Phytosociological studies of mire ecosystems in eastern Canada

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PHYTOSOCIOLOGICAL STUDIES OF MIRE ECOSYSTEMS IN EASTERN CANADA

By

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The content of this thesis is

entirely my own work, except for

the text references to publications.

It has not been previously submitted

for any degree or diploma.

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November 1977

ABSTRACT

The vegetation of a large number of mire complexes from the eastern Canadian provinces of Nova Scotia, New Brunswick and Québec were described and classified using the phytosociological methods of the Scandinavian and Zürich-Montpellier Schools and comparison was made with similar classifications proposed for Europe.

The vegetation of the examined mires was found to belong in a single Class: OXYCOCCO-SPHAGNETEA for which two Orders are proposed: the KALMIO-SPHAGNETALIA FUSCI of forested and non-forested ombrotrophic mire and the SPHAGNO-CARICETALIA of damp depressions in ombrotrophic sites as well as transition and rheotrophic mire. The former includes two Alliances and three Associations:

Alliance	Association
LEPIDOZIO-PICEION	PICEETUM MARIANAE
CLADONIO-SPHAGNION FUSCI	CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE
	SPHAGNETUM FUSCI

while the latter includes three Alliances and four Associations:

Alliance	Association
SPHAGNION CUSPIDATI	RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI
ANDROMEDO-SPHAGNION	SPHAGNETO-CARICETUM OLIGOSPERMI
MYRICO-CARICION	CALAMAGROSTIETO-MYRICETUM GALE
	ALNETUM RUGOSAE

Water samples were collected from most of the examined mires and analysed to determine the concentrations of the major ions. The results obtained together with other environmental factors influencing mires (climate, geographical location, geology and soils, and human disturbanse) were shown to be correlated with phyto and ecogeographical variation in eastern Canadian peatlands. Comparison with studies on European mires revealed that similar trends in variation exist on both sides of the Atlantic.

ACKNOWLEDGEMENTS

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Valuable assistance was given in the field by Keith Gooderham (1974) and Andrew Allen (1975), while some of the necessary field equipment was provided by James Stanley. I thank them all for making this aspect of the work so much easier.

The following people deserve special thanks for providing their expertise where needed. For identifying many of the collected plants: Dr. Albert E. Roland (vasculars); Dr. Robert R. Ireland (mosses); Mr. Harry Williams (liverworts); and Mr. John Skinner (lichens). For helping in the chemical analysis of the mire water samples: Dr. Charles Sheppard and Mr. Thomas Brett (cations); and Mrs. Gwynneth Walker (chloride). For providing some assistance in computing: Mr. Bernard Diaz.

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CONVENTIONS AND TERMS

A. Nomenclature

The names of the species used throughout this study are taken from the following authorities:

FERNALD, M. L. 1950. Gray's Manual of Botany. 8th ed. American Book Company. New York. 1632 pp.

CRUM, H., W. C. STEERE and L. E. ANDERSON. 1965. A list of the mosses of North America. The Bryologist. 68: 377-432.

SCHUSTER, R. M. 1953. Boreal hepaticae. A manual of liverworts of Minnesota and adjacent regions. Am. Midl. Nat. 49: 258-684.

HALE, M. E., and W. L. CULBERSON. 1966. A third checklist of the lichens of the continental United States and Canada. The Bryologist. 69: 141-182.

B. Problems in Nomenclature

There was some ambiguity regarding the nomenclature of several closely related species which deserves brief consideration. Polytrichum strictum Brid. is related closely to Polytrichum juniperinum Hedw. according to Watson (1968) and appears to be synonymous with Polytrichum juniperinum Hedw. var. affine (Funck) Brid. as described by Crum (1973) with both species having a white tomentum covering the stem. Throughout the thesis Polytrichum strictum is the name used.

Dicranum leioneuron Kindb. had been treated by some authors (Ahti and Isoviita, 1962) as only a form or ecotype of Dicranum scoparium Hedw. In a more recent publication Ahti et al (1965), however, suggest that it may be more closely related to Dicranum bonjeanii De Not. than to Dicranum scoparium. Dr. R. R. Ireland of the National Museum of Canada recognizes Dicranum leioneuron as a species in its own right (personal communication) and it has been treated as such in the present study.

Pohlia sphagnicola (BSG) Lindb. & H. Arnell may be only an environmental form of Pohlia nutans (Hedw.) Lindb. according to Ireland (personal communication) but more study is needed on the two species before a decision is made as to whether or not they are the same. In the majority of the cases where these species are recorded in the relevés they are given the name Pohlia sphagnicola.

Whenever Microlepidozia setacea (Web.) Joerg is listed in the thesis it is synonymous with Lepidozia setacea (Web.) Mitt. the older name for the species.

Cladonia chlorophaea (Flk.) Spreng. has four chemical strains according to Hale (1969) which are separated into two groups on the basis of microchemical crystal tests. Most of the samples encountered during the study reacted P + red (fumarprotocetraric acid) and these are the true Cladonia chlorophaea species. A few specimens reacted P - negative indicating some of the other chemical variants were found as well. In eastern Canada Hale reports the presence of two of these, namely, Cladonia grayi Merr. and Cladonia cryptochlorophaea Asah. As they cannot be separated without thin layer chromatography they have been left as Cladonia chlorophaea.

Cladonia deformis (L.) Hoffm. and Cladonia gonecha (Ach.) Asah. had to be separated by fluorescence analysis as they are otherwise indistinguishable (Hale, 1969). The latter reacts positively to ultraviolet light with the white fluorescence indicating the presence of squamatic acid.

C. Glossary

The following words are defined here so that their meaning is correctly understood whenever they are encountered in the thesis.

BOG - a synonym for ombrotrophic mire

BRYOPHYTE - refers only to mosses (Musci) and liverworts (Hepaticae)

FEN - a synonym for rheotrophic mire

FRUTICOSE - refers to those lichens having a shrub-like growth form as opposed to those having a crustose (crust-like) or foliose (leaf-like) form.

QUADRAT - a synonym for relevé

HUMMOCKY - an intermediate topographic feature between true hummocks and distinct depressions or hollows.

LAYERING - a growth feature in some species, especially Picea mariana, whereby the lower lateral branches, except for the tips, are buried by the cushion-forming mosses. The tips continue to grow upwards as independant stems.

PEATLAND - a synonym for mire

D. Conventions

Authorities for the species names are not included in the main text but are given in the Check List of Species found in Appendix A.

Authorities for the syntaxonomic names have been left out of this thesis except where a previously named syntaxon is incorporated into the proposed classification scheme for eastern Canadian mires. A reference is always given, however, when the syntaxa of other authors are mentioned in the text. A conspectus of the proposed syntaxonomic units is presented at the end of Chapter VII.

The names of associations and syntaxa of higher rank are always spelt with capital letters throughout the thesis.

The names of species usually are abbreviated in the tables in order to save space. The full names of the species are given in Appendix A or in the Species List at the end of Volume 2.

I INTRODUCTION

Knowledge is necessary before potential can be realised. This statement applies as much to the writing of this thesis as it does to its subject matter - mire ecosystems. At the present time Canada ranks high in possession of the earth's peat resources but ranks low in their utilization. Peat is being used to a limited extent in agriculture but hardly at all as an energy source. This situation is likely to change because of the rapid depletion of other fossil fuels. When the need arises, therefore, sensible utilization must take precedence over indiscriminate exploitation. The continual accumulation of knowledge concerning mires is important if this resource is to be treated wisely. The present study attempts to make a contribution in this regard.

A review of the literature on North American mires revealed that no phytosociological classifications had ever been made that were comparable in geographical scale to those of Schwickerath (1940), Duvigneaud (1949) and Moore (1968) for European mires. Time and size of the area were the limiting factors to be considered in attempting a project of this kind for North American mires.

Eastern Canada below the permafrost zone, therefore, was selected as a suitable study area for the following reasons:

1) environmental conditions of climate, topography and drainage have enabled an abundance of mires to develop within this region following the Wisconsin glaciation

2) below the permafrost zone this area contains the same types of mire complex that are found in western Europe, namely,

aapamires, domed tertiary, flat tertiary and blanket mires (Moore and Bellamy, 1974).

In order to ensure that variation within the region and within mires was adequately covered the following objectives were set forth:

1) to include the major phytogeographical areas in eastern Canada as described by Rowe (1972). These are the Acadian, the Great Lakes-St. Lawrence and the Boreal forest regions

2) to include areas having a distinct maritime climate as well as those having a distinct continental one.

3) to include the three groups of mire systems as first classified by Kulczynski (1949), namely, rheophilous, transition and ombrophilous, and

4) to include all stages of hydroseral development on mires as described by Moore and Bellamy (1974). These are the open, closed, building and climax stages which correspond to Oosting's (1956) hydrach successional sequence.

In addition to these selection standards for variation it was decided to:

5) choose geographical areas in eastern Canada where little previous work had been done on mires in order to increase the number of sites for which information is available. The exception to this was the Bas Saint-Laurent region where work had already been done on some of the mires by Auer (1930) and Gauthier and Grandtner (1975), and

6) to confine the sampling mainly to virgin mires in order to minimize the effects of human disturbance. Again the most notable exception was the Bas Saint-Laurent area where peat is being excavated from many of the mires for agricultural purposes.

The literature pertaining to the vegetation of North American mires dates back to the turn of this century. In general the earlier investigations were mainly descriptive and concerned with the development of the mires. Any attempt at classification usually was done on a morphological rather than a vegetational basis. Some of the contributions from this earlier period include those of Transeau (1903), who speculated on the glacial and postglacial migrations of bog plant societies in North America in an attempt to explain their recent distributions; Nichols (1918, 1919) who focused his attention on the development of raised bogs in northern Cape Breton Island and eastern Maine; Lewis and Dowding (1926) who examined the development of raised and flat bogs in Alberta and attributed retrogression in the "muskegs" mainly to climatic changes which have brought about desiccation; and Rigg (1940a, 1940b, 1951) who discussed and compared the development of *Sphagnum* bogs from different regions across the North American continent.

More recent efforts to classify mires on the basis of morphology have included the use of aerial photographs to interpret surface features. Contributions here come from: Radforth (1955, 1958, 1968, 1969) who on the basis of airform patterns in permafrost regions established descriptive categories for these features; Allington (1961) who classified the bogs of central Labrador-Ungava by correlating patterns observed from the air with those field checked on the ground; and Heinselman (1963) who proposed a classification for the Lake Agassiz peatlands of Minnesota using aerial photographs and ground surveys.

Descriptive surveys where some emphasis has been placed on a vegetational classification include those of Gates (1942) for the mires of northern lower Michegan; Conway (1949) for the mires of northern

Minnesota; and Thompson (1969) for the mires of the Northern Peninsula in Newfoundland.

Numerous investigations have been carried out on North American mires using the procedures of the European schools of phytosociology. Studies which have been influenced by the Scandinavian tradition include the work of Osvald (1933) on the vegetation of mires along the Pacific coast region; the study of Drury (1956) on the vegetation and development of mires in central Alaska; the investigations of Sjörs (1959, 1961a, 1963) on mires within the vast Hudson Bay Lowland region; and the work of Pollett (1968a, 1968b) and Heikurainen (1968) on the mires of Newfoundland with emphasis on their utilization in forestry.

Other studies have used the phytosociological methods of the Zürich-Montpellier school in attempting to classify the vegetation on North American mires. Contributions here include the work of Janssen (1967) and Heinselman (1970) on the forest and mire vegetation of Minnesota; Comeau (1971) on the vegetation and development of raised bogs in northern Cape Breton Island; Pollett (1972) on the boreal peatlands of central Newfoundland; and Fabiszewski (1975) on the vegetational composition of mires in eastern Canada with emphasis on the role of lichens in mire development. The latter two studies make comparisons based on vegetational classification between North American and European mires.

All of the works mentioned above were carried out in regions that are situated beyond the geographical area chosen for this study. Only a few investigations have been conducted inside the study area where they are all very localized. The earliest of these works was one carried out by Ganong (1897) in southwestern New Brunswick in which he investigated some of the raised bogs along the Bay of Fundy coast. Although the study is mainly descriptive in nature, comparisons are made between the bog flora in the area and that found on some of the European mires. Auer (1930) conducted an extensive survey of the mires in southeastern Canada in which the main emphasis was centered on their stratigraphy. Some of the sites he examined were located along the Bas Saint-Laurent region in Québec and the Northumberland Shore area in New Brunswick, both localities being included in the present study. Based on his observations he discusses the origin and development of mires but makes no attempt at classifying their vegetation. Dansereau and Segadas-Vianna (1952) defined seven pioneer stages and seven consolidation stages in seral development on mires which culminate in a subclimax or forest stage. The study examined mires located on the Laurentian Shield and in the Saint Lawrence Valley. Criteria also are set forth to distinguish bogs from swamps and marshes. In a later paper Dansereau (1959) defined the principal plant associations of the Saint Lawrence Valley based on vegetation structure. All the forest and bog communities were sampled on the basis of their dominants, physiognomy and ecological position. More recent studies by Gauthier (1967) and Gauthier and Grandtner (1975) dealt with the phytosociological classification of the mires along the Bas Saint-Laurent. They recognized ten associations and 15 subassociations and placed these into two vegetation series, namely, the Sphagnum-black spruce series on ombrotrophic mire and the cedar swamp series on transition sites. Finally, Osvald (1970), in a report based on his earlier investigations, described the vegetation and stratigraphy of North American mires. The majority of the sites he examined in eastern Canada are located in Nova Scotia but mainly in areas other than the Eastern Shore region. Following the traditions of the Scandinavian approach to phytosociology he places the mire communities into "sociations" which are characterized by dominants from the different vegetation layers.

The classification systems for vegetation in Europe generally have been applied to mire vegetation modified somewhat by human disturbance. This particularly is true of the Zürich-Montpellier approach as developed by Braun-Blanquet (1928). One of the aims of the project, therefore, was to test the applicability of this system of phytosociology to predominantly virgin mire vegetation in eastern Canada. From this would emerge the principal aim of the project - to formulate a classification system for these mires based on plant community structure, one that would allow quick and easy recognition of its basic units in the field. In addition to this, by examining as many mires as possible within a large geographical area that contains a climatic gradient it was hoped to illustrate any phyto or ecogeographical trends that may exist.

The present study was started in 1973 with the field work taking place during the summer months of 1974 and 1975. A total of 156 sites were examined from which 114 mires were chosen for detailed study. From these mires 1300 relevés were sampled. The sites are listed in Appendix B page 338.

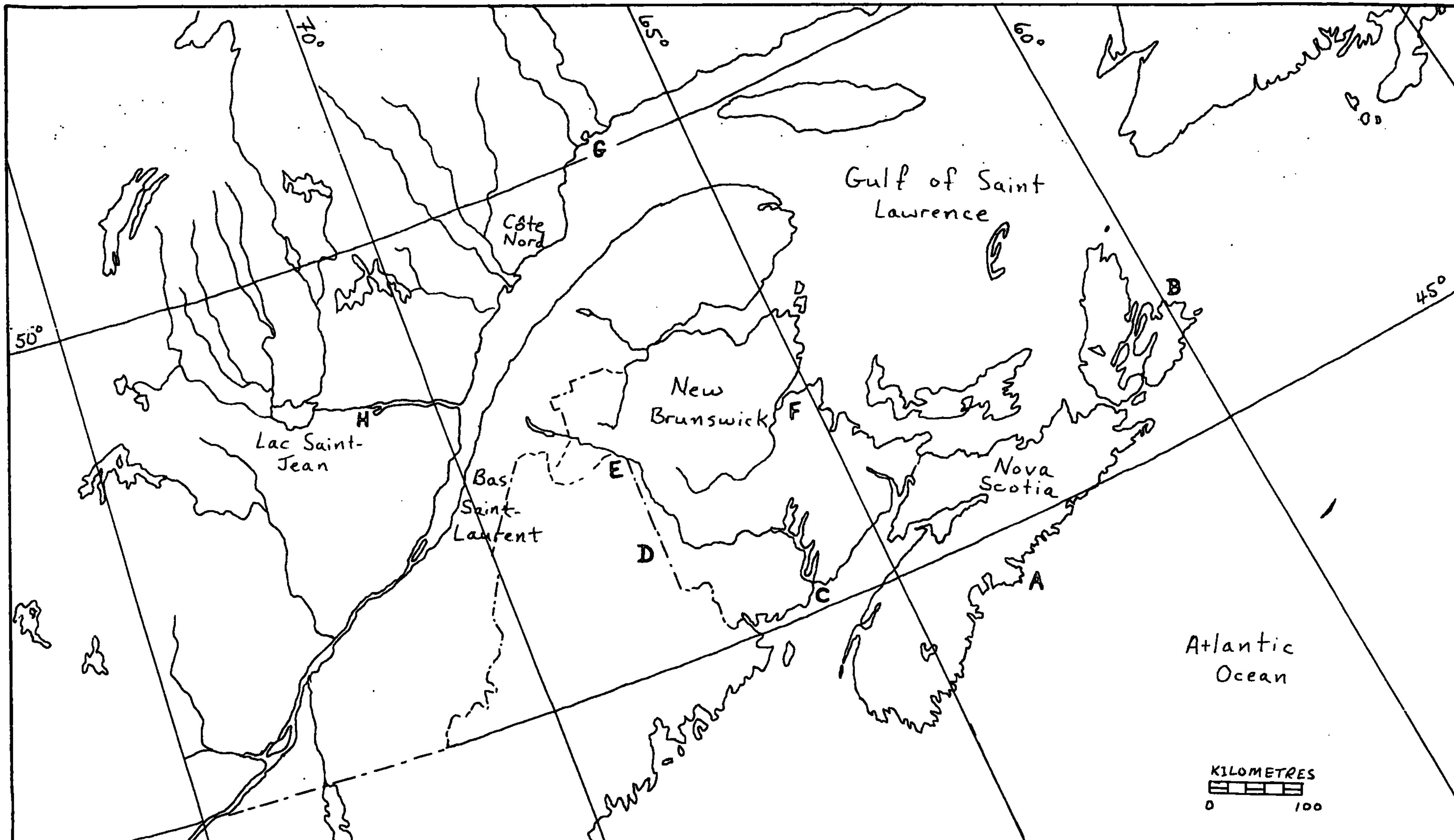


Fig. 1. Map of the study area in eastern Canada showing the major geographical regions. (The letters "A" to "H" refer to the locations for the climatic diagrams shown in Fig. 6)

II ENVIRONMENTAL BACKGROUND

The physical attributes of the study area are examined in this chapter. Attention is focused on climate, topography, geology, and soils in relation to the vegetation.

A. Location

The field work took place in the three eastern Canadian provinces of Nova Scotia, New Brunswick and Québec. The mires examined within these provinces are located in the following geographical regions (see Fig.1 page 7):

Eastern Shore (Nova Scotia - **see Fig. 2 page 9**)

The study area within this region extends from St. Margarets Bay (lat. 44°30'N, long. 64°00'W) near Halifax, along the Atlantic coast to the eastern end of Cape Breton Island near Louisburg (lat. 45°55'N, long. 60°00'W), a distance of approximately 340 kilometres (211 miles) with nearly all of the mires being less than ten km (6 miles) from the sea (the farthest at just over 35km). A total of 34 mires were sampled in this area.

Lake Ainslie (Nova Scotia - **see Fig. 2 page 9**)

The study site includes part of the catchment area in the northwest corner of the lake (lat. 46°09'N, long. 61°17'W), the lake itself being located in Inverness County on the western side of Cape Breton Island.

