000 acres) have been surveyed and mapped. These deposits are capable of yielding more than 200 million tons of highly humified material suitable for fuel, and more than 15 million tons of less humified material useful for other than fuel purposes. The availability of superior sources of fuel in Canada all but restricts the production from our bogs to the lesser humified material formed mainly from sphagnum moss that is used for agricultural and horticultural purposes in North America.

Peat moss production in Canada is continually increasing and the industry is showing all signs of progressive growth, as is demonstrated by Figure 1. It is apparent that this growth has been due mainly to increasing demands for the Canadian product in the United States; however, there is also a rising domestic consumption. In 1963 about 80 per cent of our production was exported to the United States at a value of almost ten million dollars; Canada supplied about four-fifths of the total peat imports of the United States. Production data of peat products by province for 1962 and 1963 are shown in Table 1.

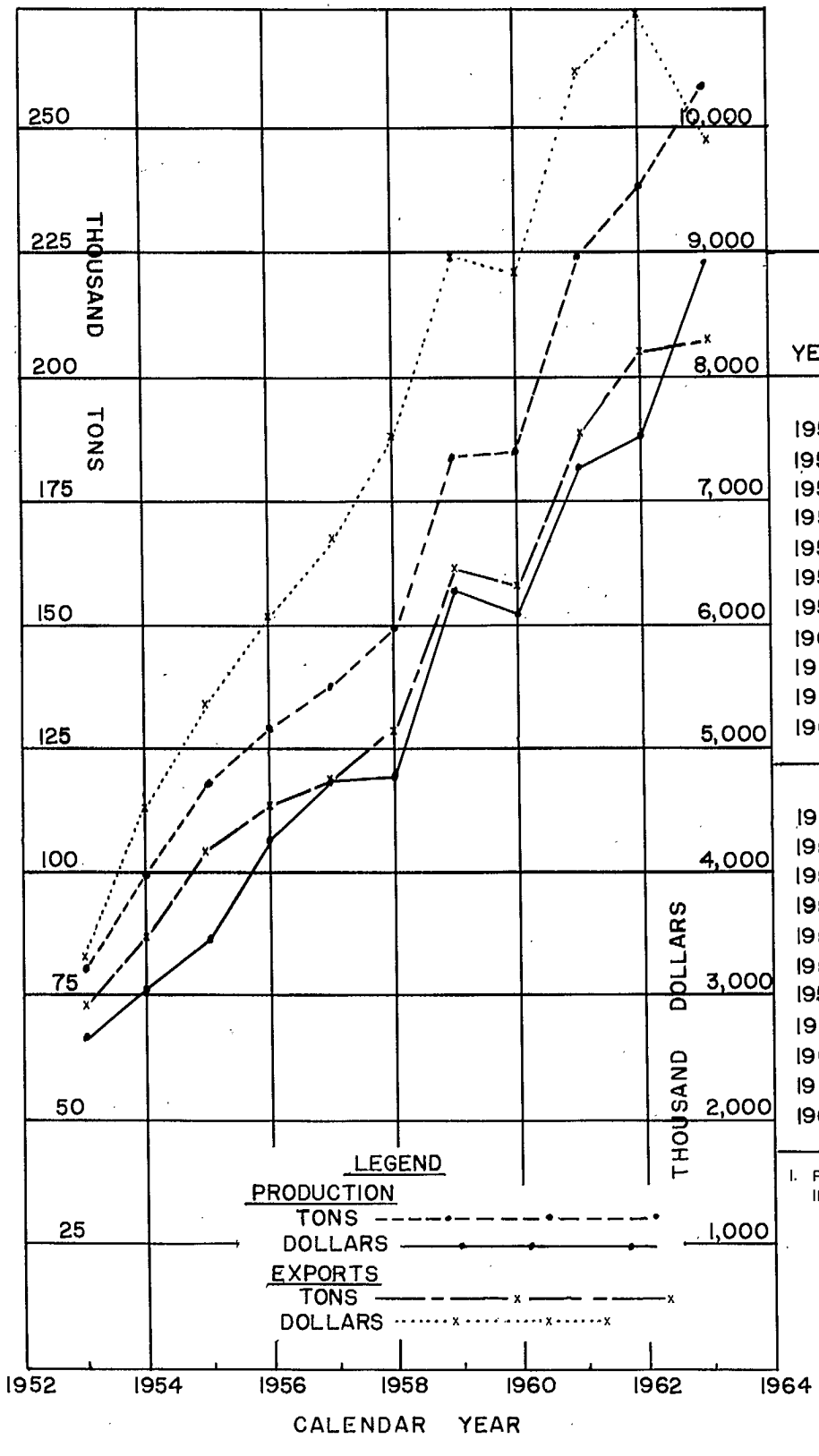
TABLE 1

Production of Peat Moss by Provinces, 1962 and 1963

Province	1963			1962		
	% of Total	Short Tons	Value* $	% of Total	Short Tons	Value* $
Nova Scotia & New Brunswick	13.7	35,480	1,373,200	16.7	39,744	1,540,299
Quebec	34.5	89,417	2,182,072	32.7	77,889	1,968,483
Ontario and Manitoba	20.1	51,960	2,368,360	18.7	44,521	1,268,550
British Columbia	31.7	82,000	3,000,000	31.9	75,881	2,703,064
CANADA		258,857	8,923,632		238,035	7,480,396

*Value at plant.

FIGURE I - GROWTH OF PEAT INDUSTRY IN CANADA, 1953-1963.



YEAR	THOUSAND TONS	GROSS VALUE, THOUSAND DOLLARS [1]
	PRODUCTION	
1953	81.4	2,643
1954	99.3	3,019
1955	117.6	3,485
1956	128.1	4,241
1957	137.7	4,735
1958	149.4	4,779
1959	184.0	6,227
1960	184.8	6,088
1961	224.0	7,295
1962	238.0	7,480
1963	258.9	8,924
	EXPORT	
1953	73.5	3,290
1954	87.3	4,500
1955	103.0	5,388
1956	113.3	6,069
1957	117.9	6,669
1958	129.0	7,507
1959	161.2	8,976
1960	157.5	8,826
1961	187.6	10,415
1962	205.2	10,999
1963	207.0	9,901

1. PRODUCTION VALUE DOES NOT INCLUDE COST OF CONTAINERS

It has been suggested that a comprehensive survey of potential peat moss areas in Canada be undertaken by the Department of Mines and Technical Surveys. The cost of such an undertaking would be prohibitive; and, in any event, peat moss as a bulk agricultural or horticultural product can only tolerate a given freight cost in relation to a specific market area. Hence, many areas in Canada must remain beyond the possibility of economic exploitation for the time being. On the other hand, there are still areas that offer these opportunities within reasonable access to possible markets.

In 1961 an area of southern Ontario was used to demonstrate methodology of evaluation of peat bogs. Considerable interest has been evinced in the publication (1).

The present bulletin is a further demonstration of these methods of peat bog evaluation, the Rainy River District of western Ontario being selected because of its generally favourable location with respect to large markets for peat moss in the United States and Ontario. The field methods used in the evaluation are substantially as described in the prior publication (1). However, in this bulletin more emphasis is placed on the techniques of sampling and a special sampling study is mentioned in Appendix I. This study was undertaken with sampling devices used in Canada and Europe, particularly to illustrate that the preferred design of a sampling tool is one that would ensure the inclusion of thin layers of bog material. The physical and chemical tests are basically as described in the earlier publication (1), with some minor revisions, and are given in full herein for easy reference. In addition, what is considered to be a more scientific and reliable method than the Rigg (2) test for determination of the degree of humification of peat, developed in Germany and being studied at the laboratory of the Fuels and Mining Practice Division, is outlined and results given for some tests in Appendix II.

Some of the peat deposits covered in this investigation were examined by Leverin and others (3, 4) some years ago. The present study is a more detailed investigation of the area covered by earlier examinations and, in addition, includes peat deposits not formerly investigated in the Rainy River District.

ACKNOWLEDGEMENT

Acknowledgement is due T. A. Lloyd, of the Fuels and Mining Practice Division, who conducted the analyses of the samples collected and assisted in preparing aerial photographs and maps for reproduction in this report.

GENERAL INFORMATION ON PEAT AND PEAT BOGS

The Formation and Characteristics of Peat and Peat Bogs

Topography, drainage, and climate are controlling factors in the formation of a peat deposit. It is necessary to have a basin in which water can accumulate; drainage must be sufficiently inhibited to permit the accumulation of organic debris; the climate must be such as to permit the growth of the various mosses, grasses, shrubs and sedges the remains of which form a peat bog, and for this to take place the proper balance between rainfall and evaporation must be maintained. Variations in these factors produce variations within an individual bog as well as variations between bogs in the same area. Prolonged dry seasons result in the lowering of the water level and, consequently, humification of old and the inhibition of new plant growth. Renewed rains result in the formation of new strata. Modification in topography can produce the same effect; changes in drainage patterns can result in local and temporary flooding, resulting in the growth of reeds, grass and sedges rather than moss. This can take place in one part of a bog and not in another. Conversely, local primary topographic features, combined with changes in climate and/or drainage, can promote growth of trees and shrubs, resulting eventually in the formation of woody peat.

Other factors that can result in humification or the destruction of the fibrous nature of the moss are: (a) fire, (b) planned drainage for agricultural purposes.

Bogs can be completely humified, humified at the bottom and unhumified at the top, or comprised of interbedded humified and unhumified material. Likewise, the botanical composition can vary laterally and vertically within an overall bedded structure.

Dead, slightly humified sphagnum moss is usually what is referred to as "peat moss", although this term is sometimes also used in reference to the slightly humified residues of other mosses, such as hypnum, and sedge plants. There are several species of each of these; and the dead residues of these plants or composites of plants vary in colour from yellowish brown to dark brown, depending on such factors as the degree of humification, composition, and the acidity condition of the environment.

Table 2 presents the characteristics of different classes of peat material.

TABLE 2

Characteristics of Different Classes of Peat

Major Classes	Subdivisions (Types) of Peat	Vegetation Sources of Peat	Colour of Peat	Texture of Peat	Structure of Peat
I. Sedimentary Peat	Oozy, macerated, or pulpy peat.	Aquatic.	Olive green, brown to black.	Coarse to very fine grained, pasty.	Amorphous, soft sticky, impervious.
	Calcareous sedimentary peat.		Grey to greyish brown or cream.	Coarse to finely divided.	Gritty, crumbly.
	Silicious sedimentary peat.		Greyish brown to black.	Fine grained.	Plastic to friable.
Ia. Sedimentary Fibrous Peat	Cattail peat, tule peat, etc.	Marsh.	Dark brown to black.	Partly stringy fibred, sticky to platy.	Dense, plastic to lumpy.
	Reed peat.		Yellowish, reddish to dark brown.	Coarse to fine fibred, loamy to powdery.	Matted to felty porous, brittle.
	Sedge and carex peat.		Reddish brown to dark brown.	Coarse to fine fibred, loamy to powdery.	Matted to felty porous, brittle.
II. Fibrous Peat	Hypnum moss peat.	Bog.	Yellowish brown to dark brown.	Fine fibred.	Loose to firm porous.
	Sphagnum moss peat.		Yellowish brown to dark reddish brown.	Coarse to fine fibred.	Spongy porous to fluffy.
IIa. Woody-Fibrous	Heath shrub peat.	Swamp forest.	Brown to dark reddish brown.	Partly fibred, coarse fragmented.	Firm, lumpy.
	Willow-alder peat.		Brown to very dark brown.	Partly fibred to coarse woody, granular.	Sticky to loose crumbly.
	Bay shrub peat.		Brown to blackish brown.	Partly fibred to coarse woody, granular.	Compact, sticky to lumpy.
III. Woody Peat	Coniferous woody peat.	Swamp forest.	Reddish brown to dark brown.	Coarse woody, fragments to granular.	Loose to firm, lumpy or crumbly.
	Mixed woody peat.		Brown to dark brown.	Woody fragments to loamy granular.	Lumpy to friable.
	Deciduous woody peat.		Dark brown to black.	Woody fragments to loamy granular.	Lumpy to mellow loamy.

Further detailed descriptions of the formation, structure and botany of peat deposits may be obtained from the following publications:

Anrep, A.V.	Investigations of Peat Bogs and Peat Industry of Canada, 1911-1912; Can. Dept. of Mines; Mines Branch, Bulletin No. 9, Rpt. No. 266; 1914.
Auer, Vaino	Peat Bogs in Southeastern Canada; Can. Dept. Mines; Geol. Survey, Memoir No. 162, Rpt. No. 2230; 1930.
Gerard, H.	Peat in Quebec; Quebec Dept. Mines, G.R. 31; 1947.
Haanel, B.F.	Final Report of the Peat Committee; Can. Dept. Mines; Mines Branch, Rpt. No. 641; 1926.
Leverin, Harald A.	Peat Moss Deposits in Canada; Can. Dept. Mines and Resources; Mines and Geol. Branch, Rpt. No. 817; 1946.

Properties and Uses of Peat Moss

Peat bogs, when drained and the soil properly conditioned, are excellent land for market gardens. Examples of bog lands being used for this purpose are the Holland Marsh, near Toronto; the Alfred Bog, near Ottawa; and the Moose Creek Bog, 30 miles south of Ottawa. The peat must be humified for this purpose and can represent a valuable asset after the unhumified moss has been removed. Apart from agriculture, the earliest use of peat was for fuel, and at the turn of the century considerable effort was made in Canada to use it as such. However, the availability of other fuels has precluded its use on a large scale, for the time being at least. The Alfred Bog was one of the earliest to be developed for this purpose, and advantage was taken of the drainage carried out to develop it into a successful market garden.

A further use of the more or less humified material is as a binder in the pelletizing of iron ore. This use is being studied in Canada.

Canadian peat moss is almost exclusively used for horticultural purposes. For this use, the slightly humified sphagnum moss is most often demanded. This material is basically distinguished by being light in colour, fibrous, elastic, somewhat acid, and having a high water-absorbing capacity. It resists decay and adds vegetable matter to the soil. Its ability to retain water under moderate drying conditions contributes greatly to its value. It aids in the correction of alkaline soils.

As a soil conditioner, peat moss adds porosity, thus allowing better soil aeration, and retains moisture. It gives body to sandy soil and lightens heavy clay and therefore is very beneficial to lawns, golf courses, and racetracks. Peat moss acts as a carrier or diluent for chemical fertilizers. It is used as a seed inoculant, as an earth worm culture, and for mushroom beds. A growing use is in the manufacture of pots for plants. Peat moss has been used for many years for stable and chicken litter, the discarded material making an excellent fertilizer rich in nitrogen. Minor uses are for foundry facings and in the brewing industry. It is a deodorant and has been used as an insulator and for surgical dressings. Peat moss is an excellent packing material for perishable vegetables and for cut flowers.

