

CONSULTANT'S REPORT

**A STUDY ON THE FEASIBILITY
OF PEAT PRODUCTION
IN THE PROVINCE OF BRITISH
COLUMBIA**

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March, 1994



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31ST MARCH 1994 .

FUNDING FOR THIS REPORT WAS PROVIDED

BY

NATURAL RESOURCES CANADA

UNDER THE CANADA-BC PARTNERSHIP ON MINERAL DEVELOPMENT

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EXECUTIVE SUMMARY

Peat resources in British Columbia are not being exploited to any significant extent despite the existence of many potential sites with reasonable transportation access. Some of the potential peat production sites are located in areas that may be subject to reduced tree harvest allowances and may offer alternate employment for workers displaced from the logging industry. As an extractive industry there are some interesting possibilities for sustainable development. Peat mosses grow back over exploited surfaces if conditions are properly designed. Land use may be more productive after exploitation even if peat regrowth is not an option. The important peat producing provinces in Canada include New Brunswick, Quebec, Manitoba and Alberta. New Brunswick is supplying peat valued at over \$15.5 million, annually, to Japan. Their peat industry, as a whole, employs almost 1000 full-time and seasonal workers.

Markets for peat in Japan and the West Coast of the NAFTA Bloc are estimated to amount to over \$47,000,000 or 208,000 tonnes. Additional Pacific Rim markets are estimated (1992) to amount to a further \$2,000,000 from about 7,300 tonnes. Most of the needs of local British Columbia markets (possibly 16,000 tonnes annually with a value of over \$3,000,000) are currently supplied from Alberta.

The potential for a provincial peat industry to take over 10% of the Pacific Rim market appears to be very good. The markets are not believed to be saturated at this time and further growth would be projected from the base described in this study. This business potential has either not been recognized by local venture capital or has been found to be too difficult to realize under the terms of tenure and regulations prevailing in British Columbia compared to other jurisdictions.

Although a large body of production and resource distribution data has been gathered traditionally by provincial and federal Mines Agencies, peat is not always defined as a mineral. In British Columbia peat cannot be acquired by staking a mineral claim under the Mineral Tenure Act (1988). A mineral claim may however cause problems for a potential peat miner since bed-rock mining activity may conflict with the orderly exploitation of the peat bog.

Under current tenure policy it appears possible to acquire rights for peat exploration and development, subject to compliance with normal rigorous environmental criteria both during operations and after termination of the exploitation. The terms of such licences or leases as may be granted appear to be less than the time required to justify a substantial investment in plant and equipment. The terms and conditions of such licences or leases are set and may be changed in a discretionary manner by individual managers of Crown lands. A public bid may be called for in the case of a renewal, and the

operator, who paid to develop the resource and established the markets, could lose any right to continued tenure.

Where surface rights fall within the Agricultural Land Reserve (ALR), peat lands are protected by the Agricultural Land Commission (ALC) for the needs of the next millennium. On Crown lands, the BC Lands division of the Ministry of Lands Parks and Environment controls tenure, permitting and royalty rates. Where Crown lands are within the ALR, additional permits are required from the ALC and a lease will not be granted over ALC objections.

Regional Directors of BC Lands appear to exercise strong local control over decision making relating to tenure, while working within the written policies of the Land Administration Manual. The administration of tenure is open to strong personal influences on the part of the regulators who, by virtue of the policy backgrounds of their ministries, do not necessarily have an advocacy position for the development of a large scale extractive industry.

Royalty rates proposed by BC Lands for peat operations are 15 to 70 times higher than those applied in the successful producer provinces for industrial scale operations. An emphasis is set on recovering revenue by royalties rather than stimulating new industrial activity to generate direct and indirect taxes. BC Lands has not been identified in any departmental activity to promote the development of a peat industry. This may be due to a lack awareness about the potential significance or impact of such an industry in British Columbia.

The close market relationship of peat with several industrial minerals allows the recommendation that tenure, exploitation and reclamation can be administered by the Resource Management Division of the Ministry of Energy Mines and Petroleum Resources. Industrial minerals of the Province are being promoted under a joint arrangement between BC Trade and MEMPR which could be extended to include peat without significant cost.

The current administration of the peat resource of the Province is focussed on conservation rather than on the development of an extractive industry. Government advocacy is required to develop a peat industry. This should at least include the facilitation of tenure and the permitting of new operations under standard terms that would allow companies and individuals to define project costs and life with some certainty. MEMPR is a ministry with an established record of advocacy for the development of the mineral resources of the Province and is well equipped to give the type of sponsorship needed to re-start the peat industry.

For the interim, it is recommended that peat be included in the protocol agreement (1993 - 1994) between BC Lands and the Resource Management Branch to enable sponsorship by MEMPR.

INTRODUCTION AND TERMS OF REFERENCE

The peat resource of British Columbia has **been** historically exploited in large scale operations on private lands in the Fraser Delta area and in some small operations near population centres such as Kamloops. Until the early 1960's British Columbia was the leading producing province **in Canada**.

Currently, exploitation of the peat resource is at a very small scale, with operations only producing for local markets. Only small amounts of **fibric** peat are shipped. Attempts **to re-start** peat exploitation in the area 'of the largest earlier production, the privately owned portions of the Burns Bog, are being opposed by special interest groups.

This study has been commissioned under, and all funding provided under the Canada-British Columbia Mineral Development Agreement through Natural Resources Canada. The terms of reference for the study require the authors to report briefly on the available markets for our peat resource and assesses the potential for developing a viable industry based on peat exploitation. The existing structure of the tenure of **peat-**lands and their regulation is summarized and comparisons are made with the larger peat producing provinces of New Brunswick, Quebec, Manitoba and Alberta. The study identifies and analyzes the non-market forces (mainly legal, land use and tenure) which are perceived to impede the development of a healthy peat industry in the Province.

Recommendations are made for changes in the tenure system and regulations, for improving the peat data base in the Province, and for product promotion and marketing support. If acted upon, the very small peat industry in British Columbia of today would have the potential to grow to provide a strong rural industry.

Canadian dollar amounts and metric units of measure are used throughout this study unless otherwise identified. An attempt has been made to verify data where possible but some discrepancies in reporting have been noted. This report is based upon a review of published and unpublished data and upon discussions with many individuals representing industry and federal and provincial government departments. An attempt has been made to verify verbal information with other respondents where possible. Some of the information obtained from respondents (and presented in some form herein) has been accepted by the authors in good faith.

THE FORMS OF PEAT

Peatlands occur where climate and surplus water conditions permit wetlands to form. There are five wetlands in the Canadian classification system: bog, fen, swamp, marsh, and shallow open water (Zoltai 1980). Most of the horticultural peat produced in Canada is obtained from bogs. The main peatlands in British Columbia are associated with the bog and fen classes of wetlands.

A bog, the word is derived from the Celtic "bocc" meaning soft, is typically a wetland that depends on rainfall for the perpetuation of its waterlogged condition. It is an acidic system with generally low nutrient or mineral content in which plant material is preserved in the upper zone of the deposit. Bogs often have a raised or domed surface and are characterized also by the presence of Sphagnum mosses and ericaceous shrubs (Thibault, 1993).

A fen, meaning "mud" in the early Anglo-Saxon language, is a peatland that depends more on ground waters to maintain its saturation. The lower acidity and relatively high nutrient content causes plant material to decompose more rapidly and results in the formation of peaty muck. Fens may supply different types of peat derived from sedge grasses, reeds and brown mosses.

Common peat landforms occurring in the Province include: basin bogs, blanket bogs, collapse scar bogs, domed bogs, flat bogs, northern plateau bogs, palsa bogs, peat plateau bogs, slope bogs, string bogs, veneer bogs, collapse scar fens, floating fens, horizontal fens, net fens, northern ribbed fens, shore fens, and stream fens (Tarnocai, 1984).

Peat occurs as organic surficial material that can be classified mainly on its level of decomposition as follows:

Fbrisols . .	well preserved organic structure	- fibric peat
Mesisols . .	moderately decomposed organics	- mesic peat*
Humisols . .	well decomposed or humified	- humic peat*

* "Mesic" and "humic" are the common Canadian forms of "hemic" and "sapric" as used by the American Society for Testing and Materials (ASTM) Designation D 4427 - 92.

The von Post system of classification of peats has been most widely accepted in North America and Europe. The system uses the recognizable features of original plant constituents. The degree of humification, indicated, by the letter "H", is divided into ten categories ranging from H1 to H10. The von Post scale was developed as a field method or squeeze test in which a von Post of H1 represents undecomposed peat from which clear water is expressed on squeezing and the remainder contains easily discernible plant matter. At the other end of the scale, H10 is a completely decomposed peat which upon squeez-

ing would be expressed through the fingers as homogeneous material with no plant remains recognizable.

In general, fibric peat mosses are in the von Post range between H1 and H3, mesic ranges are between H4 and H6 and humic peat is between H7 and H10. Further subdivision can be made based on moisture regime, fibre content and degree of woodiness. A more complete description of this classification can be found in Open File 1988-33 issued by the Mineral Resources Division of the Geological Survey Branch MEMPR. (Maynard, 1988).

A typical analysis for peat would yield a moisture content of about 50%, carbon 26%, oxygen 16%, hydrogen 3%, nitrogen 1%, sulphur 0.1% and ash 4%. Fuel grade peats may vary between 2,225 Kcal/kg and 5,560 Kcal/kg depending on moisture content and peat type.

ASTM has developed a range of tests for characterizing peat matter. The ASTM classification of Peats, Mosses, Humus and Related Products requires the use of three parameters: ash content, fiber content and botanical composition. Earthy organic materials must have an ash content of no more than 25% by dry weight to be classified as "peat". A higher ash content would define the material as an organic soil. Fibrous peat is defined as material retained on a No. 100 screen or material that is 0.15 mm or larger.

Sphagnum moss peats must have a fibre content greater than 66%, all of which must be derived from the genus *Sphagnum*, as determined by screening and botanical examination. Hypnum moss peats must have a 33% minimum fibre content of which at least 50% must be derived from the genus *Hypnum*. Reed-sedge peats must have more than 33% fibre content of which a minimum of 50% is reed-sedge and other non-moss fibres.

THE USES FOR PEAT

The main properties of peat are its high water retaining capacity, its low density, high resistance to decomposition, low heat conductivity and high porosity. Peat can hold up to 20 times its weight in liquids and gas (Bergeron, 1993). The North American uses of peat are dominated by its application for general soil improvement, horticultural and agricultural uses.

In horticultural, silvicultural and nursery uses, peat is used predominantly for potting soils and growing substrates. Peat mosses in the von Post ranges H1 to H5 are used. B.C. Forests estimates that their requirement for tree seedlings for 1993 alone amounted to \$640,500 of imported baled peat.

In agriculture, peat is used for general soil improvement, mixed fertilizers, as a composting agent for yard waste, as a carrier and coating agent in seed inoculants, for vegetable cultivation and as poultry and livestock litter.

As a poultry litter application, it reduces ammonia and odor levels and makes for an environment that is healthier for the poultry than the traditional wood shavings litter. The peat based litter makes a high quality compost for horticultural applications that does not leach so rapidly into ground waters.