Bay of Fundy Coast (New Brunswick - **see Fig. 3 page 11**)

The study area is confined to a small section of coast in the vicinity of Point Lepreau (lat. 45°03'N, long. 66°28'W) which is situated approximately 35km (21 miles) southwest of Saint John, with the mires

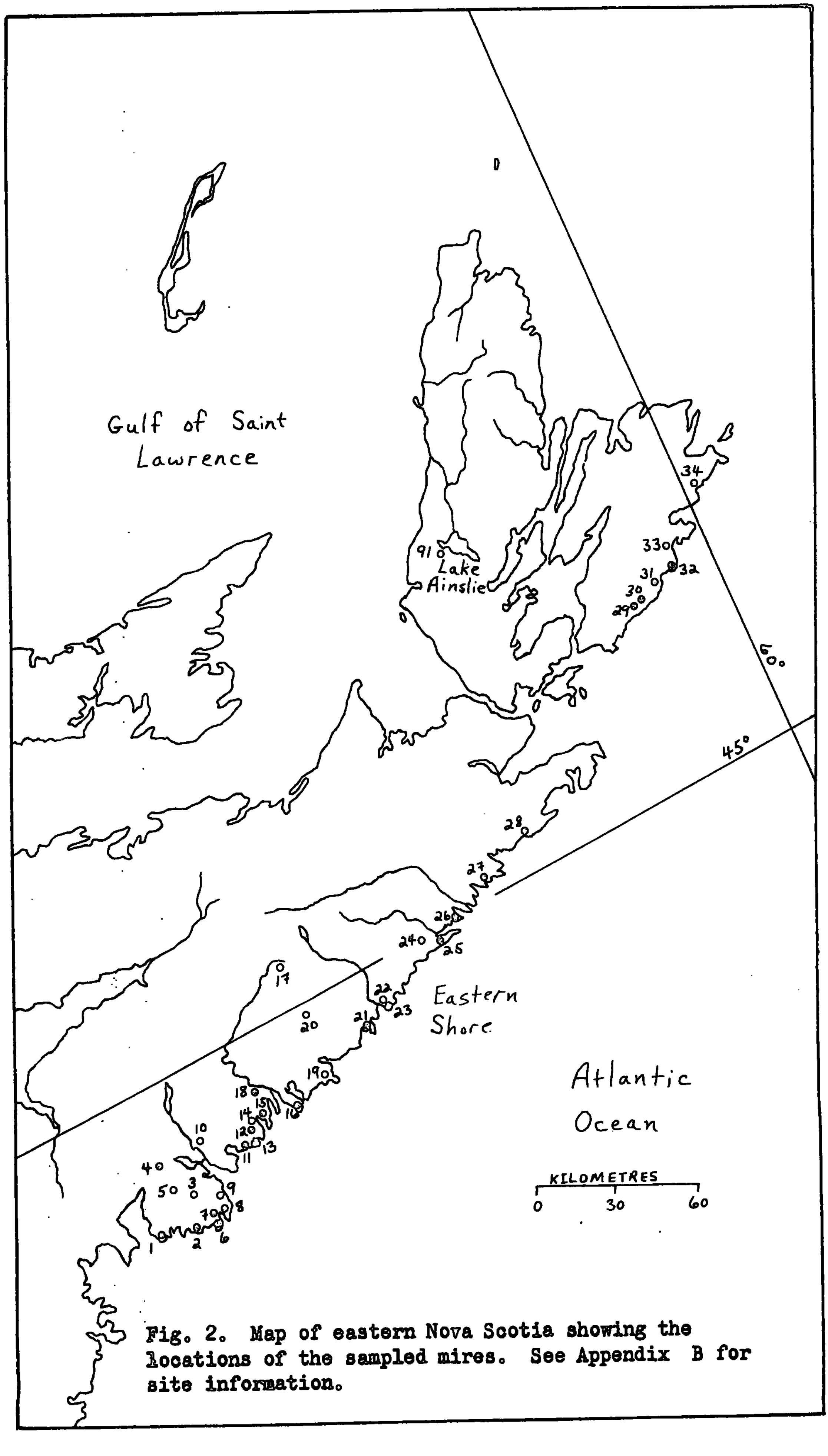


Fig. 2. Map of eastern Nova Scotia showing the locations of the sampled mires. See Appendix B for site information.

being less than five km (3 miles) from the sea. Two mires were sampled in this region.

Saint John River Valley (New Brunswick - see Fig. 3 page 11)

The study area covers most of the length of the river system (within New Brunswick) extending from the New Brunswick-Québec border (lat. 47°30'N, long. 68°30'W) near Edmundston in the northwest to South Oromocto Lake (lat. 45°25'N, long 66°40'W) in the south, a distance of approximately 359km (223 miles). There were 11 mires sampled in this area.

Restigouche River (New Brunswick - see Fig. 3 page 11)

The study site includes a small section of the Restigouche watershed region situated in the St. Quentin and Kedgwick area (lat. 47°39'N, long. 67°21'W) in northern New Brunswick. Two mires were sampled in this region.

Southwest Miramichi River (New Brunswick - see Fig. 3 page 11)

Here the study area extends from Juniper (lat. 46°33'N, long. 67°10'W) in the west to Rogersville (lat. 46°45'N, long. 65°25'W) in the east, a distance of approximately 140km (87 miles) and covering a large part of the watershed system. Five mires were sampled in the area.

Northumberland Shore (New Brunswick - see Fig. 3 page 11)

The study site includes only a small section of the coast near Point Sapin (lat. 46°58'N, long. 64°50'W) with the farthest inland mire situated approximately 37km (23 miles) from the sea. Only three mires were sampled here.

Bas Saint-Laurent (Québec - see Fig. 4 page 13)

The area covered by the study extends along the south shore of the Saint Lawrence River from Matane (lat. 48°50'N, long. 67°31'W) in the northeast to St. Pacôme (47°25'N, long. 69°57'W) in the southwest, a distance of approximately 240km (149 miles) with all of the mires being less than 13km (8 miles) from the shoreline. Nine mires were

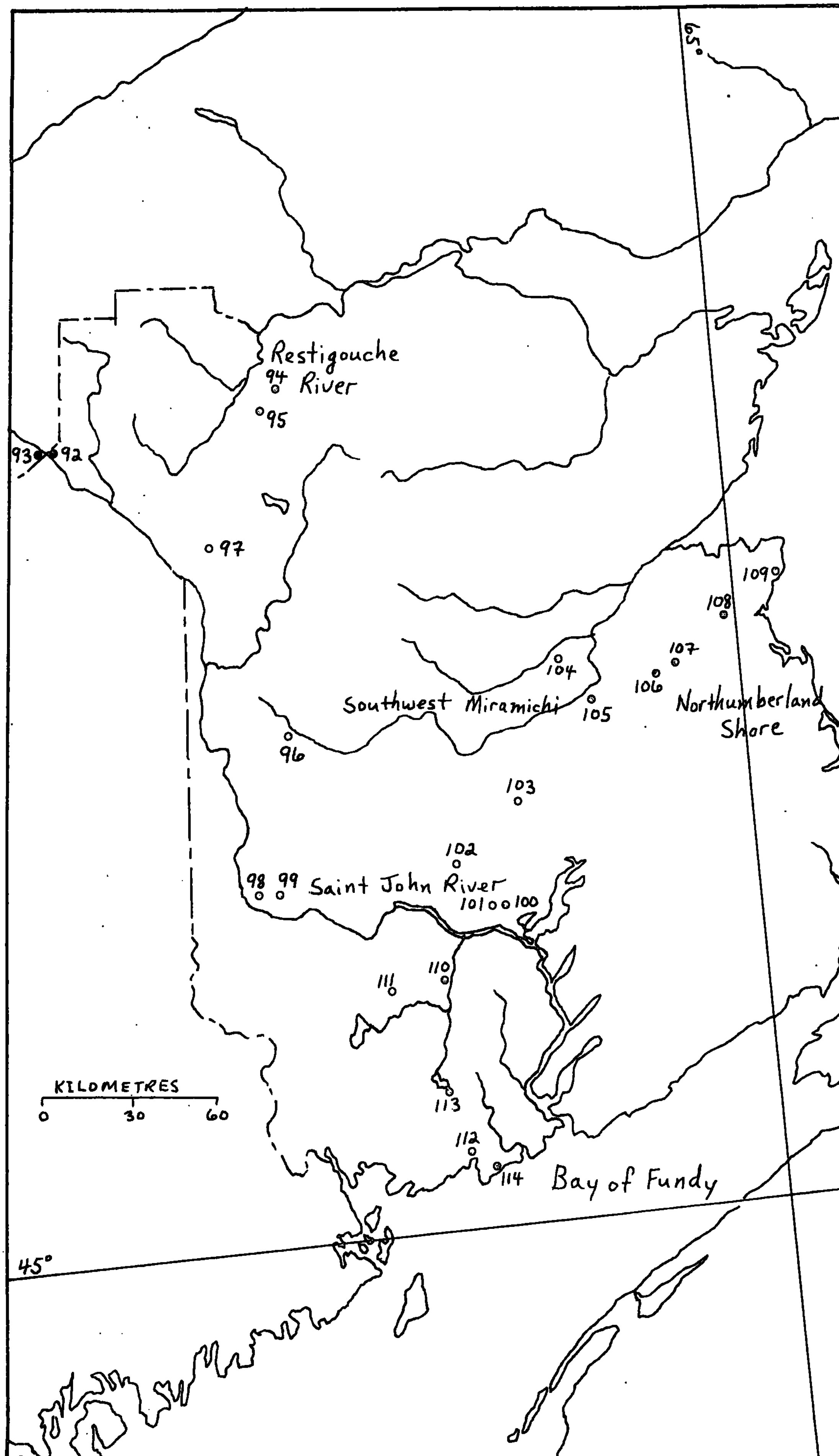


Fig. 3. Map of New Brunswick showing the locations of the sampled mires. See Appendix B for site information.

sampled in this region.

Côte Nord (Québec - see Fig. 4 page 13)

The study area along the north shore of the Saint Lawrence River extends from Tadoussac (lat. 48°08'N, long. 69°43'W) near the mouth of the Saguenay River in the southwest to Sept-Iles (lat. 50°12'N, long. 66°23'W) in the northeast, a distance of approximately 420km (261 miles) with all the mires located less than ten km from the shore. A total of 21 mires were sampled in this region.

Lac Saint-Jean (Québec - see Fig. 5 page 14)

The study area includes the catchment region on the northern side of the lake extending from St. Ambroise (lat. 48°33'N, long 71.°20'W) in the east to St. Thomas-Didyme (lat. 48°55'N, long. 72°40'W) in the west, a distance of approximately 105km (65 miles), while the northern end of Lac aux Rats (lat. 49°14'N, long. 72°17'W) represents the greatest northward extension of the study area from the lake edge (around 55km or 34 miles). Twenty-six mires were sampled in this region.

The entire study area covers approximately 6° of latitude (44°- 50°N) and 13° of longitude (60°- 73°W), an east-west distance of roughly 1000km (621 miles) and a north-south distance of 650km (404 miles).

B. Climate

The climate of eastern Canada is basically a continental one despite the proximity of a large part of the region to the sea. Lying at mid-latitude on the east coast of a large continental landmass the weather systems influencing the region originate in the interior coming from the northwest, west and southwest depending on the time of year. The continental influence, nevertheless, is modified somewhat by the maritime exposure. This fact plus the large area

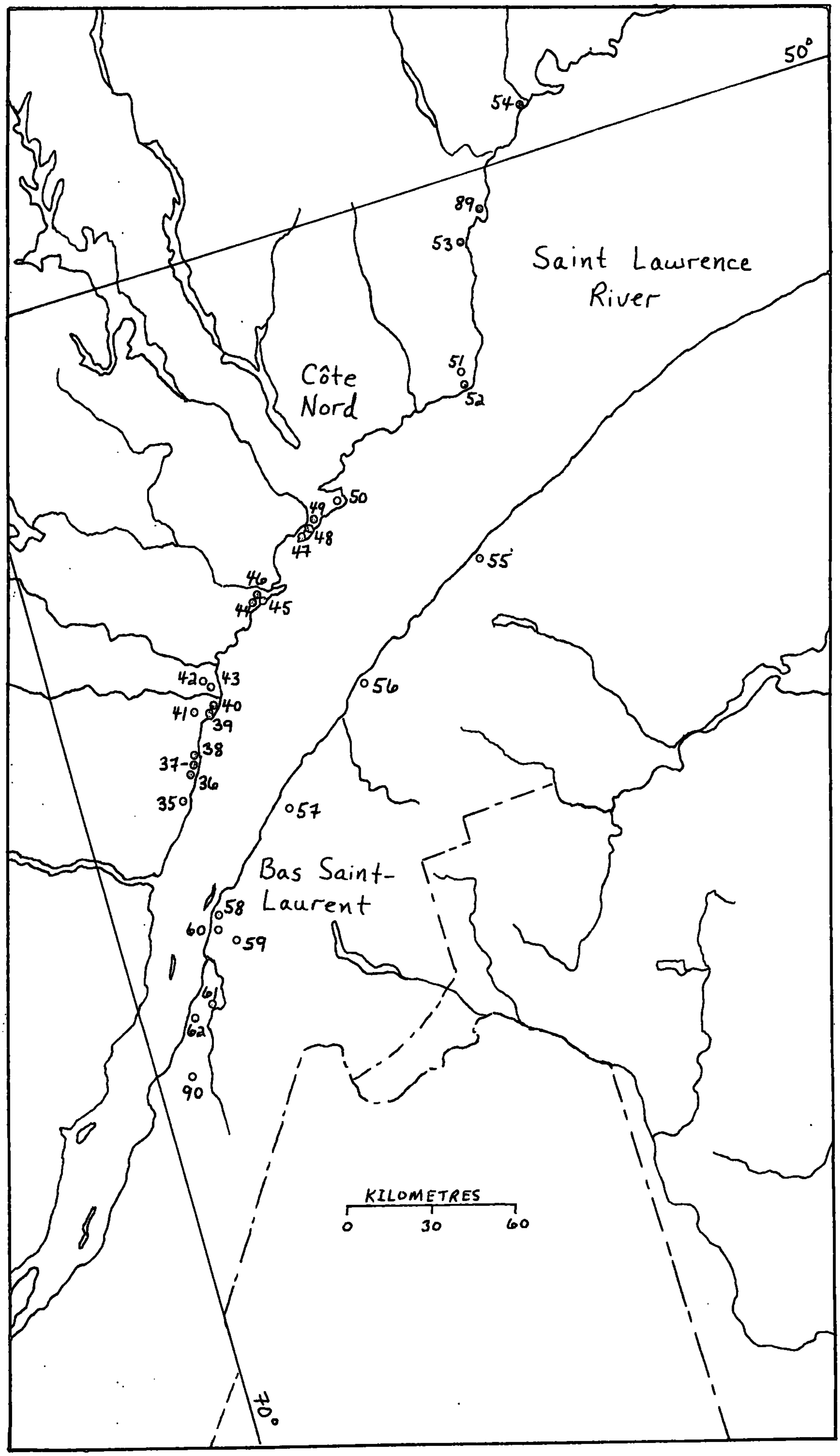


Fig. 4. Map of the lower Saint Lawrence River Valley showing the locations of the sampled mires. See Appendix B for site information.

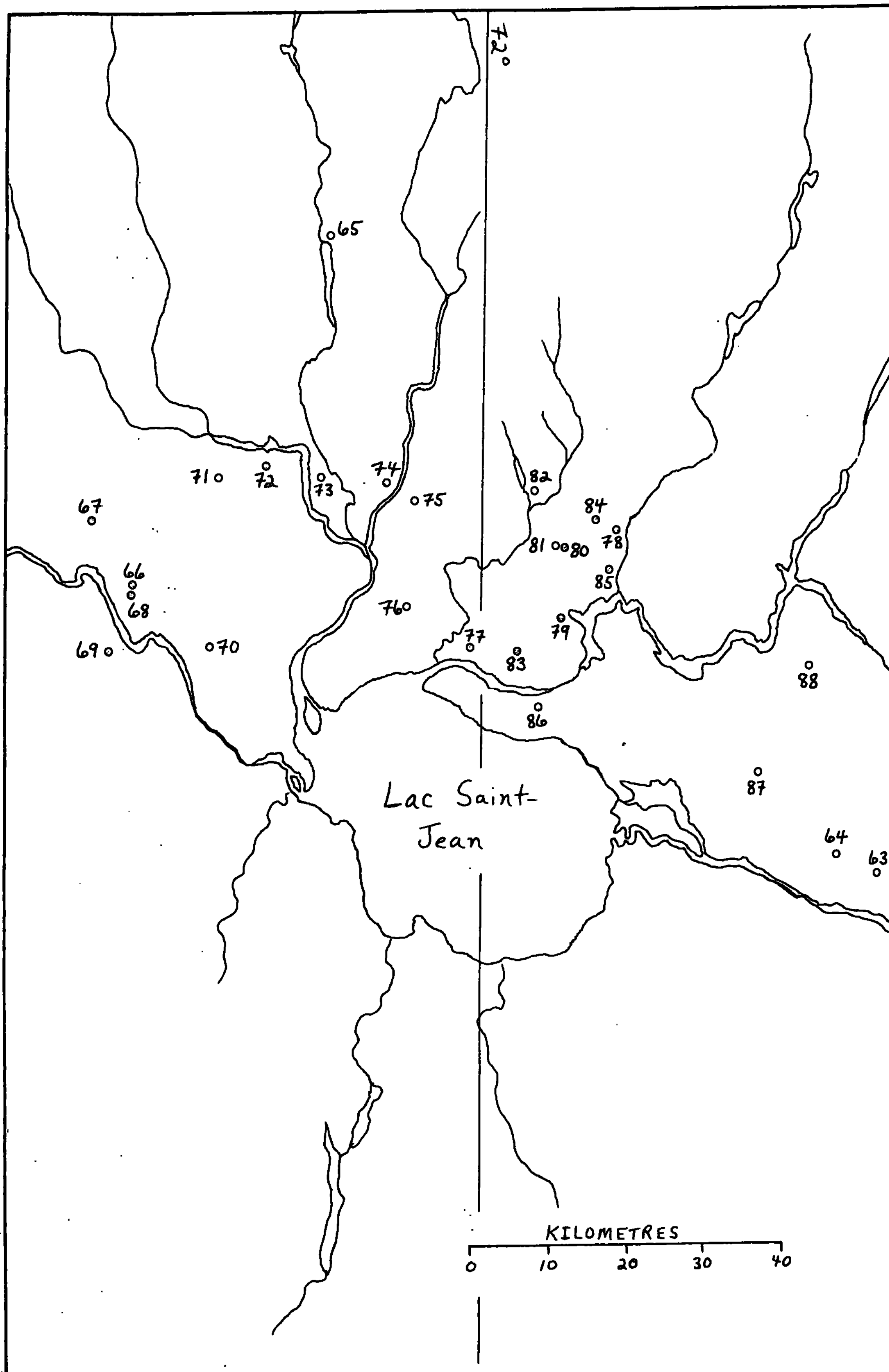


Fig. 5. Map of the Lac Saint-Jean Basin showing the locations of the sampled mires. See Appendix B for site information.

involved provides for considerable variation in climate.

Winds

According to Putnam (1940, 1952) the prevailing winds in both the Maritime Provinces and the Saint Lawrence River Valley are from the northwest in winter and the southwest in summer. Pollett (1972) reports that Newfoundland experiences winds that are predominantly from the southwest. The cyclonic storms moving outward from the central part of the continent tend to follow the same pattern inducing the flow of cold air from the northwest in the winter and warm air from the southwest in the summer.

Temperatures

Selected climatic data from meteorological stations (near sampled mires) that represent the different geographical regions within the study area are shown in Table 1 page 16. The mean daily temperature (M.D.T.) for a 12 month period varies considerably throughout the region. Along the Eastern Shore of Nova Scotia it averages around 6.2°C ranging from a high of 7.5°C at Halifax to a low of 5.3°C at Ecum Secum. It remains above 5°C near Lake Ainslie (Port Hood), as well as in the interior region of central Nova Scotia (Upper Stewiacke and Trafalgar, averaging 5.3°C for the two locations), and along the Bay of Fundy Coast in New Brunswick (Musquash). Near the Northumberland Shore (Rexton) it drops below 5°C as it does along the Southwest Miramichi and Saint John River valleys where it averages 4.4°C and 4.7°C respectively. The latter has M.D.T.'s ranging from 3.8°C at Edmundston and Grand Falls in the northwest to 5.8°C at Minto in the south central region. The Restigouche River watershed area in north central New Brunswick, at an elevation of around 300 metres, has a M.D.T. of 2.0°C (Kedgwick) comparable to the average for the Côte Nord in Quebec (1.9°C) where moving southwest from Sept-Iles to Tadoussac the M.D.T. increases from 1.1°C at the

Table 1 - Selected Climatic Data For Eastern Canada

The information presented in this table is derived from the following sources:

TEMPERATURE AND PRECIPITATION. 1941-1970. ATLANTIC PROVINCES. Atm. Envir. Ser., Dept. of the Envir. Canada.

TEMPÉRATURE ET PRÉCIPITATION. 1941-1970. QUÉBEC. Ser. de l'Envir. Atm., Min. de l'Envir. Canada.