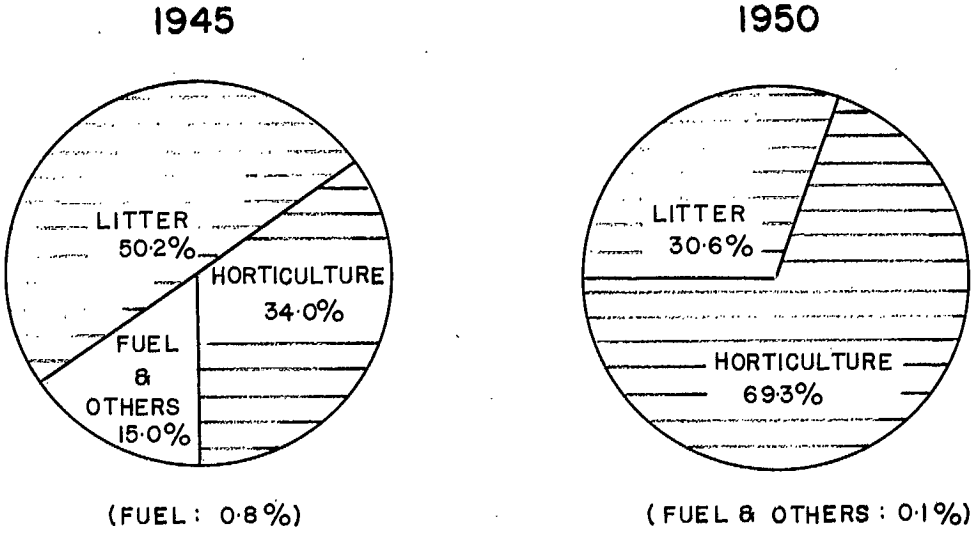
Substitutes for peat moss as chicken and stable litter and as an insulator have resulted in a decline in these uses. This decline has been more than offset by the ever-growing horticultural demand as shown in Figure 2, which illustrates the change in the proportions of Canadian-produced peat and peat moss used for various purposes from 1945 to 1963.

As humification (decay) of peat moss increases, absorptive capacity and elasticity decrease and the colour becomes darker. The material becomes heavy and on drying is hard and brittle, disintegrating in the preparation process into an unsatisfactory product.

Different types of unhumified peat exhibit the desirable properties in varying degrees. For practical purposes, most of them absorb sufficient water. Five main plant types form peat moss, and the water-absorbing capacities of their residues were described by Leverin (3) as follows:

Sphagnum Moss	- There are six varieties which absorb from 18.6 to 26.8 times their own weight of water. This is the most desirable type of moss.
Eriophorum (Cotton Grass)	- Absorbs appreciably less water than does the sphagnum moss.
Reed and Sedge (exclusive of Carex)	- Absorb from 3.5 to 8 times their own weight of water.

FIGURE 2 - CANADIAN PRODUCTION OF PEAT AND PEAT MOSS BY USES, 1945-63.



Hypnum Moss	- Absorbs from 8 to 13 times its own weight of water.
Carex (Reed and Sedge group)	- Absorbs from 8 to 13 times its own weight of water.

The elasticity and fibrous nature of peat-forming plants vary. Eriophorum, reed, sedge, and carex plants are grassy varieties, and the residues do not have the good cellular texture of that of the sphagnum moss variety; but reed and sedge peats are among the most effective of the peat substances for soil improvement and general horticultural purposes, as these add humus to the soil (5). Hypnum is a mossy plant, but the residue is brittle when dry and hence lacks some of the commercial application of sphagnum moss.

The water-absorbing capacity, ash, acidity, and nitrogen contents can be measured quantitatively in the laboratory. Absorptive capacity decreases with humification for each moss type. The ash content varies with the botanical origin of the peat moss and with the foreign mineral-matter present.

In the characterization of peat moss, elasticity and fibrous structure are important qualities. The acidity usually has a pH range of between 3.5 and 6. An absorptive value in excess of 15 on a dry basis is an indication that a high proportion of sphagnum moss is present. An ash content of less than 5 per cent is desirable. Although the presence of a high proportion of unhumified sphagnum moss is indicated by a light colour, the market in some cases does not appear at present to be aware of this, inasmuch as it is not particularly selective as to colours from light yellowish brown to dark brown.

In general horticultural use, the moss is air-dried, for example to 35 per cent moisture by weight, and is broken down and screened to 1/4 inch or less. For poultry litter it may be shredded to 3/4 inch (medium shredded) and the dust is removed. For stable litter the moss is coarsely shredded.

METHOD OF SELECTING BOGS FOR EXAMINATION

An examination of air photos was made of the area extending from Fort Frances east to Rainy River and from the international boundary north to the 49° of latitude. The air photos were obtained from the Ontario Department of Lands and Forests, Toronto.

Information derived from the air photo examinations was compared with information published earlier (3, 4).

In the Rainy River District, bog areas, or 'areas of organic terrain' as they are sometimes termed, exhibit features on aerial photographs which permit of easy identification, namely:

(1) They all occur in local depressions.

(2) Their boundaries are sharply delineated by an abrupt change from a dark grey monotone, sometimes mottled, to the lighter grey and more variable texture of higher ground.

(3) The outline of the bog area is generally further accentuated by a narrow rim of dense spruce growth or deciduous bush or a combination of the two.

(4) Forested bog can be distinguished by the uniformity of tree type--which is always coniferous, unless drained--and the uniformity of growth density. This is in contrast to the variability of tree type and growth density on mineral soil.

(5) Open areas in treed bogs are nearly always present. These exhibit a characteristic texture and shading on the photograph.

(6) If a bog is too shallow to be of interest with respect to total quantity of peat, this fact can sometimes be distinguished on aerial photographs by the gradual merging of shading and textural contrast between the organic and mineral soils. Cultivation seldom enters into a deep bog or into an area of heavy growth rimming a deep bog.

From these features and with the help of the stereoscope, the bogs were classified according to area, surface growth, drainage, and accessibility. The selection of bogs for field examination was made from the above information. Where the production of peat moss is considered, the results of the field investigation should be correlated with the method of harvesting and the availability of markets. Similarly, to support cultivation a market for the produce is required. The significance of each of these factors is briefly described below.

Area

The bog area required depends on the depth of the moss, the method of production, and the scale of production anticipated. If the cut sod method is considered, perhaps by use of a mechanical digger, a smaller bog area would be required than for the milled peat method. However, abundant roots adversely affect the use of a mechanical digger. In general, it might be said that to be commercially attractive on other than a part-time basis, a supply to support a production in the order of 150,000 bales per

year should be considered. Assuming a minimum depth of five feet and a settling of two feet due to drainage, one acre contains 130,680 cubic feet. Assuming a volume of 170 cubic feet per ton for air-dried peat (3), there are present 769 tons per acre. This is equivalent to 10,172 six-cu. ft. bales based on a compression ratio of 2 to 1, or sufficient to supply production for 0.06 year. Based on the above estimate, it can be seen that 100 acres would probably be a minimum prerequisite area. This was used as a guide for selecting areas of photographs for field investigation.

Surface Growth

Other things being equal, the fewer the trees that grow in a bog the lower will be the cost of preparation. Particular attention was paid to those bogs that were essentially free of trees. However, where market conditions are particularly favourable, bogs have been cleared of timber in preparation for production.

Drainage

The cost of drainage is an important factor in bog development. Contoured topographic maps were not available to study the bog areas in conjunction with the air photo examination. However, with the aid of the stereoscope the feasibility of drainage could, to a considerable degree, be determined. Bogs adjacent to lakes and rivers represent a prohibitive development cost if they are at the same elevation as the adjacent water, unless the hydraulic method for production were considered.

Accessibility

Two factors are of importance with reference to accessibility: (1) easy access from the plant site to the bog, and (2) proximity of the plant site to a railway or a good road.

In the former instance, the plant should be as close to the bog as possible and centrally located in order that transportation of harvested moss from the bog to the plant be reduced to a minimum. This results in greater efficiency and lower costs.

Peat moss is a bulky item to ship, generally being transported in carload lots. Both truck and railway are extensively used as carriers. The heavy shipping seasons are early spring and late summer. If an inferior road provides access to the plant, spring thaws result in deterioration of the road by truck traffic. Half-load regulations imposed on most secondary roads can also increase the cost of transportation. Rail transport is not affected by these conditions.

Harvesting Methods

There are three main methods for harvesting peat moss. These have been described by Swinnerton (6).

Hand cutting into blocks and drying on the field was at one time the most widely used method. This technique has been modified by the use of mechanical cutters or diggers.

A second method, which has largely supplanted the cut sod method, is the milled peat or "scratch" method. In this case the surface of the bog is harrowed or scratched to produce an inch or so of loose moss. When this is sufficiently dry it is lifted off the bog and into conveyances by means of a vacuum-type pickup.

Compared with the cut sod method, for equivalent production the milled peat method requires a large bog area, as only a thin layer is excavated at a time. For a cut sod peat operation, travel on the bog is less and the moss does not have to be so dry; consequently, production is not affected to the same degree by periods of wet weather. The trend has recently been towards milled peat, in spite of these advantages with regard to the cut sod method, due to the generally cheaper cost of production.

The processing plant is the same for both cut sod and milled peat and consists essentially of shredding, screening, and baling. The present trend is toward the installation of artificial drying to ensure better control of the water content, and consequently the shipping weight, of the product.

A third method is that of excavating peat by a hydraulic monitor. The force of the water loosens the peat and it flows in the form of a thin slurry, along a ditch into a sump where the roots and twigs are screened out. The peat and water mixture is then pumped to the plant, where it is further screened and dewatered, passed over and around the rolls of a paper machine, shredded, dried, and baled. The hydraulic method has been used successfully in British Columbia but requires considerably more initial capital than do the other two methods.

Markets

Any production, whether peat moss or market garden produce, should be preceded by a market study. This is a necessary precaution in order to determine the acceptability of the product, the area in which it can compete with other sources, and the demand in that area. This will influence the size of the operation and the capital required.

SAMPLING AND ANALYSIS

Sampling

It has been described, in a previous section, how many bogs are comprised of layers of peat material at varying stages of decomposition or humification and having various botanical origins. It is important to have as accurate an evaluation as possible of the composition of a bog, not only to establish information on the reserves of various types of peat, but also in order to ascertain the most suitable production method. To do this a good knowledge of the thicknesses of the different layers is required. When the milled or "scratch" method of production is used, the type of peat material occurring in layers even only one to two inches thick could have a considerable effect on production; such thin layers would provide the production for a significant period of time. If the material is of inferior quality, in order to maintain overall quality control it would have to be either mixed with material of better quality or even rejected. In either case the additional cost of handling would be significant. On the other hand, the occurrence of thin layers of inferior material, unless very frequent, would not greatly affect cut sod peat production, as then these layers would be incorporated in the blocks or sods and mixed with higher-quality peat moss during the shredding process.

The strata of the School House Bog, for example, demonstrate very well the occurrence of various thin layers of unhumified and humified peat material.

The Mines Branch peat sampling instrument was the main means of collecting samples for this evaluation study. It is a piston-type sampler and is illustrated in Figure 3. This instrument consists of a sample chamber, about 3/4 inch in diameter and 15 inches long, and a piston, one end of which is tapered to a point to allow easy movement through the material of the bog. The overall length, including detachable rod handle, is five feet. In sampling, when the desired depth is reached the piston is drawn into the sample chamber by pulling upward on the handle. This upward motion is arrested automatically by a locking device. The open sample chamber is then pushed downward and material from the bog is forced into the sample chamber, thereby allowing recovery of a sample core. Extension rods are attached to the handle of the instrument, to recover samples beyond a depth of five feet. These rods are marked off at one-foot intervals in order to measure intermediate depths.

The efficiency of a sampling instrument is indicated by its capability of collecting a relatively undisturbed core of bog material, unhumified and at various degrees of humification, from the surface to the bottom of the bog. The core sample should be sufficiently large to allow

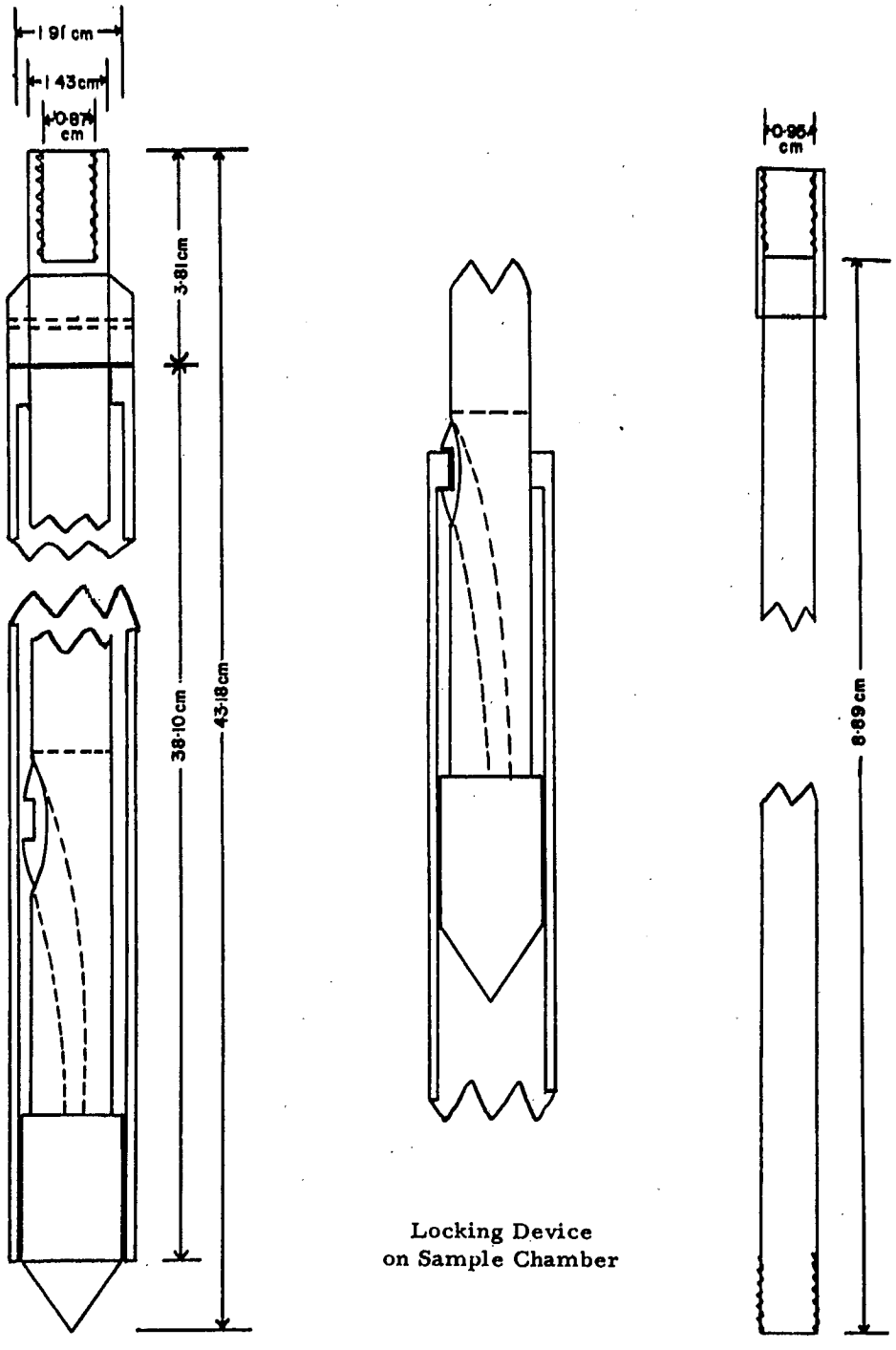


FIGURE 3 - Peat Sampler, Fuels and Mining Practice Division.

visual examination and qualitative analysis of the material at any depth and at intervals no greater than one foot. Certain weaknesses are apparent in the use of the Mines Branch sampler, including the following: (a) the diameter of the core is too small to allow the required qualitative analysis without resorting to collection of several increments at a sample station; (b) forcing the sampling chamber into the peat material compresses the latter, and a full core is usually not obtained; (c) there is a tendency for a certain amount of mixing of material, due to drag by the cylinder walls; (d) raw or only slightly humified moss does not core well in the sampler, and small roots are usually pushed aside in the downward movement of the sampler; (e) in some bogs there are certain layers that appear to be water courses that cannot be cored — this can sometimes be determined by the fact that water containing highly dispersed peat is trapped in the sample chamber but the open end of the sampler usually allows an escape for this material when the sample chamber is withdrawn; (f) discharge of the sample core from the chamber is inconvenient.