Specialty applications include the application of peat during construction and maintenance of golf courses, as an earthworm culture medium, for mushroom cultivation, oil absorption, waste water filtration and use in hygienic products. Some of these specialty markets are important locally. Mushroom cultivation in British Columbia, for example, consumes peat worth over \$410,000 annually.

Research into peat applications in environmental remediation work has developed several new applications. A unique hydrophobic sphagnum peat moss has been marketed that has superior hydrocarbon absorption properties. For one product, 1 pound of the product would effectively absorb 1 gallon of oil weighing about 8.2 pounds (Cantrell, 1993). The product has disposal advantages since it is EPA qualified as an alternative fuel with low ash content and is vapour suppressive. In Canada, Hi-Point Industries of Newfoundland and Sphag Sorb Inc of Alberta are marketing similar hydrophobic products. They are used for spills of oil based products, particularly on water or wet surfaces, and can be enclosed in socks for placement around oil seeps.

Clay-based absorbents have been banned in the northeastern U.S. and peat absorbent products have been found by State transportation agencies to represent an environmentally friendly and economically viable clay substitute. The use of peat absorbents was found to be advantageous to employee health, represented indirect cost savings in disposal, avoided landfills and could be consumed in industrial fuel applications.

The U.S. Bureau of Mines has developed porous polymeric beads containing peat for the extraction of toxic metal in solution from a variety of wastewaters. The beads designated BIO-FIX removed cadmium, arsenic, lead and other toxic metals from acid drainage waters collected from several mine sites. The metals can be extracted from the beads by washing with dilute mineral acids and the beads are re-usable in repeated loading-elution cycles.

Artificial peat wetlands have been successfully used to remove metals from acid drainage streams. Over a 2 year operating period of one test, 80% to 90% of copper and nickel were

removed. The metals may be recoverable by periodically changing the peat and burning the metal-rich material in a smelter. The artificial wetlands approach to closure of mine sites offers a durable, low maintenance system that may become a standard for those areas where there is sufficient rainfall or artesian ground water supply.

Johnson and Johnson have developed a new line of ultrathin feminine hygiene pads in Canada that has an absorbent core of processed peat moss. The company states that the processed moss can absorb 20 times its weight in liquid and makes a pad that is slightly thinner than the "ultra thin" pads that are made of superabsorbent polymers. The peat type used is reported to have similar properties to the *S. Fuscum* mosses; the attractive characteristics are their resistance to breaking and high absorbency.

A very important use of peat in the former Soviet Union (FSU), Eire and Finland is as a fuel source. Fuel peat is in the range of H6 to H10 on the von Post scale. This application is usually only undertaken where the fuel would be used at a nearby site or where transportation might mitigate the cost of importing alternate fuel materials. British Columbia is not likely to find much application for peat as a primary fuel since there is an abundance of coal and hydrocarbon fuel available. It is conceivable that a remote community might develop peat as a fuel source, particularly if supplemented with hog fuel or wood waste, rather than truck in fuels. However, the capital cost of a small energy system would probably be relatively high. Because there is little hope of transporting the fuel peat economically over long distances it is unlikely that this sector will be supplied by British Columbia peat.

THE RESOURCE IN BRITISH COLUMBIA

Approximately 1 per cent of the total land area of British Columbia is reportedly covered by peatland, much of which is located in remote areas. Mapping of the peat resource of British Columbia only covers about 60 per cent of the land surface, so it is possible that there are some additional resources yet to be identified. In particular, the mountainous regions of the Province have been discounted in the past. The experience of the authors is that many valleys in the mountainous regions have treeless, flat areas that have typical peatland characteristics.

Peat extraction carried out in past years in the Fraser Valley and the Interior regions of the Province have not exhausted these near-market sources. However, the level of activity has been more or less at a "mom and pop" scale for the most part,

except for certain operations in the Lower Mainland and in particular on Burns Bog.

Three regions of the Province are identified by the peatland inventory as being the main sources of peatland resources (Maynard, 1988). The most extensive deposits occur in the northeast although their full extent is unknown because of incomplete mapping in this area. There are also huge peat deposits reported on some of the coastal lowland areas. Peatlands in the Interior Plateau are usually smaller but occur in clusters over large areas of the rolling land surface.

Information is available from several government sources describing, for the most part, generalities of the distribution and characteristics of peatlands in the Province. The Peatland Inventory of British Columbia (Maynard, 1988) is a good starting point for those interested in investigating the data base for potential sites for exploitation, but admits to not being site specific. Other sources from Agriculture Canada, the BC Ministry of Agriculture and the BC Ministry of Lands Parks and Environment also supplement the local data base. Our information on the peat resource in the Province indicates that there is probably an adequate source of raw material to support a long term rural industry: with the exception of peatlands like Burns Bog, we do not know where the resource is in any detail.

In order to promote the development of a peat industry in British Columbia, it is recommended that peatlands, in particular along the corridors of **transportation** in the Province, are, characterized in sufficient detail to attract further assessment of the feasibility of exploitation.

ENVIRONMENTAL ASPECTS

In current terminology peat bogs and fens are now classified as wetlands and are subject to extreme scrutiny from public and private groups concerned with environmental impacts on ecological domains that are perceived to be important. In Ontario, for example, wetlands in Southern Ontario have been mostly designated for preservation where they lie on Crown lands, without defining **any** special environmental value or purpose for a given bog. Peat exploitation on private lands is regulated through local zoning and planning ordinances and may still be subject to strenuous public criticism. It appears that the closer to urban centres, the more strenuous the public objections might be.

Peat exploitation on some 5000 acres of property in the Burns Bog area of the Fraser Delta is being vigorously opposed by

groups in local communities even though the land is industrially zoned and permitted for peat extraction. This is part of the same area that was exploited through the early part of the 1980's as a substantial local industry. Any exploitation of wetlands can be expected to enjoy similar opposition from environmental groups and sympathetic regulators. The term "wetlands" has become high profile in the language of activists and administrators in North American.

Studies have been undertaken to develop satisfactory reclamation approaches for areas of peatland that have been exploited. Field testing appears to indicate that good land use can be achieved after peat removal. Peat does regenerate over exploited areas if hydraulic regimes can be arranged in a manner to assist the growth of the moss or sedge species that form the peat. In the Burns Bog, one area with 30 years accumulation of "new" peat has been measured to be from between 8.2 mm/year in hummocks of *Sphagnum capilaceum* and 0.7 mm/year in hollows. Conditions created by peat extraction do not appear to cause irreversible damage to the generative capacity of the bog (Hebda and Briggs, 1980).

It would be straining the meaning of the word "sustainable", as used to describe resource management, by applying it to peat exploitation. The impact of peat mining can, however, cause at worst another use of the land by the development of waterfowl habitat, arable land or range, woodland or perhaps fish farms. At best the impact can be a faster regeneration of peat in an area of relatively low biological productivity.

PEAT STATISTICS

The statistics for peat production and pricing suffer from inconsistencies of reporting by different jurisdictions. Pricing is not only reported on varying size bases but also sometimes on an "f.o.b." plant basis or as an export value price that may include some freight costs. The values reported by Energy Mines and Resources, Canada (EMR) are reportedly adjusted to remove costs associated with packaging in order to arrive at a normalized value for the peat. The information presented here will identify where the authors have made estimates but in the reported data there are discrepancies amounting to as much as 30% when comparing information from different sources.

These discrepancies also appear to occur from the use of different bases of measurement, especially where conversions from bales (volume) to tonnages (weight) are undertaken. Variations in water content may be part of the reason for these differences. One tonne of peat is taken to be equivalent to 29 of the 6 cu. ft. bales in New Brunswick. For Alberta, a

conversion using 26 of the 6 cu. ft. bales to the tonne is recommended by EMR. Alberta ships more of the 4 cu. ft. bales as a percentage of its total product mix and it is possible that these are in practice denser than the 6 cu. ft. bales. Hence, when all sizes are normalized to a 6 cu. ft. basis there is an actual weight difference. There is clearly some risk in taking the numbers presented as hard data but they represent a reasonable order of magnitude estimate of the movements and pricing of peat.

The U.S. Bureau of Mines has estimated global peat production for 1993 at 148 million tonnes. Production is dominated by the former Soviet Union (FSU) which "accounted for 87% of this total or some 129.1 million tonnes. Present production is down from the 1989 high of 201 million tonnes due to the geopolitical and socio-economic events within the FSU since that year.

Canada is the sixth largest producing nation behind the FSU, Ireland, Finland, Germany and Sweden. Most of these countries are producing substantial amounts of fuel peat. Canada ranks third as a producer of peat for agricultural/horticultural use, behind FSU and Germany. Preliminary data for 1992 for that market sector has production as follows:

Agricultural/Horticultural Peat Production

Country	Million tonnes
FSU	120.00
Germany	2.91
Canada	0.86
U.S.A.	0.60
Finland	0.36

Canadian Production

Statistics presented by EMR show that Canadian peat shipments have increased by 16% over the 5 year period from 1988 to 1992. Over the same period the value of these shipments is reported to have increased by 31% (not adjusted for inflation).

Most of Canadian production is exported, with only 18% to 23% being retained for the domestic markets. In 1991, exports totaled 650,124 tonnes valued at \$136 million; from an extrapolation of the estimates for the first 9 months of 1992 we have projected that exports for the full year will be in the order of 720,000 tonnes valued at some \$165 million.

The United States is by far Canada's largest customer, taking mainly baled sphagnum peat moss. In 1992, they imported 638,000 tonnes of Canadian peat or approximately 74% of our total estimated shipments. This tonnage formed more than 99.5% of total U.S. peat imports and represented approximately 50%

of U.S. peat supply. Canadian exports into the U.S. were projected to reach 654,500 tonnes in 1993 (Cantrell, 1994). These imports are expected to have had a value at U.S. Customs of U.S. \$176.40 per tonne for a total of U.S.\$ 115 million. The U.S. Bureau of Mines reports that for 1992 an additional U.S.\$19 million of Articles 'of Peat (such as Jiffy Pellets, peat pots and some peat mixes) were imported from Canada.

Japan is the second largest importer of Canadian peat which forms approximately 84% (on a value basis) of the Japanese market. Most of this is sourced from New Brunswick and is shipped through Halifax. In 1991, shipments totalled 66,196 tonnes with a reported value of \$14.65 million. Shipments for 1992 are estimated at 71,750 tonnes valued at \$16 million and our projections for 1993 are for 77,000 tonnes with a value of \$17.2 million.

Exports of Canadian peat in 1992 to other regions of the world accounted for approximately 1% of Canada's total exports. These exports went principally into Australia (2,500 tonnes) and the Asian-Pacific Rim countries dominated by Taiwan and South Korea. (2,300 tonnes). Peat shipments for the same year to Europe (450 tonnes), South Africa (800 tonnes), the Near East (300 tonnes) and the Caribbean (150 tonnes) showed a continuing decline over past years.

Provincial Production

Canada produces mainly sphagnum peat from about 77 operations spread across the country. Mining activities are weather dependent and are typically conducted between the months of May and September. Most of the national peat production comes from the northeastern and eastern parts of New Brunswick, the southeastern and eastern portions of Quebec, southeastern Manitoba, east-central Saskatchewan, and central Alberta. Small amounts of peat are also produced in Newfoundland, Nova Scotia and Prince Edward Island. Production in Prince Edward Island is reported to have increased substantially in the last two years, although specific data are confidential.