The numbers in brackets beneath the figures represent the "type of normal" upon which the data are based. The eight types of normal are listed below:

Type of Normal	Period of Record
1	30 years or more between 1941-1970
2	25 to 29 years " " "
3	20 to 24 " " " "
4	15 to 19 " " " "
5	10 to 14 " " " "
6	less than 10 years
8	adjusted
9	estimated

The geographical regions listed at the top of the table have been abbreviated because of the limited amount of space. The full name of each region is given below:

Abbreviation	Geographical Region
L.S.J.	Lac Saint-Jean
C.N.	Côte Nord
B.S.L.	Bas Saint-Laurent
R.R.	Restigouche River
S.J.R.V.	Saint John River Valley
Sw.M.R.	Southwest Miramichi River
N.S.	Northumberland Shore
B.F.	Bay of Fundy (Coast)
E.S.	Eastern Shore
L.A.	Lake Ainslie
C.N.S.	Central Nova Scotia

Geographical Regions	L.S.J.				C.N.			B.S.L.				R.R.
PARAMETERS / STATIONS (35) (with altitude)	Normandin, P.Q. (137 m)	Albanel, P.Q. (127 m)	Peribonca, P.Q. (106 m)	St. Ambroise, P.Q. (106 m)	Tadoussac, P.Q. (45 m)	Baie Comeau, P.Q. (22 m)	Sept-Iles, P.Q. (57 m)	Matane, P.Q. (30 m)	Pointe au Père, P.Q. (7 m)	Rivière du Loup, P.Q. (148m)	La Pocatière, P.Q. (30 m)	Kedgwick, N.B. (274 m)
A Mean daily temp. (°C) for a 12 month period	1.1 (1)	1.8 (2)	1.4 (4)	1.7 (8)	3.4 (1)	1.3 (8)	1.1 (2)	2.9 (4)	2.9 (3)	2.8 (9)	4.3 (1)	2.0 (8)
B No. of months with mean daily min. temp. above 0°C	6 (1)	6 (2)	6 (4)	6 (8)	6 (1)	6 (8)	5 (2)	6 (4)	6 (3)	6 (9)	6 (1)	5 (8)
C No. of frost free days within the period covered by parameter "B"	148 (1)	155 (2)	153 (4)	147 (4)	168 (2)	156 (6)	135 (2)	164 (4)	170 (3)		170 (1)	122 (5)
D Mean daily min. temp. (°C) within the period covered by parameter "B"	5.8 (1)	6.6 (2)	6.3 (4)	5.7 (8)	7.3 (1)	5.5 (8)	6.3 (2)	6.9 (4)	6.8 (3)	7.2 (9)	8.2 (1)	5.7 (8)
E Mean rainfall (mm) within period covered by parameter "B" above	480 (1)	486 (2)	489 (8)	553 (8)	496 (1)	516 (8)	467 (2)	502 (8)	435 (8)	446 (9)	515 (1)	437 (5)
F Mean rainfall (mm) for a 12 month period	568 (1)	589 (2)	585 (8)	657 (8)	634 (1)	659 (8)	677 (2)	636 (8)	562 (8)	531 (9)	665 (1)	646 (5)
G Mean total ppt. (mm) for a 12 month period	804 (1)	794 (2)	789 (8)	936 (8)	914 (1)	971 (8)	1090 (2)	958 (8)	848 (8)	772 (9)	964 (1)	973 (5)
H % of mean rainfall of parameter "E" of the total ppt. of parameter "G"	59.7 (1)	61.2 (2)	61.9 (8)	59.0 (8)	54.2 (1)	53.1 (8)	42.8 (2)	52.4 (8)	51.2 (8)	7.7 (9)	53.4 (1)	44.9 (5)
I No. of days with measurable rain for a 12 month period	87 (1)	75 (2)	95 (4)	103 (4)	81 (2)	83 (5)	85 (2)	77 (4)	82 (3)		93 (1)	94 (5)
J No. of days with measurable ppt. for a 12 month period	140 (1)	111 (2)	131 (4)	161 (4)	121 (2)	135 (5)	146 (2)	123 (4)	135 (3)		142 (1)	148 (5)

Geographical Regions	S.J.R.V.							
PARAMETERS / STATIONS (35) (with altitude)	Edmundston, N.B. (152 m)	Grand Falls, N.B. (152 m)	Woodstock, N.B. (60 m)	Harvey Station, N.B. (152 m)	Blissville, N.B. (22 m)	Fredericton, N.B. (39 m)	Acadia Forest, N.B. (76 m)	Minto, N.B. (7 m)
A Mean daily temp. (°C) for a 12 month period	3.8 (3)	3.8 (3)	5.1 (2)	5.0 (1)		5.3 (1)	4.5 (5)	5.8 (4)
B No. of months with mean daily min. temp. above 0°C	6 (3)	6 (3)	6 (2)	6 (1)		6 (1)	6 (5)	6 (4)
C No. of frost free days within the period covered by parameter "B"	160 (3)	160 (3)	157 (3)	168 (2)		165 (1)	150 (5)	171 (4)
D Mean daily min. temp. (°C) within the period covered by parameter "B"	7.5 (3)	7.4 (3)	7.3 (2)	8.2 (1)		7.9 (1)	6.3 (5)	8.6 (4)
E Mean rainfall (mm) within period covered by parameter "B" above	570 (3)	550 (3)	424 (3)	519 (1)		524 (1)	533 (5)	524 (4)
F Mean rainfall (mm) for a 12 month period	759 (3)	756 (3)	598 (3)	824 (1)	840 (6)	839 (1)	837 (5)	839 (4)
G Mean total ppt. (mm) for a 12 month period	1103 (3)	1021 (3)	815 (3)	1089 (1)	1072 (6)	1084 (1)	1086 (5)	1078 (4)
H % of mean rainfall of parameter "E" of the total ppt. of parameter "G"	51.6 (3)	53.8 (3)	52.0 (3)	47.6 (1)		48.3 (1)	49.0 (5)	48.6 (4)
I No. of days with measurable rain for a 12 month period	112 (3)	74 (3)	77 (3)	96 (2)	114 (6)	108 (1)	96 (5)	99 (4)
J No. of days with measurable ppt. for a 12 month period	165 (3)	105 (3)	109 (3)	128 (2)	151 (6)	140 (1)	124 (5)	124 (4)

Geographical Regions	Sw.M.R.		N.S.	B.F.		E.S.							L.A.	C.N.S.	
PARAMETERS / STATIONS (35) (with altitude)	Doaktown, N.B. (38 m)	Renous, N.B. (45 m)	Rexton, N.B. (4 m)	Musquash, N.B. (15 m)	Timberlea, N.S. (83 m)	Bedford, N.S. (38 m)	Halifax, N.S. (25 m)	Sheet Harbour, N.S. (9 m)	Ecum Secum, N.S. (22 m)	Whitehead, N.S. (13 m)	Loch Lomond, N.S. (30 m)	Sydney, N.S. (60 m)	Port Hood, N.S. (7 m)	Upper Stewiacke, N.S. (22 m)	Trafalgar, N.S. (152 m)
A Mean daily temp. (°C) for a 12 month period	4.4 (4)	4.4 (4)	4.8 (1)	5.0 (1)	6.4 (4)	6.2 (6)	7.5 (1)		5.3 (1)	6.1 (4)		6.0 (1)	5.8 (5)	5.8 (1)	4.8 (8)
B No. of months with mean daily min. temp. above 0°C	6 (4)	6 (4)	6 (1)	6 (1)	6 (4)	6 (6)	8 (1)		7 (1)	7 (4)		7 (1)	7 (5)	6 (1)	6 (8)
C No. of frost free days within the period covered by parameter "B"	151 (4)	153 (4)	162 (2)	159 (2)	164 (5)	167 (6)	220 (1)		184 (1)	194 (4)		189 (1)	190 (5)	155 (2)	149 (6)
D Mean daily min. temp. (°C) within the period covered by parameter "B"	6.4 (4)	6.6 (4)	7.5 (1)	6.4 (1)	7.6 (4)	7.6 (6)	8.0 (1)		6.6 (1)	7.2 (4)		7.1 (1)	8.0 (5)	6.9 (1)	6.1 (8)
E Mean rainfall (mm) within period covered by parameter "B" above	453 (2)	506 (5)	469 (2)	574 (1)	576 (5)	576 (6)	812 (1)		825 (1)	666 (4)		715 (1)	828 (6)	522 (2)	556 (3)
F Mean rainfall (mm) for a 12 month period	684 (2)	787 (5)	795 (2)	1088 (1)	1259 (5)	1187 (6)	1108 (1)	1292 (5)	1263 (1)	1033 (4)	1184 (5)	1053 (1)	1131 (6)	959 (2)	1073 (3)
G Mean total ppt. (mm) for a 12 month period	942 (2)	1048 (5)	978 (2)	1292 (1)	1449 (5)	1416 (6)	1318 (1)	1501 (5)	1442 (1)	1149 (4)	1364 (5)	1340 (1)	1330 (6)	1109 (2)	1350 (3)
H % of mean rainfall of parameter "E" of the total ppt. of parameter "G"	48.0 (2)	48.2 (5)	47.9 (2)	44.4 (1)	39.7 (5)	40.6 (6)	61.6 (1)		57.2 (1)	57.9 (4)		53.3 (1)	62.2 (6)	47.0 (2)	41.1 (3)
I No. of days with measurable rain for a 12 month period	81 (2)	75 (5)	75 (2)	103 (1)	118 (5)	115 (6)	125 (1)	97 (6)	129 (1)	80 (4)	70 (5)	133 (1)	86 (6)	96 (2)	103 (4)
J No. of days with measurable ppt. for a 12 month period	106 (2)	102 (5)	99 (2)	128 (1)	146 (5)	139 (6)	152 (1)	114 (5)	151 (1)	97 (4)	84 (6)	179 (1)	115 (6)	117 (2)	140 (4)

former to 3.4°C at the latter. Slightly higher M.D.T.'s are recorded from the Bas Saint-Laurent region where they average 3.2°C (2.8°C at Riviere du Loup to 4.3°C at La Pocatiere). The Lac Saint-Jean area has the lowest average M.D.T. at 1.5°C ranging from 1.1°C at Normandin to 1.8°C at Albanel.

The number of months during the year having a mean daily minimum temperature (M.D.Min.T.) above 0°C, giving an indication of the length of the growing season, is six for the Lac Saint-Jean area, the Côte Nord (except Sept-Iles), the Bas Saint-Laurent, New Brunswick (except Kedgwick), the interior central region of Nova Scotia and at Timberlea and Bedford along the coast. Both Sept-Iles and Kedgwick only have five months with the M.D.Min.T. above 0°C while most of the Eastern Shore region and Port Hood have seven months, with Halifax having eight. In terms of the number of frost free days for the same periods of time, those stations having six months with the M.D.Min.T. above 0°C have from 147 to 171 days (free of frost), those with five months from 122 to 135 days, and those with seven months from 184 to 194 days, while Halifax with eight months has 220 frost free days within this period. The M.D.Min.T.'s above 0°C within the five to eight month periods mentioned above reach their highest level in south central New Brunswick (Minto 8.6°C) and their lowest at Baie-Comeau (5.5°C) along the Côte Nord.

Precipitation

The mean total precipitation (M.T.P.) for a twelve month period averages 1372mm for the Eastern Shore of Nova Scotia and is 1330mm near Lake Ainslie (Port Hood). In the interior central region of the province it drops to 1229mm. In New Brunswick, the Bay of Fundy Coast has the highest annual precipitation with 1292mm being recorded for Musquash while at Rexton on the Northumberland Shore the yearly total is 978mm. The Southwest Miramichi and Saint John River valleys have average yearly totals of 995mm and 1043mm respectively. In the latter drainage basin, Woodstock in the western part of the province has the lowest amount of precipitation at 815mm. Around the watershed region of the Restigouche River in northern New Brunswick, Kedgwick has a M.T.P. of 973mm. In the Saint Lawrence River Valley the Bas Saint-Laurent has an average M.T.P. of 885mm with Riviere du Loup being the driest location with only 772mm per year. The Côte Nord is slightly wetter with an average of 991mm with Sept-Iles in the northeast having 1090mm. The Lac Saint-Jean basin is the driest region within the study area with an average M.T.P. of 830mm.

Of more significance is the amount of rainfall occurring during the growing season and what percentage this is of the total precipitation for the year. Lac Saint-Jean and the region near Lake Ainslie (Port Hood) have the largest percentage of their precipitation occurring during the growing season. The former having six months of the year with the mean daily minimum temperature above 0°C has on average 60% of its total precipitation occurring during this period while the latter having seven months with the M.D.Min.T. above 0°C has 62% of its total yearly precipitation occurring during this time. The lowest percentage values in this regard are found in the interior of central Nova Scotia and along the Bay of Fundy Coast in New Brunswick where 44% of the total annual precipitation occurs during a six month period when the M.D.Min.T. is above 0°C, and also along the Restigouche watershed in northern New Brunswick (Kedgwick) where 45% occurs during a five month period. The remaining regions all have around 50% of their total precipitation occurring during the growing season.

Another indication of the amount of moisture available is provided by examining the relationship between water deficiency, surplus and need.

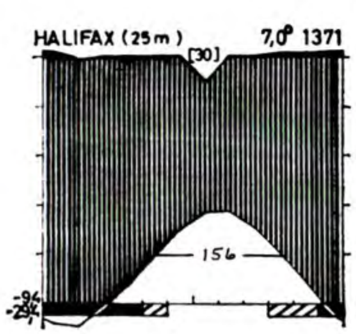
The ratio of water deficit to need provides an index of aridity while the ratio of water surplus to need gives an index of humidity. Thornwaite (1948) devised a moisture index whereby six-tenths of the aridity index is subtracted from the humidity index. The positive indices obtained indicate moist climates while the negative ones indicate dry climates. Based on this method Sanderson (1948) worked out the moisture regions for Canada. All of the areas selected for study in eastern Canada have a moisture surplus. Perhumid regions (those having a moisture surplus of 100 or more) include the Eastern Shore in Nova Scotia and the Bay of Fundy Coast and the Restigouche River watershed around Kedgwick in New Brunswick. Humid regions with moisture surplus between 80 and 100 are Lake Ainslie and the interior central region of Nova Scotia (around Upper Musquodoboit), most of the Saint John and all of the Southwest Miramichi river valleys plus the Northumberland Shore in New Brunswick, part of the Côte Nord from the Rivière Betsiamites to Sept-Iles as well as most of the Lac Saint-Jean basin. Humid regions with the moisture surplus between 60 and 80 include a small part of western New Brunswick between Woodstock and Grand Falls, the Bas Saint-Laurent, the Côte Nord from Tadoussac to the Rivière Betsiamites, and a small part of the Lac Saint-Jean basin.

From the temperature and precipitation data presented above the pattern that emerges shows the warmer and wetter regions to be situated along the coastal areas of Nova Scotia and southern New Brunswick while the drier and cooler sites occur at inland localities around Lac Saint-Jean and northern New Brunswick and to a lesser extent the Saint Lawrence River Valley where the Côte Nord has lower temperatures and higher precipitation in comparison to the Bas Saint-Laurent which has higher temperatures and lower precipitation. The data which has been derived from records kept by the Canadian Department of the Environment are in close agreement with the climatic diagrams produced by Walters and Lieth (1960) and which are shown in Fig 6 page 22 .

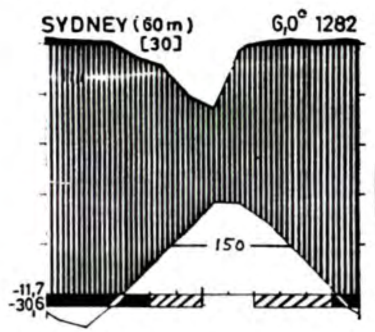
Climatic Regions

Putnam (1940, 1952) recognizes a number of minor climatic regions in Nova Scotia and New Brunswick. The Eastern Shore falls into two of these categories namely "Southern Nova Scotia" and "Eastern Nova Scotia" with the region from St. Margarets Bay to Sheet Harbour (lat. 45°55'N, long. 62°32'W) occurring in the former, which is described as being mild and humid, while the latter is described as being slightly cooler. The Lake Ainslie region falls into the "Northern Nova Scotia" climatic zone which is similar to the "Eastern Nova Scotia" zone in mean annual temperature but receives less precipitation. The Bay of Fundy Coast occurs in the "Bay of Fundy" climatic region which is distinguished by having mild winters and cool summers with frequent fog. The Saint John River Valley below Woodstock, plus the major part of the Southwest Miramichi River drainage system and the Northumberland Coast belong in the "Southern New Brunswick" climatic zone, a region having warm summers and cold winters. The upper part of Saint John River Valley above Woodstock, plus a small part of the Southwest Miramichi watershed in western New Brunswick and the Restigouche River in the north fall into the "Northern New Brunswick" climatic region. Here the summers are short and warm while the winters are long and cold with lots of snow.

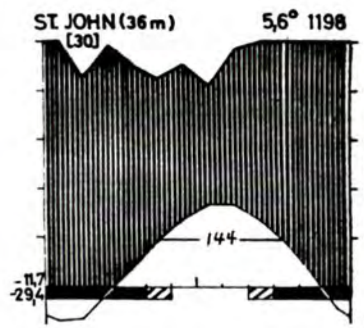
In the regions within Québec covered by the study, Kling (1948) designates three climatic subdivisions. The Bas Saint-Laurent plus the Côte Nord from Tadoussac to Godbout (lat. 49°19'N, long. 67°36'W) is included in "The Estuary" climatic zone while the rest of the



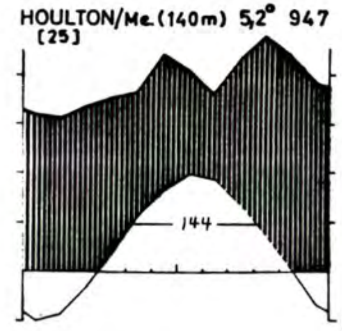
(A) Eastern Shore



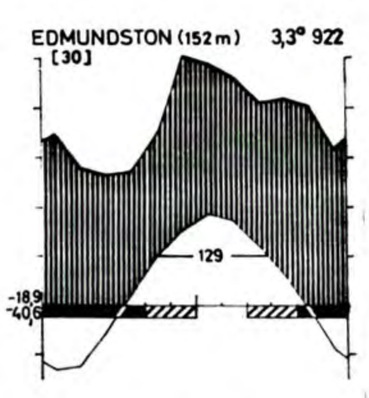
(B) Eastern Shore



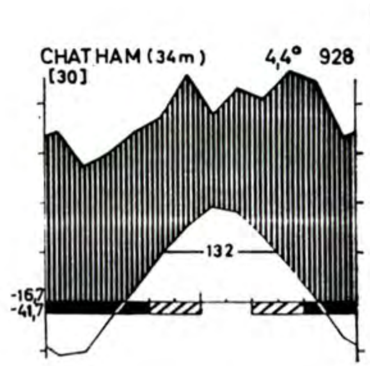
(C) Bay of Fundy



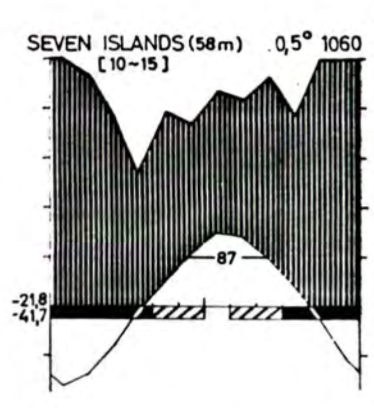
(D) Saint John River



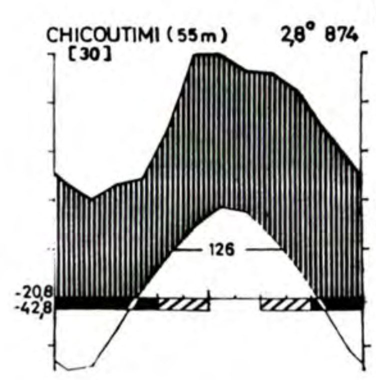
(E) Saint John River



(F) Northumberland Shore



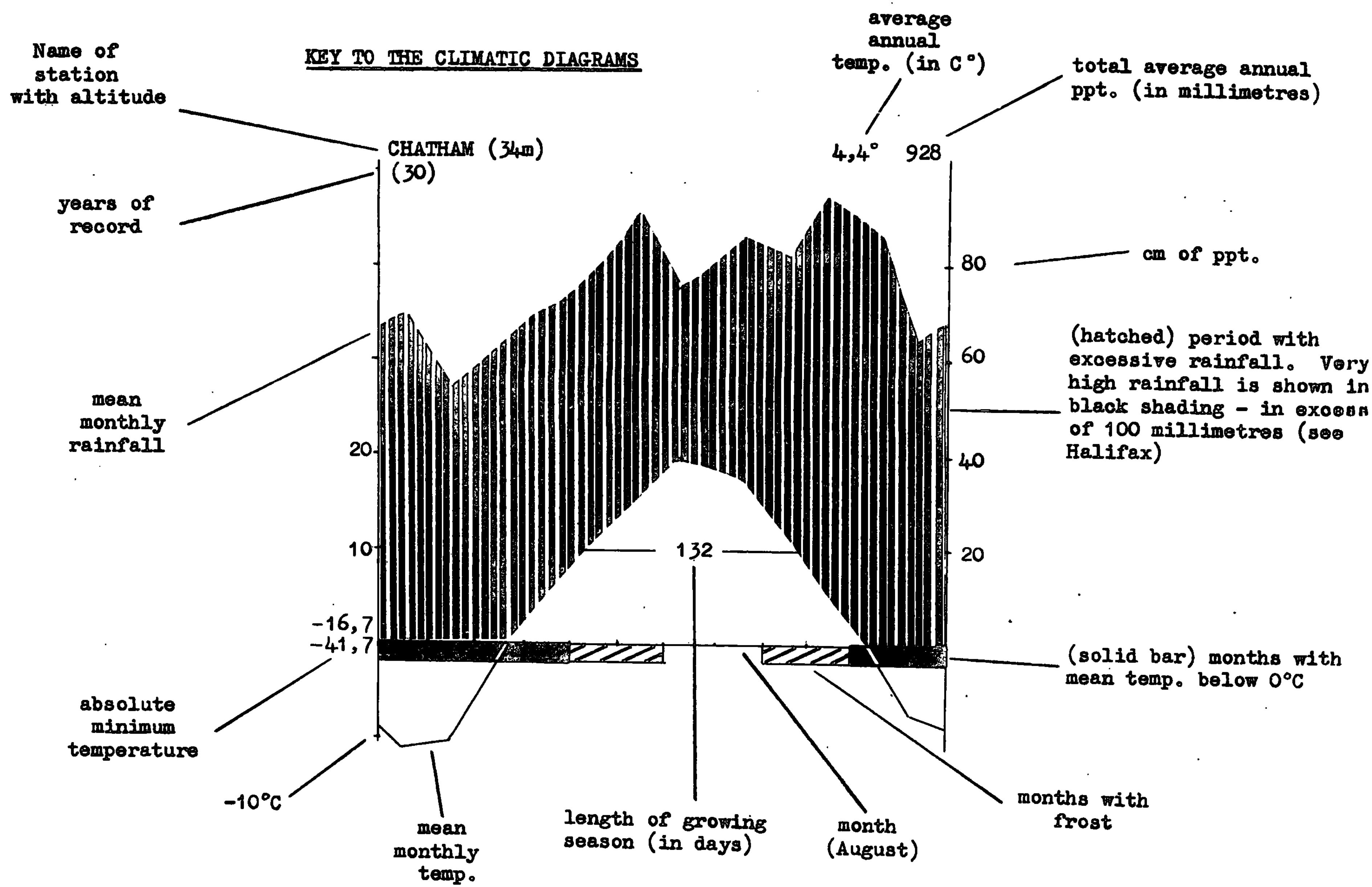
(G) Côte Nord



(H) Lac Saint-Jean

Fig. 6 Climatic diagrams for selected sites in eastern Canada. (The locations of the sites designated by the letters (A) to (H) are shown in Fig. 1 page 7 ; the key to the diagrams is on the following page)

KEY TO THE CLIMATIC DIAGRAMS



Côte Nord from Godbout to Sept-Iles belongs in the "Gulf of Saint Lawrence" climatic region. The Lac Saint-Jean basin is part of the "Lake Saint John" zone which also includes most of the Saguenay River Valley as well.