A peat sampler which overcomes the main weaknesses of the Mines Branch sampler is described in Appendix I, and analytical data are given for samples collected in one field test of this instrument.

In spite of the apparent weaknesses of the Mines Branch peat sampler, it is sufficiently accurate to allow differentiation (within relatively wide limits) between various layers of peat material. This accuracy is demonstrated in Appendix I.

In this investigation all sampling was of a reconnaissance or semi-reconnaissance nature. The method used on a particular bog was dependent on the size of and the access to the bog.

From an inspection of the aerial photograph, a traverse line was selected which would cross-section the open part of the bog, where maximum depth would be expected. Portions of the open area where grass cover or an overgrowth of shrub could be distinguished on the air photo were avoided in laying out the preliminary traverse. If access required such areas to be crossed in order to reach the selected traverse line, then these areas were sampled.

For bogs having an area in the order of 100 acres, a single sample might suffice if humified material was present, because it was considered that unhumified material, even if present elsewhere, would cover too small an area to merit development on a commercial scale. For larger bogs the traverse line was completed unless humified material extended sufficiently far laterally into the bog to suggest that access on a commercial basis would represent a problem.

The distance between samples was generally 1000 feet, although this could be varied depending on sample results and nature of the bog. Where type of material in one sample area differed unexpectedly from preceding sample areas, two or three check samples were taken. Where more information was required with regard to variations in, or limits of, different types of peat, additional traverse lines or sample areas were selected.

The pace and compass method was used for locating the sampling points. These locations were corrected where indicated by reference to recognizable land marks on the aerial photographs. They were then plotted in the field on an acetate overlay, along with any other significant topographic features. Reproductions of the photographs are used in this report to illustrate the description of the bogs.

While the present investigation was carried out on foot, much more could be accomplished, particularly in the larger bogs, by use of tracked vehicles such as the Bombardier, or by helicopter.

Realizing the inadequacies of the Mines Branch sampler, when the preliminary sampling indicated a significant area of horticultural peat moss it was believed advisable to take at least one sample of greater cross section than could be obtained from the sampler, in order that a better examination could be made of the variation of the peat in the column.

A larger sample can be collected by a shovel to a depth of 2 to 2 1/2 feet, or by a post-hole digger to a depth of five feet. A method found to be very satisfactory was to blast a pit 4 to 5 feet deep and 4 feet in diameter. This provided an excellent exposure and permitted the selection of a large sample if required. The pit can be deepened, if required, with a shovel.

To blast the pit, two holes, three feet apart at the surface, are punched into the bog with a wooden pole 1 1/2 inches in diameter. These holes are inclined towards each other at 55 to 60 degrees to the horizontal. The holes should be four feet long. Each hole is loaded with four sticks of 40 per cent Forcite, one inch in diameter. The top stick contains the blasting cap with fuse attached. If necessary, the pole can be used to push the dynamite into place. A ten-minute fuse gives ample time for lighting and leaving the blast area.

The size of the charge can be varied for optimum results, depending on the nature of the bog, viz. amount of contained water, degree of humification, type of peat, and nature of roots.

Ditching powder, rather than 40 per cent Forcite is a more satisfactory charge, if available.

Samples collected were examined and briefly described. Consecutive samples of similar material were grouped as one.

Loss of moisture in the samples was minimized by placing them in plastic bags, the tops being tied with a string. Each sample was tagged, the tags indicating sampling location and depth interval.

Analysis

The qualitative evaluation of peat material is carried out with the main use of the material in view - for agricultural and horticultural purposes.

Such physical characteristics as colour, density, and texture of peat material are considered in view of the apparent relationship of these characteristics to the degree of humification — an important factor in evaluating peat material for use as a soil conditioner. In the field the samples collected are examined and such characteristics as those mentioned are noted. The degree of humification can be further indicated by a simple test described by Rigg (2). In this test a quantity of peat material is squeezed in the hand and observation is made of what comes out between the fingers and what remains in the hand. If nothing but clear water comes out, humification has not started. If all of the material can be squeezed through the fingers, humification is almost complete. There are stages between the extremes, indicated by modifiers such as slightly, somewhat, moderately, or completely. The fibrous, relatively unhumified stage is peat moss and the final stage is humified peat, or peat fuel. On a scale devised by von Post (7, 8), numbers are related to the structural properties of the peat, characterizing ten successive degrees of decomposition or humification, expressed as H.

Slightly decomposed, fibrous, light coloured peat material is designated as H_1, whereas well-decomposed, colloidal, deep brown material is H_{10}. Except for secondary characterizations of peat strata, these systems of classifying peat in terms of the degree of humification have only a limited application; therefore, a reliable test to directly measure the degree of humification is being sought by the Mines Branch in order to better characterize peat in this regard. A method presently being studied is outlined in Appendix II.

Benefits from the use of peat moss in agriculture - for litter purposes mainly — are derived chiefly from its absorptive capacity. The ability of peat moss to absorb moisture is also of prime importance in evaluating the material for use in horticulture.

The acidity of peat moss varies from about pH 3.5 to pH 6 and this factor to a considerable extent governs its use as an additive to the soil. An accurate determination of the degree of acidity is therefore considered very important in a qualitative evaluation of peat moss.

It is a well known fact that peat moss contains a large percentage of organic matter. The presence of large quantities of mineral matter (ash) in peat moss, in addition to reducing the proportion of desired organic matter, adversely affects the desirable properties of the product.

Although, in some earlier evaluations of peat materials, determination of the nitrogen content has sometimes formed part of the analysis, it is not considered of the same importance as other values mentioned; it is now realized that the nitrogen contained in peat materials, and particularly in relatively unhumified peat moss, is largely in a form not readily available to plants. The nitrogen content was not determined in samples collected for this study, but the method for its determination is outlined for reference purposes.

Qualitative analyses were not conducted on all samples. In some instances the samples were merely air-dried and visually examined for the physical characteristics. In other instances it was not possible to collect sufficient sample for laboratory analysis. The methods of analysis as conducted on peat materials by the Mines Branch at Ottawa are outlined below:

Moisture Content

Five to ten grams of sample (as received) are weighed to the nearest milligram in a tared porcelain crucible and placed in a drying oven and dried at a temperature of 105°C to 110°C until constant weight is obtained; this normally requires about three hours. Before each weighing the crucible and contents are cooled to room temperature in a desiccator. The percentage of moisture is computed based on the oven-dry weight.

Mineral Matter (Ash) and Organic Matter

In determining the mineral matter in peat, the dried sample and the crucible from the moisture determination are used. The weighed crucible and the peat material are placed in a standard muffle furnace, which is at room temperature. The furnace is then heated to a temperature of 750°C and this temperature is maintained until a constant weight of the residue is obtained; this normally requires three to four hours. The weight of the residue is recorded and calculated as the percentage of dried peat. Organic matter is determined by difference (100 per cent minus mineral matter).

Absorptive Value

For this determination, peat in the raw state should not be subjected to partial preliminary drying, because dried or partly dried peat or muck may not re-absorb water to its original absorbing capacity. In the analysis, 30 grams of peat material (as received) is placed in a beaker of 2 litre capacity and 1 litre of boiling water is poured over it. The mixture is then stirred several times until it is noted that all material will sink to the bottom of the beaker when stirring ceases. The peat is allowed to soak for at least 6 hours, then the water is decanted off and the material remaining in the beaker is transferred to a mortar and mashed with a pestle. The decanted water is then added to the mash and stirred to dissipate any lumps. The contents of the mortar are then poured into a tared, cube-shaped, copper-wire basket having a mesh opening of about 300 microns and a capacity of 1 litre. If it is obvious that peat substance has passed through the basket mesh with the water, screening is repeated. No notice is taken if the filtrate is coloured or muddy. The basket is then inclined at an angle of 45 degrees with one corner turned downward and is kept in this position until less than one drop of water a minute passes from the basket. The basket with contents is then rotated 180° and again allowed to drain until less than one drop of water a minute passes from the basket. The basket and contents are then weighed, standing in an evaporating basin. This weight less the tare weight of the basket and basin, equals the weight of the peat material and the water absorbed (C). The basket, saturated peat and basin are dried at 105°C until a constant weight is obtained. This weight less the tare weight of the basket and dish is equal to the weight of dry peat (D). C - D equals the weight of the water absorbed (E). The following calculations are made:

(a) Absorptive value of dry peat = E/D.
(b) Absorptive value of peat at 25 per cent moisture = $(E - D/3)/(D + D/3)$

The absorptive value of peat containing X per cent moisture may be calculated using the following formula:

$$\text{Absorptive value at X per cent moisture} = \left(\frac{E}{D} \cdot \frac{100-X}{100}\right) - \frac{X}{100}$$

Acidity

In preparing the solution for this determination, distilled water and the sample are mixed in a ratio of 4:1, respectively, by weight. The peat material is allowed to soak for a minimum of 30 minutes at room temperature (20°C to 30°C). The hydrogen ion concentration of the solution is then determined by use of a pH meter.

Nitrogen

This determination is made by the Kjeldahl-Gunning method. One gram of sample is boiled with 30 ml of 1.84 specific gravity sulphuric acid, 7 to 10 grams of potassium sulphate and 0.6 to 0.8 gram of metallic mercury in a 500-ml Kjeldahl flask until all particles are oxidized and the solution is nearly colourless. Boiling is continued for two hours after the colourless stage is reached.

The solution is then cooled and diluted with 200 ml of cold water and the following reagents are added: 25 ml of potassium sulphide (40 grams of potassium sulphide per litre), to precipitate the mercury; 1 to 2 grams of granular zinc, to prevent bumping; and, finally, sufficient strong sodium hydroxide solution to make the whole solution distinctly alkaline (usually 80 to 100 ml). The flask is inclined and the sodium hydroxide is slowly added. The flask is immediately attached to a condensing apparatus and the solution is agitated by gently shaking the flask. The ammonia is distilled over into 10 ml of standard sulphuric acid solution. The solution is distilled slowly until 150 to 200 ml of distillate have passed over. The distillate is then titrated, using methyl orange indicator, with standard sodium hydroxide solution. The percentage of nitrogen in the sample is then calculated using a standard formula.

DESCRIPTIONS OF PEAT BOG AREAS EXAMINED

Maps and aerial photographs of a total of sixty-four bog areas were examined. These areas are indicated by the dark, shaded areas on the map, that is included in this report, of the western part of the Rainy River District.

Twenty-three of the areas, because they illustrated features on the map and air photos indicative of potential for commercial development, were selected for further investigation by field and laboratory procedures. Seventeen of these areas were so studied and descriptions of the bogs (identified on the map by numbers from 1 to 17), accompanied by the appropriate air photos, are presented in this section of the report. Time did not permit such a study of the six other selected bogs, numbered from 18 to 23 on the map; however, brief descriptions of these are also given.

Investigation of the forty-one remaining areas was limited to examination of the maps and aerial photographs; these indicated the bogs to be unsuitable for development, after consideration of the criteria outlined in the previous section of this report.

General Features - In the Rainy River District, all bogs examined in the field have certain common features, including the following:

(1) they are all of the low moor type;

(2) the surface growth consists of green (raw) sphagnum moss extending to a depth of six inches to one foot and intermixed with varying quantities of sedges, grasses and shrubs;

(3) considerable amounts of roots are present beneath the surface growth;

(4) the overgrowth consists of such trees as spruce, balsam, tamarack and banksian pine, with poplar and birch present in the drained areas.

The degree of humification in general varies with depth, and also laterally; however, some of the bogs consist entirely of well humified material. Sphagnum moss is characteristically present throughout the unhumified portions of the bogs, but the amount of grass, sedge, reeds and coniferous woody peat varies from minor to predominant, both vertically and laterally.

1. FORT FRANCES BOG

Map Reference 1

Aerial Photograph Reference 49-4829
2-73

Location

The Fort Frances bog extends across the northern part of the town of Fort Frances.

Access

Roads lead to the south side and the northwest end of the bog. The Canadian National railway passes by the southeast end.

Area

The bog is for the most part open and is comprised of an area of approximately 1,300 acres.

Drainage

Little additional drainage would be required to support light traffic. The outlet for any further drainage would be provided by existing

No. 1
FORT FRANCES BOG
(EAST LOBE)

ditches along the roads and railway.

Cover

The cover is a mixture of sphagnum moss, grass, and labrador tea. The overgrowth averages 4 feet in height and consists of scattered poplar and alder bushes. In the eastern and western parts there are local stands of spruce with a maximum size of 4 inches at the stump and averaging 1 inch. In these areas grass and deciduous growth are absent.

Depth

The Fort Frances bog in general is shallow, with two deeper lobes towards the east and west ends. Judging from textural features on the air photographs, the eastern lobe is the deeper of the two, and this lobe was investigated in the field. The bottom of the bog was not reached in all test holes, because of roots, but the bottom of the central portion of this lobe, which is less shallow, varies from a depth of 4 1/2 feet to more than 7 feet.

Nature of Peat

Sampling indicates an area of 85 acres in the south-central part to contain slightly humified sphagnum moss with some reeds and sedge to a depth of 3 feet to 5 feet, below which the material is humified. Elsewhere, the peat is well humified except for the top 0.5 to 1 foot of raw moss.