Canadian peat production in 1992 was estimated by EMR at 745,000 tonnes, a decrease of 13% from 1991. Peat shipments were higher by 2.7% to 856,000 tonnes for the same period. The value of 1992 shipments increased 8.1% from 1991, returning a total of \$108.2 million. New Brunswick and Quebec were expected to account for 75% of shipments and Alberta 11.7%. Data for Manitoba, Saskatchewan and Nova Scotia are kept confidential due to the small number of producers in each of these provinces. Taken together these three provinces were estimated to provide 13.3% of total shipments. Ontario, Prince Edward Island and British Columbia were not expected to

report any production. The original EMR estimates for 1992 are presented below together with provisionally revised EMR estimates for the same year:

Province	Original Amount (000t)	Estimate Value (\$000)	Prov. Revised Amount (000t)	Estimate Value (\$000)
Newfoundland	1	53	2'	285
PEI			11*	1,300
Nova Scotia	n.a.	n.a.	10*	1,200
New Brunswick	309	32,465	322	38,000
Quebec	332	40,558	272	37,000
Manitoba	n.a.	n.a.	96*	14,412
Saskatchewan	n.a.	n.a.	21*	3,153
Alberta	100	17,250	94	21,000
	856	108,199	828	116,350

Note: *estimated by the authors.

Peat production in western Canada is dominated by Manitoba and Alberta who have supplied some 90% of the shipments in the region for the last decade. Traditionally, Manitoba appears to have produced somewhat more than Alberta although, for 1992, both provinces are each estimated to have contributed 45% of the regional total. Provisional revised figures for Alberta, obtained from EMR, indicate shipments of 94,000 tonnes valued at \$21 million. Total shipments from western Canada were given as approximately 211,000 tonnes. The authors estimate that Manitoba shipped 96,000 tonnes at a value (published by the Mines Department of Manitoba) of \$14.4 million. Saskatchewan was estimated to have shipped 21,000 with a calculated value of \$3.15 million, based on the estimated Manitoba per tonne price.

EMR estimates that, for 1993, shipments in Atlantic Canada will be down by 10% from 1992; this will be countered to some extent by increased shipments from Quebec and Alberta resulting in a slight overall decrease in shipments and total value.

Production in British Columbia

Current peat production in British Columbia appears to be limited to several small operations mostly on private land in the southwestern portion of the province. These supply bulk product to local customers. Product type and end-use may be quite varied. The precise nature of the peat produced has not been determined for this study. Information supplied by some producers suggested that peat types include fibric sphagnum, sedge and mesic to humic sphagnum. The fibric sphagnum is primarily used by mushrooms growers and the horticulture

industry. Some of this peat is retailed in bulk and also used with soil and manure in mixes that are retailed for potting soils and top dressings for lawn care and golf courses.

The more decomposed or humified peat is marketed as a landscape grade product and is **usually mixed** with soil on site and sold in bulk. At some locations landscape grade may be extracted by mining a "**peaty**" soil, referred to herein as "soil peat". This is distinct from a peat and soil mix which is referred to as "peat soil".

The leases and **licences** administered by BC Lands for peat are recorded together with ordinary soils so **it is** not possible to detail the operations from the central data bank. Records for the last 5 years show no more than 52 short term leases (six months or less) for the whole of the Province. These leases were located mainly in the Thompson-Cariboo land district that includes the City of Kamloops (**13**), the Omineca land district that includes the City of Prince George (**10**), the Skeena district around Smithers and the Bulkley Valley (9) and the Cranbrook District (9). Production from any one of such leases is reported to be "from tens of (cubic) yards to a couple of thousand (cubic) yards" only.

More or less continuous operations are reported to exist in the Lower Mainland, the Okanagan, and in the 100 Mile House area.

In the Lower Mainland, peat is mined in South Burnaby (**Marmax** and **Alantic**) and in Delta (Pineland). These are believed to be the main producers in the area but others of similar size may exist from time to time. **Alantic** and **Marmax** produce (fibric?) sphagnum peat moss, locally called "Red Sphagnum", and black "amorphous" (**humic?**) peat. The **Alantic** operation is based on preparation of a site for industrial development. **Pineland** once produced a fibric sphagnum peat but now appears to market more humified landscape grade peat, usually in the form of a bulk topsoil mix.

The Burns Bog in Delta represents a very large peat resource in the Lower Mainland, the development of which has been the subject of much recent public debate. Most of the Bog is privately owned by Western Delta Land Inc and is zoned to allow for peat extraction. The Bog has had a long history of mining which essentially ceased in 1984, due to the availability of cheaper peat from Alberta. Approximately one third of this holding is still under lease to the last mining operator (Fisons - now Sun Gro). Reserves have recently been estimated at 18 million tonnes including both sphagnum and sedge peat. Western Delta is seeking to obtain municipal permits to continue the earlier mining operations which would be very well located with respect to local markets and export transportation links.

Small volumes of peat are reported to be produced from locations around the north edge of Bog along the South Arm of the Fraser River. This material is being extracted during the preparation of disposal sites for clean fill and industrial wastes.

Overall production from Lower Mainland peat operations is estimated at 60,000 cubic yards per annum of bulk uncompressed peat, valued at approximately \$815,000.

The 100 Mile House production facility is owned and operated by Omni Soils Inc. Fibric sphagnum and sedge peats are harvested for a variety of purposes including the supply of a blended product for golf course applications. Current production is about 5,000 cu.yds., with plans to expand to 7,000-10,000 cu. yds. per year. The peat is delivered in bulk to Vancouver area markets for a cost of \$33/cu.yd. The value of annual production is estimated at \$105,000.

Peat production in the Kamloops and Vernon areas are reported to be mostly well rotted, soil peat products. These are delivered in bulk to garden centres in the immediate urban areas and to housing developments for landscaping:

The combined estimated values for British Columbia peat production on a "f.o.b." extraction site basis is \$920,000.

Over the past few years there have been unsuccessful attempts to establish peat extraction operations in the, Fort St. James area and on the Queen Charlotte Islands. The Fort St James lease was taken over by Pineland Peat and Money's Mushrooms. Fibric sphagnum peat was mined with an excavator to produce large "blocks" that were air dried. Some 1200 compressed bales measuring 4.6 cubic meters were shipped to the Pineland operation in Delta where the peat was fluffed and bagged for the retail market. The Fort St James site is well located with respect to rail and road infrastructure and power. Wood waste from a neighbouring lumber mill could be available for thermal drying. The bog is reported to be cleared, ditched and ready for mining. Pineland is planning to build production to some 15,000 cubic yards/year from this lease.

Estimates of Peat Imports to the BC Market

Estimates for the amount of baled peat imported into British Columbia for internal use vary considerably according to the data set used. The best estimate made by the authors is that approximately 16,000 tonnes are currently imported by the Province.

For 1991 and 1992, EMR estimated that domestic peat consumption in Canada was between 20% and 23% of total Canadian production in the respective years. During 1992, production from the prairies totaled 211,000 tonnes. Using the average for the two years, 21.5%, domestic consumption would have accounted for 45,400 tonnes. Due to the larger silviculture, horticultural, nursery and growing industries in British Columbia, together with a longer growing season demand for the retail sector, it is probable that the domestic market share for this Province is above the national average. If it is assumed that British Columbia consumes 50% of the estimated domestic market for Western Canada, then this translates into 22,700 tonnes.

Of the total exports of Canadian peat to the United States and Japan in 1991, 27% and 8% respectively came from Western Canada. Applying these percentages to the 1992 Canadian export totals, some 178,000 tonnes were exported to these two countries from Western Canada. Adding an estimated 500 tonnes for other countries, the amount of peat retained for the Western Canada domestic market is suggested as 32,500 tonnes. If 50% of this is allotted to British Columbia, it amounts to 16,250 tonnes.

It was found difficult to estimate the amount of peat imported into British Columbia by canvassing distributors. Apparently a number of producers sell direct to certain growers and consequently there appears to be no clear understanding of the actual size of the provincial market. One industry that is reasonably sure of its consumption is forestry. Their estimate for 1993 peat consumption was 94,156 of the 4 cu. ft. bales (some 2,414 tonnes) which is used to provide a growing medium for some 230 million seedlings. Based upon telephone enquiries with selected users and distributors, the authors estimate that imported peat for use within the Province ranges between 13,500 and 18,500 tonnes. This provides an average of 16,000 tonnes which is consistent with the tonnage estimated from reported export data above.

The value of baled peat delivered in to the Province is estimated by the authors as being over \$3.5 million. This figure reflects the value of the bagged peat at plant site, ready for shipment. The raw peat value alone is estimated to be over \$3 million. Transportation costs are estimated to be in the order of \$850,000. A total cost of over \$4.35 million would be paid by British Columbia distributors located mainly in the Lower Mainland and Okanagan and those customers who buy directly from the peat producers.

The estimates above were derived using the following assumptions:

- 4 cu. ft. bale of unbagged peat is valued at \$4.60 at the plant site.
- 4 cu.ft. bale of peat is delivered into the Greater Vancouver area for a total cost of \$6.80.

- Average trucking costs from Alberta are taken to be \$1.40 per 4 cu. ft. bale.
- bag costs for the 4 cu. ft. bale are \$0.80 per bag.
- The conversion of volume to weight is 39 of the 4 cu. ft. bales to 1 tonne.

Actual peat shipments are in mixed sizes of bales. In addition to the 4 cu. ft. used for the estimate base case, 1 and 2 cu. ft. bales with higher unit value are also shipped. If British Columbia imports 16,000 tonnes of peat, the total unbagged value for 4 cu. ft. bales at \$4.60 per bale is calculated as \$2.87 million. The total bagged value for that size is calculated as \$3.37 million. These two totals are minima and the higher unit value of the 'smaller bale sizes together with peat combined in mixes is the justification for rounding the totals up to \$3 and \$3.5 million respectively.

EMR estimates 1992 total shipments for Alberta production to amount to 94,000 tonnes with a value of \$21 million. This is equivalent to a per tonne value of \$223.40. If this per tonne value is applied to the estimate of 16,000 tonnes imported into British Columbia, this gives a peat value of \$3.57 million, which is very close to the bagged peat value attributed above. For New Brunswick and Quebec, EMR state that their reporting does not include the cost of bags. Therefore it is possible that the relatively high value per tonne for Alberta peat is the result of a higher average unit price due to smaller bale sizes and mixes. Consequently, the value of raw peat imported into the Province could well be in excess of \$3.5 million.

Retail prices in one Vancouver area garden centre for one brand of 'peat were as follows:

Bale Size	Bale Price	Equivalent Price per Tonne
4 cu. ft.	\$11.99	\$467.61
2 cu. ft.	\$ 7.99	\$623.22
1 cu. ft.	\$ 5.99	\$934.44

The price increase on a per tonne basis with reduction of bale size is an indication of the impact the smaller bales can have on the base case estimate of value for British Columbia imports.

The authors are aware that not all of the peat imported into the Province came from Alberta. However, peat from Manitoba or Saskatchewan will come from one of the large producers, supplementing their stock as needed and marketing it at Alberta peat prices.