C. Topography and Drainage

The information is obtained from topograhic maps (see Appendix C page 348) while the physiographic regions are discussed in Putnam (1952) and are only briefly outlined here (see Fig. 17 page 38).

The Eastern Shore of Nova Scotia falls into two physiographic regions, namely, the Atlantic Uplands and the Southeastern Upland. The former includes the study area from St. Margarets Bay to Cape Canso on the mainland while the latter includes that part of the Eastern Shore area which is situated on Cape Breton Island. The Atlantic Uplands is the largest physiographic region on the mainland of Nova Scotia covering more than half the land area. It forms an inclined surface that slopes gently towards the Atlantic coast from elevations of 180 to 200 metres along its northern boundary. Some of the important drainage systems within the study area include the Musquodoboit, Tangier, Sheet Harbour, Liscomb and St. Mary's rivers, all of which flow towards the Atlantic. The Southeastern Upland on Cape Breton Island rises gradually from the coast to elevations of between 90 and 120 metres and is drained by small rivers and streams such as the Framboise.

Lake Ainslie on the western side of Cape Breton Island is surrounded by hills and uplands ranging between 150 and 300 metres. These gradually increase in elevation towards the north eventually merging into the Cape Breton Plateau region. The uplands in the vicinity of Lake Ainslie are drained mainly by the Mabou, Broad Cove and Margaree river systems all of which flow into the Gulf of Saint Lawrence.

New Brunswick contains four major physiographic units, namely, the Central Highlands, the Northwestern Plateau, the Southern Uplands and the Central and Eastern Lowlands. The geographical regions of the study area are included in most of these units, the exception being the Central Highlands where elevations are well above 300 metres.

The Bay of Fundy Coast and part of the watershed of the lower Saint John River Valley are included in the Southern Uplands region. Here elevations range from 30 metres near the coast to around 150 metres further inland in the area west of the Saint John River. The section studied along the coast is drained by the Lepreau and Musquash rivers flowing into the Bay of Fundy while in the examined watershed region of the lower Saint John River drainage is mainly through the Oromocto River system.

The upper Saint John River Valley as well as the greater part of the Southwest Miramichi River system and the Northumberland Shore are all included in the Central and Eastern Lowlands physiographic region. Most of this area forms a broad plain extending inland from the Northumberland coast with elevations mainly below 150 metres. A large part of the region is drained by either the Saint John or Southwest Miramichi rivers, the former flowing into the Bay of Fundy and the latter into the Gulf of Saint Lawrence.

The Restigouche River watershed lies within the Northwestern Plateau physiographic region. Although elevations are frequently above 300 metres, the section of watershed examined around St. Quentin and

Kedgwick has elevations between 275 and 300 metres. Here drainage is to the north and northwest into the Restigouche River which flows into Chaleur Bay and the Gulf of Saint Lawrence.

There are three major physiographic regions in Québec: the Canadian Shield, the Saint Lawrence Lowland and the Appalachian Highlands. The geographical areas dealt with in the study occur within the first two regions.

The Bas Saint-Laurent forms part of the Saint Lawrence Lowland, a narrow section of land occurring along the Saint Lawrence River which is bounded on the south by the Appalachians. In the area included in the study this region extends up to 15km inland from the shore of the Saint Lawrence in the southwest but narrows to less than five km in the northeast around Matane. Elevations are generally under 150 metres. Several minor tributaries of the Saint Lawrence River form part of the drainage network in the area. Included here are the Matane, Métis, Rimouski, Trois-Pistoles, and Rivière du Loup.

The remaining geographical regions within the study area are included in subunits of the Canadian Shield. The Côte Nord occurs within the Laurentides which extends along the southeastern margin of the Shield as it borders the Saint Lawrence River. Within the study area, which extends no farther inland than ten km, the elevations are mainly under 150 metres, but behind this the terrain soon rises to elevations above 300 metres. Numerous rivers drain into the Saint Lawrence along the Côte Nord. Some of the larger ones include the Portneuf, Sault aux Cochons, Betsiamites, Outardes, Manicouagan, Pentecôte, and Ste-Marguerite. Lac Saint-Jean is situated in the Lake Saint John Basin subunit of the Shield. The terrain within the basin on the north side of the lake is relatively flat with elevations ranging between 120 and 180 metres. Several rivers also drain into the lake from this side. These include the Chamouchouane, Mistassini, Mistassibi and Péribonca.

D. Geology and Soils

Most of the geological information presented in this section is derived from maps listed in Appendix C page 348.

<u>Bedrock and Soil Types</u>

The underlying bedrock along the Eastern Shore on the Nova Scotia mainland dates from the Palaeozoic Era. The oldest rocks are from the Lower Ordovician which include the Meguma Group (Gold Bearing Series) made up of two formations: the Halifax composed of slate, schist and minor quartzite and the Goldenville composed of greywacke, quartzite, gneiss and minor slate. These formations are intruded by granitic rocks dating from the Lower and Middle Devonian Period. The soils overlying these rocks are mainly sandy loams which are quite often very shallow. Almost all of the mires on the mainland section of the Eastern Shore are underlain by the above formations. The one exception to this is the Upper Musquodoboit Mire located in the interior central region of the province about 35km from the coast. This mire is underlain by Carboniferous material dating from the Mississippian Period and includes the Windsor Group which is composed of limestone, gypsum, anhydrite, shale, sandstone, conglomerate and salt. The soils here are mainly the heavier loams and clays.

On Cape Breton Island along the Eastern Shore area the mires located at Lower St. Esprit and Framboise Intervale (lat. 45°42'N, long. 60° 27'W) are situated on granitic bedrock of Lower and Middle Devonian age similar to that underlying some of the mires on the mainland.

The rest of the mires along the east coast of Cape Breton are underlain by bedrock of Precambrian age belonging to the Proterozoic Era. These rocks are included in the Fourchu Group which is composed of volcanic breccia, tuff, and lava as well as greywacke, shale and schist. This group is overlain by the Morrison River Formation made up of sandstone, conglomerate, quartzite and shale. The soils in this area are often heavy textured clays derived from the shale and sandstone.

The McCormack Mire situated near Lake Ainslie on the western side of Cape Breton Island is underlain by Carboniferous material belonging to the Windsor Group. The bedrock is similar to that found in the region of the Upper Musquodoboit Mire which has already been described above. The soils are developed from fine and coarse-textured parent materials, the former being a clay loam till and the latter either a loamy sand to sandy loam outwash or a sandy loam till.

The Chance Harbour Mire (lat. 45°08'N, long. 66°22'W) along the Bay of Fundy Coast in southern New Brunswick is situated in an area underlain by Precambrian strata consisting of granite, granodiorite, quartz diorite, gabbro and gneissic rocks as well as material from the Proterozoic Era that includes volcanic and sedimentary rocks and undifferentiated areas of granite. These harder rocks are overlain in places by Carboniferous sandstone, shale, conglomerate, siltstone and volcanic rocks of Pennsylvanian and/or Mississippian age. The soils are thin stony sandy loams as well as some glacial drift and marine clays. The Lepreau Mire, also situated near the Bay of Fundy Coast, is underlain by rocks of the Proterozoic Era which have been described above in connection with the Chance Harbour Mire. Here heavy soils occur in areas of sedimentary bedrock while shallow coarser soils are present in areas containing granite.

The mires along the Saint John River Valley are underlain by a variety of bedrock types. Those occurring in the northwest near Edmundston, namely the Madawaska River and Québec Border mires, are situated on bedrock dating from the Lower Devonian which is made up of shale, limestone, sandstone, minor greywacke, and volcanic rocks. The soils consist mainly of sandy loams and loams with recent alluvial deposits occurring along the Madawaska River where the two mires are located. In the region of the Ryan Brook Mire (situated approximately 15km northeast of Grand Falls) the underlying rocks date from the Upper Ordovician to the Lower Devonian and include shales, limestone, argellites and volcanic rocks, while the soils are of a loamy texture. Near Woodstock on the east side of the Saint John River where the Kilmarnock and West Waterville mires are located the bedrock is of Ordovician age and includes argillaceous sedimentary rocks, greywacke, quartzite, conglomerate, minor chert and argillite, minor limestone, tuffs and volcanic flows. Soils include loams and sandy loams with calcareous rock fragments occurring in the parent material. Light textured stony soils are common in places where harder bedrock predominates. Several mires in the vicinity of Fredericton are situated on Carboniferous bedrock of the Pennsylvanian Period consisting of sandstone, conglomerate and siltstone. The soils overlying these rocks include clay and sandy loams. The South Oromocto Lake Mire (lat. 45°23'N, long. 66°37'W) in southern New Brunswick is located in an area underlain by Devonian granite, quartz monzonite and granodiorite. The soils here mainly include gravelly loams which are quite shallow.

Nearly all the mires located in the Southwest Miramichi watershed region (except the Juniper Mire) as well as those located in the vicinity of the Northumberland Coast are situated on Carboniferous material of Pennsylvanian age consisting of sandstone, shale, conglomerate, siltstone, coal and volcanic rocks. These bedrocks underlie the large Central and Eastern Lowlands physiographic region of New Brunswick that extends from the Northumberland Coast inland as far as Fredericton. The soils consist mainly of clay loam and sandy loam tills that are poorly drained. The Juniper Mire (lat. 46° 33'N, long. 67°12'W) located on the western side of the province in the southern approach to the New Brunswick uplands is situated in a region where the bedrock is composed of Ordovician argillite, quartzite, volcanic rocks, schist and gneiss and Lower Devonian granites and gabbro. The predominant soils are of a sandy loam texture.

In the watershed region of the upper Restigouche River where the Kedgwick and Drucour mires are located the underlying rock strata consists of slates, shales, and argillites of Upper Ordovician and Silurian age. The soils are loamy and often contain calcareous fragments.

The mires located in the Bas Saint-Laurent region in Québec are underlain by bedrock of Lower Ordovician age that includes the Sillery and Kamouraska formations. The former is made up of schists, sandstone and quartzite while the latter includes quartzite and conglomerate rocks. Much of the soil in the area is composed of glacial deposits intermixed with marine clays.

The Côte Nord situated along the edge of the Canadian Shield where it borders the lower Saint Lawrence River is underlain by bedrock of

Precambrian age dating from the Archean - Proterozoic Era. The mires occurring along or near the shoreline lie upon several different geological strata. Those situated between Tadoussac and Baie-Comeau are found mainly on bedrock composed of granitic gneiss, migmatized grey quartz, plagioclase, biotite and hornblende gneiss. Those situated near Pointe des Monts between Godbout and Baie-Trinité are underlain by quartzite, garnet-sillimanite gneiss, hornblende-plagioclase gneiss and some crystalline limestone. The remaining mires from Rivière-Pentecôte to Sept-Iles are found primarily on bedrock consisting of Labradorite anorthosite, anorthosite gabbro, gabbro, and leucocratic garnetiferous anorthosite. Most of the surface material consists of glacial and post-glacial deposits.

The mires around Lac Saint-Jean are underlain by several different bedrock groups or formations all of Precambrian age. Most of the mires that are located on the northeastern side of the lake (east of long. 72°W) are situated on bedrock composed of anorthosite and gabbro. Those located on the northwestern side are found mainly on granitic and hornblende gneiss, quartz, plagioclase and biotite rocks. Wedged between these two bedrock groups and centered around the junction of the Mistassini and Mistassibi rivers at Dolbeau is a formation consisting of gneiss, some layers of quartzite, carbonate, schist and diopside rock. The Mistassibi River and Manigouche mires lie on or very close to this formation. They also lie very close to another bedrock group that is scattered throughout the region around the lake and upon which several mires are found. This group contains green or pink pyroxene monzonite, syenite and granitic rocks. The soils in the Lac Saint-Jean region consist of marine clays and sands plus glacial deposits.

Glaciation

The last major glaciation, the Wisconsin ice sheet occurring during the Pleistocene epoch, affected the entire eastern Canadian region. Of the many changes wrought on the landscape by the overriding ice, the disruption of existing drainage patterns and the subsequent creation of numerous lakes and damp depressions provided the greatest impetus for mire development in those areas where the climate was suitable.

In the different geographical regions in which mires were examined in eastern Canada, there is considerable evidence showing the effects of glaciation upon the landscape. Along the Eastern Shore of Nova Scotia there are numerous drumlins more or less orientated in a northwest to southeast direction indicating the path of the moving ice. Direction is also inferred from glacial striations on exposed bedrock in the region. On the western side of Cape Breton Island around Lake Ainslie there is evidence in the form of lacustrine deposits to indicate that the present lake was greatly expanded at one time to more than double its current size.

In New Brunswick drumlinoid features are less common than in Nova Scotia but there is ample evidence of the direction of ice movement from glacial striations. The landmass here seems to have been depressed to a greater extent than in Nova Scotia as evidenced by elevated beach lines and marine deposits that are now situated inland from coastal areas. Approximate elevations of the marine limit range from 23m to 68m above present sea level along the Northumberland Shore and up to 70m near Saint John on the Bay of Fundy Coast.

There is also evidence of marine overlap in the Bas Saint-Laurent region in Québec where, after the retreat of the ice, marine waters advanced into the Saint Lawrence Lowlands creating the Champlain Sea. Approximate elevations of the marine limit between La Pocatière and Matane range between 129m for the former and 74m for the latter. Indications of marine overlap along the Côte Nord are not as evident as elsewhere within the Saint Lawrence River basin. The shoreline between Baie-Trinité and Sept-Iles was inundated to some extent while at Tadoussac near the mouth of the Saguenay River there is an approximate marine limit of 141m above present sea level.

Following the retreat of the ice the Lac Saint-Jean basin was filled with water creating an inland sea about four times the size of the present lake. There is ample evidence for this in the form of deep marine clay deposits in the lowland region around the lake. Approximate elevations of the marine limit range from 198m at the western end of the basin to 163m at the eastern end.

E. Vegetation

The following information deals with the forest regions in eastern Canada, focusing attention on the different geographical areas where mires were examined. Most of the information presented here is derived from Rowe (1972) and Loucks (1962) (see Fig. 17 page 38).

There are three forest regions occurring within the study area in eastern Canada: the Acadian, the Great Lakes - St. Lawrence, and the Boreal. The Acadian covers most of the Maritime Provinces except in northern New Brunswick (an area which includes the upper Saint John River Valley and the Restigouche watershed). It is related more to the Great Lakes - St. Lawrence than to the Boreal and is characterized by the presence of red spruce (Picea rubens). The Great Lakes - St. Lawrence occurs in northern New Brunswick, the Bas Saint-Laurent and around Lac Saint-Jean including the Saguenay River Valley. It also covers the southern region of Québec and Ontario extending as far west as the eastern Manitoba border. It is characterized by the presence of eastern white and red pine (Pinus strobus and Pinus resinosa), eastern hemlock (Tsuga canadensis) and yellow birch (Betula alleghaniensis). The Boreal is the largest forest region in Canada extending from Newfoundland in the east to the Alaskan border in the west. Within the study area it is found along the Côte Nord and covers the northwestern fringe of the Lac Saint-Jean basin. The forest is mainly coniferous and is characterized by white and black spruce (Picea glauca and Picea mariana).

Rowe (1972) subdivides the forest regions into forest "sections" and recognizes ten of these units within the study area in eastern Canada, seven of which belong in the Acadian Forest Region. In the areas where mires were examined in Nova Scotia and New Brunswick Loucks (1962) distinguishes 17 forest "districts" which occasionally correspond to but more frequently further subdivide Rowe's forest sections. Most of the mires along the Eastern Shore of Nova Scotia occur mainly within the East Atlantic Shore Forest Section (Eastern Shore District). It is characterized by an abundance of balsam fir (Abies balsamea) and black spruce with white spruce being common near the shoreline. A small number of mires within the Eastern Shore region occur in adjacent forest sections. The Hammonds Plains, Cranberry Lake, Caribou and Mooseland mires are situated in the eastern part of the Atlantic Uplands Forest Section (eastern end of Fisher Lake - Halifax District plus the Sheet Harbour District) an area of mainly coniferous woodland with an abundance of red spruce, while the Upper Musquodoboit Mire is found within the eastern part of the Central Lowlands Forest Section (Musquodoboit Hills District) where red and white spruce, balsam fir and eastern hemlock predominate.

Lake Ainslie on Cape Breton Island occurs in the Cape Breton-Antigonish Forest Section which on the west side of the island (Cape Breton Hills District) is made up of mixed stands of red maple (Acer rubrum), yellow and white birch (Betula papyrifera), balsam fir and white spruce.

The Bay of Fundy Coast region in New Brunswick is situated within the Fundy Coast Forest Section (Musquash District and western end of the Lepreau-Kierstead District). It is composed mainly of red, black and white spruce, balsam fir and red maple.

The mires along the lower Saint John River Valley (below Grand Falls) as well as those occurring within the Southwest Miramichi watershed are found in the Carleton Forest Section (Carleton District and western part of the Napadogan District) and the Eastern Lowlands Forest Section (northwestern half of Mount Pleasant District plus the Oromocto, Bantalor, Nashwaak-Miramichi and Harcourt districts). The former forest section is mainly deciduous and is characterized by species like butternut (Juglans cinerea), white ash (Fraxinus americana), hop-hornbeam (Ostrya virginiana), basswood (Tilia americana), sugar maple (Acer saccharum) and beech (Fagus grandifolia). The latter section, which also contains the mires in the vicinity of the Northumberland Shore (Harcourt and Northumberland Shore districts), is primarily coniferous although in the southwestern part of this section, where the land increases somewhat in elevation, deciduous trees become more abundant. Coniferous species include black and red spruce and balsam fir, while deciduous species like yellow and white birch and sugar and red maple occur more frequently at higher elevations.

The upper part of the Saint John River Valley (above Grand Falls) as well as the Restigouche River watershed belong in the Great Lakes - St. Lawrence Forest Region. The mires studied in these areas occur in the Temiscouata - Restigouche Forest Section (Edmundston and St. Quentin districts). The characteristic trees in the valleys include balsam fir and white and black spruce while on the upland regions sugar maple and yellow birch are abundant.

The Bas Saint-Laurent also belongs in the Temiscouata - Restigouche Forest Section. Near the shore of the Saint Lawrence River where most of the examined mires are located the forest is coniferous with white spruce being the dominant tree present. Moving further inland from the shore region this species plus balsam fir are prominent in the valleys along with some eastern white cedar (Thuja occidentalis) while on the ridges sugar maple, yellow birch and beech become abundant.

A large part of the Lac Saint-Jean basin is included in the Great Lakes - St. Lawrence Forest Region forming the Saguenay Forest Section. Characteristic species here include yellow birch, eastern white and red pine and sugar maple. A large number of boreal species are present as well including jack pine (Pinus banksiana), balsam fir and white birch.

The northwestern section of the Lac Saint-Jean basin plus the Côte Nord area belong in the Boreal Forest Region and form part of the Laurentide-Onatchiway Forest Section. The characteristic species are balsam fir on well drained sites and black spruce in poorly drained areas with white birch occurring throughout.

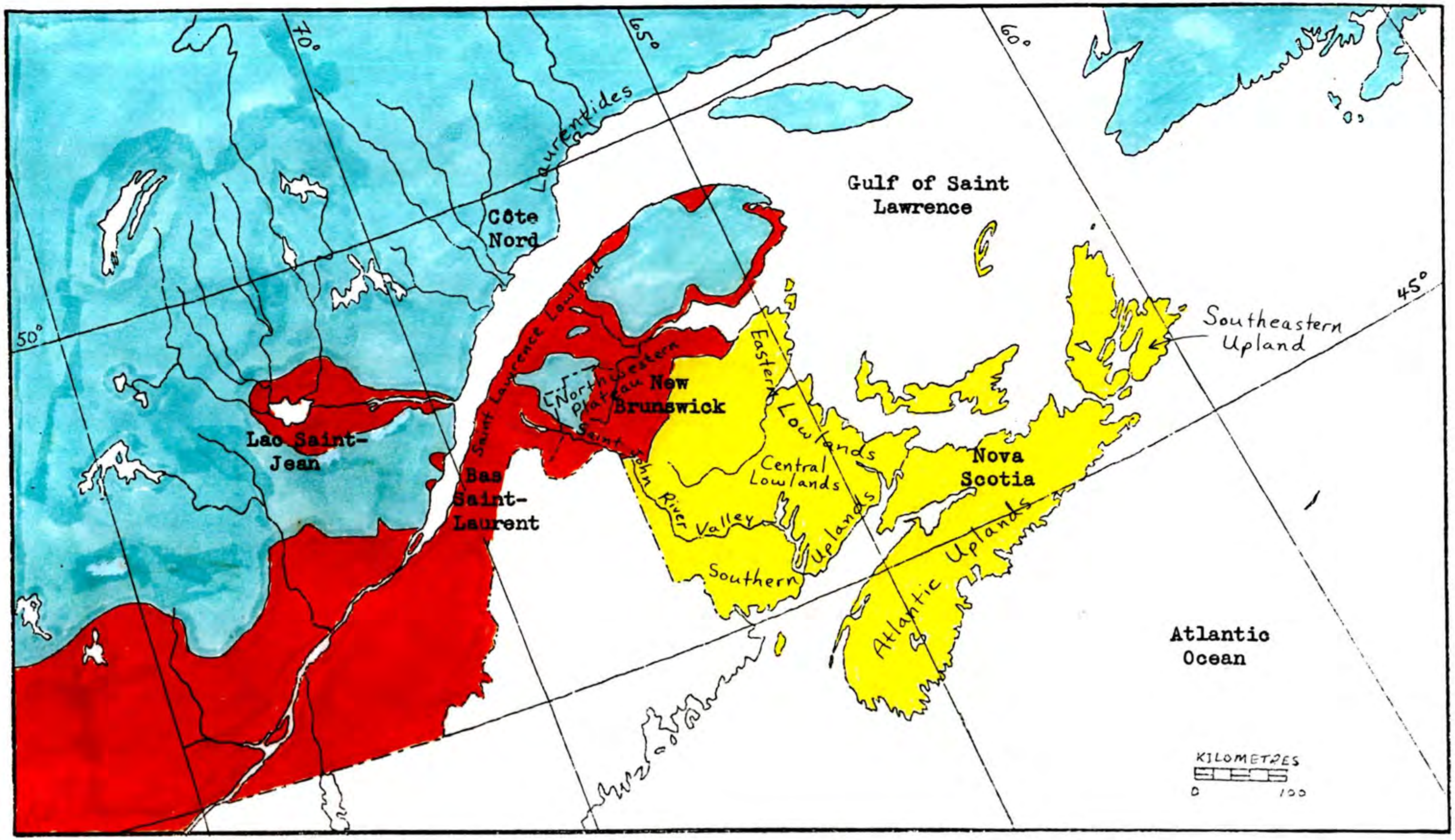


Fig. 17. Map of the physiographic and forest regions in eastern Canada. The forest regions are colour coded as follows: yellow - Acadian; orange - Great Lakes-St. Laurence; blue - Boreal.