The sample columns collected are described below:

Area A Depth, Feet		Area B Depth, Feet	
0 - 1.1	No recovery.	0 - 1	No recovery.
1.1 - 3.0	Slightly humified sphagnum moss.	1 - 2.7	Medium brown, slightly humified sphagnum moss.
3 - 3.6	Moderated humified sphagnum moss.		
3.6 - 4.7	Earthy peat.	2.7 - 2.85	Brownish-black, humified peat.

4.7	Sandy clay.	2.85 - 4.85	Medium brown, woody peat with some moderately humified sphagnum moss.
		4.85 - 5	Water layer with dispersed peat.
		5 - 6	Earthy peat. No further penetration possible because of roots.

Area C Depth, Feet		Area D Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 2.85	Medium brown, slightly humified sphagnum moss.	1 - 5	Brown, pasty, humified peat.
2.85-3	Water layer, dispersed sphagnum moss.	5	Sandy clay.
3 - 5	As from 1 to 2.85.		
5 - 5.75	Humified, oozy peat.		
5.75	No further penetration possible because of roots.		

Area E Depth, Feet		Area F Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 6	Brown, pasty humified material; roots.	1 - 4.5	Brown, pasty humified material.
		4.5	Sandy clay.

Laboratory Tests

A sample from Area D gave the following results:

Depth, Feet	Absorptive Value		Ash	
	Dry	At 25% Moisture	%, Dry	pH
1 - 5	12.4	9.1	7.0	4.5

Comments

The area from which horticultural peat moss could be obtained is limited. However, the location of this bog within the town limits of Fort Frances, and the attendant facilities, suggest that it could be developed as a market garden and for the production of peat humus and peat moss for local consumption.

Three-phase hydroelectric power is available in the town of Fort Frances.

2. RAILWAY BOG

Map Reference 2

Aerial Photograph Reference 49-4828 2-31,33 49-4829 2-67,68

Location

The Railway Bog lies in the northeast part of Crozier township and includes parts of Sections 22 to 27, 34 and 35. It extends east nearly to the town limit of Fort Frances. Crozier lies 1 1/4 miles to the west.

Access

Access is by roads leading north from paved highway No. 11 along the west side and to the south limit in the eastern part. An east-west secondary road passes 1/4 mile north of the bog. The Canadian National railway crosses the south edge.

Area

The bog has an area of approximately 2,170 acres, of which 890 acres is more or less open.

Drainage

The best drainage outlet for this bog was not determined during the field investigation. A creek drains north from the north end of the bog and thence east into Stanjikoming Bay, Rainy Lake. Ditching along the railway and along the right of way has drained the bog for several hundred

No. 2
RAILWAY BOG

feet adjacent to the ditched areas. In the north part of Section 24, the bog contains several water-rich horizons. This could be typical of the bog as a whole.

Cover

Labrador tea, sphagnum moss, and some grass comprise the surface growth of the bog. In local areas the cover is predominantly grass. Adjacent to the ditches, scattered poplar up to 4 feet high are present, attaining a maximum diameter of 4 inches at the stump in local clumps. Away from the ditched areas thick growths of spruce occur, accounting for the fact that the open areas are irregular in outline and disconnected.

Depth

The exact depth was not determined; however, it is known to be in excess of 7 feet.

Nature of Peat

Three samples were collected on the north side of the railway in Sections 22 and 23. A fourth sample was collected in the southwest corner of Section 25.

The material in the areas tested is brown, relatively unhumified sphagnum moss, with a high proportion of roots, twigs and reeds. This admixture imparts a woody character to the peat. The sample columns collected are described below:

Area A Depth, Feet		Area B Depth, Feet
0 - 0.6	No recovery.	Very little penetration due to many roots. Material similar to Area A.
0.6 - 2.85	Dry, woody, medium brown. 25% roots, 30% twigs and reeds, 35% sphagnum moss.	
2.85 - 3.85	Water and spruce needles. Many roots. Could not penetrate further with sampler.	

Area C Depth, Feet		Area D Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 3.85	Similar to Area A. Many roots. Could not penetrate deeper with sampler.	1 - 2.85	Moderately humified; woody, with some sphagnum moss.
		2.85 - 3.85	Water layer with dispersed sphagnum moss.
		3.85 - 4.85	As from 1 - 2.85
		4.85 - 6	As from 2.85 - 3.85
		6 - 6.25	As from 1 - 2.85
		6.25 - 7	As from 2.85 - 3.85
		7	No further penetration possible, due to roots.

Comments

The bog in the areas tested contains relatively unhumified sphagnum moss. However, the high proportion of roots and woody material detracts from its quality. It is possible that in the central portion the quality is better than in the areas examined. Considerable clearing would be required to provide satisfactory harvesting areas. If small-scale production is contemplated further investigation should be carried out, but drainage requirements should be investigated first.

Three-phase hydroelectric power is available at Fort Frances.

3. CROZIER BOG

The Crozier Bog occupies an irregular area in the central and western parts of Crozier township, and the eastern part of Devlin township. It extends a short distance south into Woodyatt and Roddick townships. The overall area of the bog is approximately ten square miles.

There are open areas in the northeastern, southern and northwestern parts. Three of these areas were examined, and are described as the Crozier Section, Arctic Section and Devlin Section.

3.1. Crozier Section

Map Reference 3

Aerial Photograph Reference 49-4828
2-29

Location

The open area occupies parts of Sections 16, 17, 20 and 21, Crozier township. Crozier, a siding on the Canadian National railway, lies at the north edge of the bog. A paved highway, No. 11, passes 1/4 mile east of the northeast end. Fort Frances lies 4 miles east.

Access

The railway crosses the northern part of the open area, and an east-west section road passes through the central portion. A ditched and partially graded right-of-way extends north from the section road in the central part.

Area

The open portion has an area of approximately 800 acres.

Drainage

The north and central parts are partially drained by ditches along the roads and railway. The east part is ditched and drains to the east into a stream that flows into the Rainy River. A ditch 1/4 mile south of the southeast end also drains into the Rainy River.

Cover

The bog is typical of others in the area in that it has a surface growth of sphagnum moss and labrador tea. In the northwestern portion, spruce and tamarack shrubs up to 1 inch in diameter at the stump are sparsely distributed throughout. Adjacent to the road and right of way, the bog is better drained and scattered poplar bush and birch are present. In the southern portion, grass occurs with the sphagnum moss and a scattered growth of scrub spruce is present. An island of thick spruce growth lies at the southwest end.

Depth

The bottom was reached at Area A in the west central part at a depth of 9 feet, at Area C in the northwest part at a depth of 11.25 feet,

No. 3
CROZIER BOG (CROZIER SECTION)

and at Area O at the south edge at a depth of 2 feet. In each case the bottom was blue or grey clay.

Nature of Peat

The nature of the peat varies from place to place; there are many roots throughout. The southern and eastern parts contain mainly humified peat, while in the northern and western parts medium brown, relatively unhumified sphagnum moss, with a high proportion of grasses and sedge is present. On drying, the material has a tendency to be brittle and dusty.

The least humified material occupies an area of approximately 270 acres, with an average depth of 3 to 4 feet and a maximum depth of 9 feet.

Area A Depth, Feet		Area B Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 4	Unhumified moss, predominantly sphagnum.	1 - 5.25	Unhumified moss, predominantly sphagnum.
4 - 9	Dark brown peat.	5.25 - 6.25	Medium brown, slightly more humified.
9 -	Dark blue clay.	6.25	No further penetration possible; probably a root.

Area C Depth, Feet		Area D Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 4.25	Unhumified sphagnum moss.	1 - 2.85	Unhumified, predominantly sphagnum moss.
4.25-10.25	More humified, poor quality.	2.85-4.85	Humified moss. Rooty throughout.
10.25-11.25	Brown peat.		
11.25	Clay.		

Area E Depth, Feet	
0 - 1	No recovery.
1 - 3	Unhumified, predominantly sphagnum moss.
3 - 7.25	Water with some dispersed sphagnum moss.
7.25-8.25	Moderately humified sphagnum moss.

Many roots at 1 foot and at 6 feet.

Area F Depth, Feet	
0 - 3	No recovery.
3 - 4	Too rooty to take a sample. A little recovery of good sphagnum moss. Couldn't penetrate deeper than 4 feet, due to roots.

Area G Depth, Feet	
0 - 3	No recovery.
3 - 5	Humified and mucky peat.
5 - 6	Peat.

Area H Depth, Feet	
0 - 1	No recovery.
1 - 6	Good sphagnum moss.
6 - 7	Moderately humified sphagnum moss.
7	No further penetration possible because of roots.

Area J Depth, Feet	
0 - 1	No recovery.
1 - 4	Fairly unhumified, brown sphagnum moss.
4 - 5	Humified, oozy, darker brown peat; rooty.

Area K Depth, Feet	
0 - 1	No recovery.
1 - 4	Peat.

Area L Depth, Feet		Area M Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 2	Moderately humified sphagnum moss.	1 - 4	Humified peat, dark brown. Very rooty, couldn't penetrate past 4 feet.
2 - 4	Peat.		

Area N Depth, Feet		Area O Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 4	As 1 - 4 in Area M.	1 - 2	Moderately humified sphagnum moss.
4 - 5	More humified, oozy peat.	2	Clay.

Area P Depth, Feet		Area Q Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 3	Humified, earthy peat.	1 - 3	Relatively unhumified, predominantly sphagnum moss.
		3 - 5	Humified, oozy peat.

Area R Depth, Feet	
0 - 1	No recovery.
1 - 5	Earthy peat.

Laboratory Tests

A sample of relatively unhumified material and a sample of humified material were submitted for laboratory tests. The results are given below:

Sample Area	Depth, Feet	Absorptive Value Dry	Absorptive Value At 25% Moisture	Ash %, Dry	pH
J - Fairly unhumified, brown, sphagnum moss.	1 - 4	17.1	12.6	4.7	4.5
M - Humified, pasty, dark brown peat.	1 - 3	13.7	10.1	4.6	4.5

Comments

For comparative purposes, material from Areas A, B, C, D, E and H, from visual inspection, was a little less humified than that from Area J.

The bog is favourably located with respect to transportation and supplies. Three-phase hydroelectric power is obtainable at Fort Frances. While in general the sphagnum moss contains many roots and is somewhat inferior in quality to that presently marketed, some areas appear to have sufficient good moss to permit limited production. The most favourable from this viewpoint is an area of 270 acres in Sections 17 and 18.

3.2. Arctic Section

Map Reference 4

Aerial Photograph Reference 49-4827
1-81

Location

Most of the open area is located in the southwest corner of Section 8 and the northwest corner of Section 5, Crozier township. Fort Frances lies 5 miles to the northeast.

Access

Access is by secondary roads to the southeast corner of the open area.

Area

The open area comprises approximately 100 acres.

Drainage

A main east-west ditch crosses centrally through the open area and connects with a ditch extending south into a creek which drains south into the Rainy River.

No. 4
CROZIER BOG (ARCTIC SECTION)

Nature of Peat

At the time of this evaluation, beaver dams in the ditches had caused extensive flooding and this part of the bog could not be visited.

Comments

This is the first bog from which appreciable production of horticultural peat moss has been obtained in the Fort Frances area.

Leverin (3) reports the bog to have commenced production in 1942 as the Arctic Peat Moss Corporation Ltd. He states that the peat moss stratum has a depth of 4 feet, is light brown, and at the lower level is intermixed with roots of trees and undecomposed woody material. The moss is composed mainly of sphagnum with some hypnum, and there are smaller quantities of carex and aquatic plant residues.

Leverin's analyses are reproduced below:

Sample From	Absorptive Value Dry	Absorptive Value At 25% Moisture	Ash %, Dry	Nitrogen %, Dry
Working face, west end bog	10.1	7.3	6.2	1.3
Poultry litter, average runs	12.2	8.9	6.1	1.3
Peat mull	14.2	10.4	5.0	1.1

Production was by hand cutting, the material being dried on the field and on racks and taken to the storage shed by a field railway. The baling mill was burned in 1945 but operations were back to normal by 1949.

Operations were suspended about 1950 and the plant and tools were sold by auction.

Development costs must have been high, as much of the area now open was covered by a thick growth of spruce that required clearing. The high ash content in the analyses suggests that the moss produced was not of the best quality. Three-phase hydroelectric power is available at the bog site.

3.3. Devlin Section

Map Reference 5

Aerial Photograph Reference 49-4827, 49-4828
1-77, 79 2-23, 25

Location

The Devlin open area occupies parts of Sections 11 to 14, 23 and 24 of Devlin township. La Vallee, on the Canadian National railway, lies 1/4 mile to the northwest and Fort Frances 6 miles east.

Access

The southwest end of the open area can be reached by proceeding south by road from La Vallee for 12 miles. At this point the bog is adjacent to the east side of the road. The northern part may be reached by proceeding along the railway to a point 1 mile east of La Vallee and thence south across country for 1/4 mile.

Area

The open area of approximately 1,180 acres is irregular in outline.

Drainage

Drainage from this part of the bog is west from the southwest end into the La Vallee River. The ditch along the road has drained the bog to the extent that it is firm underfoot for a lateral distance of at least 400 feet.

Cover

In the area examined the surface growth is sphagnum moss, labrador tea, and scrub poplar.

Nature of Peat

A test was taken to a depth of 4 feet. Humified peat underlies a 1/2 foot surface cover of raw moss.

Comments

Drainage appears to have affected the quality of the peat adjacent to the road. The open portion extends 1 1/4 miles east into the interior of the bog beyond the area sampled. It is possible that the quality would improve in this direction. However, access and drainage would present a problem as 2 lakes are present a short distance to the east and southeast.

No. 5
CROZIER BOG (DEVLIN SECTION)

4. BURRISS BOG

Map Reference 6

Aerial Photograph Reference 49-4831
2-200, 203

Location

The Burriss Bog extends from Lot 7, Concession II, Burriss township east to straddle the boundary of Burriss and Miscampbell townships; it projects north and south, taking in parts of Lot 1, Concessions I to III, Burriss township, and parts of Lots 11 and 12, Concessions I to V, Miscampbell township. The bog lies 3 miles north of La Vallee on the Canadian National railway.

Access

Nearly all parts of the bog are easily accessible by roads. The area sampled was reached by a secondary road leading north from La Vallee. It crosses the bog along the west boundary of Lot 4, Concession II, Burriss township.

Area

The total area of the bog is approximately 4.8 square miles, of which 1760 acres are more or less open.

Drainage

The west end of the bog is ditched along the road from La Vallee and thence east to the central part. From here a creek flows south and then west into the La Vallee River. The north end is drained by a creek into Wasaw Lake, which in turn drains into Rainy Lake. The south central portion of the bog would be difficult to drain.