MARKET OVERVIEW

The Canadian peat industry has seen strong growth since the mid-1980's. For the ten year period 1983 - 1993 peat shipments and values (based on \$/tonne) increased an average of 5.6% per year. Over the last five years of that period (ie 1988 - 1992) the annual rate of increase for unit value was maintained at 5% although the rate of increase for shipments moderated to 2.5%.

The outlook for the United States market is for consumption to outstrip domestic production by some 1.5% per annum over the next 3 to 6 years. This shortfall will likely be filled by increased imports from Canada. Other factors such as inhibiting environmental regulations and more intense competition from Canadian producers could serve to widen the U.S. production - consumption gap. Additional demand could also arise from the new uses for peat in environmental remediation applications.

For Japan, EMR reports that from 1992, future market increases are expected to range between 5% and 10% per annum. Canada's market share has slipped, however, from 94% in 1988 to 84% in 1991 due to increased imports from China, Finland and the United States. The Canadian Trade Commission in Tokyo estimates that Japan imported some 100,000 tonnes of peat in 1993. There appears to be an increased demand for the smaller bale sizes (1 and 2 cu. ft.) mimicking the trends seen in North America. The continued success of Canadian peat sales to Japan will depend upon product quality and the availability of relatively cheap transportation.

An important aspect of the successful penetration of Japanese markets by New Brunswick has been the high **profile** given to the peat industry by that province. Strong support is given to promotion of the industry in trade shows and through **high-level** representations made by provincial trade officials.

While EMR does not report projections for the Canadian market, domestic usage more than doubled between 1988 and 1991 increasing from 88,320 tonnes to 191,590 tonnes - an average yearly increase of 29%. A new Brunswick study indicates that the retail consumer market in North America is undersaturated and offers the best development potential for the Canadian peat industry (in Thibault, 1993). It is suggested that less than 22% of an estimated 69 million gardeners use soil amendments. Increased sales of peat could be achieved through programmes aimed at raising public awareness.

For the prospective peat producer in British Columbia the initial market will be in local retail, nursery and growing operations. Value added products for these applications are represented by various mixes, such as potting soil, soil amendments, and growing media. In the first two cases, peat is simply mixed with any combination of vermiculite or perlite,

lime, trace elements and slow release fertilizers. The mixes are typically sold uncompressed and bagged. In larger peat operations, the mixing is often carried out at the plant site where there may be a vermiculite or perlite expansion facility. In other cases, baled peat may be shipped to a customer who formulates a mix for their own consumption or re-sale. The production of mixes is reported to more than double the value of the peat component.

For baled peat, the advent of smaller bale sizes also provides increased unit value. A 1 cu. ft. bale may retail for as much as four times the equivalent peat value of a 4 cu. ft. bale. In addition, long fibre, screened peat will retail at higher prices than "ordinary" peat - a 3 cu. ft. bale of the higher quality peat retails at one Vancouver area garden centre for \$14.99, which compares with the "ordinary" peat quoted above for a 4 cu. ft. bale retailing at \$11.99.

It is apparent that markets for either baled, bagged or bulk peat moss can be developed by creating product awareness amongst consumers. One market opportunity, identified for the Fraser Valley and Puget Sound areas, is that of poultry litter. Current litter materials are mainly wood chips which have a tendency to leach rapidly into ground water if used later as a fertilizer application. Peat, mixed with wood chips and cereal hulls, maintains low ammonia and odor levels, and reportedly controls the micro-organisms that can cause disease in the birds. The sphagnum peat provides a low pH and a high nitrogen content which is ideal for producing high quality compost for horticultural markets. A preliminary review of costs suggests that there may be a 30% cost saving using peat for a skim coating of litter, rather than re-application of wood chip and saw dust.

An additional opportunity for the export of West Coast Peat into Japan may develop due to the reported curtailment of container movements by two shipping companies that were previously operating out of Halifax.

TRANSPORTATION

The success of any commercial venture supplying a low unit value product to a distant market is highly dependent upon the availability of convenient low-cost transportation. This is particularly true for peat, even in the compressed bale form, as it is a bulky, low density cargo. Consequently, peat operations shipping outside their local area must have access to both low cost and high capacity transportation.

Most of the peat produced in Canada is shipped by road on a backhaul basis, whether in bulk or baled form. Statistics

Canada reports that in 1990 only 2,000 tonnes were shipped by rail. In Western Canada, the preferred mode of road transportation has been the enclosed unit, such as a van. There is apparently less backhaul competition for vans than flat bed trailers which is reflected in lower freight rates. Stacked loads of bales on flat bed trailers, covered with tarpaulins, are difficult to stabilize. It is reported that a recent development has been the re-design of peat bales by producers in order to provide a stable pallet load on flat bed trailers.

Most of the peat and soil peat currently produced in British Columbia is trucked to local users within a limited radius of the producer (probably no more than 100 km). The trucks utilized are gravel trucks plus pups or trailers equipped with high-boards as the peat and soil peat is shipped in bulk form.

Quoted rates to Vancouver from a number of British Columbia locations utilizing several modes of transportation are presented below. These rates have been adjusted to reflect the cost for a 4 cu. ft. bale.

Freight Rate Comparison
(Cost per 4 cu. ft. bale)

Loading point	Transportation Mode			
	Van	TriAxle Van	Super B-Train	Rail 66' car
Ft Nelson	\$3.30	\$3.96	\$2.12	\$1.56
Dawson Creek	1.27	1.52	1.90	1.27
Ft St James	1.22	1.47	1.79	1.08
Revelstoke	0.91	1.09	1.12	n.a.
Williams Lake	0.60	0.72	1.06	0.79
Kelowna	0.65	0.78	0.95	n.a.
Cranbrook	1.08	1.30	1.34	n.a.

The freight rates are calculated on a per bale basis and vary according to the load capacity of the unit used for shipping. For the units examined above the full load is generally volume limited and will not exceed net weight limits. The number of 4 cu. ft. bales that can be shipped in each transportation mode assuming optimum use of capacity are given below. Net load weights have been calculated using an assumed weight of 56.5 lbs/bale.

V a n	768	bales totaling	43,292	lbs
TriAxle Van	768	,, ,,	43,292	lbs
Super B-Train	896	,, ,,	50,624	lbs
66ft Box Car	1650	,, ,,	93,225	lbs

[Approximately 700 Super B-Train loads would be required on this basis to move the estimated 16,000 tonnes of peat consumed in British Columbia each year]

The rates quoted for rail transportation are standard not

backhaul rates. Most backhaul by rail in British Columbia is towards the locations of likely peat operations rather than towards their markets. While the rates show that rail could be very competitive with trucking, the requirement to reach loading points on the rail system and subsequent unloading and local freight to the final destinations may result in charges that offset any cost advantages. It is reported that some loaded truck trailers are being shipped piggy-back by rail from Manitoba to the U.S.. Overall this tonnage is believed to be small.

Some of the peat shipments to depots in the Lower Mainland are forwarded to customers in the United States. Typical trucking rates into selected U.S. West Coast destinations are as follows (based on cost per 4 cu.ft. bale):

Location	Transportation Mode	
	Van	Flat Deck
Seattle	U.S.\$ 0.46	U.S.\$ 0.51
Portland	0.68	0 . 7 0
San Francisco	1.30	1.68
Fresno	1.37	1.88
Los Angeles	1.50	2.14
San Diego	1.69	2.40

Rates for vans into the U.S. reflect backhaul while the flat deck rates are typically headhaul. Direct shipping between the B.C. and U.S. locations tabulated above would result in a small net savings on transportation costs.

Most peat moss shipped through the Port of Vancouver goes to Japan. Smaller amounts go to Taiwan, South Korea and Australia as well as a number of other Pacific Rim countries. Most of this peat originates in Alberta, but the two large producers (Sun Gro and Premier Peat) may supplement stock with shipments from Saskatchewan or Manitoba.

The peat is shipped in containers, one 40 ft. container carrying approximately 465 of the 4 cu. ft. bales. Current shipping rates to Japan (Tokyo or Yokohama) from Vancouver range from U.S. \$1,013 to U.S. \$1,150 per 40 ft container. Korea was quoted at U.S. \$1,340. New Brunswick peat is shipped to these countries from the port of Halifax, Nova Scotia. The quoted rate from Halifax to Tokyo and Yokohama for a similar 40 ft. container is U.S. \$1,570. In each of the cases cited above the actual rates now have to be increased by 48% to account for current adjustment between exchange rates (yen versus U.S. dollar) plus an additional U.S. \$20 fuel adjustment factor. The resulting rates for Tokyo and Yokohama are:

From Vancouver:.....U.S. \$1,519
 From New Brunswick:.....U.S. \$2,344

It appears that for these ports, present ocean shipping rates are 54% more expensive from Halifax than from Vancouver. Some

of this difference would be offset by cheaper trucking rates for peat in New Brunswick, due to the shorter haul distances. However, it is unlikely that this would amount to more than about one-third of the overall difference in shipping costs.

In the East Coast operations, the containers are stuffed in Monckton, New Brunswick which probably reduces the cost of port handling. Some West Coast peat shipments are reported to be made in containers originating from the Edmonton area. The containers are brought into the Port of Vancouver by truck as it appears that the combined rail + ocean rates for containers from Edmonton are not competitive with truck + ocean rates.

TENURE AND REGULATIONS IN BRITISH COLUMBIA

Pre-ambble

A review of the tenure arrangements for peat in BC and their impact on the development of a provincial peat industry has been undertaken as part of this study. From this it has been possible to identify procedures that might be adopted to encourage that development. Consultation with personnel of BC Lands, the-Agricultural Land Commission (ALC), the Gold Commissioner and some peat industry sources has presented a picture of somewhat overlapping jurisdictions with potential for inconsistency of administration.

This situation is reported to be similar in some other provinces such as Saskatchewan, where the peat industry is not yet widely developed. Newfoundland has just completed approximately a year of government studies and over \$20,000 in consulting fees to try to work through the non-market problems that beset the would-be peat producers in that province. Part of that study included a field evaluation of the process of obtaining peat tenure. In provinces with substantial peat production, such as New Brunswick, Quebec, Manitoba, and Alberta, the tenure of peat lands is administered with a consistent approach.

The Status Quo

The end use of peat as fuel material suggests that it might be administered as an energy mineral such as coal or lignite. As we have seen earlier in this study, the actual market for peat in North America is mainly for growing media and soil amendment applications in the horticultural and agricultural sectors: other industrial uses are as an absorbent and filtra-

tion media for bio-remediation works and as an industrial animal litter. While perlite, vermiculite, zeolite, gypsum and limestone (for the production of agricultural lime), which are all used in soil amendment applications, are administered under the Mineral Tenure Act (1988), peat is specifically excluded at this time.

Peat occurs on private and Crown lands administered under the Agricultural Land Reserve (ALR) (which covers over 4% of the Province) by the Agricultural Land Commission (ALC) of the Ministry of Agriculture. Outside the ALR, peat on Crown lands is administered by BC Lands of the Ministry of Lands Parks and Environment.

These two provincial government departments controlling the peat lands of the Province require that any exploited areas shall have comparable or better value after the completion of peat mining to that which existed prior to mining. This is a custodial role required for the conservation of the agricultural lands in particular and the broader land base of the Province in general.