III METHODS

The methods employed in this study fall into two main categories, namely "sampling procedures" which were carried out in the field and produced the raw data and " analytical procedures" which were carried out in England at various time intervals after the former and which were used to interpret the data. This chapter is concerned only with the sampling procedures. The analytical procedures are confined mainly to two aspects: 1) synthesis of the vegetation data into phytosociological tables, and 2) the chemical analysis of the water samples. Both of these procedures were carried out at Durham University. The former is described at the beginning of Chapters IV and V and the latter at the start of Chapter VI.

Sampling Procedures

The majority of the sampling was done during the summer months of July and August with a small fraction occurring early in September.

Mire Selection

Mire complexes were provisionally selected from topographic maps at a scale of 1:250,000 and then from more detailed maps at a scale of 1:50,000. A mire was selected for sampling only after it was examined in the field. The criteria used for selection were:

1) that it be less than 1000 feet (approx. 300 metres) above sea level to avoid the inclusion of arctic-alpine species into the flora,
2) that it be situated on a "pure" peat deposit i.e., one that does not contain any noticeable traces of sand, silt or clay, and
3) that it be easily accessible because of the limited amount of time available and the very large geographical area that had to be covered.

Vegetational Sampling

Once a mire complex had been chosen for study then its different phases of vegetational development were examined using the phytosociological techniques of the Scandinavian and Zurich-Montpellier Schools (Becking 1957; Shimwell 1971). The following criteria were applied to each stand of vegetation selected for sampling:

1) the vegetation cover within the stand must be uniform in its composition and structure, and
2) the size of the sampling unit (plot) must be large enough to include the minimal area of the stand.

The plot sizes used in this study are those suggested by Oosting (1956): trees (10 x 10m), shrubs (4 x 4m) and the field and ground layers (1 x 1m). In some of the lichen dominated hollows of ombrotrophic mire where the size of the stand was less than $1m^2$ a plot size of 0.5 x 0.5m was used. In most cases a single plot was subjectively placed within each stand.

The plots are referred to as "relevés" (French) throughout the study, a word which, like the German "Aufnahme", means "picture" of the vegetation stand.

Within each relevé the following layers were recognized:

tree - woody vasculars higher than 6 feet (1.8m)

shrub - woody vasculars between 3 and 6 feet (0.9-1.8m)

field - all vasculars under 3 feet (<0.9m)

ground - all non-vascular species

epiphyte - lichens growing on other species

Percentage cover was estimated for each layer when present while height ranges were estimated only for the tree and shrub layers.

The species in a given relevé were then listed and both cover and sociability values assigned to each. The following scales were used:

Cover

- \- occurring just outside the relevé but within the stand
- \+ < 1% rare
- 1 1-20% occasional
- 2 21-40% frequent
- 3 41-60% common
- 4 61-80% abundant
- 5 81-100% very abundant

Sociability (modified after Braun-Blanquet, 1964)

1 growing singly

2 slightly grouped

3 in small patches

4 in large patches

5 in almost pure populations

Additional information recorded for each relevé included the vegetation type (usually named after the dominant species present), the mire type in which the relevé occurs, topographic features, aspect, slope and the hydroseral type (in reference to the stand in which the relevé occurs). The hydroseral categories used are taken from Moore and Bellamy (1974) and are as follows:

open - peat surface is below the ground water level

closed - vegetation mat at the surface of the ground water level

building - peat accumulation above the ground water level

climax - peat deposition has ceased

An example of a relevé data sheet used in this study is shown in Fig. 7.

Date Aug 19	Auf.# 1054	Altitude 800'
Locality Ryan Brook Mire		Grid Ref. lat. 47°09'N long. 67°36'W
Veg. type Scheuchzeria - Sphagnum		

Mire type Trans-hummocky	Tree cover % Ht.
Quad. size 1 X 1 m.	Shrub cover % Ht.
Aspect neutral	Herb cover 35 %
Slope nil	Moss cover 100 %
Hydroseral type building	Epiphyte cover %
Water sample location	Photo description

Comments Approx. plot position forest

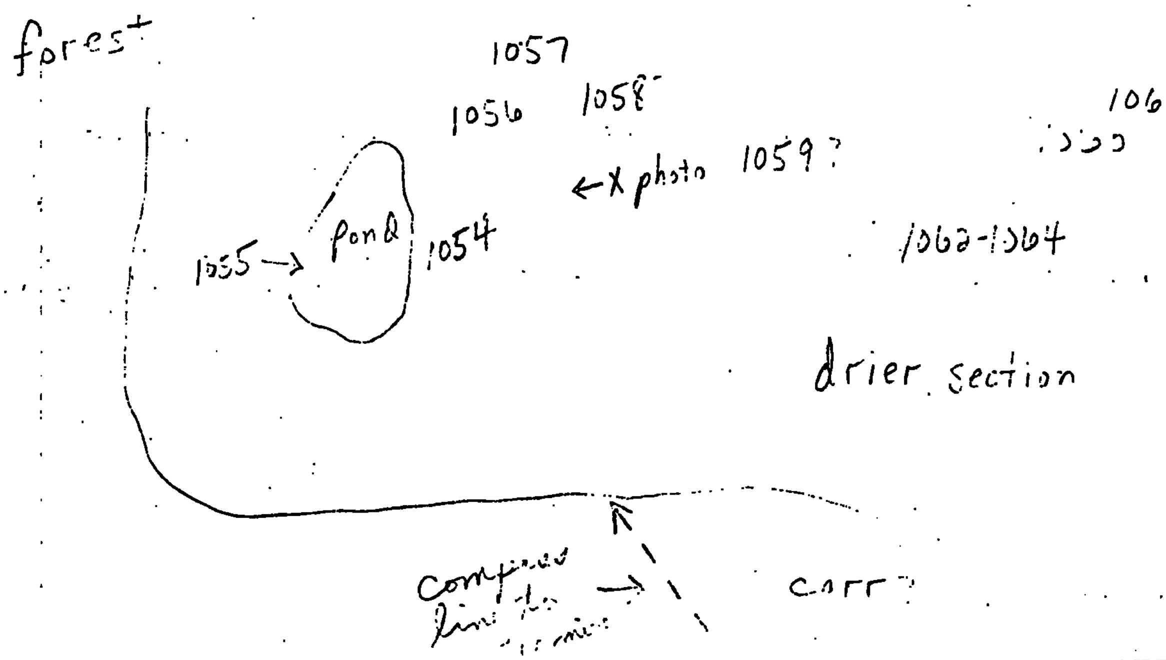


Fig. 7. An example of part of a relevé data sheet.

Water Collection

Water samples were collected in most of the mires studied using clean 125ml (4 oz) polythene bottles. A small hole dug in the surface of the peat was allowed to fill up with water and the bottle with cap detached were submerged in this and left soaking for several minutes. The bottle was carefully removed and the water emptied out. Then without agitating the water in the hole too much the bottle was re-submerged and allowed to slowly fill in order to keep the sample as free as possible of peat particles. It was then labelled and kept in a cool dark place until analysis was carried out.

Photographic Record

Colour transparencies were taken to illustrate sampled relevés, successional patterns, mire types, the mire flora, animal and human influence on mire development, climatic factors, geographical regions, topographic features as well as data collecting techniques.

Plant Collections

Plants that could not be identified with certainty in situ were given a tentative name and collected. These were then keyed out using the following sources:

For vascular species

"The Flora of Nova Scotia" (Roland and Smith, 1969)

"The New Britlon and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada," Vol. 1-3 (Gleason, 1968)

"Gray's Manual of Botany", 8th edition (Fernald, 1950)

"Flore Laurentienne" (Marie-Victorin, 1964)

For non-vascular species

"Mosses of the Great Lakes Forest" (Crum, 1973)

"British Mosses and Liverworts" (Watson, 1968)

"Mosses and Liverworts" (Conard, 1972)

"Illustrated Key to Sphagnum Mosses" (Duncan, 1961-62)

"Lichens" (Hale, 1969)

"The Lichens of Long Island, N.Y." (Brodo, 1968)

For all species

"Peatland Flora of Newfoundland" (Robertson et al, 1973)

All of the collections made of vascular plants and lichens and the majority of the collected bryophytes were subsequently verified by authorities for the respective groups (see the Acknowledgements).

IV DESCRIPTION OF THE VEGETATION

Before describing the mire vegetation an account is given of the analytical procedures used in the vegetation analysis which produced the tables found in Volume 2.

Due to the large number of relevés (1300) and species (292) a digital computer was used throughout this phase of the analysis. Phytosociological tables were obtained using a modification of program SHUFFLE (Wheeler, 1974) which was renamed BIGSHUFFLE because it simply increased the limit on relevé numbers from three to four digits thus enabling those relevés which were numbered above 1000 to be identified without confusion. The relevé data were made available for program BIGSHUFFLE by following a format described by Ceska and Roemer (1971) and outlined by Wheeler (1974). The use of program BIGSHUFFLE provided a quick and accurate way of rearranging the species and relevés. Due to the space limitations on the printout sheet the program only uses cover values and the first four letters of the generic and specific names of each plant. The relevés are arranged in vertical columns and the species listed on the left side of the table.

Based on dominance by a single species or a group of species the relevés were divided up into 28 categories and labelled as "nodum" - an abstract vegetation unit of any rank (Poore, 1955). Constancy and importance values were then calculated for each species. Constancy is the frequency with which a species occurs in a nodum provided that all the relevés are of equal size. It was determined by expressing the total number of occurrences of a species in a nodum as a percentage of the total number of relevés. The following percentage classes for constancy were then used:

Class	Percentage
I	1 - 20
II	21 - 40
III	41 - 60
IV	61 - 80
V	81 - 100

Importance values indicate the importance of a species in a nodum. They were calculated by totalling the cover values of each species and dividing the sum by the number of relevés in the nodum.

Before any meaningful construction of phytosociological tables based on dominance could be carried out it was necessary to determine the nodal amplitudes (distribution) of all the species concerned. This was done by placing all the species and the noda in a single table and recording the importance values of each species as determined for each nodum (see Table 2, inside Back Cover). In this way species with broad and narrow amplitudes readily became apparent and they were clustered accordingly.

Having this information together with the constancy and importance values of each species, the reconstruction of the "raw" tables for each nodum was undertaken. The number of alterations was directly proportional to the size and complexity of the nodum and involved the rearranging of species and relevés with the aid of the computer until a final "differentiated" table was produced.

The final table was made up of vegetation units that illustrated both the characteristic features and the variations that existed within each nodum. The following units are found in most of these tables:

Mire character species are those plants which are more or less ubiquitous to all mire types as determined from the nodal amplitude table.

Nodal dominant-character species distinguish the nodum by their very high cover and continual presence. The nodum usually derives its name from these species.

Variants constitute major sub-units of vegetation within the nodum and display the range of variation that can exist.

Sub-variants are minor sub-units of vegetation that exist within the variants. Sub-variants often have a very restricted geographical range.

Companions are those species with constancy classes I to IV that do not display any particular distribution pattern within the nodum.

A standard format is used in all the tables whereby the mire character species are listed (in descending order of occurrence) at the top of the table followed by the nodal dominant-character species, variants and sub-variants and then the companions (also listed in descending order of occurrence). Those species which occur sporadically usually are listed separately adjacent to the table.

In addition to the terms used for the vegetation units the following are applied to species that distinguished these units:

Constant species are those which have constancy class V (81 to 100% occurrence in the relevés of a vegetation unit).

Differential species are those which distinguish either a variant or a sub-variant.

Associate species occur regularly with either a nodal dominant or a differential species.

Exclusive species are those which are confined to a single nodum where they generally have a very restricted distribution.
Optimum species reach their best development within mires in a particular nodum (as indicated by their importance values) although they occur in other noda as well.

The descriptive sections for the noda are presented first followed by the sections pertaining to the variants. A summary of the detailed information presented in each section is given in Table 3 (for the noda) and in Table 32, page 151 (for the variants). The computer tables upon which each descriptive section is based are found in Volume 2 of this thesis.

A. The Noda

Name	Page
Picea mariana (Mire Forest) Nodum	52
Vaccinium angustifolium-Lepidozia reptans Nodum	55
Pleurozium schreberi Nodum	57
Picea mariana (4 x 4m) Nodum	60
Picea mariana (1 x 1m) Nodum	63
Chamaedaphne calyculata-Myrica gale (Bog) Nodum	66
Kalmia angustifolia-Chamaedaphne calyculata Nodum	68
Polytrichum strictum Nodum	71
Cladonia rangiferina Nodum	73
Sphagnum fuscum Nodum	77
Sphagnum fuscum-Cladonia rangiferina Nodum	82
Sphagnum rubellum-Sphagnum nemoreum Nodum	85
Rhynchospora alba-Cladopodiella fluitans Nodum	90
Nuphar variegatum Nodum	94
Sphagnum cuspidatum Nodum	100
Sphagnum majus Nodum	105
Sphagnum pulchrum Nodum	108
Sphagnum papillosum Nodum	113
Sphagnum magellanicum Nodum	117
Sphagnum recurvum Nodum	121

Name	Page
Sphagnum russowii Nodum	126
Calamagrostis canadensis-Myrica gale Nodum	128
Myrica gale-Chamaedaphne calyculata (Fen) Nodum	132
Sphagnum warnstorfii Nodum	136
Sphagnum fimbriatum Nodum	138
Alnus rugosa (4 x 4m) Nodum	141
Drepanocladus exannulatus-Drepanocladus fluitans Nodum	143
Sphagnum imbricatum Nodum	146

Table 3 Summary of Numerical and Percentage Values Given in the Nodal Descriptions

PARAMETERS / NODA (28)	Table no.	No. of relevés	No. of species	Avg. no. of species per relevé	% of relevés in rheotrophic mire	% of relevés in transition mire	% of relevés in ombrotrophic mire	% of relevés in maritime areas	% of relevés in continental areas	No. of mire character species
PICEA (10 x 10)	4	38	7	2	-	11	89	53	47	-
VACC-LEPI	5	3	18	8	-	-	100	67	33	-
PLEUROZIUM	6	11	45	13	-	-	100	64	36	8
PICEA (4 x 4)	7	8	56	22	-	-	100	100	-	8
PICEA (1 x 1)	8	11	58	17	-	-	100	64	36	7
CHAM-MYRI (BOG)	9	5	37	16	-	-	100	80	20	9
KALM-CHAM	10	24	71	19	-	-	100	96	4	7
POLYTRICHUM	11	5	25	14	-	-	100	60	40	10
C. RANGIFERINA	12	81	101	17	-	-	100	79	21	10
S. FUSCUM	13	144	86	14	-	5	95	42	58	10
S. FUSC-C. RANG	14	12	60	27	-	-	100	100	-	7
S. RUBE-S. NEMO	15	130	107	13	3	13	84	59	41	10
RHYN-CLAD	16	44	50	10	-	11	89	68	32	8
NUPHAR	17	106	57	3	21	29	50	66	34	4
S. CUSPIDATUM	18	116	53	6	1	35	64	55	45	10
S. MAJUS	19	16	31	6	-	100	-	75	25	6
S. PULCHRUM	20	51	73	9	2	80	18	67	33	10
S. PAPILLOSUM	21	51	76	10	10	82	8	55	45	10
S. MAGELLANICUM	22	53	90	11	6	56	38	36	64	10
S. RECURVUM	23	47	100	10	15	49	36	17	83	10
S. RUSSOWII	24	4	39	15	50	-	50	50	50	8
CALA-MYRI	25	61	136	9	74	26	-	64	36	10
MYRI-CHAM (FEN)	26	36	115	11	67	33	-	57	43	9
S. WARNSTORFII	27	3	30	18	100	-	-	-	100	1
S. FIMBRIATUM	28	11	42	10	82	18	-	100	-	5
ALNUS (4 x 4)	29	7	4	2	100	-	-	86	14	-
D. EXAN-D. FLUI	30	7	38	8	57	14	29	57	43	5
S. IMBRICATUM	31	10	67	15	50	30	20	70	30	10

Table 3 (continued)

PARAMETERS / NODA (28)	Table no.	% of relevés in ponds	% of relevés in depressions	% of relevés on hummocky surfaces	% of relevés on distinct hummocks	% of relevés in dry hollows	Avg. tree cover (%)	Avg. shrub cover (%)	Avg. field cover (%)	Avg. ground cover (%)	* Avg. epiphytic cover (%)
PICEA (10 x 10)	4	-	-	100	-	-	35	20	72	89	5
VACC-LEPI	5	-	-	100	-	-	-	-	5	8	+
PLEUROZIUM	6	-	-	91	9	-	-	-	39	98	1
PICEA (4 x 4)	7	-	-	12	88	-	31	59	17	48	11
PICEA (1 x 1)	8	-	-	18	82	-	-	-	96	89	5
CHAM-MYRI (BOG)	9	-	-	80	20	-	-	-	92	31	+
KALM-CHAM	10	-	-	76	12	12	-	-	85	61	+
POLYTRICHUM	11	-	-	-	100	-	-	-	74	99.6	+
C. RANGIFERINA	12	-	-	38	14	48	-	-	56	98	+
S. FUSCUM	13	-	1	13	86	-	-	-	72	99.8	+
S. FUSC-C. RANG	14	-	-	8	92	-	-	-	78	99	+
S. RUBE-S. NEMO	15	-	16	69	15	-	-	-	60	99.6	+
RHYN-CLAD	16	-	100	-	-	-	-	-	42	90	+
NUPHAR	17	100	-	-	-	-	-	-	51	10	-
S. CUSPIDATUM	18	39	61	-	-	-	-	-	43	99.6	-
S. MAJUS	19	19	81	-	-	-	-	-	46	98	-
S. PULCHRUM	20	-	65	35	-	-	-	-	44	99.8	+
S. PAPILLOSUM	21	-	41	45	14	-	-	-	45	99.9	+
S. MAGELLANICUM	22	-	11	55	34	-	-	-	59	99.8	+
S. RECURVUM	23	-	15	81	4	-	-	-	63	99	+
S. RUSSOWII	24	-	-	50	50	-	-	-	77	100	-
CALA-MYRI	25	3	97	-	-	-	-	-	79	9	-
MYRI-CHAM (FEN)	26	-	94	-	6	-	-	-	92	12	+
S. WARNSTORFII	27	-	33	67	-	-	-	-	98	97	+
S. FIMBRIATUM	28	-	36	27	36	-	-	-	66	99	-
ALNUS (4 x 4)	29	-	86	14	-	-	-	95	58	48	1
D. EXAN-D. FLUI	30	-	86	14	-	-	-	-	65	93	-
S. IMBRICATUM	31	-	10	30	60	-	-	-	61	99.7	+

* "+" indicates average < 1%

Picea miriana (Mire Forest) (Table 4)

The description deals primarily with the tree layer and is based on a total of 38 relevés (each $100m^2$) for which seven species are recorded with three of these occurring only once. There is an average of two species per relevé.

The Picea mariana (Mire Forest) Nodum as dealt with in this study is found mainly in the drier sections of peatland. Its best development is in ombrotrophic mire with 89% of the relevés occurring here. It is only an occasional feature of transition sites, and is absent in rheotrophic mire.

The Nodum is distributed widely throughout the study area occurring in all geographical regions. It is found in both maritime and continental environments in ombrotrophic mire and only in continental areas in transition sites.

The topography within the Nodum consists of a complex of hummocks and hollows, the former usually dominated by mosses like Sphagnum while the latter, in addition to these species, sometimes containing various lichens as well. When occurring under dense clumps of trees these topographic features often are void of vegetation cover.

Structurally, the Nodum contains four strata. The tree layer has an average cover of 35% ranging from 5% to 97% with the majority of the relevés having less than 50% cover. The average maximum height for the trees is 6.3m ranging from 3.6m to 15.2m. The shrub layer has an average cover of 20% (range 5% to 60%) with the majority of the relevés having less than 30% cover. The field and ground layers both have high cover, the former with an average of 72% (range 2% to 95%) and the latter 89% (range 3% to 99%). There is an epiphytic cover present in each relevé, the average being 5% ranging from less than 1% to a high of 25%.