Cover

The cover is typical of other bogs of the area, consisting of sphagnum moss, labrador tea, and some grass, with an overgrowth of scattered scrub spruce.

Depth

Samples were taken to a depth of 4 1/2 feet and bottom was not reached.

No. 6
BURRISS BOG

No. 6
BURRISS BOG
(EAST EXTENSION)

Nature of Peat

Two samples were collected. The peat in these samples was medium brown and relatively unhumified to the depth sampled. It was comprised of 40 to 80 per cent sphagnum moss, 10 to 45 per cent fine sedge, 5 per cent reedy material, and 5 to 10 per cent roots.

Comments

The sphagnum moss content in the area tested is variable. However, this material is representative of about 40 acres, and in view of the large open area of the bog, further investigation should be carried out. Three-phase hydroelectric power is available at Fort Frances, 8 miles east of La Vallee.

5. BIG FORK BOG

Map Reference 7

Aerial Photograph Reference 49-4824
1-10

Location

The Big Fork Bog occupies the north part of Section 20, the central part of Section 21, and the southwest part of Section 29, Woodyatt township. Devlin, on the Canadian National railway, lies 6 miles to the north.

Access

A gravel road leads south from Devlin and passes centrally through the bog.

Area

The open portion is comprised of approximately 250 acres.

Drainage

The central part is drained by ditches along the road leading to Devlin. From the road a ditch leads west along the south side of the bog into the Rainy River. This bog is fairly well drained and hence is dry and relatively firm underfoot.

No. 7
BIG FORK BOG

Cover

The surface is comprised of labrador tea, wood moss, and sphagnum moss.

Depth

One sample was taken to a depth of 4 feet, but bottom was not reached.

Nature of Peat

The sample collected showed 4 feet of dark-brown, earthy peat.

Comments

This bog is in an advanced stage of drainage. It is doubtful that there is any unhumified peat moss present. Little additional drainage would be required for the portion examined to be suitable for cultivation.

6. SCHOOL HOUSE BOG

Map Reference 8

Aerial Photograph Reference 49-4830
2-125

Location

The School House Bog occupies parts of Lots 2 to 4, Concession I, Carpenter township, and the north part of Section 35, Lash township.

Access

Secondary gravel roads lead to the western extremity of the bog from highway No. 11, 3 1/2 miles east of Emo, and to the eastern extension 2 miles west of Devlin. Access for the current investigation was from the west end. The road along the south boundary of Carpenter township was taken to its eastern termination in Lot 4 at an abandoned schoolhouse. The right of way has been extended east across the bog, and access is by foot along the right of way.

Area

The bog is mostly covered by a thick growth of spruce. An open area of about 30 acres lies on the north side of the right of way 1800 feet east of the end of the road.

No. 8
SCHOOL HOUSE BOG

Drainage

Drainage is from the northeast into a creek that flows east into the La Vallee River. The La Vallee River drains into the Rainy River.

Cover

The treed portion is comprised of spruce, balsam and tamarack, up to 5 inches in diameter at the stump. The open portion is covered with sphagnum moss, labrador tea, and scattered clumps of grass.

Depth

The bog was tested to a depth of 7.5 feet without bottom being reached.

Nature of Peat

Two sample columns were collected. These showed a distinct layering of unhumified sphagnum moss and humified peat. The former occurs in beds from 0.25 feet to 1.5 feet thick, and the latter from 0.2 feet to 1 foot thick.

The sample columns collected are described below:

Area A Depth, Feet		Area B Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 2.5	Slightly humified sphagnum moss.	1 - 2.5	Slightly humified sphagnum moss.
2.5- 2.75	Moderately humified sphagnum moss.	2.5 - 2.75	Moderately humified sphagnum moss.
2.75-3	Slightly humified sphagnum moss.	2.75 - 3	Slightly humified sphagnum moss.
3 - 3.2	Moderately humified sphagnum moss.	3 - 4	Slightly humified sphagnum moss.
3.2 - 4.3	Slightly humified sphagnum moss.		
4.3 - 4.8	Moderately humified sphagnum moss.		

Area A
Depth, Feet (Cont'd)

4.8 - 6	Slightly humified sphagnum moss.
6 - 6.5	Moderately humified sphagnum moss.
6.5 - 7	Slightly humified sphagnum moss.
7 - 7.5	Moderately humified sphagnum moss.

Comments

The close interlayering of moderately humified and slightly humified material would probably result in the production of a dusty product which would be unsatisfactory under present market conditions.

7. BOG IN SECTIONS 26 TO 28, LASH TOWNSHIP

Map Reference 9

Aerial Photograph Reference 49-4829
2-51

Location

This bog includes parts of Sections 21, 22, 26, 27, 28 and the southern parts of Sections 33 and 34, Lash township. The open area is located in Section 28, 2 miles east of Emo. Highway No. 11 passes along the north side, and the Canadian National railway along the south side.

Access

Access is most convenient from highway No. 11.

Area

Most of the bog is covered by spruce forest. An area of approximately 160 acres of lighter overgrowth lies to the west and northwest, in Section 28.

Drainage

The bog is partially drained by ditches along the highway and railway.

No. 9
BOG IN SECTIONS 26 TO 28
LASH TOWNSHIP

Cover

The surface growth is sphagnum moss, labrador tea, and some cotton grass, with an overgrowth of spruce.

Depth

No sample columns were collected.

Nature of Peat

An examination of material from the ditches on both the north and south sides of the bog indicated a high root content and poor quality material for horticultural purposes.

The moss is more humified on the south side of the bog than on the north side.

Comments

The number of trees and roots and the poor quality of the moss do not encourage further investigation for horticultural purposes. The quality might be better in the central part where drainage effects would be less. However, it is doubtful if there would be a sufficient quantity present to merit harvesting.

8. LA VALLEE BOG

Map Reference 10

Aerial Photograph Reference 49-4828
2-22

Location

The La Vallee Bog is located in parts of Sections 15, 16, 21 and 22, Devlin township. The town of La Vallee, on the Canadian National railway, is at the northeast edge. Fort Frances lies 8 miles east.

Access

The central part of the open area can be reached by proceeding south on the road from La Vallee to a point 2,700 feet south of the railway and thence west for 2,100 feet across farm land. The northern part is immediately adjacent to the railway, 3,000 feet west of La Vallee.

No. 10
LA VALLEE BOG

Area

The predominantly open area consists of 700 acres within which are islands consisting of thick growths of spruce.

Drainage

A creek flows southwest along the southeast side of the bog and thence west into the La Vallee River. The bog has a raised portion, or crown, in the east central part.

Cover

This bog is mainly grassy and wet. An area of 180 acres in the northeastern part, and a smaller area in the southwest, are relatively mossy and associated with labrador tea, cranberry bushes, and poplar.

Depth

The depth of the bog is not known.

Nature of Peat

The bog was tested to a depth of 3.85 feet. In the mossy sector the top foot is comprised of raw sphagnum moss. In both the mossy and grassy portions the underlying material is moderately humified sphagnum moss or woody peat with twigs and reeds.

The sample columns collected are given below:

Area A Depth, Feet		Area B Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 2	Dark brown moderately humified sphagnum moss with twigs and reeds.	1 - 2.85	Dark brown, woody peat.
2 - 3.85	Blackish-brown peat.		

Area C (Crown of bog)

Depth, Feet	
0 - 1	No recovery.
1 - 3.85	Dark brown, woody peat.

Comments

The degree of humification of the material from this bog indicates that a product could not be produced comparable in quality to presently marketed Canadian sphagnum peat moss.

9. CARPENTER BOG

The Carpenter Bog includes a large portion of the north half of Carpenter township and extends west into Lots 1 and 2, Concession V, Dobie township. It covers an area of 4,380 acres which are mostly open. An area of high ground, about 280 acres, is in the centre of the bog. The southeastern and western portions were examined and are described separately.

9.1. Southeastern Portion

Map Reference 11

Aerial Photograph Reference 49-4832
3-43

Location

The area examined comprises the western part of Lot 6 and the eastern part of Lot 7, Concession IV, Carpenter township. Emo, on the Canadian National railway, lies 5 miles to the southwest.

Access

The secondary, gravel road from Emo to Barnhart crosses the bog on the boundary of Lots 6 and 7.

Area

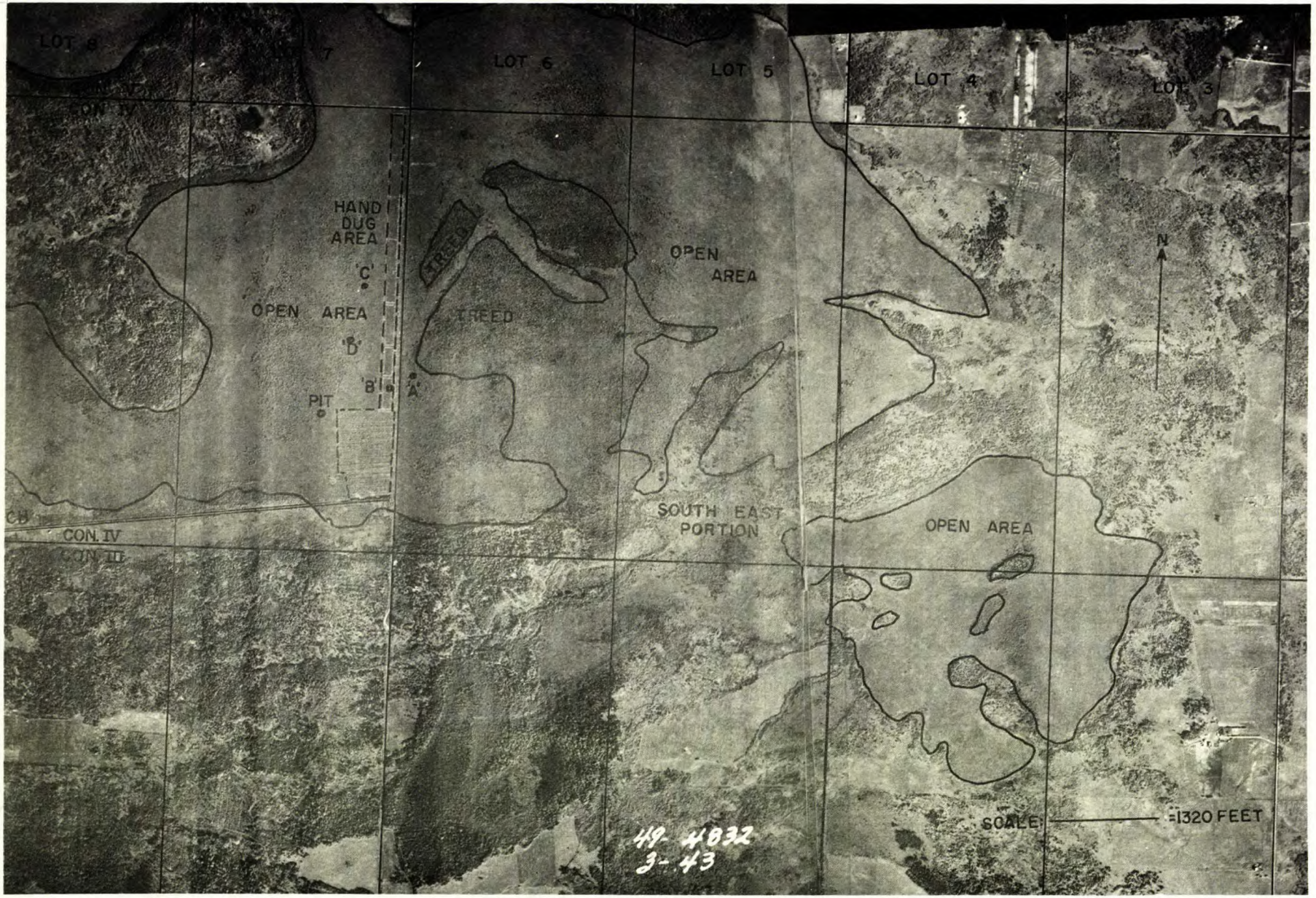
The sampling is representative of approximately 100 acres.

Drainage

Drainage is by a ditch along the south side of the bog in Lots 7 and 8 and into the ditch along the road. Smaller ditches in the old diggings provide supplementary drainage. These are at intervals of 50 feet and are oriented in an east-west direction.

Cover

The bog contains scrub spruce 1 inch to 2 inches in diameter, scattered over the area and growing on sphagnum moss, labrador tea and



No. II

CARPENTER BOG

(SOUTHEASTERN PORTION)

grass. Areas of heavy spruce growth lie east of the road and west of the old workings.

Depth

Sampling adjacent to the road reached a depth of 10 feet without bottom being reached. Leverin (3) indicates this portion of the bog to be 15 feet deep. One thousand feet west of the road a depth of 16 feet was attained without bottom being reached.

Nature of Peat

An examination of old diggings on either side of the road showed a depth of 3 feet of brown moss containing 25 per cent roots which were up to 1/5 inch in diameter. The moss contains 20 per cent reed and sedge, the latter being somewhat humified and occurring in layers; the layers are up to 1/10 inch thick separated by 1/2 inch to several inches of sphagnum moss. This layering continues to a depth of between 8 and 9 feet, after which the moss is increasingly humified. Roots are abundant throughout.

The distance that this material extends east of the road is not known. From test holes 500 to 1,000 feet to the west, humified peat was obtained throughout.

The sample columns collected are described below:

Area A East side of road Depth, Feet		Area B West side of road Depth, Feet	
0 - 1	No recovery.	0 - 2.85	No recovery.
1 - 2.85	Brown sphagnum moss, with some reeds; becomes gradually more humified to end of section.	2.85-5	Medium brown sphagnum, rooty. Becomes somewhat humified between 4.5 and 5.
2.85-6	Light brown, less humified, some reeds.	5 - 9.75	As from 2.85 to 4.5.
6 - 6.25	Humified peat.	9.75-10.5	Humified peat.
6.25-8.25	As from 2.85 - 6	10.5	Further penetration not possible because of roots.

Area A
East side of road
Depth, Feet (Cont'd)

8.25 - 10	Darker brown, fairly well humified.

Area C Depth, Feet		Area D Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 4	Humified oozy peat.	1 - 4	Humified oozy peat.

Test Pit
Depth, Feet

0 - 1	Raw moss.
1 - 4	Humified oozy peat.
4 - 6	Mixture of 50% humified oozy peat and 50% unhumified fine hairlike grass.
6 - 16	Humified peat with grass (taken with sampler).

Laboratory tests were carried out on a sample of hand cut air dried peat left from the previous operation. The results are given below:

Absorptive Value		Ash	
Dry	At 25% Moisture	%, Dry	pH
9.5	7.0	4.4	4.5

Comments

Pinewood Peat Industries commenced production of peat moss from this part of the bog circa 1945 (4), and operations continued until some time after 1950. Harvesting was by hand cutting over an area 4,800 feet long and extending 300 feet east and 700 feet west of the Emo-Barnhart road.