This requirement is not unusual, under current policies, for any natural resource exploitation. However, since no norms exist for defining these requirements in peat exploitation, there are no clear guidelines as to what will be acceptable as an end-use for completed areas. The lack of any large scale peat production in the Province makes it difficult to establish such norms and indicate what reclamation or remediation costs could be .

BC Lands and the ALC have a mandate that is better designed for preserving wetlands and the Agricultural Land Reserve (ALR), respectively, than for developing an orderly rural industry based on the extraction of peat. The magnitude of the markets for peat and the benefits that this could return to the Province, in the context of multiple land usage, is justification for exploring how to stimulate an extractive industry in a small percentage of the total wetland area of the Province.

While BC Lands controls peat tenure on all Crown Lands, the exploitation of peat that exists on such land within the ALR would not be permitted unless the ALC approved such exploitation and a soil removal permit were obtained.

The acquisition of tenure on Crown lands outside the ALR is described in the Land Administration Manual under the section covering "Quarry Materials Land Use". A copy of the policy summary of the types and terms of tenure in British Columbia is included here for reference.

The key Strategic Objectives that apply to the delivery of tenure include:

1. The equitable allocation of quarry lands amongst private

operators and public agencies.

(This is more specifically related to construction materials such as sand and gravel as there are no identified public agencies involved in the production of peat)

2, To provide a fair economic return to the Crown for the extraction of quarried materials in a manner which is equitable to the quarry industry.

3. To facilitate the operation of quarry activities in a manner which minimizes adverse environmental impacts on Crown land.

The Strategic Policies that have been derived to achieve these objectives are:

1. Disposal by open competition except where new quarry deposits have been identified through independent initiative or where replacement tenure is required.

2. The establishment of a royalty fee that reflects the amount of material extracted and the market value of the raw material.

3. The pre-payment of a land rental based on land value as a means of encouraging bona fide use of the quarry resources.

4. The issuance of tenure only after all regulatory requirements have been met for quarry land management and reclamation.

A limited tenure that might be converted into a tenure for the life of an operation after carrying out a programme of evaluation of a peat deposit can be obtained. This limited tenure would be achieved by applying for a General (Section 10) Quarry Licence which has a maximum term of six months.

The current form of tenure that applies to a peat operation in British Columbia is a Licence of Occupation or a Lease. The Licence of Occupation granted to all new operators is for five years which may be followed by a discretionary replacement licence with a term of up to 10 years. The Land Administration Manual indicates that a renewal might be by open bid rather than a simple confirmation subject to performance records. The preference of Regional Directors of BC Lands would appear to be for shorter terms with renewals based on performance or success in open bids for tenure.

The time frames given above do not give a larger scale operation, which would plan comparably larger scale investments of plant and equipment, sufficient duration of certain tenure to develop markets (3 to 5 years) and then continue with a ten year operation life. The so-called competitive bid for the renewal of tenure does not describe how the capital investment such as clearing, drainage ditches, foundations and roadworks are to be credited to the first operator, should he not receive an extension.

The normal term of a Lease is ten years which may be increased at the Regional Director's discretion to a maximum of 20 years. However, the lease is only issued on surveyed land and

this would require a full legal survey which is not normally done for a tenure that could be as short as 10 years. As with the Licence of Occupation, the initial lease to new operators is issued for a maximum term of 5 years with renewal, provided that the performance has been satisfactory during the initial term, to 10 to 20 years. The measure of performance is not defined in the Land Administration Manual.

The practical aspects of the time taken to complete an application for a license or a lease have not been determined by direct experience. Discussions with peat industry or potential peat industry sources indicated that broad discretionary powers given at the local regional management level did not result in rapid acquisition of even a General Quarry Licence. As this information was only anecdotal it is difficult to assess the underlying truths for the purposes of this study. The study carried out on the feasibility of the peat industry of Newfoundland went through the application process to determine what, if any, problems might exist with the process.

The staking of a mineral claim under the Mineral Tenure Act (1988) does not presently convey any right to peat that might occur in the surficial materials on the property. If peat is classified as an industrial mineral by virtue of the end use applications described earlier, its tenure, exploitation and reclamation can be administered by MEMPR. Material extracted as soil peat (see page 11 this report) whose use, without modification, is generally restricted to landscaping applications would be classified as a Quarry Resource or Soil.

In order to stimulate the development of the peat resources of the Province in the short term in those applications that can reasonably be classified by end use to be an industrial minerals application, it is recommended that, for the interim, peat be included in the general terms of the 1993 Protocol Agreement.

Problems related to the existing overlap of tenure, where mineral claims and peat tenure may co-exist, can also be reduced by including peat in the Protocol Agreement. The permitting of exploitation would still require input from the Ministry of Lands Environment and Parks. In the case of mineral claims staked over land that falls within the ALR, the ALC would continue to have the opportunity to deny permission of an operation if it was deemed not to be in the public interest.

Peat Royalties

Royalties are required to be paid for any material removed from a peat tenure. The royalty rates are not fixed but are recommended to the Ministry Executive by regional staff under the same policy section that deals with bentonite, clay, diatomite, earth, marl, pozzolan and soil. Current policy on establishing royalty rates for the small operations in British Columbia is to charge no less than private land-owners currently charge. The basis for this level of royalty is an established policy to avoid underselling the private sector. These rates are reportedly much higher than the royalty rates charged in the provinces that have successful peat industries. That the local private sector can charge high rates compared to the rates set by other provincial governments may reflect an artificial scarcity of product.

Current thinking at BC Lands includes opinions that want to continue with this high royalty level. The availability of sand and gravel is deemed to be greater than that of peat and therefore the regulators consider that the royalty should reflect a scarcity value for the peat. Sand and gravel royalties can range from a low of \$0.63 to well over \$3.00 per cubic meter in different parts of the Province. The actual royalty rate for "peat" operations in the **Kamloops** area was quoted as over \$4.75 per cubic meter in some cases. This is equivalent to over \$0.81 per 6 cu.ft. bale. In the main producing provinces the royalty rates per 6 cu.ft. bale (compressed **2:1**) are, New Brunswick \$0.05, Quebec \$0.025, Manitoba \$0.01 and Alberta \$0.011.

New Brunswick has a stated royalty objective of between 1% and 1.5% of the base value of the peat before packaging at the plant site; their \$0.05 royalty rate is estimated to be recovering approximately a 1% royalty. The **\$0.81** royalty level discussed for British Columbia would be equivalent to a 16.2% royalty if a similar value basis to New Brunswick peat could be achieved.

If the Kamloops area royalty rates are to be the minimum basis for setting peat royalties, the British Columbia industry would have a significant handicap compared with its competition in the other provinces.

Where Provincial royalties are set according to some perceived market price, a producer might be severely penalized if the higher value-added amounts were used to establish the benchmark rather than a nominal deemed base price-for the peat. Where prices accommodate costs due to private arrangements with landowners they may also be excessively high for benchmark use. It is likely that the landowner will have to insure that the cost of the reclamation of the mined area is covered by his return from the operation and will "over-insure".

The payment of the royalty requires an annual payment based on the amount of material removed from the tenure. A land rental for the tenure is also required in British Columbia which must be pre-paid annually. This consists of a non-creditable rental or fee of 1% of the Appraised Market Value as established and reviewed by the Ministry at ten year intervals or \$500 minimum if there is no appraised value. This rental is estimated to be equivalent to a cost in the range of \$10 and \$25 per hectare per annum, which compares with \$5 per hectare per annum in New Brunswick, and up to \$10.50 per hectare per annum in Alberta for small tenures.

Regulation

Peat exploitation in British Columbia will likely be subject to regulations not only related to environmental impacts and crown land usage but also, where a "mechanical disturbance of the ground or any excavation is made to explore for or to produce coal, mineral bearing substances, placer minerals, rock, limestone, earth, clay, sand or gravel", those applicable regulations administered under the Mines Act; In practice, it appears that peat extraction activities in the Province are not actively regulated under the Mines Act.

Notwithstanding the provisions of the Mining Act, The Land Administration Manual specifically excludes-soil and peat extraction from the 'requirement for approvals from the MEMPR for a work system and reclamation permit. Performance guarantees are also specifically excluded for peat operations from the requirement of MEMPR that is set for other quarry materials: no bond is required to be set aside for that ministry but it may be established by BC Lands.

Tenure will be granted only after a complete operations plan is submitted with estimates of annual production and type(s) of end product indicated. Also required is a description of the type and location of equipment and facilities on site, a description of drainage control measures and provisions for public safety and a reclamation plan complete with a the post-extraction land use.

Tenure, Regulation and Government Support in other Provinces

The following information was gathered mainly from telephone calls and has not been verified in all cases with inspection of Acts and regulations for the various jurisdictions. The principal peat producing provinces are New Brunswick, Quebec,

Manitoba, Alberta and Saskatchewan, in order of importance.

New Brunswick:

Peat is administered by the Department of Natural Resources and Energy on Crown lands only, under legislation termed the Quarriable Substance Act. Since large land tracts are required, acquisition of tenure is through leases rather than staking. An exploration licence for two years allows continuing rights in the case of a proposal for exploitation being submitted and accepted. The proposal amounts to a full feasibility study with plans for reclamation and closure.

The lease has a ten year life and is renewable. The rental cost for the lease is \$5/ hectare annually.

A royalty objective of between 1% and 1.5% of the raw peat value is being met with a royalty of \$0.05 per 6 cu. ft. bale (compressed 2:1) or equivalent.

The Province has completed a five year mapping project, covering the peatlands, with details of peat types, depths and cross-sections.

Quebec:

Peat tenure is included within the Mining Law, treated as a surface deposit and administered by the Department of Natural Resources. Leases are issued for 15 years, renewable for a further 15 years.

The royalty is set at \$0.025 per 6 cu. ft. bale (compressed 2:1) or about \$0.07 for an uncompressed cubic metre.

Quebec has documented and characterized much of the peat resource in the southern and eastern parts of the province.

Al b e r t a :

For tenure purposes peat is treated as a "surface resource". In unsettled areas peat is subject to the Environmental Protection Act; in settled areas it is subject to the Agriculture Act.

Application is made to Public Lands for tenure which is given on a first come first served basis. The average rental fee paid is \$2.47 per hectare, which can rise to \$10.50 per hectare for small areas.

A royalty is set at \$0.05 per cu. yd. (compressed 2:1) which is equivalent to \$0.011 for a 6 cu. ft. bale.

No information was obtained about the provincial data base on peat; it is expected that the Department of Agriculture will have characterized peat on settled lands.

Manitoba:

Peat is administered under the Mines Act as an industrial mineral.

Tenure is obtained as a lease whose terms were not obtained.

A royalty of \$0.06 per cubic metre is set; this is equivalent to \$0.01 per 6 cu. ft. bale.

Saskatchewan

This province has a relatively small production. Tenure is divided between the Mines Act for fuel peat, and the Department of Parks and Renewable Resources for horticultural peat.

Ontario

The Province leases peatlands in Northern Ontario under the Mines Act. Southern Ontario peatlands which are close to large markets are mostly supplied from private lands. Crown land peat is almost entirely designated as special wetland, that is not available for exploitation.