The nodal dominant-character species, Picea mariana, is constant with low to very high cover values and in 45% of the relevés is the only species present in the tree layer. In immature stands it spreads itself mainly through layering and thus usually grows in clumps. There are no species that are associated constantly with the nodal dominant.

A single variant along with two sub-variants are found within the Nodum. Larix laricina is the differential of the principal Variant with primarily low cover. The Variant occurs with equal frequency in both maritime and continental areas in all geographical regions with 80% of the relevés located in ombrotrophic mire and the remainder in transition sites. The average cover for the different layers is as follows: trees 37%, shrubs 14%, field 73% and ground 86%. There is an average of two species per relevé.

Sub-variant "a" occurring within the principal Variant is differentiated by Betula papyrifera of very low cover. It is located only in ombrotrophic mire in the maritime region of the Saint Lawrence River Valley. The Sub-variant has an average of four species per relevé. Pinus banksiana is the differential of Sub-variant "b" with low to moderate cover values. The Sub-variant is found mainly within the principal Variant. It occurs in dry ombrotrophic mire in the maritime area of the Saint Lawrence River Valley and the continental region of Lac Saint-Jean. The average number of species per relevé is three.

The only species exclusive to the Nodum is Pinus strobus located in a dry section of ombrotrophic mire from the continental area of southern New Brunswick.

Vaccinium angustifolium - Lepidozia reptans Nodum (Table 5)

The following description is based on only three relevés. A total of 18 species are recorded in this nodal group. The average number of species for each relevé is eight.

The Vaccinium angustifolium - Lepidozia reptans Nodum is observed only in ombrotrophic mire, where it forms part of the mosaic of understory vegetation within mature Picea mariana stands of dense canopy (average cover in $100m^2$ quadrat is 84%). It is placed, therefore, in the hydroseral category of Mire Forest.

The Nodum's geographical distribution within the study area is unknown because of the minimal number of relevés sampled. Two of the quadrats are located in the same mire from the Bas Saint-Laurent while the third is from the Lac Saint-Jean region. The evidence indicates that no preference is made for either a continental or maritime distribution.

The topography ranges from gently undulating to distinctly hummocky with the surface occasionally broken by extruding tree roots. In disturbed sites, where cutting has occurred, the rotting stumps provide a habitat for some of the bryophytes and lichens.

The characteristic feature about this Nodum is the sparceness of the vegetation layers with forest litter covering most of the peat surface. The average field cover is 5%, ranging from a high of 10% to a low of only 2%. The average ground cover is slightly higher at 8%, ranging from a high of 15% to a low of 5%. The epiphyte cover is always less than 1%.

The Nodum has no mire character species present (see Table 2). The nodal character species include Vaccinium angustifolium and Lepidozia reptans both of which are present constantly. There is no evidence of variants occurring within the Nodum.

Cladonia coniocraea, Tetraphis pellucida and Pleurozium schreberi occur in two of the three relevés. No species has a cover value greater than one, although several of the bryophytes and lichens do grow as pure colonies in the form of small patches. These include Cladonia coniocraea, Lepidozia and Pleurozium as well as Odontoshisma sphagni, Sphagnum fuscum and Dicranum fuscescens. There are no species that are exclusive to this Nodum.

Pleurozium schreberi Nodum (Table 6)

The description is based on 11 relevés. There are 45 species recorded in the nodal group. The average number of species for each relevé is 13.

The *Pleurozium schreberi* Nodum is found in ombrotrophic mires where it typically forms part of the understory vegetation mosaic within *Picea mariana* stands. The only exception to this is Relevé 546 where it occurs in association with *Chamaedaphne calyculata* and *Kalmia angustifolia* on a hummock in open ombrotrophic mire. Due to the Nodum's preference for habitats within *Picea mariana* stands it is placed in the category of Mire Forest.

The Nodum's geographical range extends from continental areas (Lac Saint-Jean, northwest New Brunswick) to maritime ones (the Côte Nord and the Bas Saint-Laurent). There are no relevés for this Nodum from Nova Scotia.

The topography is usually gently undulating but distinct hummocks do occur as in Relevé 546. In the *Picea mariana* stands extruding roots and fallen trees and branches contribute to the unevenness of the surface.

The vegetation cover is abundant with the field layer averaging 39%, but ranging widely from a high of 99% (Relevé 546) to a low of only 3%. The majority of the relevés, however, have field cover values of less than 35%. The dominant vegetation cover is provided by the bryophytes with the average ground cover being 98% (range 97% to 100%). The average epiphytic cover is 1%.

The Nodum has the following mire character species present:

Chamaedaphne calyculata	Sphagnum magellanicum
Vaccinium oxycoccos	Sphagnum recurvum
Kalmia polifolia	Sphagnum rubellum
Smilacina trifolia	Eriophorum angustifolium

These are almost completely absent from the relevés of the Bas Saint-Laurent, but occur with higher frequency in the other regions where sampling was done.

The nodal dominant-character species is Pleurozium schreberi. In some of the relevés it forms an unbroken carpet excluding nearly all other bryophytes and lichens. It is associated most frequently with Kalmia angustifolia and Ledum groenlandicum.

Two variants occur within the Nodum. Variant A has Vaccinium angustifolium as the differential species with Picea mariana constantly present, while Variant B has the differential Lepidozia reptans with Dicranun undulatum and Dicranum fuscescens as frequent associates. The former Variant is found mainly in the Saint Laurence River Valley while the latter shows strong preference for more continental sites.

The following species, with their importance values, reach their optimum level of development within mires in this Nodum: Vaccinium angustifolium (1.0), Gaultheria hispidula (0.5), Dicranum polysetum (0.1), Dicranum drummondii (0.1), Dicranum flagellare (0.1) and Dicranum majus (0.1), the latter three occurring only once. Nearly all of these species have very low cover values, the exception being Vaccinium angustifolium.

Species showing strong affinity for mire forest include *Plagiothecium laetum*, *Tetraphis pellucida* and *Pohlia nutans*, all of low occurrence and cover, with *Pohlia* being exclusive to this Nodum.

Picea mariana (4 x 4m) Nodum (Table 7)

The data is based on eight relevés from which 56 species are recorded for the Nodum. The average number of species for each relevé is 22.

The Picea mariana (4 x 4m) Nodum is found in ombrotrophic and transition mires where it forms small "spruce islands" (see Fig 11b). Ecologically it occupies an intermediate position between mire forest and dry ombrotrophic mire.

Its distribution covers the whole geographical range of the study area and seems to show no preference for either a continental or a maritime environment. The relevés, from which the following description is derived, are from maritime areas only. Nearly all are from the coastal region of Nova Scotia, the exception being Relevé 340 which is from the Côte Nord in Quebec.

The topography forms one of the bases for characterising this Nodum. In ombrotrophic mire the spruce island has a ring of hummocks around its outer margin with a depressional area in its central part. It resembles a very large hummock that has a collapsed centre. In transition mire where these ombrotrophic islands occur (see Fig 9a) the centre is usually of the same elevation as the outer margin.

Structurally the Nodum consists of four layers. The average cover for each is as follows: trees 31% (range nil to 50%), shrubs 59% (range 25% to 85%), field 17% (range 1% to 35%) and ground 48% (range 15% to 90%). The two upper layers (combined) constitute the dominant cover. The average epiphytic cover is comparitively high at 11% (range + to 25%), due to the increased number of conifers present. The average maximum tree height is 3.1m ranging from 2.7m to 3.9m.

The Nodum contains 80% of the mire character species of which Chamaedaphne calyculata is the most constant but of low cover.

The nodal dominant-character species Picea mariana, always with a cover greater than 60%, is present constantly. This species makes up most of the tree and shrub layers. It frequently spreads by layering so that an entire relevé of $16m^2$ may be covered by Picea derived from one individual. Due to the height it attains and the open exposed position of these spruce islands on the mire's surface, the upper branches of the trees often display an asymmetrical growth form (see Fig 11b) termed "Krummholz" (Oosting, 1956).

The following species consistently occur with Picea but generally are of low cover: Ledum groenlandicum, Kalmia angustifolia, Dicranum fuscescens, Dicranum undulatum and Lepidozia reptans.

Three variants from the field and ground layers occur within the Nodum. Variant A has Sphagnum russowii as the differential species and is associated always with Cephalozia connivens and frequently with Mylia anomala. Variant B is differentiated by Vaccinium angustifolium, with Viburnum cassinoides being present constantly. Variant C is made up of association between Pleurozium schreberi, Pohlia sphagnicola and Odontoschisma sphagni, all with very low cover.

The following species attain their best development in this Nodum. They are listed in descending order of occurrence along with their importance values, the last five occurring only once:

Dicranum undulatum (1.0)	Hypnum imponens (0.2)
Viburnum cassinoides (0.3)	Maianthemum canadense (0.1)
Nemopanthus mucronata (0.2)	Vaccinium boreale (0.1)
Cladonia gracilis (0.3)	Vaccinium vitis-idaea (0.1)
Clintonia borealis (0.4)	Cladonia pityrea (0.1)
Cephalozia media (0.3)	Dicranum scoparium (0.1)

Also to be included here are *Dicranum montanum*, *Dicranum fuscescens*, and *Bazzania trilobata*. The latter three along with *Abies balsamea* show affinity towards mire forest. In nearly all cases the cover is low. There are no species exclusive to this Nodum.

Picea mariana (1 x 1m) Nodum (Table 8)

The description is based on 11 relevés. The total number of species for the nodal group is 58 and the average number of species for each relevé is 17.

The Picea mariana (1 x 1m) Nodum is found only in the driest sections of ombrotrophic mire where the spruce usually occurs in dense clumps, intermixed with a variety of Ericaceous plants.

The Nodum's geographical distribution is widespread throughout the study area. The relevés sampled are from the continental regions of central New Brunswick and Lac Saint-Jean and the maritime region of the Côte Nord. No sampling was done in Nova Scotia or the Bas Saint-Laurent.

Topographically, the Nodum is confined mainly to hummocks, which appear to be somewhat retarded in their growth because of the high density of the spruce cover, reducing the amount of light available to the mosses. This enables more shade-tolerant, non-hummock-forming species to become established.

The vegetation cover consists of two strata both of which are of high density. The average field cover is 96% ranging from a low of 85% to 100% with the majority of the relevés having values greater than 94%. The average ground cover is 89% (range 65% to 100%) with the majority of the relevés having values greater than 89%. The average epiphyte cover is 5% (range 2% to 15%) with the highest values being recorded from the relevés of central New Brunswick (average 12%) and the lowest from the Côte Nord (average 3%).

The nodum contains seven mire character species with Chamaedaphne calyculata being constant but with low cover.

The nodal dominant-character species Picea mariana has a cover in excess of 80% in the majority of the relevés. It often spreads by layering and dominates the field layer preventing other vascular species, especially the Ericaceous plants, from attaining high cover values. Only Gaylussacia dumosa and Kalmia angustifolia in Relevés 1177 and 508 respectively have cover values between 21% and 40%, all the other vasclars are less than 20%. The latter species along with the liverwort Lepidozia reptans are associated almost constantly with Picea.

In the ground layer several species occasionally reach a high degree of cover. This is true of Lepidozia as well as Sphagnum magellanicum, Sphagnum fuscum, Sphagnum russowii, Pleurozium schreberi, Cephalozia connivens and Cladonia rangiferina.

There are two variants within the Nodum both of which are found in the ground layer. Variant A is differentiated by Sphagnum fuscum and Cladonia rangiferina. Growing with the Sphagnum are the liverworts Mylia anomala, Odontoschisma sphagni and Microlepidozia setacea, the first two being present constantly. An associate of less frequent occurrence is the moss Pohlia sphagnicola. Variant B is differentiated by Pleurozium schreberi and Cladonia rangiferina with Dicranum undulatum being present almost constantly. A Sub-variant occurs within Variant A which is found only in maritime regions. It is differentiated by Rubus chamaemorus, with Eriophorum spissum occurring with high frequency.

The following bryophytes and lichens, with their importance values, attain their best development in mires within this Nodum: Lepidozia reptans (1.4), Cephalozia connivens (0.5), Cladonia chlorophaea (0.4), Lophozia attenuata (0.3) and Hylocomium splendens (0.2). Nearly all occur in more than one relevé, the exception being Hylocomium. Two species are exclusive to the Nodum, namely Cladonia bacillaris and Lophozia porphyroleuca, both having very low cover values.

Chamaedaphne calyculata-Myrica gale (Bog) Nodum (Table 9)

The following description is based on five sampled relevés, with 37 species being recorded for the nodal group. The average number of species for each relevé is 16.

The *Chamaedaphne calyculata-Myrica gale* (Bog) Nodum is found in the drier sections of ombrotrophic mire. In the majority of cases the sampling was done near the margin of each mire, with a road or lake close by. The exception to this is Relevé 657. Here, however, the mire was dissected by a drainage ditch, resulting in a lowering of the water table for the entire mire.

Sampling was done in all geographical regions except Lac Saint-Jean. The Nodum, however, is found mainly in maritime areas. Relevé 1187 was sampled in a mire that is located approximately 13 kilometres from the sea, and based on floristic and chemical evidence it may be regarded as being more under the influence of a continental environment.

The topography within the Nodum is hummocky. The density of the field layer seems to have retarded the growth of the hummocks due to the decrease of shade-intolerant hummock-forming mosses.

The average field cover for the Nodum is high at 92% (range 85% to 98%). It consists mainly of perennial woody vasculars most of which belong to the Ericaceae. The ground layer, on the other hand, has a low average cover of 31% (range 2% to 60%) while the epiphytic layer has as average of less than 1%.

The Nodum contains 90% of the mire character species with Kalmia polifolia and Chamaedaphne calyculata being constant while Drosera rotundifolia and Sphagnum rubellum are present in all but one relevé. Sarracenia purpurea, Sphagnum recurvum and Smilacina trifolia occur just once with only the latter having high cover.

There are two nodal dominant-character species, Chamaedaphne and, with less frequent occurrence but high cover, Myrica gale. The former dominates the field layer when the latter is absent. Only in Relevé 1187 do both of these species have relatively low cover. Here the dominant becomes Gaylussacia dumosa. Other species, in addition to those already mentioned, that occur constantly (or nearly so) with the nodal dominants, include the Ericaceous plants Kalmia angustifolia and Ledum groenlandicum and the liverworts Mylia anomala and Odontoschisma sphagni, none of which have very high cover values.

Only one distinct variant occurs in the Nodum, and this is differentiated by Sphagnum fuscum. Associated with the Sphagnum are Larix laricina (seedlings), Pohlia sphagnicola, Polytrichum strictum, and Cephalozia connivens.

There are no species that are exclusive to this Nodum.

Kalmia angustifolia-Chamaedaphne calyculata Nodum (Table 10)

A total of 24 relevés were sampled and 71 species recorded for the nodal group. The average number of species for each relevé is 19.

The Kalmia angustifolia-Chamaedaphne calyculata Nodum occurs only in the driest sections of ombrotrophic mire and is associated frequently with areas that have been burned.

Although the Nodum is found throughout the study area it seems to occur most frequently in the Saint Lawrence River Valley. The majority of the sampled relevés (79%) are from the Côte Nord, while 13% are located in the Bas Saint-Laurent region. There is no apparent preference for a maritime environment over a continental one, despite the fact that approximately 96% of the sampled quadrats occur in the former.

The topography is generally hummocky in nature, but occasionally the Nodum occurs in dry hollows between hummocks. The field cover is usually of high density and the hummocks are often in a state of apparent senescence due to the diminished presence of cushion-forming mosses.

The vegetation consists of two strata and is dominated by the field layer which averages 85% (range 20% to 99%) with the majority of the relevés having greater than 80% cover. The Ericaceae makes up the principal component of this layer. Two striking exceptions to this are Relevés 355 and 356 with 35% and 20% cover respectively. This is due to the recent occurrence of fire leaving the field layer practically void of vegetation. The initial colonizers were the lichens which make up a large proportion of the high cover values for the ground layers (98% and 99%). The ground layer's cover for the Nodum averages 61% (range 20% to 99%) with the lichens forming an important component within this strata. The average epiphytic cover is slightly less than 1% ranging from + to 3%.

The nodum contains seven mire character species, with only Chamaedaphne calyculata being present almost constantly. Due to its importance in this nodal group it is treated also as a nodal dominant-character species along with Kalmia angustifolia. Both occur with high cover, especially the latter, which in three relevés has cover values greater than 80%. Ledum groenlandicum, Vaccinium angustifolium and Odontoschisma sphagni are associated almost constantly with the nodal dominants, but generally have low cover.

There are two principal variants within the Nodum. Variant A, the smaller of the two, consists of five relevés and is differentiated by Pleurozium schreberi. Associated with this species are Picea mariana and Lepidozia reptans. This Variant shows no preference for a specific geographical region. Variant B, on the other hand, is confined only to the Saint Lawrence River Valley, principally from the Côte Nord. It includes the majority of the sampled relevés and has Rubus chamaemorus and Cladonia rangiferina as the differential species. Occurring with these and of high frequency are Polytrichum strictum, Cladonia crispata and Cladonia impexa. In two relevés, Polytrichum has a cover ranging between 40% and 60%.

Three sub-variants, which are mainly differentiated by lichens, occur within Variant B, and all seem to be found in mires under the influence of fire. Sub-variant "a" has Cladonia deformis as the differential species with the closely related Cladonia gonecha occurring frequently as well. Sub-variant "b" is differentiated by Ochrolechia frigida and Microlepidozia setacea while Sub-variant "c" has Lecidea granulosa as the differential species and Cladonia cornuta and Cladonia cenotea as frequent associates.

A large number of species reach their optimum development in mires in this Nodum and are mentioned below along with their importance values. The majority of them reflect the dry conditions that exist where the nodal group is found. Two members of the Ericaceae previously referred to, Kalmia angustifolia (2.3) and Ledum (1.1), as well as the liverwort Odontoschisma sphagni (0.9) do well in this Nodum. This is also the case with the following lichens: Cladonia crispata (0.5), Cladonia deformis (0.4), Cladonia gonecha (0.2) and Cladonia cristatella (0.4), all having mainly low cover values. In addition to these, there are several other species that reach their optimum here but are of low constancy and cover. They include the vasculars Melampyrum lineare (0.2) and Geocaulon lividum (0.1) and the lichens Cladonia cornuta (0.1), Cladonia cenotea (0.1), Lecidea granulosa (0.1) and Ochrolechia frigida (0.2). There are no species exclusive to this Nodum.

Polytrichum strictum Nodum (Table 11)

The nodal description is based on only five quadrats for which 25 species are recorded. The average number of species per relevé is 14.

The *Polytrichum strictum* Nodum is found in the drier sections of ombrotrophic mire where this species grows abundantly and is intermixed with two or three *Sphagnum* to form a compact ground layer.

The Nodum, described here in its best developed state, does not appear to be a very common feature in the mires where sampling was done. Geographically the relevés are located in the continental and maritime regions of New Brunswick and the Côte Nord respectively. In mires that are affected by fire, there appears to be a tendency towards this form of nodal development. The drier conditions that fire often brings enables *Polytrichum* to replace *Sphagnum* as one of the dominant components of the ground layer.

The Nodum occurs only on hummocks where *Polytrichum*, by replacing *Sphagnum*, has the effect of slowing down their growth and expansion. The hummocks, therefore, become more stabilized with the gradual removal of the cushion-forming mosses.

Typically, the Nodum has two vegetation layers, namely field and ground. Relevé 453, however, also contains a shrub layer with 15% cover, formed by dwarf *Picea* and *Larix*. The average field cover for the Nodum is 74% with a range between 65% and 90%, while the average ground cover is just under 100% (99.6%), with the majority of the relevés having complete cover. The average epiphytic cover is less than 1% but does reach a high of 2% in Relevé 453 due to the presence of the conifers.

The Nodum contains all of the mire character species with Chamaedaphne calyculata and Vaccinium oxycoccos being constant but only the former attains moderately high cover values. Smilacina trifolia, Eriophorum angustifolium and Sphagnum recurvum occur only in the continental areas of New Brunswick while Kalmia polifolia and Sarracenia purpurea are restricted to the maritime environment of the Côte Nord.

The nodal dominant-character species is Polytrichum strictum with cover values of four or more. It forms the most conspicuous aspect of the ground layer which it completely dominates in nearly all the quadrats, the exception being Relevé 564 where it is co-dominant with Sphagnum fuscum. There are three constant associates of Polytrichum, two of which are mire character species already mentioned above (see Table 11). The third is Kalmia angustifolia which is generally of low cover.

Only one variant occurs within the Nodum and it is differentiated by Picea mariana and Sphagnum fuscum with only the latter frequently having high cover values. Associated with these two differentials are Ledum groenlandicum and Pohlia sphagnicola, both constant but of low cover. The Variant shows no preference for either a maritime or continental environment. It is absent only in Relevé 1199 which, unlike the other quadrats, is situated in a predominantly transition section of mire.

There are no species exclusive to this Nodum.

Cladonia rangiferina Nodum (Table 12)

The data is based on a total of 81 sampled quadrats for which 101 species are recorded, with 19% of these occurring only once. The average number of species per relevé is 17.

The Cladonia rangiferina Nodum is found in the drier sections of ombrotrophic mire. One of the distinguishing features about the Nodum is the complete dominance of lichens in the ground layer to the exclusion of nearly all the Sphagnum. Thus hummock growth and development has practically ceased and a state of stability or senescence exists within the Nodum.