The moss produced was somewhat dusty, due to the humified layers present. The area from which this material is available is limited to the west of the road. Further sampling would be required to determine its

No. 12
CARPENTER BOG
(WESTERN PORTION)

extent to the east. Three phase hydroelectric power is available at Barwick, 7 miles west of Emo.

9.2. Western Portion

Map Reference 12

Aerial Photograph Reference 49-4833
3-130

Location

The area examined comprises Lot 1, Concession V, Dobie township and Lot 12 and the western part of Lot 11, Concession V, Carpenter township. Emo, on the Canadian National railway, lies less than 6 miles south.

Access

The old Kenora highway leads north from Emo and passes centrally across the area examined. An unused concession road skirts the south side of the open area along the south boundary of Lot 1, Concession V, Dobie township.

Area

The open area examined consists of 780 acres.

Drainage

Ditches on either side of and parallel to the north-south road cross the bog. At the south end an outlet ditch extends east from the road and drains into Everett Creek. A second outlet ditch 4,000 feet to the north drains west for 1,200 feet into a creek which flows into the Sturgeon River.

The south outlet ditch and the ditch along the west side of the road were cleaned out to a depth of 6 feet and a width of 10 feet. The ditch draining west from the road is now partially closed.

The bog is quite firm for 300 feet north from the concession road and for 200 feet on either side of the north-south road. Towards the western end of the area examined there is considerable water below a depth of 3 feet.

Cover

The area west of the north-south road contains a few scrub hemlock and poplar up to 4 feet high. Spruce grows up to 8 feet or more in height in the northern part. East of the road the bog is lightly wooded, with spruce averaging 1 inch to 1 1/2 inches in diameter at the stump. Scattered areas of heavier growth attain heights of 20 feet.

The surface is comprised of sphagnum moss, cotton grass, labrador tea, and pitcher plants.

Depth

The depth of the bog where tested in the east central part varies from 7.5 feet to 19 feet.

Nature of Peat

The peat east of the north-south road and north of the creek on the west side of the road, to a depth of from 3 to 8 feet, is light brown to yellowish brown, slightly humified sphagnum moss containing 10 to 20 per cent reeds and fine fibrous rootlets. The area south of the creek is more humified.

Roots up to 2 inches in diameter are scattered throughout. Along the ditch there is a greater concentration of roots at a depth of 5 feet than at lesser depths. There are fewer roots east of the road than west. The roots are not present in sufficient quantity to hinder sampling as was the case in other bogs.

The sample columns collected are described below:

Area A Depth, Feet		Area B Depth, Feet	
0 - 1.5	No recovery.	0 - 1.5	No recovery.
1.5 - 4	Brown sphagnum moss, moderately humified.	1.5 - 3	Medium brown, moderately humified sphagnum moss.
		3 - 5	Medium brown peat.
4 - 7.8	Brownish-black peat.		

Area A
Depth, Feet (Cont'd)

7.8 - 10	No recovery, probably a water layer.
10 - 14.8	As from 4 - 7.8.

Area C Depth, Feet		Area D Depth, Feet	
0 - 1.5	No recovery.	0 - 1.5	No recovery.
1.5 - 4	Slightly humified sphagnum moss.	1.5 - 6	Slightly humified sphagnum moss.
4 - 6	Slightly humified sphagnum moss dispersed in water.	6 - 8	Darker brown, more humified than at lesser depths.
6 - 8	Slightly humified sphagnum moss.		
8 - 10	Darker brown, more humified.		
10 - 14	No recovery.		

Area E Depth, Feet		Area F Depth, Feet	
0 - 1	No recovery.	0 - 1	No recovery.
1 - 3.5	Slightly humified sphagnum moss.	1 - 6.5	Slightly humified sphagnum moss.
3.5 - 5	Peat.	6.5 - 7	Peat.

Area G Depth, Feet		Area H Depth, Feet	
0 - 1	No recovery.	0 - 2	No recovery.
1 - 6.3	Slightly humified sphagnum moss.	2 - 6	Slightly humified sphagnum moss.
6.3 - 10	Slightly darker and more humified.	6 - 8	Darker brown and slightly more humified.

Area H
Depth, Feet (Cont'd)

8 - 10	Granular and humified.

Area J
Depth, Feet

0 - 1	No recovery.
1 - 6	Brown, slightly humified sphagnum moss with a few reeds.
6 - 6.8	Moderately humified sphagnum moss.
6.8 - 7	As from 1 - 6, rooty.

Area K
Depth, Feet

0 - 1	No recovery.
1 - 5	Brown, slightly more humified than area J, 1 - 6 feet.
5 - 6	Humified, oozy and rooty.

Area L
Depth, Feet

0 - 1	No recovery.
1 - 4	Slightly humified sphagnum moss; rooty.
4 - 6	Reddish brown, granular and rooty with 50% fine, slightly humified sphagnum moss.

Area M

At outlet ditch east from road, south end of bog, 4 feet of slightly humified sphagnum moss on clay.

Area N

700 feet north of concession road, from ditch 4 feet of slightly humified sphagnum moss to water level. Total depth of moss not known.

Test Pit
Depth, Feet

0 - 1	Raw sphagnum moss.
1 - 3	Light brown, slightly humified sphagnum moss with 20% fine reeds.

Core Sample (same location as test pit)
Depth, Feet

0 - 1	Raw sphagnum moss.
1 - 3	No recovery.
3 - 7,5	As from 3 to 5 in test pit.

Test Pit Depth, Feet (Cont'd)		Core Sample Depth, Feet (Cont'd)	
3 - 5	Darker brown sphagnum moss, 50% humified material.	7.5 - 8	Light brown, slightly humified sphagnum moss.

No roots noted in pit.

The results of laboratory tests on some of the samples collected are given below:

Sample Area	Depth, Feet	Absorptive Value Dry	Absorptive Value At 25% Moisture	Ash %, Dry	pH
J	1 - 6	14.3	10.5	6.8	4.5
K	1 - 5	19.4	14.2	4.3	4.5
N - Most humified, composite	1 - 4	20.3	14.9	3.1	4.5
N - Least humified, composite	1 - 4	26.5	19.6	4.3	4.5
	Samples by Leverin (3)				
West End, line east of and at right angles to old Kenora Highway:					
1942	0 - 3	14.5	10.6	6.6	
1943	—	14.4	10.5	6.1	
1942	3 - 5	11.4	8.3	6.0	
1942	5 - 6	9.1	6.6	5.2	
West of old Kenora Highway:					
1943	1 - 3	11.5	8.4	8.8	

Comments

In view of the above and the favourable results obtained from the sampling, further investigation is warranted.

The laboratory results from the present work give, in general, better results than those quoted from Leverin. However, the exact location of his sampling is not known and correlation with the present work is thus not possible. The absorptive value and ash content from Area K indicate better quality material than from Area J, while visual examination indicated the reverse to be true. The reason for this is not apparent.

Leverin reported 3 to 4 feet of fairly good to very good moss which should yield a marketable horticultural product from this area. The results of the present sampling indicate a depth of 3 to 8 feet of good material with admixed reeds and rootlets.

The ditching already carried out will be helpful in any future operations. The bog is relatively dry. There was little seepage into the test pit during the 30-minute examination period. Access is good and railway facilities are close. A transformer station for three-phase hydroelectric power is at Barwick, 7 miles west of Emo.

10. DOBIE TOWNSHIP BOG

Map Reference 13

Aerial Photograph Reference 49-4831 49-4832
2-186 2-36

Location

The portion examined comprises parts of Lots 5 and 6, Concessions III and IV, Dobie township. The towns of Emo and Barwick, on the Canadian National railway, lie 5 1/2 miles by road to the southeast and southwest respectively.

Access

A paved highway, No. 71 to Kenora, passes near the west side of the bog. The south end of the open area is reached by proceeding east for 1,000 feet from highway No. 70, 2 1/2 miles north of its junction with highway No. 71. The route follows a partly ditched right-of-way between Concession III and the Manitou Rapids Indian Reserve. It is at present flooded by beaver dams.

No. 13
DOBIE TOWNSHIP BOG

The northern part is reached by proceeding due east from highway No. 70 through wooded terrain for 200 feet.

Area

The open area consists of a north and a south lobe with a constriction, overgrown with scrub, separating the two. The north lobe covers an area of 250 acres and the south lobe covers 230 acres.

Drainage

A creek flowing west into the Sturgeon River passes 200 feet north of the bog and could provide a means of drainage for the north lobe.

The south lobe would be most conveniently drained west to highway No. 71 from the south end, along the right-of-way between Concession III and the Manitou Rapids Indian Reserve. A hand level survey indicates the drop from the bog to the bottom of the culvert at the road is approximately 17 feet. The culvert drains west into Sims Creek, which has been deepened by ditching.

A shallow lake approximately 38 acres in area lies 660 feet south of the right of way. This lake would probably require draining to permit efficient harvesting.

Cover

The south lobe supports a growth of sphagnum moss, with some labrador tea. Widely scattered spruce, banksian pine and tamarack are present. These average about 6 feet in height and 1 inch in diameter at the stump but attain a maximum of 4 inches in diameter.

The north lobe is similar to the south except no banksian pine was noted and grass up to a maximum of 6 inches in height occurs sporadically throughout. Tree growth is somewhat heavier and locally averages 2 inches at the stump.

Depth

Sampling was limited to a depth of between 6.3 and 14 ft. In only one instance was bottom definitely encountered, this in Area NB. Here blue clay was reached at a depth of 12 feet.

Nature of Peat

The material in the north lobe is a dark brown mixture consisting of 70 to 90 per cent sphagnum moss, the remainder being comprised

of reed and sedge. This is intermixed with between 10 to 25 per cent humified material.

The south lobe is comprised of a mixture of similar colour of 15 to 60 per cent sphagnum moss with 40 to 85 per cent reed and sedge. Approximately 30 per cent is humified material.

On drying, the material has a tendency to be dusty and brittle.

The sample columns collected are given below:

North Lobe

Area NA Depth, Feet		Area NB Depth, Feet	
0 - 2	No recovery.	0 - 1	No recovery.
2 - 3	Medium brown, slightly humified, 90% sphagnum moss, 10% reed and sedge. Rooty.	1 - 4.9	Dark brown, slightly humified, 70% sphagnum moss, 30% reed and sedge.
3 - 4	No recovery.	4.9 - 5.9	Lighter brown and less humified.
4 - 4.9	As from 2-3.	5.9 - 9.5	Reddish brown, woody.
4.9 - 5.4	Woody, darker brown, more humified.	9.5 - 10	Earthy, humified.
5.4 - 11.5	As from 2-3, fine twigs.	10	No further penetration for samples was possible.
11.5 - 12	Dark brown, earthy.		
12	Blue clay.		

Area NC Depth, Feet		Area ND Depth, Feet	
0 - 2	No recovery.	0 - 3	No recovery.
2 - 5	Dark brown, slightly humified, 70% sphagnum moss, 30% reed and sedge.	3 - 4.5	Humified, earthy peat.

Area NC
Depth, Feet (Cont'd)

5 - 7	Dark reddish brown, woody, some sphagnum moss.
7 - 7.3	Slightly humified sphagnum moss.
7.3	Root condition prevented further penetration. Check sampling showed this area to be more uniform than Area NB.

Area NE Depth, Feet		Area NF Depth, Feet	
0 - 0.5	No recovery.	0 - 1	No recovery.
0.5 - 4.9	As from 2 -3, Area NA.	1 - 4	As from 2 -3, Area NA.
4.9 - 5.5	Reddish brown, woody.		
5.5	Root condition prevented further penetration.		

South Lobe

Area SA Depth, Feet		Area SB Depth, Feet	
0 - 3	No recovery.	0 - 3	No recovery.
3 - 5.8	Medium brown, slightly humified, mainly sphagnum moss, with some reed and sedge.	3 - 5.8	Medium brown, slightly humified, 75% sphagnum moss, 25% reed and sedge.
5.8 - 6	Humified.	5.8 - 12	As above but containing 3" to 4" layers of humified material.
6 - 6.3	As 3 - 5.8.		

Area SA
Depth, Feet (Cont'd)

6.3 - 7.3	Humified.

Rooty throughout.

Area SB
Depth, Feet (Cont'd)

12 - 14	As from 3-5.8

No roots noted.

Area SC
Depth, Feet

0 - 3	No recovery.
3 - 6	Medium brown, slightly humified, 80% sphagnum moss, 20% sedge and reed; 3" humified layer at 5'.
6 - 7	Very little recovery; woody material.
7 - 7.3	Dark, reddish brown; woody.
7.3	Root condition prevented further penetration.

This column rooty throughout.

Area SD
Depth, Feet

0 - 1	No recovery.
1 - 5.3	Medium brown, slightly humified, 70% sphagnum moss, 30% reed and sedge. At 3', 3" layer of humified peat.
5.3 - 6.3	Humified.

Area SE
Depth, Feet

0 - 1	No recovery.
1 - 6.3	Medium brown, slightly humified, 75% sphagnum moss; remainder reed and sedge.
6.3 - 7.3	Humified.

Column rooty throughout.

Area SF
Depth, Feet

0 - 6	Yellowish brown, mainly reed and sedge; slightly humified.

Test Pit midway between Area SA and Area SB

Depth, Feet

0 - 1 Raw sphagnum moss.

1 - 2 Brown, slightly humified sphagnum moss.

2 - 3.5 Moderately humified cotton grass, reed, sedge and sphagnum moss.

3.5 - 4 Moderately humified sphagnum moss and fine reeds.

The results of laboratory tests are given below:

Sample Area	Depth, Feet	Absorptive Value Dry	Absorptive Value At 25% Moisture	Ash %, Dry	pH
		North Lobe			
NA	2-4.9 and 5.4-11.5	15.2	11.1	7.2	6.0
NB	1 - 4.9	15.0	11.0	5.4	4.5
NB	4.9 - 9.5	10.0	7.3	7.6	6.0
NC	2 - 5	13.9	10.2	5.5	4.5
NC	5 - 7.3	11.4	8.3	6.9	5.5
		South Lobe			
SA	3 - 5.8	19.0	14.0	4.5	4.5
SC	3 - 6	12.8	9.4	7.9	4.5
SD	1.5 - 3	17.0	12.5	3.7	4.5
SE	1 - 6.3	20.1	14.8	3.6	4.5

Comments

The peat in the north lobe on drying appears to contain more sphagnum moss and is less humified than that in the south lobe, particularly that at the southern extremity of the south lobe. The peat in the south lobe has a tendency to become brittle and dusty on drying. Absorptive values from the south lobe indicate better material than suggested from visual inspection. Further investigation might outline an area of horticultural moss that merits production on a moderate scale. In view of the fact that

a paved highway is adjacent, hydroelectric power is close and drainage is not a problem, such an investigation is warranted. A transformer station to provide three-phase hydroelectric power is located at Barwick.