Newfoundland

Peat is now classified as a mineral and a year long study has just been completed to investigate the peat resource of the province. The results of that study are not available yet.

Tenure is obtained as a lease with a small royalty and rental fee.

THE MOST PRODUCTIVE PROVINCES APPEAR TO HAVE ARRANGED A FAIRLY SIMPLE TENURE SYSTEM WITHOUT **AN** ONEROUS ROYALTY.

POLICY CHANGES FOR A PEAT INDUSTRY

It is clearly stated in the Land Administration Manual in several places that soil and peat are excluded from the regulations administered by MEMPR. Any changes in the current administration for peat operations would require amendments to the Land Act and/or its regulations and the Mineral Tenure Act. An interim measure should be the inclusion of peat in the existing Protocol Agreement between MEMPR and the Ministry of Environment Lands and Parks for the Administration of Indus-

trial Minerals and Quarry Resources. Under this inclusion, claims staked under the Mineral Tenure Act (1988) could recognize peat as a commodity or material that could be administered by MEMPR.

The peat soil (as defined earlier in this study) production activity in the Province should not be included with peat production that might be used for industrial uses such as absorbents for environmental remediation, manufactures, and soil amendments. Peat products that can be exported from the Province are not in the same category of market as the small, local supply of organic soil for landscaping and should be considered in broader, terms that include the competitive suppliers in other provinces.. Peat soil would' remain a quarriable material under the administration of BC Lands.

There is a clear distinction between the policy backgrounds of MRMPR and both BC Lands and the ALC. MRMPR is an advocacy ministry, with a mandate to promote the development of the natural resources under its administration. BC Lands and the ALC are mandated to act more as custodians of the land base and its particular uses. It is reasonable to conclude that the peat industry has not flourished in British Columbia as it has in New Brunswick and Alberta in part because of the underlying policy base of the departments administering it. It would seem useful to consider the modification of the administration of peat lands to allow the vigorous development of the industry.

RECOMMENDATIONS

The recommendations made in the body of this study are assembled in the following listing. Provided that it is decided that there can and should be large scale exploitation of peatlands in British Columbia, in the context of both fuller employment in rural areas and the desire to preserve substantially all pristine land surfaces, these recommendations should be implemented. Our recommendations are as follows:

*****Changes should be made in the tenure system for peat

*****Classify peat appropriately as an industrial mineral by virtue of its end use applications so that its tenure, promotion, exploitation and reclamation can be administered by MRMPR.

*****Include peat in the Protocol Agreement in order to overcome problems related to overlap of tenure where mineral claims and peat leases co-exist.

*****Set royalties at rates that will allow peat

producers in British Columbia to compete with producers in other provinces.

*******Complete a reliable data base for the Peat Inventory of the Province along the main transportation corridors.**

*******Include peat with other industrial minerals that are being promoted at trade fairs under a joint arrangement between BC Trade and MEMPR.**

*******Consideration should be given to forming a committee to establish environmental policy related to the operation, reclamation and closure of peat mining activity to provide a consistent approach to peat development.**

ACKNOWLEDGEMENTS

Funding for this study was provided by Natural Resources Canada under the Canada - British Columbia partnership on mineral development. **Z.D.Hora** was instrumental in initiating the work and provided much useful assistance to the authors.

The authors also-express their thanks to the many respondents from provincial and federal governments and the private sector, who helped develop their understanding of the broader picture of peat in Canada and the realities of peat in British Columbia.

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APPENDIX

Figures describing Peat Statistics

Taken in their entirety from:

Jacques J. Thibault (1993)

THE DEVELOPMENT OF THE CANADIAN PEAT INDUSTRY

**New Brunswick Department of Natural Resources and Energy
Mineral Resources Division**

presented at

**Newfoundland Peat Opportunity Conference, Corner Brook,
Newfoundland;
September 7-10, 1993**

Peatland resources - Canada

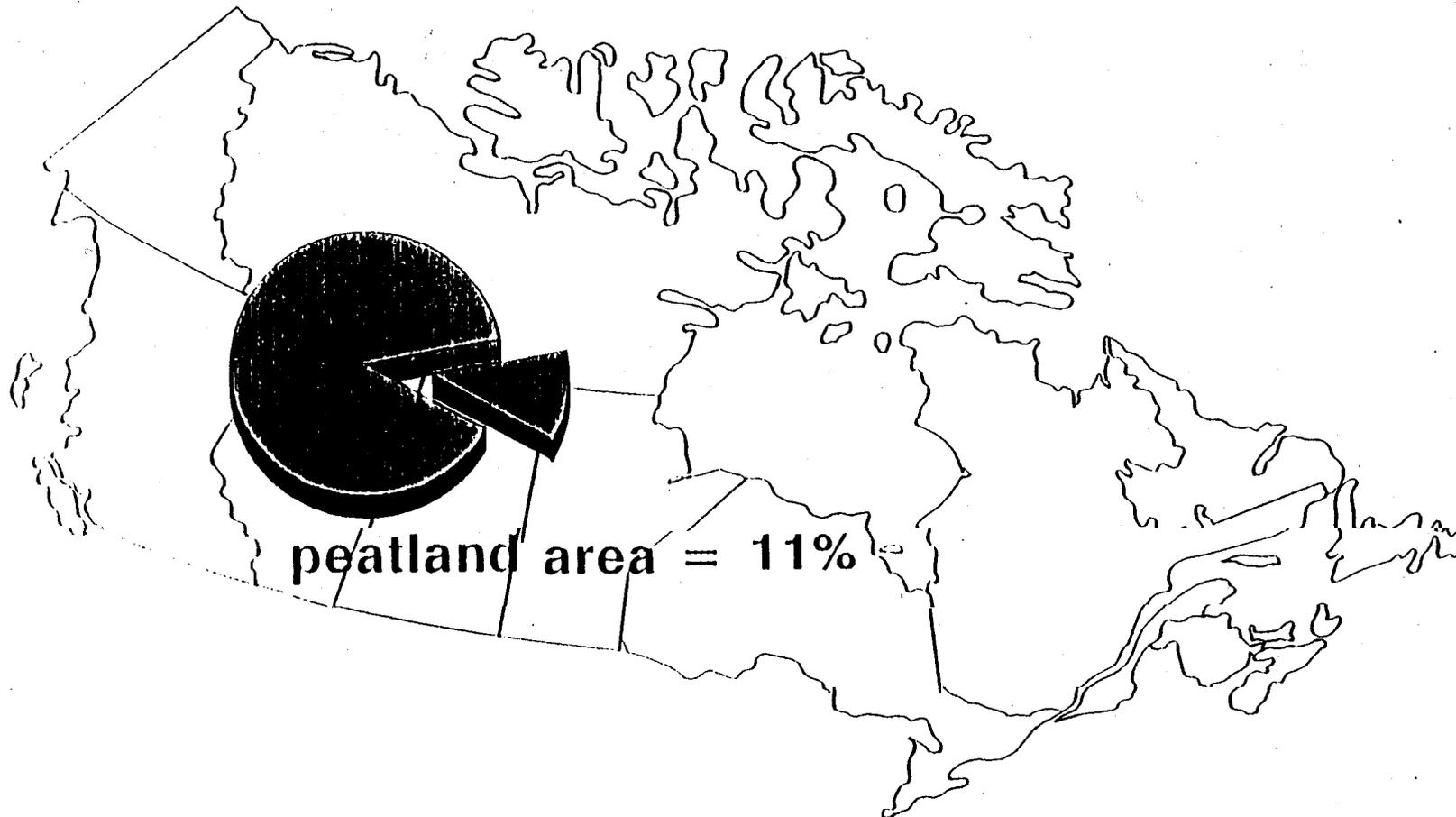


Figure 1. Peatlands cover about 111 million ha (11%) of Canada's land and freshwater area and account for 90% of the 127 million ha of wetlands found across the country.

PEATLAND AREA

Comparison between Canadian Provinces

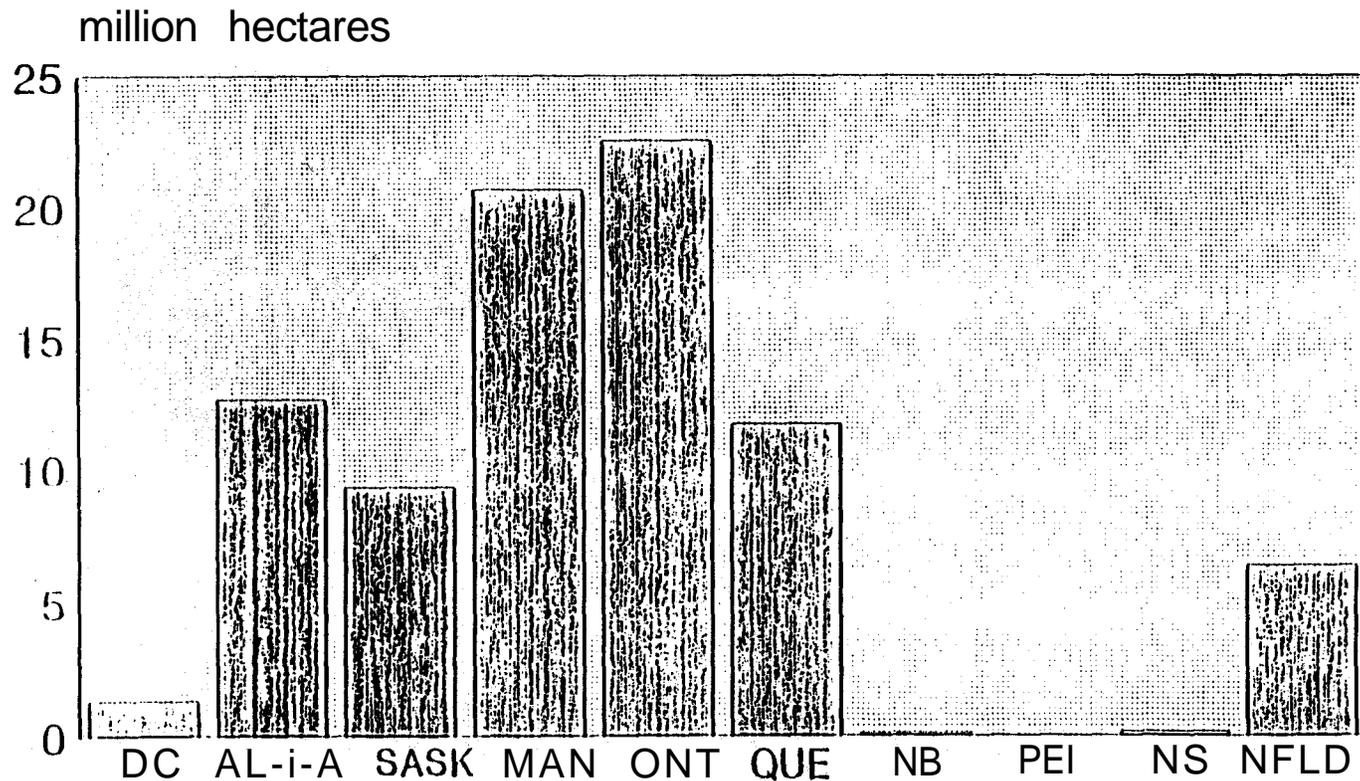


Figure 2. Peatland area - comparison between Canadian provinces (source: Zoltai 1988)