The Nodum is found predominantly in maritime areas, with 79% of the sampled relevés belonging in this category. Extensive surveys of the mires in all regions revealed that the more continental the environment the rarer the Nodum becomes.

Topographically, the Nodum is found often in the small hollows scattered throughout the growing Sphagnum hummocks in the drier sections of a mire. Approximately 48% of the sampled relevés are of this kind. When not found in hollows, the Nodum frequently occurs in areas that are hummocky (38%) with a smaller number of relevés occupying distinct hummocks (14%).

The Nodum's vegetation is divided into two strata. The field layer has an average cover of 56%, ranging from 20% to 85%, with members of the Ericaceae forming the principal component. The bryophytes and lichens form the dominant strata with an average cover of 98% (range 75% to 100%), with the majority of the relevés having values of either 98% or 99%. The fruticose lichens are the most important feature of this layer. The average epiphytic cover is slightly less than 1%.

All of the mire character species are present in this nodal group. Chamaedaphne calyculata, Kalmia polifolia and Vaccinium oxycoccos are the only three, however, that occur with regularity. The others, which include Sphagnum rubellum, Sphagnum magellanicum, Sphagnum recurvum, Drosera rotundifolia, Sarracenia purpurea, Smilacina trifolia and Eriophorum angustifolium, are absent almost completely from the Côte Nord and Lac Saint-Jean, while mainly occurring sporadically in the other regions.

The nodal dominant-character species is Cladonia rangiferina which is present in 94% of the relevés. It occasionally completely dominates the ground layer where it is sometimes the only lichen present. In the few cases where it is entirely absent its place is taken by other fruticose lichens. Its most constant companions are five members of the Ericaceae. These include Chamaedaphne, Ledum groenlandicum, Vaccinium angustifolium, Kalmia angustifolia and Kalmia polifolia, the majority of which occasionally attain high cover values, the exception being the last one which remains conistently low.

There are two principal variants within the Nodum. Variant A is differentiated by three fruticose lichens: Cladonia alpestris, Cladonia impexa and Cladonia arbuscula, which often attain high cover values. This Variant occurs in both continental and maritime regions. Only the first two species are found in the Lac Saint-Jean area. Variant B has two differential species, namely, Rubus chamaemorus and Empetrum nigrum. This Variant is exclusive to maritime areas, but within this category it was recorded only once from the Bas Saint-Laurent.

There are two sub-variants of somewhat similar species composition which occur in the Nodum. Sub-variant "a", which contains the smallest number of relevés, is associated with Variant A and is differentiated by Aronia prunifolia. Occurring more than once with this species are Gaylussacia dumosa, Trientalis borealis and Cladonia uncialis. This Sub-variant is found in the maritime region of Nova Scotia and in the continental areas of New Brunswick and Lac Saint-Jean. Sub-variant "b" is associated with Variant B and, therefore, confined to maritime areas only, in this case mainly to Nova Scotia and to a smaller extent coastal New Brunswick. It is differentiated by a combination of species, of which Aronia is the most constant but of very low cover. Other species, in addition to those already mentioned for Sub-variant "a", include Solidago uliginosa, Gaultheria procumbens, Cornus canadensis, Juniperus communis, Cladonia boryi and Cladonia terrae-novae. Only the last species occurs with high cover values.

In addition to the variants described above, there are two relevés which do not fit into these categories. Relevé 1239 is from a mire forest in continental New Brunswick and does not contain any of the species from the principal variants but has a high cover value for Cladonia rangiferina. The other exception is Relevé 880 located in an ombrotrophic mire in the Lac Saint-Jean region. It is unusual in that it was found in a wet depressional area of the mire. It does not have either the nodal dominant-character species or any of the differential species of the variants. Instead it has Cladonia squamosa as the dominant lichen along with Cetraria ericetorum with a cover value of two. The wetter nature of the relevé is reflected in the presence of species like Rhynchospora alba (15% cover), Eriophorum virginicum and the liverwort Cladopodiella fluitans.

The following lichen species with their importance values reach their best development within mires in this Nodum: <u>Cladonia rangiferina</u> (2.4), <u>Cladonia alpestris</u> (1.0), <u>Cladonia impexa</u> (1.1), <u>Cladonia boryi</u> (0.1) and <u>Cetraria ericetorum</u> (0.1).

There are five species that are exclusive to this nodal group. They are sporadic in their occurrence and nearly all of low cover. They include <u>Lycopodium annotinum</u>, <u>Baeomyces roseus</u>, <u>Cornicularia aculeata</u>, <u>Cladonia verticillata</u> and <u>Cladonia subsquamosa</u>. This last species is a chemical variant of <u>Cladonia squamosa</u> and according to Hale (1969) it was known previously only from the Pacific Northwest, thus it may prove to be an important find as it is recorded in three relevés from New Brunswick (1100, 1204, 1294) and one from the Bas Saint-Laurent (667). In Relevé 1294 this species has a cover of approximately 20%.

Sphagnum fuscum Nodum (Table 13)

The description is based on a total of 144 relevés for which 86 species are recorded, with 14% of these occurring only once. The average number of species per relevé is 14. In continental relevés this figure drops to 12 while in maritime ones it increases to an average of 17 per relevé.

The Sphagnum fuscum Nodum is found predominantly in the drier sections of ombrotrophic mire. This proved to be the case in approximately 85% of the sampled quadrats. The majority of the remaining relevés are from slightly damper areas of ombrotrophic mire while 5% are located in transition mire.

The Nodum occurs extensively in the mires of the study area and shows no preference for either a continental or maritime environment.

Topographically, the Nodum is situated primarily on hummocks. In ombrotrophic mire this occurs in 85% of the relevés, while 14% are found on gently undulating topography and slightly more than 1% within depressions. In transition mire the Nodum is located only on hummocks.

Structurally, the Nodum consists of two vegetation strata both of which have high cover. The field layer has an average cover of 72% ranging from a low of 15% to a high of 98%. In the vast majority of relevés the cover exceeds 60%. Relevés with less than 50% field cover often are associated with transition hummocks or in the case of ombrotrophic mire where hummocks are either absent or immature. The ground layer usually is very compact and has an average cover of slightly less than 100% (99.8%) with a range from 95% to 100%. The epiphytic cover, found in 41% of the relevés, is very low at less than 1%.

The Nodum contains all ten of the mire character species. Those of high constancy and low cover include Vaccinium oxycoccos, Kalmia polifolia, Sphagnum magellanicum and Sphagnum rubellum. Several species are restricted, to a high degree in their distribution, to specific geographical areas. These include: Drosera rotundifolia and Sarracenia purpurea which occur frequently in Nova Scotia, New Brunswick and the Côte Nord but only sparsely in the Bas Saint-Laurent and Lac Saint-Jean regions; Sphagnum recurvum and Eriophorum angustifolium which show a strong preference for continental sites, occurring frequently in the Lac Saint-Jean region and the interior of New Brunswick, while both are absent or nearly so from Nova Scotia, the coastal areas of New Brunswick and the Saint Lawrence River Valley; and Smilacina trifolia which occurs with moderate frequency in all regions except the Côte Nord where it is absent almost completely. Nearly all of these species of restricted distribution have low cover, the exception being Smilacina which occasionally has cover values as high as three.

There are two nodal dominant-character species, Sphagnum fuscum and Chamaedaphne calyculata. The former completely dominates the ground layer (importance value of 4.9) and is quite distinctive in its compact carpet formation and typical brown coloration. The latter species occurs with high constancy and ranges from low to high cover. Its highest cover values (4 to 5) occur mainly in continental regions where the number of species for each relevé is generally low in comparison with maritime areas and competition, therefore, is reduced somewhat. The mire character species Vaccinium oxycoccos is the only constant associate of the two nodal dominants.

A single large variant occurs within the Nodum and is differentiated by two members of the Ericaceae Kalmia angustifolia and Ledum groenlandicum, both of which occasionally attain high cover. The Variant occurs throughout the study area in both continental and maritime regions and is found in transition as well as ombrotrophic mire. It is, therefore, only a floristic variant and not an ecological or a geographical one.

Several sub-variants, which are of an ecological or a geographical nature, occur within the principal Variant. The first of these, Sub-variant "a", is differentiated by Empetrum nigrum which has very high constancy and frequently high cover. This Sub-variant is found only on hummocks in ombrotrophic mire and is confined almost entirely to maritime areas with the majority of the relevés occurring in Nova Scotia. There are a large number of associated species, none of which have very high cover values. These include:

Scirpus cespitosus	Cladonia rangiferina
Aronia prunifolia	Myrica gale
Gaylussacia dumosa	Cladonia terrae-novae
Microlepidozia setacea	Juniperus communis
Calopogon pulchellus	Trientalis borealis
Solidago uliginosa	

Sub variant "b", differentiated by Picea mariana that is generally of low cover, occurs only in ombrotrophic mire where it is found predominantly on hummocks and occasionally on gently undulating topography. Approximately 66% of the relevés in this Sub-variant are from the continental regions of New Brunswick and Lac Saint-Jean while the remainder are from maritime areas especially the Côte Nord in Québec. Closely associated with the Picea Sub-variant is Sub-variant "c" differentiated by Carex trisperma and Gaultheria hispidula, both having low cover values. It is found primarily in continental sites, where it occurs on hummocks or slightly hummocky surfaces. Sub-variant "d", differentiated by Carex oligosperma with very low cover, is found in both transition and ombrotrophic mire where it occurs mostly on hummocks. This Sub-variant seems to be restricted mainly to continental areas with 12 of the 13 relevés being from the Lac Saint-Jean region. The only exception to this is Relevé 411 from the Côte Nord which also is unique because it is one of two relevés of the Sub-variant that do not occur on hummocks but instead are confined to slightly hummocky terrain.

Sub-variant "e" occurs mainly outside the principal Variant and is related in some degree with Sub-variant "a". Both Sub-variants have the same differential species, namely Empetrum nigrum, and occur only in ombrotrophic mire in predominantly maritime regions, principally Nova Scotia. Sub-variant "e" differs from Sub-variant "a" in the following respects: the relevés never occur on hummocks but are confined to depressional areas or gently undulating topography; the differential species is always of low cover; and a much smaller number of associated species are present. Those that are found in Sub-variant "e", however, also occur in Sub-variant "a". They include: Scirpus cespitosus, Aronia prunifolia, Gaylussacia dumosa and Microlepidozia setacea, all predominantly of low cover.

A small number of relevés do not occur within either the principal Variant or the Sub-variants. These are found primarily in continental areas (Lac Saint-Jean) where they are confined to hummocks in ombrotrophic and transition mire. The field cover is generally greater than 50%, but species-poor allowing Chamaedaphne to dominate this layer.

Only a single species reaches its optimum level of development in mires within this Nodum. Eriophorum spissum, with an importance value of 0.4, occurs with moderate frequency and low cover in both maritime and continental areas. The liverwort, Lophozia marchica with very low cover, is the only species exclusive to the Nodum. It is recorded from two mires in central New Brunswick where it is embedded in the Sphagnum fuscum hummocks.

Among the companion species the two mosses Polytrichum strictum and Pohlia sphagnicola are associated frequently with Sphagnum fuscum and are distributed throughout the study area, while the liverwort Odontoschisma sphagni occurs with regularity in all regions except Lac Saint-Jean where it is only encountered in two out of 51 sampled relevés. These bryophyte associates of Sphagnum are present with moderate to low cover values.

Sphagnum fuscum - *Cladonia rangiferina* Nodum (Table 14)

The description is based on 12 sampled quadrats for which a total of 60 species are recorded. The average number of species per relevé is 27.

The *Sphagnum fuscum* - *Cladonia rangiferina* Nodum is found only in the drier sections of ombrotrophic mire where, in the majority of the quadrats, these two species together with several fruticose lichens make up the most prominent aspect of the ground layer.

The Nodum's geographic distribution appears to be restricted to a maritime environment. All of the sampled relevés are from Nova Scotia.

Topographically, the Nodum is found mainly on hummocks, with 11 out of 12 relevés occurring in this situation. The remaining relevé is located on gently undulating topography.

The Nodum consists of two vegetation strata, both of which have high cover percentages. The average field cover is 78%, ranging from a low of 40% to a high of 90% with the majority of the relevés having greater than 70% cover. The ground layer's average cover is 99% (range 95% to 100%) with the majority of the quadrats having greater than 98% cover. The average epiphytic cover is very low at 0.2%.

There are 70% of the mire character species present within the nodal group, all of which occur in at least 50% of the relevés and none of which have very high cover values. Only two, *Drosera rotundifolia* and *Vaccinium oxycoccos*, are present constantly.

The two nodal character species are Sphagnum fuscum and Cladonia rangiferina both of which have high constancy but only the former attains moderately high cover values. There are a large number of species of high constancy associated with the nodal characters. In addition to the two mire character species already mentioned, a third Kalmia polifolia occurs regularly along with the following:

Rubus chamaemorus	Microlepidozia setacea
Ledum groenlandicum	Polytrichum strictum
Solidago uliginosa	Empetrum nigrum
Odontoschisma sphagni	Kalmia angustifolia

Only the last two frequently have cover values greater than one.

There is only one principal variant within the Nodum and it is differentiated by three fruticose lichens, namely Cladonia impexa, Cladonia arbuscula and Cladonia terrae-novae, each of which occasionally attains moderately high cover values. This Variant occurs in nearly all the quadrats, the exception being Relevé 194 which is located the farthest from the coast at 10.6 kilometres.

Within the principal Variant a single Sub-variant occurs which is differentiated by Gaylussacia dumosa and Scirpus cespitosus. Both Aronia prunifolia and Andromeda glaucophylla occur as constant and frequent associates respectively, but their cover is always low.

A total of 16 species reach their optimum development in the mires examined within this Nodum. These include two of the mire character species Drosera rotundifolia and Sarracenia purpurea, three of the constant associates of the nodal character species, namely, Empetrum nigrum, Solidago uliginosa and Microlepidozia setacea, as well as two of the principal Variant species, Cladonia arbuscula and Cladonia terrae-novae. The remaining species that attain their optimum development are all companions and are listed in descending order of occurrence followed by their importance values, the last one occurring only once:

Juniperus communis	(0.7)	Larix laricina	(0.4)
Trientalis borealis	(0.3)	Cetraria islandica	(0.3)
Calopogon pulchellus	(0.2)	Riccardia latifrons	(0.1)
Gaultheria procumbens	(0.2)	Cladonia mitis	(0.2)

There are no species exclusive to this Nodum.

<u>Sphagnum</u> <u>rubellum</u> - <u>Sphagnum</u> <u>nemoreum</u> Nodum (Table 15)

The description is based on a total of 130 relevés for which 107 species are recorded with 36% of these occurring only once. The average number of species per relevé is 13. For the quadrats sampled in continental regions this figure is lower at 11 per relevé while in maritime areas it increases to an average of 15.

The <u>Sphagnum</u> <u>rubellum</u> - <u>Sphagnum</u> <u>nemoreum</u> Nodum is found predominantly in ombrotrophic mire (84% of the relevés) where it sometimes occurs in the driest sections, but more often is located in damper areas. The Nodum is an occassional feature of transition mire and a rare feature in rheotrophic sites.

The Nodum commonly occurs throughout the different geographical regions and shows no preference for a maritime or a continental environment.

The topography within the Nodum is mainly gently undulating in nature in both ombrotrophic and transition mires while hummocks and depressions are a less common feature. In rheotrophic mire, however, the Nodum is confined more frequently to hummocks.

The Nodum consists of two strata, namely field and ground. The former has an average cover of 60% ranging from 15% to 100%. In the drier sections of ombrotrophic mire the average field cover reaches a high of 84% while in damper areas it is as low as 40%. The bryophytes and lichens form the dominant layer with an average cover of 99.6% (range 70% to 100%) with almost all of the relevés having complete cover. The average epiphytic cover is extremely low at 0.1% being recorded in only 20% of the quadrats with the largest concentration of these recordings occurring in relevés from the drier sections of ombrotrophic mire.

The Nodum contains all of the mire character species, two of which are also nodal dominant-character species, namely Sphagnum rubellum and Chamaedaphne calyculata. These will be dealt with in more detail below. Those occurring with high constancy and predominantly low cover include Vaccinium oxycoccos, Kalmia polifolia, Sphagnum magellanicum and Drosera rotundifolia. The last species is entirely absent from the Lac Saint-Jean region and almost completely so from the Bas Saint-Laurent. The remaining mire character species also have restricted distributions within this Nodum. Sarracenia purpurea is found frequently but with sparse cover in all regions except Lac Saint-Jean where it has very low occurrence. Smilacina trifolia has its best distribution in Nova Scotia and Eriophorum angustifolium in New Brunswick. Both occasionally attain moderately high cover values. Sphagnum recurvum shows a strong preference for continental sites where it consistently has very low cover.

There are three nodal dominant-character species. Sphagnum rubellum usually distinguishes the Nodum with its deep red coloration that is present so frequently. It grows in dense patches and in the vast majority of the relevés completely dominates the ground layer with an importance value of 4.3. In nearly 20% of the quadrats Sphagnum nemoreum is present where it occasionally replaces the closely related Sphagnum rubellum (Crum, 1973) or sometimes occurs as a co-dominant with it. Chamaedaphne occurs with very high constancy and low to high cover values. Its highest cover is found predominantly in continental sites. The mire character species Vaccinium oxycoccos is the only plant that is associated almost constantly with the nodal dominants.

There are seven variants present which illustrate the moisture gradient that exists within the Nodum. Variant A is differentiated by Vaccinium angustifolium with high constancy and low cover. Polytrichum strictum is a constant associate and Melampyrum lineare and Pohlia sphagnicola are present in 50% of the relevés. All three associates have very low cover values. Two companion species, Kalmia angustifolia and Ledum groenlandicum do well within this Variant, especially the former which sometimes attains very high cover values. The Variant is predominantly a maritime one occurring almost exclusively in the Saint Lawrence River Valley. It is found only in the drier sections of ombrotrophic mire, occasionally in areas affected by fire.

Variant B and C, closely related floristically, grade into each other and together comprise the largest number of relevés within the Nodum (51% of the total). Variant B has Eriophorum spissum as the constant differential species, occassionally attaining moderately high cover, while Variant C is differentiated by Scirpus cespitosus occurring constantly and often with high cover values. These Variants, in addition to the differentials, have the following liverworts as associate species, namely Microlepidozia setacea and Cladopodiella fluitans both of which have low cover. The former is the most frequently occurring associate in each Variant and shows a strong correlation with the companion species Odontoschisma sphagni which often is present with high cover values. Another companion species Andromeda glaucophylla occurs with moderate regularity in the two Variants, but always with low cover. Variant B sometimes can be found in drier sections of ombrotrophic mire and shows no preference for either a maritime or continental environment although it seldom is found in Nova Scotia. Variant C, on the other hand, occurs only in damper sections of mire and is located more frequently in maritime areas. It is absent in the Bas Saint-Laurent and Lac Saint-Jean regions.

Variant D is differentiated by Rhynchospora alba, constantly present and generally of low cover. Cladopodiella fluitans is the only associate species, occurring in just over 50% of the relevés. Two companion species, Eriophorum virginicum and Andromeda glaucophylla, are found frequently within the Variant. All of these species typically have low cover values. The Variant occurs in the damper sections of predominantly ombrotrophic mire. It is located more frequently in maritime areas and is absent from the Bas Saint-Laurent and almost entirely so from Lac Saint-Jean.

Variant E has Carex paupercula as the differential species which is predominantly of low cover. Two associates of moderate frequency are Eriophorum spissum and Cladopodiella both with very low cover. The companion species Odontoschisma is present frequently within the Variant with moderate to low cover values. The Variant is found in the damper sections of both ombrotrophic and transition mire and shows a strong preference for maritime sites.

Variant F is differentiated by Carex oligosperma which occurs with moderate to low cover values. It has no true associates but the companion species Kalmia angustifolia is found frequently within the Variant in relevés belonging to ombrotrophic mire, and Ledum groenlandicum occurs with moderately high cover in over 50% of the quadrats. The Variant is located in the damper sections of transition mire and generally in slightly drier areas of ombrotrophic mire which is reflected in a relatively high average field cover of 68%

(compared with 40% for nodal variants occurring in damper areas). The Variant is found predominantly in continental sites.

Carex exilis is the differential species in Variant G where it occurs with moderate to low cover. The associate species include Solidago uliginosa, which is constant, plus Calamagrostis pickeringii, Alnus rugosa and Aster nemoralis which are present in at least 50% of the relevés. All the associates have mainly low cover values. The companion species Andromeda glaucophylla is found frequently within the Variant. The nodal dominant Sphagnum nemoreum does very well here being the dominant or co-dominant bryophyte in all the relevés. The Variant is located only on hummocks in the maritime region of Nova Scotia where it is found predominantly in transition mire.

A small number of relevés do not occur in the principal variants. The majority of these are found in ombrotrophic mire mainly from New Brunswick while the rest are located in either transition mire, where they are situated predominantly in laggs, or rheotrophic mire where Myrica gale often is present with high cover.

Three species reach their optimum level of development within mires in this Nodum. They include, with their importance values, the mire character species Vaccinium oxycoccos (1.0), the differential Scirpus cespitosus (0.7) and the companion Carex bullata (+). There are no species exclusive to this Nodum.

<u>Rhynchospora alba</u> - <u>Cladopodiella fluitans</u> Nodum (Table 16)

The following description is based on a total of 44 sampled quadrats for which 50 species are recorded, with 28% of these occurring only once. The average number of species per relevé is ten. This figure remains the same for the relevés of both continental and maritime areas as well as for those belonging to ombrotrophic mire while those of transition mire have an average of 11 per relevé.