11. BOG IN SECTIONS 24 AND 25, SHENSTONE TOWNSHIP

Map Reference 14

Aerial Photograph Reference 49-4833
3-122

Location

The bog occupies the north 1/4 of Section 24, and the south 1/2 of Section 25, Shenstone township. It lies 4 miles north of Barwick.

Access

The bog is reached by proceeding west for 1/4 mile along the road 4 miles north of Barwick.

Area

The open area consists of 300 acres.

Drainage

The ditches along either side of the road crossing the bog can be utilized for drainage.

Cover

The cover consists of sphagnum moss, labrador tea, pitcher plants and cotton grass, with a scattering of scrub spruce.

Depth

The bog was not sampled or sounded. Leverin (3) reports a depth of 6 feet of moss.

Nature of Peat

This bog was examined visually, but no samples were taken. Leverin (3) reports a 6-foot cover of fairly uniform quality, light brown, light in weight, and only slightly humified. The analysis of a sample of the 6-foot stratum was reported as follows:

No. 14
BOG IN SECTIONS 24 & 25,
SHENSTONE TOWNSHIP

Absorptive Value		Ash	Nitrogen
Dry	At 25% Moisture	%, Dry	%, Dry
13.9	10.2	7.2	0.9

Comments

The ash content is higher than one would expect from the description. The quality for horticultural purposes appears adequate but the available area is small.

Old diggings over a relatively small area immediately adjacent to the road indicate that at one time an attempt was made to harvest the moss.

The bog could be operated on a small scale; further investigation may be warranted.

12. BARWICK BOG

Map Reference 15

Aerial Photograph Reference 49-4831
2-180

Location

The Barwick Bog occupies parts of Sections 10 and 15 in Shenstone township and parts of Sections 10 and 15 in the Long Sault Indian Reserve.

Access

Access is most convenient from the east. A road leads to the southeast corner of Section 15, Shenstone township. From this point a tractor road leads west to the east edge of the bog.

Area

The bog is for the most part wooded, but relatively light growth occurs over 125 acres at the east side.

Drainage

Good drainage could be obtained by ditching east for 1,500 feet into the Sturgeon River.

No. 15
BARWICK BOG

Cover

The surface growth is comprised mainly of sphagnum moss, with some labrador tea and grass.

Depth

Sampling did not exceed a depth of 5 feet. Bottom was not reached.

Nature of Peat

The peat is humified below a depth of 1 1/2 feet. A typical sample column is described below:

Depth, Feet	
0 - 1	Raw sphagnum moss.
1 - 1.5	Slightly humified sphagnum moss.
1.5 - 3.5	30% moderately humified sphagnum moss and 70% fine grassy material.
3.5 - 5	Oozy peat.

Comments

This bog was worked during the summer of 1963 by Mr. Briggs of Barwick. Top moss was harvested and placed on drying frames made from chicken wire and tilted to face south. The moss was loaded from the frames onto a rack which was mounted on a stone boat and then pulled off the bog by a tractor. It was taken to a hay baler, which at the time of this study was located 100 feet west of the southwest corner of Section 15 and adjacent to a storage shed; the shed is approximately 30 feet long, 10 feet wide and 8 feet high. A small shredder was also present but apparently this is not being used, as the moss was not shredded or screened. The baled moss was rooty and contained some labrador tea.

13. PINEWOOD BOG

The Pinewood Bog occupies an area of some twenty-three square miles in Pattullo and Nelles townships. The bog is open in four localities, two of which were examined. One of the economic areas is described as the Polar Bear Section and the other as the Nelles Section.

13.1. Polar Bear Section

Map Reference 16

Aerial Photograph Reference 49-4836 49-4837
4-1441 5-28

Location

The open portion includes Sections 19 and 30 in Pattullo township and Sections 24 and 25 in Nelles township.

Pinewood, on the Canadian National railway, lies 6 1/2 miles by road to the south of the bog.

Access

A north-south gravel road on the Nelles and Pattullo townships boundary passes through the open bog area. This boundary road connects with highway No. 11 two miles east of Pinewood.

Area

The open portion has an area of 680 acres; most of this lies to the west of the boundary road.

Drainage

The bog has been partially drained by a ditch 8 feet in depth along the boundary road between Pattullo and Nelles townships and by a ditch leading west from the road into the Kishkakoesis River, a distance of 4,400 feet. The ditch lies 4,800 feet north of the south boundary of Section 24, Nelles township. Additional drainage is provided by old diggings on either side of the road which extend 4,000 feet in a north-south direction and 1,500 feet in an east-west direction. These ditches are oriented east-west, are 2 to 3 feet deep and 30 to 50 feet apart.

Cover

The cover is sphagnum moss, labrador tea and some cotton grass, with an overgrowth of scattered scrub spruce.

Depth

At the south end of the old diggings referred to above, and immediately west of the road, the bog is 9 1/2 feet deep with a blue clay bottom. Leverin (3) states the bog ranges in depth from 4 to 12 feet.

No. 16
PINEWOOD BOG
(POLAR BEAR SECTION)

Nature of Peat

An inspection of the old diggings shows the top 3 feet to consist of sphagnum moss containing 10 per cent roots up to 1/2 inch in diameter, 5 per cent reeds, and 15 per cent fine humified sedge in layers up to 1/4 inch in thickness. One sample taken at the south end of the workings, and a second taken 5,000 feet to the north of this point, indicated a thickness of between 6 and 9 feet of this material. The ditching along the road shows the top 18 inches to be very rooty. At the north end there are practically no roots below this layer. Proceeding south, after 1,000 feet, it was noted that the bog is rooty to a depth of at least 4 feet.

The sample columns collected are described below:

Area A Depth, Feet		Area B Depth, Feet	
0 - 2.5	No recovery.	0 - 1	No recovery.
2.5 - 6	Medium brown, slightly humified sphagnum moss.	1 - 9.5	Medium brown, slightly humified sphagnum moss. Roots encountered in 3 places.
		9.5	Blue clay.

Laboratory tests carried out on a sample of hand-cut, air-dried sod from the old workings gave the following results:

Absorptive Value		Ash	
Dry	At 25% Moisture	%, Dry	pH
12.5	9.1	3.7	4.5

Comments

The moss in the area investigated, with proper shredding and screening, would provide a marketable product. Consequently, this bog merits further investigation to determine the actual extent of the unhumified material.

Power facilities are close. Access is by secondary road; the bridges have an 8-ton load limit. Some modification of road and bridges would probably be required for heavy shipments in the early spring shipping season.

This bog was worked previous to 1942 (3) by the Polar Bear Peat Moss Products Registered. The moss was harvested by hand-digging and transported to a mill at Pinewood. In 1945 the mill burned and operations were transferred to the eastern part of the Carpenter-Dobie bog (4).

During World War II the bog was worked by Jack Briggs, of Barwick.

In 1962, about 16 acres on the east side of the road, just east of the Kishkakoesis River, was worked by a Pinewood cooperative. Harvesting was by hand-digging from ditches 50 feet apart oriented in an east-west direction. The ditches were 15 to 18 inches deep and the material harvested was from the rooty top stratum.

The moss was processed across the road from the area being worked. The hand-cut blocks were shredded, blown into a hay loader, and elevated to the top of a 10-foot platform housing a 4-cubic-feet bin. The bin discharged into a hydraulic baler. A shed 8 feet wide and 10 feet long was used for storage purposes.

The nearest transformer station for three-phase hydroelectric power is at Sleeman, 6 miles west of Pinewood.

13.2. Nelles Section

Map Reference 17

Aerial Photograph Reference 49-4835
4-48

Location

The area examined lies along the west boundary of Section 11, Nelles township. Pinewood, on the Canadian National railway, lies 3 miles to the south.

Access

The Arbor Vitae secondary gravel road leads north from Pinewood and forms the west boundary of the open area examined.

Area

An area of 300 acres is more or less open.

No. 17
PINEWOOD BOG
(NELLES SECTION)

Drainage

Drainage could be accomplished by using the ditch along the road; this drains into the west branch of the Pinewood River, 1 mile to the north.

Cover

The bog is covered with scrub spruce averaging 1 inch in diameter at the stump, spaced at an average distance of 20 feet. Larger, denser clumps occur throughout and occupy a total area of approximately 30 acres. The surface growth consists of labrador tea, sphagnum moss, and cotton grass.

Depth

The depth exceeds 7 1/2 feet. The sampler could not penetrate deeper, because of numerous roots.

Nature of Peat

The moss is of good quality to a depth of 6 feet. Many roots are present throughout.

The sample column collected is described below:

Depth, Feet	
0 - 1	No recovery.
1 - 6	Slightly humified sphagnum moss, the many fine roots imparting a woody quality.
6 - 7.5	More humified, peaty; many small roots.
7.5	Further penetration impossible because of roots.

Comments

The clearing that would be required and the numerous roots present detract from the commercial aspects of this bog as a producer of horticultural peat moss. The nearest transformer station for three-phase hydroelectric power is at Sleeman, 6 miles west of Pinewood.

OTHER SELECTED BOGS (NOT EXAMINED IN FIELD)

Bog in Miscampbell and Crozier Townships

Map Reference 18

A bog north of the Railway Bog covers 700 acres in Lots 5 and 6, Concession I, Miscampbell township, and Sections 34 and 35, Crozier township. The eastern part appears shallow and the southern part is thickly forested with coniferous trees. An area of about 240 acres in the northwest part is mostly open. A road crosses the eastern edge of the open area along the boundary between Lots 4 and 5, providing good access. Drainage could be achieved by ditching 1,500 feet into a creek at the northeast end. The creek drains east into Rainy Lake.

Bog in Lash, Devlin, Woodyatt and Aylesworth Townships

Map Reference 19

A bog of some 1,300 acres covers parts of Sections 1, 12 and 13, Lash township; part of Section 6, Devlin township; part of Section 31, Woodyatt township; and part of Section 36, Aylesworth township.

The south half in Aylesworth and Woodyatt townships is more or less open. A lake 2,000 feet long and 400 feet wide lies in the northern part of the open area. A road crosses the bog just north of the lake, and a second road lies 2,000 feet east of the southeast portion.

This bog merits investigation. Drainage could represent a problem.

Bog in Aylesworth Township

Map Reference 20

A bog covers parts of Sections 23 and 26 to 28, comprising an area of approximately 450 acres about half of which is open. The overgrowth is scattered coniferous shrubs with islands of larger and denser growth. A road comes to within 1,500 feet of the north end. Possible drainage is into a ditch 1,200 feet east of the bog.

Bog in Long Sault Indian Reserve

Map Reference 21

The central part of the Long Sault Indian Reserve, 4 miles due east of Stratton, is covered by a bog of approximately 1,800 acres. The bog is for the most part overgrown with coniferous trees. Small open areas occur in the southern part, adjacent to the Canadian National railway. Highway No. 11 follows along the south side of the railway through this area.

Bog in Mather Township

Map Reference 22

A bog of 1,000 acres occupies the north part of Lot 10, Concession II; Lot 10 and part of Lot 9, Concession III; Lot 9 and the south part of Lots 10 and 11, Concession IV. The bog is mostly open but has wooded islands of high ground scattered throughout. Access is by roads near the east side and at the northwest end. Drainage is by a creek which flows south from the east side into the Sturgeon River.

Bogs in Pattullo, Tait and Sifton Townships

Map Reference 23

A disconnected bog of some 12,300 acres partially covers the northwestern part of Tait township, the northeastern part of Pattullo township, and the southeastern part of Sifton township. This bog is for the most part forested, but there is an open area of 270 acres in the western part. The Dewart Road crosses the western side of the open area, providing good access. A creek skirts the western side of the open area and this should be investigated as a drainage outlet.

Five hundred to 1,400 feet west of the Dewart Road and just west of the creek is an open area at the eastern limit of the Pinewood Bog (Map Reference 16). This open area is in excess of 500 acres, and contains local groves of coniferous trees. The creek is a possible outlet for draining this section of the bog.

The nearest three-phase hydroelectric power is some 15 miles distant, and transportation is by secondary gravel road, which could present a problem in the spring shipping season. Stratton, on the Canadian National railway, is 8 1/2 miles by road to the south. However, investigation of this bog is warranted, as there is a relatively large open area available in the adjacent bogs.

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2. George B. Rigg, "Peat Resources of Washington", Division of Mines and Geology, Department of Conservation, State of Washington, U.S.A., Bulletin No. 44, 1959.

3. Harald A. Leverin, "Peat Moss Deposits in Canada", Can. Dept. of Mines and Resources, Mines and Geology Branch, Report No. 817, 1946.

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5. H. Girard, "Peat in Quebec", Quebec Dept. of Mines, Geological Report No. 31, 1947.

6. A.A. Swinnerton, "Peat Moss in Canada", Can. Dept. of Mines and Technical Surveys, Mines Branch, IC 104, February 28, 1958.

7. L. v. Post, "Das genetische System der organogenen Bildungen Schwedens", Mem. Nomenclature Classification Sols. International Soil Sc. Cong. (Helsingfors) 1924: 287-304, 1924.

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APPENDIX I

ON SAMPLING INSTRUMENTS

The Djos Peat Borer, manufactured by Beus and Mattson AB, Sweden, is illustrated in Figure A. This sampler is used very successfully in Europe for evaluating peat bogs and has been acquired recently for this purpose in Canada. This sampler is so designed that the sample chamber is closed when the sampler is being inserted into the bog. When the sampler has reached the depth where the sample is to be taken, by turning the handle the sample chamber is opened. Continued turning of the handle causes peat bog material to be turned into the sample chamber by the action of the knife-edge lip of the sample chamber enclosure. Turning the handle in the opposite direction closes the sample chamber, preventing contamination of the sample.

This sampler is recognized as being of greatly improved design as compared with the Mines Branch sampler described in the main body of this report, for several reasons, including the following: (1) the sampling chamber is larger in diameter, 30 to 35 mm (Mines Branch sampler is 25 mm diameter), permitting a sufficiently large sample to be collected in a single increment for qualitative analysis; (2) since the sampler is not moved vertically, once the desired depth is reached in the bog the "in situ" layering is maintained in the sample; (3) it is possible to collect a sample representative of all materials in the bog, including unhumified sphagnum moss and small roots such as occur at or near the bog surface; (4) because the sample chamber is closed after sample collection, there is no loss of material when withdrawing the sampler from the bog; (5) visual inspection can be made of the sample core without removing it from the sample chamber, thereby guaranteeing the detection of the occurrence of thin layers of various peat material; (6) removal of the sample core or any part thereof from the sample chamber can be accomplished readily.

A field trial was conducted, using the Djos and the Mines Branch peat samplers. Both sampling instruments were used to collect samples from the surface to the bottom at one sampling station. Samples were collected at one-foot intervals. When using the Mines Branch sampler it was necessary to collect several increments at each depth in order to composite a large enough sample for analysis, whereas a single increment only was required when using the Djos peat sampler. The samples were analysed for ash content and absorptive values and the data are tabulated below.