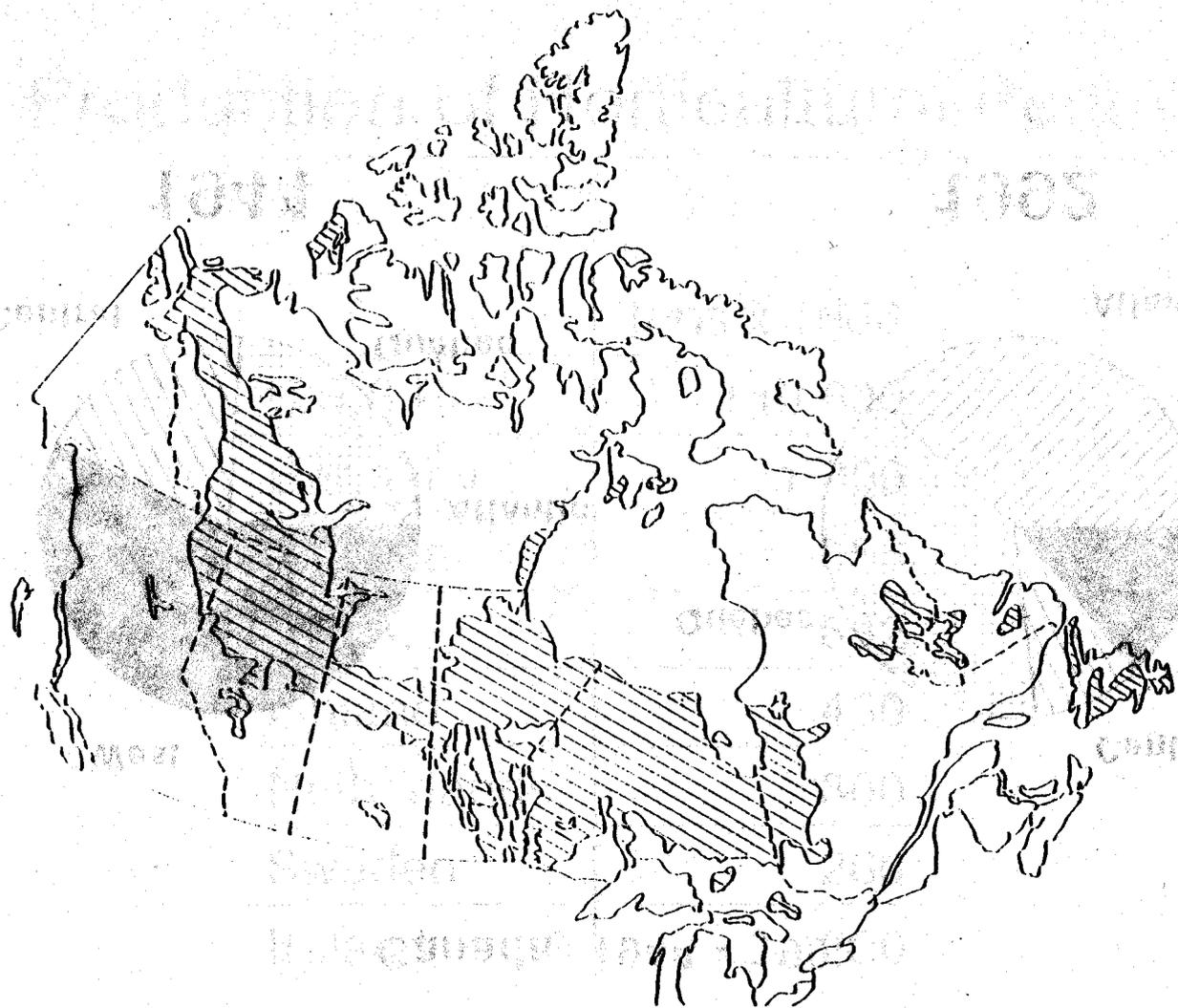


Figure 3. Areas of Canada with a high concentration of wetlands (25% to 100% of the surface cover).
Source: National Wetlands Working Group, 1988.

SHIFT IN PRODUCTION CENTRE

Canada 1944 - 1992

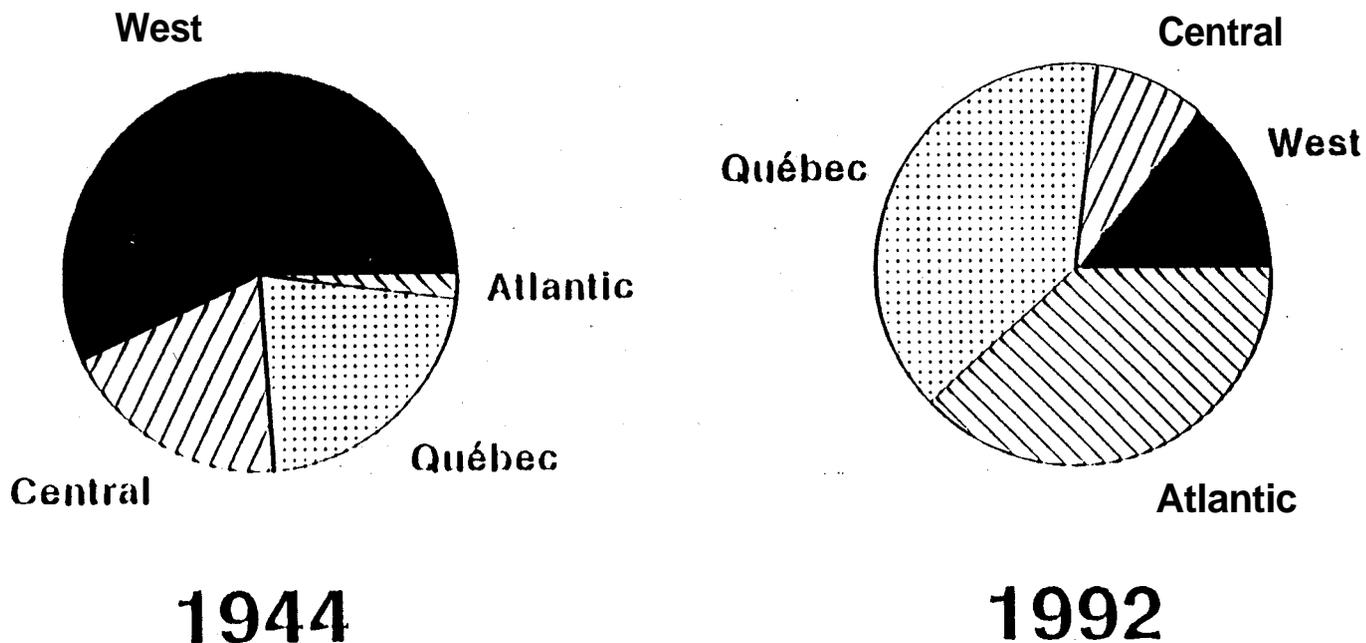


Figure 4. Shift in the peat production centre in Canada: 1944 vs 1992

World Production of Horticultural Peat - 1991

	tons x 1000
U.S.S.R.	140 600
Germany	1 300
Canada	856
U.S.A.	632
Finland	450
Netherlands	300
Sweden	260
Ireland	200

Figure 5. Leading horticultural peat producing nations in 1991 (source: Bergeron 1992).

Peat Usage in Canada

1943-1992

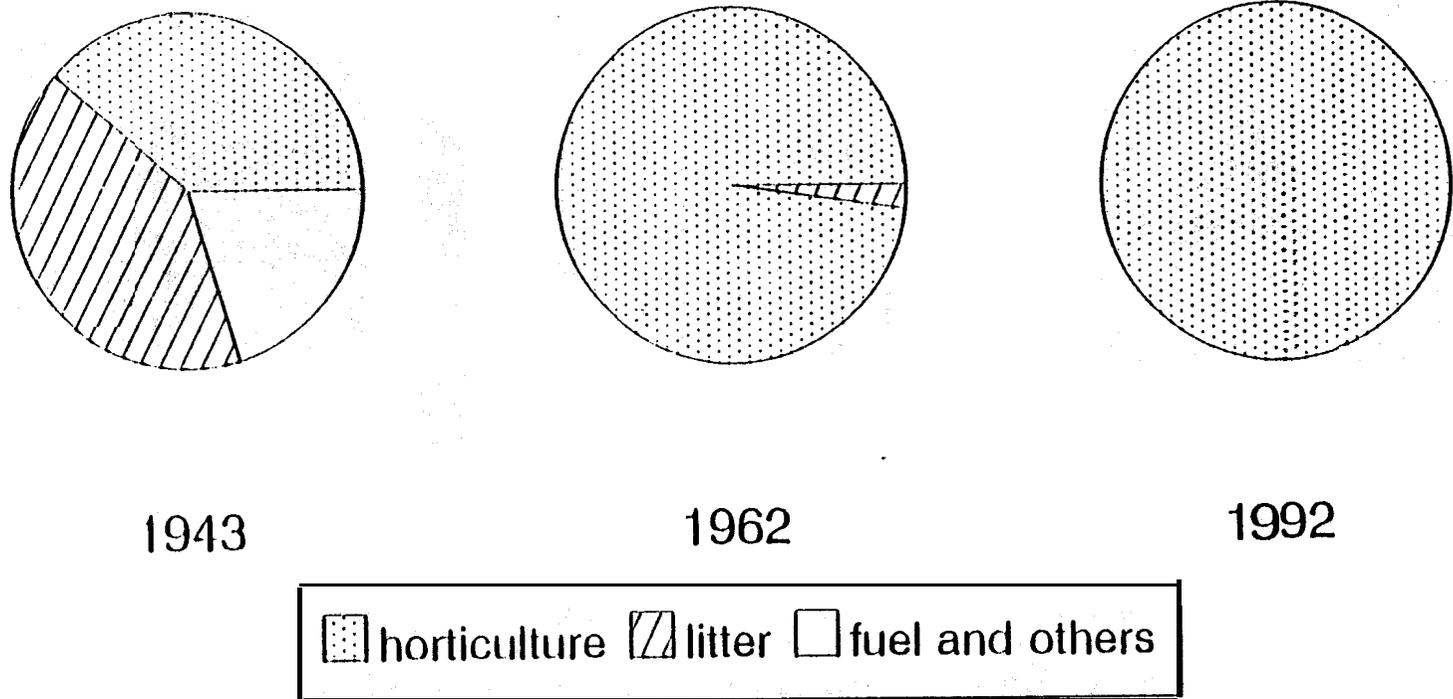


Figure 6. Changes in peat usage in Canada from 1943 to 1992.