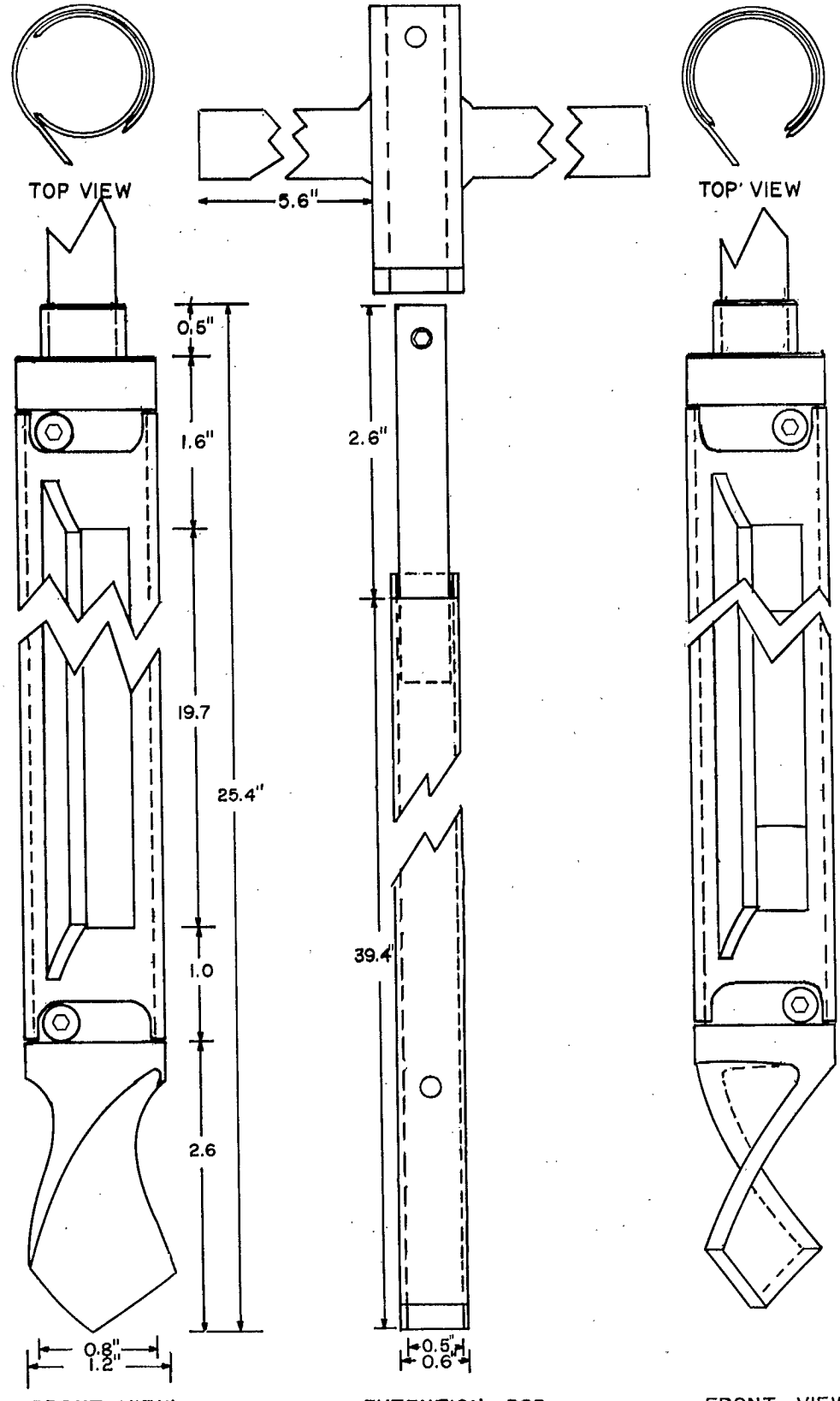

FIGURE A - THE "DJOS" PEAT BORER

Depth, Feet	Mines Branch Sampler		Djos Sampler	
	Absorptive Value (Dry)	Ash %, (Dry)	Absorptive Value (Dry)	Ash %, (Dry)
0 - 1	Would not core		23	2.0
1 - 2	Would not core		26	1.4
2 - 3	+26	0.8	+26	1.0
3 - 4	+26	1.2	+26	0.8
4 - 5	+26	1.0	+26	1.4
5 - 6	+26	1.3	+26	0.9
6 - 7	+26	1.4	+26	1.0
7 - 8	+26	1.0	+26	1.0
8 - 9	+26	1.0	+26	3.0
9 - 10	+26	0.8	+26	2.8
10- 11	+26	0.9	25	2.7
11- 12	26	1.4	26	2.7
12- 13	20	1.7	18	2.5
13- 14	15	2.2	14	2.6
14- 15	23	2.0	22	2.3
15- 16	15	3.2	21	3.0
16- 17	-	-	17	7.7
17- 18	8	20.8	12	8.4

This initial field trial was conducted on a bog in which the material was relatively uniform from the surface to a depth of ten feet. Below this depth there is a general increase in the degree of humification, as demonstrated by the general decrease in the absorptive values, and an increase in the ash content. Thin layers of distinctly different material as witnessed in some bogs were lacking; therefore, in this case it is not possible to compare the two samplers with respect to their capacity to isolate such layers in core samples. Further field trials are planned on bogs where test pits have illustrated such strata.

This test illustrated the capability of the Djos peat sampler to core the unhumified surface material (from 0 to 2 feet). The presence of small roots in the slightly humified material down to ten or twelve feet was observed in samples collected by the Djos peat sampler; these were not present in the samples collected by the Mines Branch sampler. The high ash content of material collected at the 17-18 feet interval by the Mines Branch sampler is believed to be due to penetration of the open sample chamber into the clay bottom.

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APPENDIX II

ON THE DETERMINATION OF DEGREE OF HUMIFICATION OR DECAY

The following is quoted directly from the English translation of a paper by H. Goetzke, Torfinstitutes, Hannover, Federal Republic of Germany*:

"The contemplated quality standardization of peat products intends to make only demarcations but pass no judgements as to value. The qualities of products must be measured by those of the raw materials. As a characteristic of the 'degree of humification' we chose the r-value according to Keppeler. The relations between the r-value and the von Post scale are demonstrated, and a suggestion of a classification of peat samples on the basis of the r-value is developed. This classification may be used also as a standard of comparison for peat products." (In this report it is reasoned that, in the future, tests or measurements must be confined to such characteristics which change significantly in the course of peat formation.)

" . . . . physical methods cannot be applied for standardization, for the following reasons:

1. The humification of the plant mass is fundamentally a complex of chemical processes. The change of the physical structure is a result of it — that is, secondary.

2. The physical methods can be applied only to peat samples in a moor-fresh state**. Any processing, even drying, results in major physical changes which make a determination impossible. It does not mean, however, that physical methods are dispensable."

"The rule-of-thumb method, according to von Post, remains unsurpassed for quick tests in the field, and in practical moor assessments it helps to evaluate the raw material with a view to the subsequent production."

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*Reference: "Torfnachrichten" des Torfinstitutes Hannover und der Torfforschung GmbH., Bad Zwischenahn., Vol. 14 (1963), Nos. 3/4, pp. 5-8.

**"In situ" condition.

" For an evaluation of the state of humification of a product from high moor peat, the r-value introduced by von Keppeler (3)* was chosen. This value may be determined relatively easily and with good reproducibility. It is defined as that proportion in weight per cent of the peat substance (moisture and ash free) which is not dissolved by 80 per cent sulphuric acid. It is an attempt, so to speak, to accelerate the completion of the peatification in the laboratory. The more humified a peat sample is the more resistant it will prove against this attack (by the sulphuric acid)."

From the foregoing it is apparent that the r-value may serve as a characteristic for the humification state of a peat sample. The method of determination of the r-value, as carried out in the Mines Branch laboratory in a study of the possibilities for applying this measurement to the characterization of Canadian peats and peat products, is outlined below. The method is substantially as described in the draft of the German standard DIN 11542 concerning the properties of peat moss, with some minor modifications of the apparatus used.

A sample of air-dried material (moisture content 10-13 per cent), on which the moisture and ash have been determined, is ground to pass a 48-mesh (Tyler) sieve. About 0.5 gram of the sample, weighed exactly to within 0.2 mg (E), is wetted with 5 ml of 80 per cent sulphuric acid in a weighing glass. The sample is allowed to stand, the glass being covered. It is stirred every 15 minutes. After 3 hours the contents are poured into a 500 ml flask, diluted to about 200 ml and boiled for 5 hours, using a condenser. During this time the contents are slightly stirred to prevent peat from sticking to the sides of the flask. The contents are then poured into a 400 ml glass beaker, covered, and allowed to stand overnight. The next morning the clear liquid at the top, and finally the sediment, are filtered through an asbestos mat in a filtering crucible and washed free of sulphates. The crucible is dried for 3 hours at 105°C and then weighed (weight I). The residue is burned in a muffle furnace at 900°C for 2 hours, and weighed after cooling (weight II).

The r-value, in weight per cent, is expressed by the following formula:

$$r = \frac{(I - II) \cdot 100}{E \cdot \left(1 - \frac{w+a}{100}\right)}$$

where
I = weight of residue after drying,
II = weight of residue after burning,
E = weight of air dried sample,

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*Keppeler, G., "The Determination of the Degree of Humification of Moor and Peat Samples", Journal f. Landwirtschaft (1920), pp. 43-50.

w = moisture content of air-dried sample, and
a = ash content of air-dried sample.

The table below illustrates how classification by the r-value is being used by the Peat Institute in Hannover for peat evaluation, in comparison to the von Post scale:

H v. Post	Designation	r-value % (equalized)
1 - 3	Slightly humified sphagnum peat (white peat, light colour).	20 - 38
4 - 5	Slightly humified sphagnum peat (white peat, medium colour).	38 - 48
5 - 6	Rather strongly humified sphagnum peat (also called brown peat).	48 - 54
6 - 7	Strongly humified sphagnum peat (black peat).	54 - 63
8 - 10	Very strongly humified sphagnum peat (black peat).	> 63

Four samples of commercial peat material marketed as peat moss were analysed in the Mines Branch laboratory using the method, and the following r-values were reported:

Sample No.	Test No. 1	2	3	4	Average
I	47.7	46.8	46.9	45.7	46.8
II	43.3	45.8	45.3	-	44.8
III	45.2	44.9	45.8	44.3	45.1
IV	53.8	55.9	56.2	58.2	56.0

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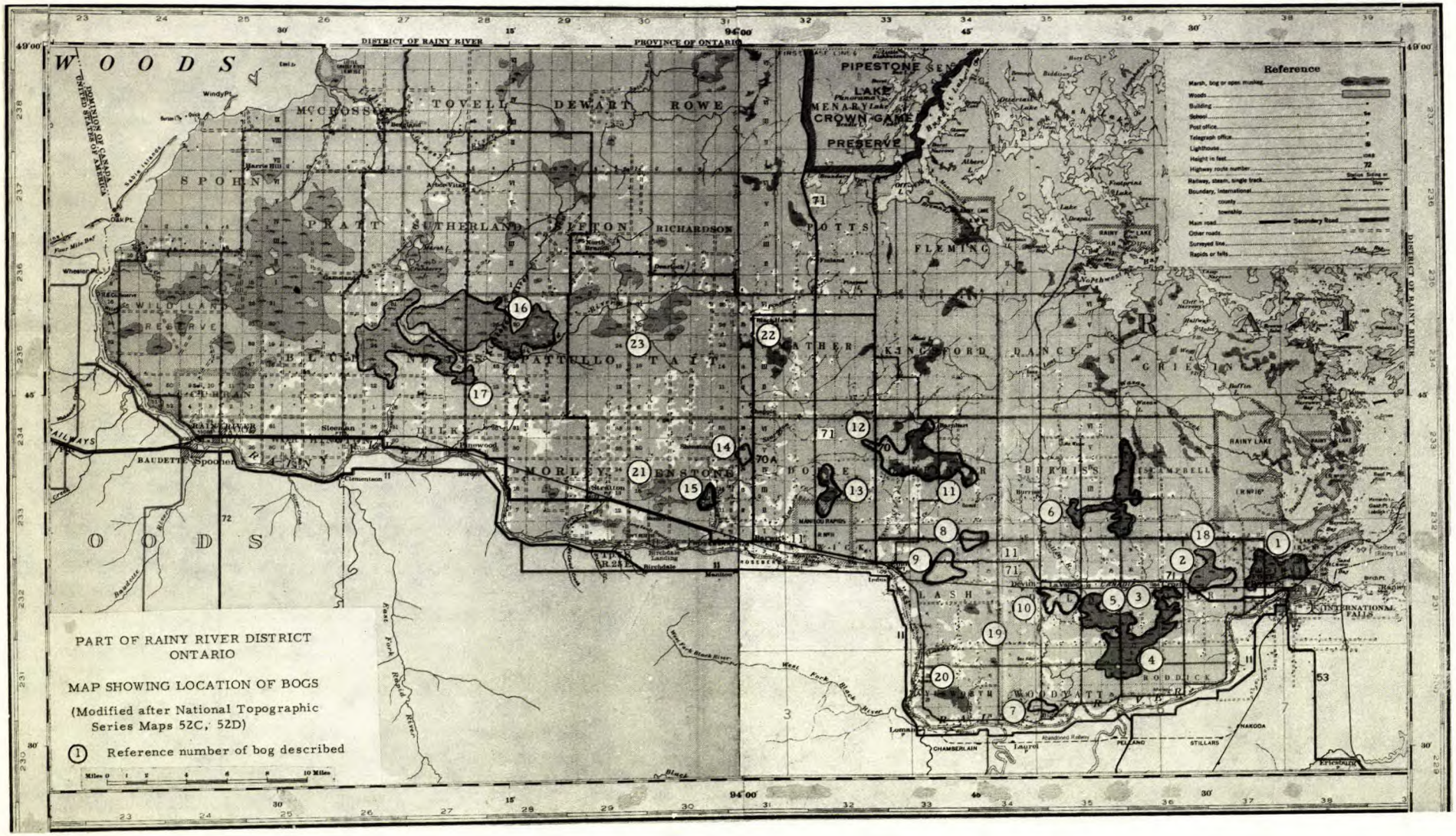
RBG:TET:(PES)PH


PART OF RAINY RIVER DISTRICT
ONTARIO
MAP SHOWING LOCATION OF BOGS
(Modified after National Topographic Series Maps 52C, 52D)
(1) Reference number of bog described
Reference
DISTRICT OF RAINY RIVER
PROVINCE OF ONTARIO
PIPESTONE
LAKE
CROWN GAME PRESERVE
WOODS
INTERNATIONAL FALLS
RAINY LAKE