U.S. IMPORTS OF PEAT

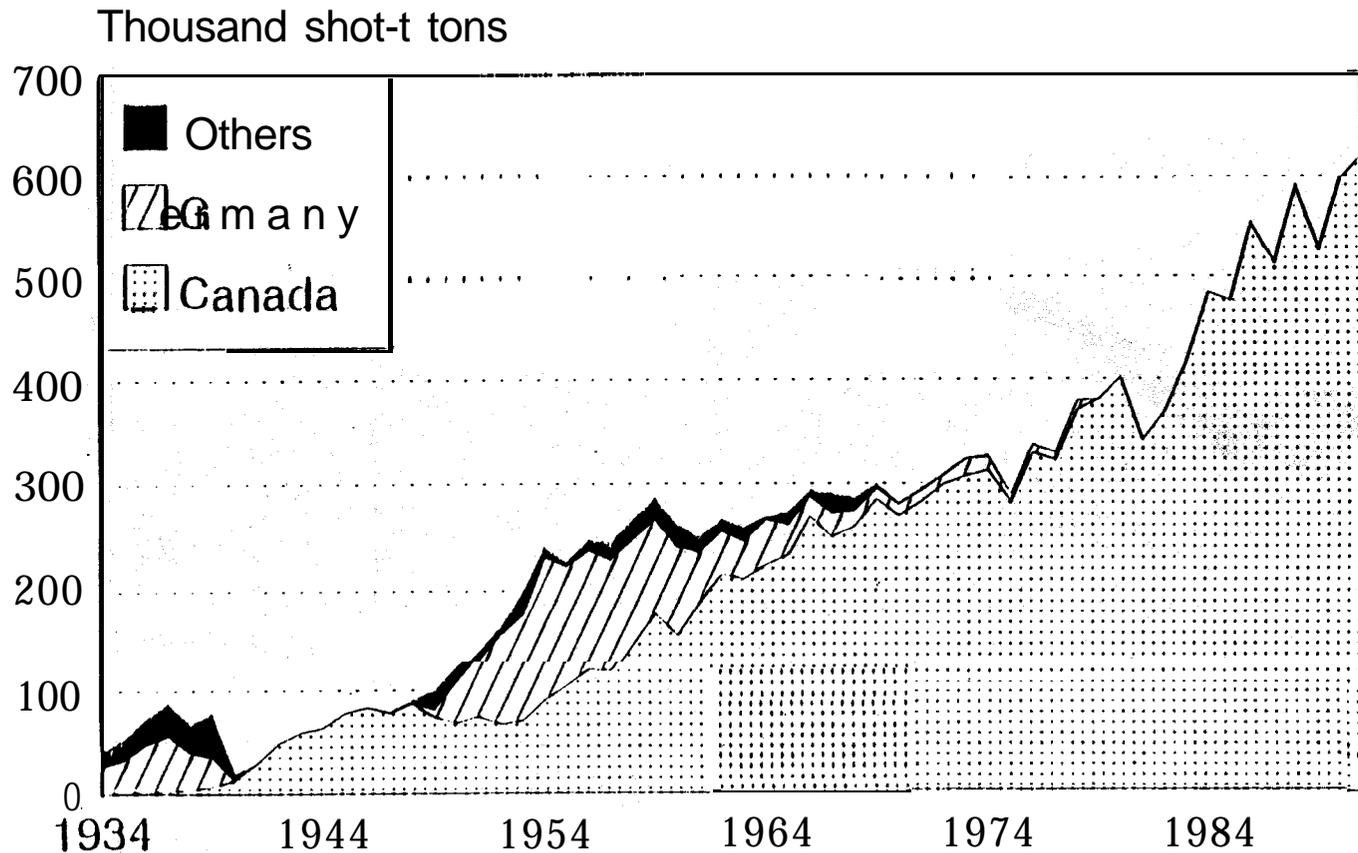


Figure 7. USA imports of peat from Canada, Germany and other countries between 1934 and 1991 (source: U.S. Bureau of Mines).

JAPANESE IMPORTS OF PEAT MOSS

Canada vs Others

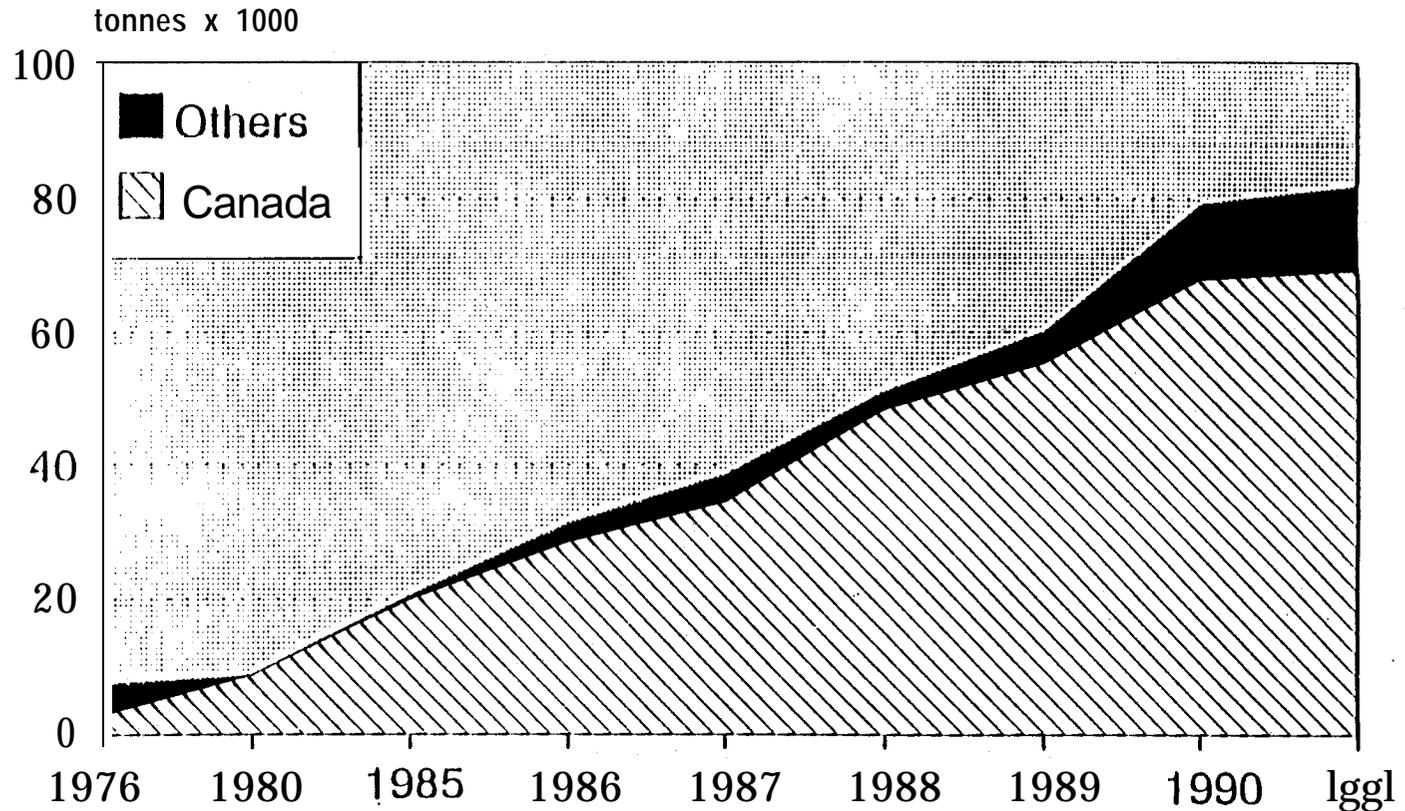


Figure 8. Japanese imports of peat moss - Canada vs other sources of supply - 1976 to 1991
(source: Japan Tariff Association)

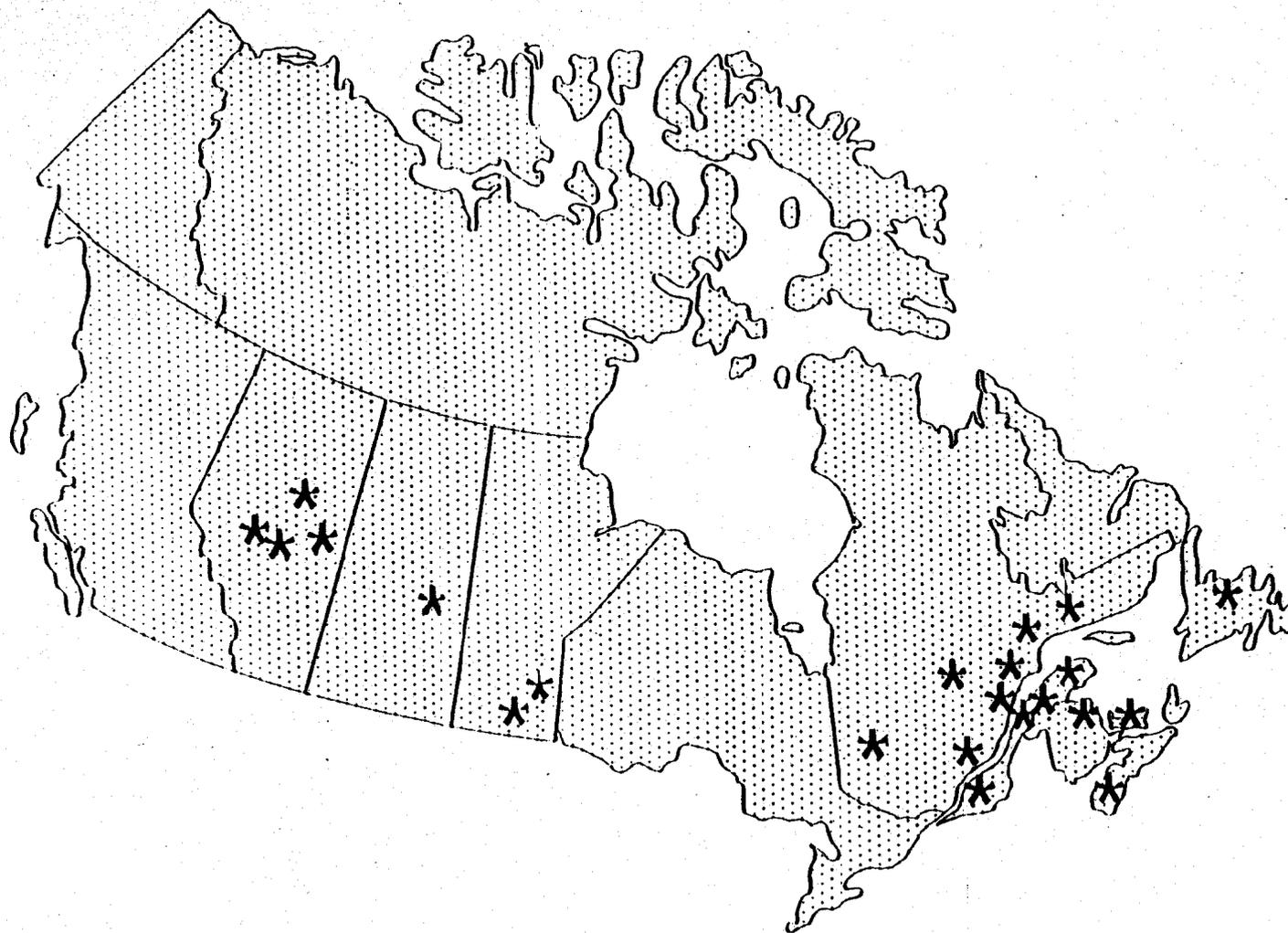


Figure 9. Regions of peat mining in Canada (source: Keys 1992).