Within the study area the <u>Rhynchospora alba</u> - <u>Cladopodiella fluitans</u> Nodum is quite a common feature of ombrotrophic mire with 89% of the relevés occurring here. It is found occasionally in transition mire but never in rheotrophic areas. It is located only in the damper sections of these mires and usually represents the final phase of the filling-in process which takes place in the mire pools before hummocks develope.

As the data indicates and extensive survey reveals the Nodum seems to occur more frequently in maritime regions. It was not found in any of the mires from the Bas Saint-Laurent where the majority of the sites have been disturbed causing a decrease in the presence of damper areas.

The topography within the Nodum provides one of the distinguishing features as it always occurs in a flat depression with the marginal area of the pond usually still visible (see Fig 8b).

Structurally, the Nodum consists of a moderately developed field layer and a well developed ground layer. The average field cover is 42% ranging from 10% to 85% with the majority of the relevés (32 out of 44) having less than 50% cover. The average ground cover is 90% (range + to 100%) with all but ten of the relevés having greater than 98% cover. Epiphytic cover was recorded only in Relevé 1096 where it is less than 1%. Many of the species in the field and ground layers contribute to the fabric of interwoven vegetation that covers the surface of the filled-in pond or exposed peat. This forms the basic framework upon which future hummocks can develop and is one of the distinctive features about the Nodum.

There are eight out of the ten mire character species present within the Nodum, all with low cover values. The two missing ones are *Eriophorum angustifolium* and *Sphagnum recurvum*. Those occurring quite regularly are *Vaccinium oxycoccos*, *Chamaedaphne calyculata* and *Drosera rotundifolia* while *Sphagnum rubellum* and *Sphagnum magellanicum* have only moderate distribution. The remaining mire character species,

n *Sarraceria purpurea*, *Kalmia polifolia* and *Smilacina trifolia*, have sporadic occurrence with the first two being absent from Lac Saint-Jean and the last present only in Nova Scotia.

There are two nodal dominant-character species which partly distinguish the Nodum. *Cladopodiella fluitans* usually dominates the ground layer with an importance value of 4.5. The liverwort's compact carpet formation and blackish coloration are two of its typical features. *Rhynchospora alba* usually is quite a prominent species in the field layer and occasionally attains high cover. Both of the nodal characters have very high constancy.

Several variants occur within the Nodum. The first of these, Variant A, is differentiated by *Carex limosa* with moderate to low cover. *Sphagnum cuspidatum* is a constant associate and in two relevés has a cover value of four. The companion species *Andromeda glaucophylla* is present with complete constancy and low cover. This Variant is found only in ombrotrophic mire in continental areas, particularly from the Lac Saint-Jean region. It has an average of nine species per relevé along with an average field cover of 39%. The ground cover is usually very high being around 100%. Relevé 873 is the exception where each layer has only 15% cover.

Variants B and C encompass over 50% of the Nodum's relevés. They are related floristically in that they both contain Drosera intermédia and Sphagnum cuspidatum, otherwise they differ enough to be treated separately. Variant B in addition to the two species already mentioned has the companion species Andromeda constantly present, and is found only in ombrotrophic mire from the continental region of New Brunswick. Its average field cover is 37% while the ground layer usually has 100% cover. The average number of species per relevé is 11. The Variant has no exclusive differential species. Variant C, on the other hand, occurs predominantly in ombrotrophic mire in maritime areas and is differentiated by Utricularia cornuta and Vaccinium macrocarpon, both occurring frequently, with the former ranging from low to very high cover and the latter with low to moderate cover values. The average number of species for each relevé within the Variant is 11 while the average field cover is 49%. Only three out of 21 relevés in the Variant occur in transition mire, all from maritime sites. These are all located near the marginal area of each mire with two relevés (104 and 270) very near to salt water influence. None of the mire character species are present within these quadrats.

Variant D has Carex paupercula as the differential species with very low cover. The companion species Drosera anglica always is present with cover values no greater than one. The Variant occurs only in ombrotrophic mire in the maritime region of the Côte Nord. The average number of species per relevé is nine while the average field cover is low at 35%. All the relevés within the Variant have complete ground cover.

Several species attain their best development in mires within this Nodum. These include, along with their importance values, the nodal character species Rhynchospora alba (1.5) as well as the variant species Drosera intermedia (0.7) which occurs only in Nova Scotia, New Brunswick and the Côte Nord, the differentials Utricularia cornuta (0.6) and Vaccinium macrocarpon (0.5), as well as the companions Drosera anglica (0.3) only recorded from the Côte Nord and Sphagnum pylaesii (0.1) which occurs only once in this Nodum from a coastal mire in southern New Brunswick.

There are three species exclusive to the Nodum, namely, Littorella americana which only occurs in Nova Scotia, Xyris montana and Muhlenbergia uniflora, which is recorded only once in a transition mire.

In addition to Littorella the following companion species are found only in Nova Scotian mires:

Sphagnum majus	Juncus brevicaudatus
Sphagnum tenellum	Myrica gale
Aster nemoralis	

Nuphar variegatum Nodum (Table 17)

The following description is based on a total of 106 sampled relevés for which 57 species are recorded, with 31% of these occurring just once. The average number of species per relevé is very low at three. In maritime regions this figure remains the same while in continental areas it drops to only two per relevé.

The Nuphar variegatum Nodum is found most frequently in ombrotrophic mire with 50% of the relevés occurring here as compared with 29% in transition sites and 21% in rheotrophic mire. The Nodum is restricted to the aquatic areas of these mire types.

Approximately 66% of the relevés are from maritime regions with the remainder occurring in continental areas. The Nodum is well distributed in all geographical regions except the Bas Saint-Laurent where it is absent, due to the dry state of the mires.

Topographically, the Nodum is confined to streams and ponds with 25% of the relevés occurring in the former and 75% in the latter. These ratios remain approximately the same for both maritime and continental areas but when mire type is examined it is found that for ombrotrophic sites 2% occur in streams and 98% in ponds, for transition areas 19% are located in streams and 81% in ponds, and for rheotrophic mire 91% are found in streams and only 9% in ponds.

The Nodum has a field layer with 51% average cover ranging from less than 1% to complete coverage, with the majority of the relevés having less than 60% cover. The average ground cover for the Nodum is very low at 10% ranging from a total absence to a high of 100%. Only 53 relevés have a ground layer with the majority of these having less than 30% cover. In addition to these two layers, the presence of an algal layer is recorded for a third of the relevés in the Nodum. No percentage estimates are made, but based on field notes, this layer ranges from low to very high cover. The layer occurs predominantly in ponds, especially those of ombrotrophic mire in both maritime and continental areas, where it spreads out in varying degrees beneath the surface of the pond, but mainly concentrates near the bottom. It rarely is found in the streams of transition and rheotrophic mire. There is no epiphytic cover occurring in the Nodum.

Only four out of ten mire character species are present within the Nodum, with two of these appearing just once, namely, Kalmia polifolia and Smilacina trifolia. The following mire character species are absent:

Vaccinium oxycoccos	Sphagnum rubellum
Drosera rotundifolia	Eriophorum angustifolium
Sarracenia purpurea	Sphagnum recurvum

Chamaedaphne calyculata and Sphagnum magellanicum have only sporadic occurrence with the former having low to very high cover and the latter only very low cover values.

The nodal dominant-character species, Nuphar variegatum is present with moderately high constancy and low to high cover having an importance value of 1.3. It occurs in all mire types in both maritime and continental areas. There are no species that are associated constantly with the nodal dominant.

A total of seven variants occur within the Nodum. The first of these, Variant A, is the largest and is differentiated by Sphagnum cuspidatum of moderate to low cover. It is found primarily in ombrotrophic mire and in maritime areas, but occurs as well in the continental regions of New Brunswick and Lac Saint-Jean. The variant is located predominantly in ponds with an average field and ground cover of 45% and 19% respectively, while there is an average of just three species per relevé.

Variant B has several species as the differentials ranging from low to quite high cover. These include Scirpus subterminalis, Utricularia geminiscapa, Numphaea odorata and Eriocaulon septangulare. The Variant occurs in all mire types in predominantly maritime regions, with the majority of the relevés located in Nova Scotia. It is confined almost entirely to ponds in ombrotrophic and transition mire while occurring only in streams in rheotrophic mire. The average field cover is 56% while 21 of the 37 relevés within the Variant have a ground cover with an average of 14%. The average number of species is low at three per relevé.

Menyanthes trifoliata is the differential species of Variant C, present with moderate to low cover. It is located only in ponds of transition mire, primarily from maritime regions, being absent from New Brunswick. The average field cover is 45% while bryophytes are missing almost completely. There is an average of three species per relevé.

Variant D is differentiated by Utricularia vulgaris with low to very high cover values. It occurs in streams and ponds of both transition and rheotrophic mire. In the former mire type the Variant is found in maritime and continental regions while in the latter it is restricted to maritime sites only. The average field cover is 65% while there are no bryophytes present. The average number of species per relevé is three.

Three *Sparganium* species differentiate the remaining principal variants. Variant E has *Sparganium fluctuans* as the differential with low cover in the maritime area of the Côte Nord and very high cover values in the continental region of western New Brunswick. It is absent from the other geographical areas in which the Nodum is found. The Variant occurs mainly in streams and occasionally in ponds with four of the six relevés belonging to rheotrophic mire and the remaining ones from transition sites. The average field cover is relatively high at 75% while the ground cover is nil. There is an average of four species per relevé.

Sparganium multipedunculatum is the differential of Variant F with moderate to low cover. It occurs only in the streams of rheotrophic mire, principally in maritime regions, being absent from New Brunswick. The nodal dominant-character species is not present in any of the relevés within the Variant. The average field and ground cover is 68% and 20% respectively, the latter layer being absent from the relevés in the Lac Saint-Jean region. The average number of species per relevé is four.

Variant G is differentiated by *Sparganium androcladum* with moderate cover. The algal species *Chara foetida* is a frequent associate with high cover values, while the nodal dominant-character species is absent. The Variant is restricted in its distribution to a single rheotrophic mire in the continental region of Lac Saint-Jean where it is located in a stream flowing through the mire.

There are three sub-variants occurring in the Nodum. The first, Sub-variant "a", occurs mainly within Variant A and is differentiated by *Andromeda glaucophylla* of moderate to low cover. The mire character species *Chamaedaphne* does very well within this Sub-variant.

It is found only in the ponds of ombrotrophic mire principally from continental areas, being absent from Nova Scotia. The average field cover is 62% and ground cover 16% while there is an average of four species per relevé.

Sub-variant "b" occurs within Variant A and partially within Variant B. Cladopodiella fluitans is the differential of moderate to low cover. It is found only in ponds principally in maritime regions in ombrotrophic and transition mire, being absent from Lac Saint-Jean. The average field and ground cover is 46% and 35% respectively with an average of five species per relevé.

Rhynchospora alba with low cover values differentiates Sub-variant "c" which occurs within Variants A and B. The associate species Sphagnum pylaesii is present in 50% of the relevés while the companion species Myrica gale and Drosera intermedia occur frequently here. All of these species have low cover values. The nodal dominant-character species is absent. The Sub-variant is found only in the maritime region of Nova Scotia where it is located mainly in the ponds of transition mire while a single relevé occurs in a stream in ombrotrophic mire. The average field cover is 55% and the ground cover 61% while the average number of species per relevé is six.

Approximately 18% of the relevés are not associated with either the principal variants or the sub-variants. The majority of these (13 relevés) contain only Nuphar and usually have an algal layer present as well. They are located in the ponds of ombrotrophic and transition mire predominantly in continental areas (being absent in Nova Scotia) and, in a single relevé, in the stream of a rheotrophic section of peatland. The average field cover for these relevés is

40%. The remaining relevés occur in the streams of rheotrophic mire in the maritime region of Nova Scotia and in the ponds of ombrotrophic and transion sites in both maritime and continental areas. They have an average of three species per relevé, and, aside from the nodal dominant, have little else in common.

The following species along with their importance values reach their optimum level of development in mires within this Nodum:

Scirpus subterminalis (0.4)	Sparganium multipedunculatum (0.1)
Utricularia geminiscapa (0.3)	Eriocaulon septangulare (0.1)
Utricularia vulgaris (0.2)	Potamogeton epihydrus (0.1)

The last species occurs only in streams of rheotrophic mire in maritime regions. A large number of species are exclusive to this Nodum. These include:

Nymphaea odorata	Potamogeton filiformis
Sparganium fluctuans	Fontinalis antipyretica
Utricularia minor	Chara foetida
Sparganium androcladum	Potamogeton natans
Potamogeton confervoides	Brasenia schreberi

Sphagnum cuspidatum Nodum (Table 18)

The description is based on a total of 116 sampled relevés for which 53 species are recorded, with 24% of these occurring only once. The average number of species per relevé is comparatively low at six. For maritime regions this figure drops slightly to five while in continental areas it increases to seven per relevé.

The Sphagnum cuspidatum Nodum occurs only in the wettest sections of peatland. Approximately 64% of the relevés are found in ombrotrophic mire, 35% in transition sites and only 1% in rheotrophic.

The Nodum occurs extensively throughout the study area and is found in all geographical regions except the Bas Saint-Laurent. It is located in both maritime and continental sites with 55% of the relevés occurring in the former and 45% in the latter.

The majority of the relevés in the Nodum are found in depressions (61%) with most of the remaining ones occurring in partially filled-in ponds. In the latter situation the Nodum sometimes forms part of the mosaic of floating vegetation mats that extend out into a pond from its marginal area. When the topographical features are examined in terms of maritime and continental environments it is found that in the former the Nodum is located more frequently in ponds (55% of the relevés) while in the latter it is found predominantly in depressions with 83% of the relevés occurring here. Similar ratios occur when mire types are compared. In ombrotrophic sites 54% of the relevés are located in ponds while in transition mire 88% are found in depressions.

The average field cover for the Nodum is 43% ranging from nil to 99%

with the majority of the relevés having less than 50% cover, while the average ground cover is 99.6% (range 90% to 100%) with most of the relevés having complete cover. There is no epiphytic cover present in the Nodum.

All of the mire character species are found within the Nodum, most of them having very low cover values. The exceptions are Chamaedaphne calyculata which sometimes occurs with very high cover and Eriophorum angustifolium with sporadic occurrence and moderate to low cover. The former species, along with Vaccinium oxycoccos, Drosera rotundifolia and Sphagnum magellanicum, are present in all the geographical regions in which the Nodum is found while the others have restricted distributions.

The nodal dominant-character species Sphagnum cuspidatum is constant with very high cover having an importance value of 4.9. It occurs in loose mats in both ponds and depressions and is often the only bryophyte present. There are no species constantly associated with the nodal dominant.

There are three principal variants within the Nodum, two of which have sedges as differentials. The first, Variant A, has Cladopodiella fluitans and Rhynchospora alba as the differentiating species, the former occurring with low to high cover while the latter has low to moderate cover values. The Variant occurs predominantly in ombrotrophic mire and occassionally in transition sites. It is found in both maritime and continental areas in depressions and partially filled-in ponds. The average field cover is 42% while the average number of species per relevé is seven.

Variant B has Scheuchzeria palustris, Carex oligosperma and

Eriophorum tenellum as differentials all with mainly moderate to low cover with the first two having higher constancy than the last. The mire character species do not occur frequently within this Variant. The Variant is located almost exclusively in transition mire mainly in continental regions and only occasionally in maritime areas, being entirely absent from Nova Scotia. Only three out of 34 relevés are from ombrotrophic mire and these are all in continental sites. The Variant is found mainly in depressions with 88% of the relevés occurring here while only 9% are located in ponds. The average field cover is low at 38% while there is an average of six species per relevé.

Nuphar variegatum is the differential of Variant C with moderate to low cover values. It is found only in ponds in ombrotrophic mire from maritime areas, mainly from the Côte Nord. There are no mire character species within the Variant and in five out of seven relevés the only other species present is the nodal dominant. The average field cover is comparatively low at 38% while there is an average of only two species per relevé.

Along with the principal variants there are three sub-variants present as well. The first of these, Sub-variant "a", is associated partially with Variant A and is differentiated by Vaccinium macrocarpon which occurs mainly with moderate to high cover. The mire character species Chamaedaphne does very well within this Sub-variant where it dominates the field layer in 50% of the relevés. These two species along with the nodal dominant make up dense vegetation mats which float on the surface of ponds, growing out from the marginal areas. These mats only occur in ombrotrophic sites in both maritime and continental regions but appear to be absent in Nova Scotian mires.

The average field cover is quite high at 82% and the average number of species per relevé is five.

Several species differentiate Sub-variant "b" which occurs mainly within Variant A. These species include Andromeda glaucophylla, Eriophorum virginicum, Drosera intermedia and Drosera anglica, none of which have very high cover. The Sub-variant is predominantly a feature of ombrotrophic mire in both maritime and continental areas. It does not occur, however, in mires examined from Nova Scotia. It is found in depressions and partially filled-in ponds and has an average field cover of 51% while there is an average of seven species per relevé.

Sub-variant "c" is associated with Variant B and has Myrica gale and Carex lasiocarpa as the differentials, the former with low cover while the latter has low to high cover values. Vaccinium macrocarpon is a frequent associate along with the mire character species Chamaedaphne. The Sub-variant is restricted in its distribution to a single transition section of mire from continental New Brunswick. It is found only in depressions and has an average field cover of 66% with an average of eight species per relevé.

Only a single relevé in the Nodum is from rheotrophic mire with Myrica gale as the most prominent species in the field layer. The relevé is located in the maritime region of Nova Scotia and has none of the mire character species present. In addition to this relevé there are a small number which are not associated with either the principal variants or the sub-variants. The only feature these relevés have in common, in addition to the nodal dominant, is that they all occur in maritime regions principally from the Côte Nord.

Apart from the nodal dominant, there are no species which reach their optimum level of development in mires within this Nodum. One species, Eriophorum virginicum with an importance value of 0.2, does as well here as in other noda. It occurs in all geographical regions except Nova Scotia and has predominantly low cover values. There are no species exclusive to the Nodum.

Sphagnum majus Nodum (Table 19)

The following description is based on 16 sampled quadrats for which 31 species are recorded. The average number of species per relevé is six. For maritime regions this figure is slightly higher at seven while in continental areas it drops to five per relevé.

The Sphagnum majus Nodum is found only in the wetter sections of transition mire.

The Nodum occurs predominantly in maritime regions with 75% of the relevés located in Nova Scotia and the Côte Nord. The remaining 25% are all from the Lac Saint-Jean area. The Nodum is absent from New Brunswick and the Bas Saint-Laurent.

Topographically, the Nodum occurs in partially filled-in ponds and depressions with 19% of the relevés located in the former and 81% in the latter.

The average field cover is 46% ranging from a low of only 5% to a high of 85%, while the average ground cover is 98% (range 80% to 100%) with the majority of the relevés having complete cover in this layer. There is no epiphytic cover recorded for the Nodum.

Only 60% of the mire character species are present. None of them occur with very high frequency or cover. Sarracenia purpurea, Smilacina trifolia and Sphagnum magellanicum are restricted in their distribution to Nova Scotian mires with the latter two occurring only once. Those missing altogether include Kalmia polifolia, Eriophorum angustifolium, Sphagnum rubellum, and Sphagnum recurvum.

The nodal dominant-character species, Sphagnum majus is present constantly with very high cover, having an importance value of 4.8. It occurs in loosely knit mats and is frequently the only bryophyte present.

Three variants occur within the Nodum two of which have sedges as differentials. Variant A is differentiated by Menyanthes trifoliata which has cover values ranging from low to very high. There are no associate species exclusive to this Variant, although the mire character species Drosera rotundifolia and the companion Rhynchospora alba occur frequently within it. The Variant is found mainly in depressions in both continental and maritime sites with its best development occurring in Nova Scotia. The average field cover is 46% while there is an average of six species per relevé.

Variant B has two differentials, namely, Scheuchzeria palustris and Carex limosa both with mainly low cover values. There is almost a complete absence of mire character species within this Variant. It occurs in the maritime region of the Côte Nord and is located in a single mire in the Lac Saint-Jean area, while being absent from Nova Scotia. The Variant is found occasionally in partially filled-in ponds but occurs more frequently in depressions. The average field cover is comparatively low at 40% while the average number of species per relevé is seven.

Variant C has Carex oligosperma as the differential with moderate to low cover. Like Variant B, it almost has a complete absence of mire character species. It is found only in depressions in the maritime and continental areas of the Côte Nord and Lac Saint-Jean respectively. The Variant has an average field cover of 44% with an average of only five species per relevé.

There are three relevés which are not associated with the principal variants. These are all from maritime regions and in two of them sedges form a prominent part of the field layer. Aside from the nodal dominant the only other species present constantly in these relevés is the mire character Vaccinium oxycoccos.

The following species along with their importance values reach their optimum development in mires within this Nodum, namely, Menyanthes trifoliata (0.9), Scheuchzeria palustris (0.5) and Juncus brevicaudatus (0.3), the last occurring only in maritime sites. Species which do equally well here as in other noda include Carex limosa (0.4) and Carex vesicaria (0.2), the latter being recorded with moderately high cover from a single relevé in a mire along the Côte Nord. There are no species exclusive to this Nodum.

Sphagnum pulchrum Nodum (Table 20)

The description is based on 51 sampled quadrats for which 73 species are recorded with 35% of these occurring only once. The average number of species per relevé is nine. In maritime regions the average is slightly higher at ten while in continental areas it is much lower at six per relevé. When mire type is considered the average for ombrotrophic peatlands is 11 and for transition areas eight. The number of relevés in rheotrophic mire is not large enough to produce a meaningful figure.

The *Sphagnum pulchrum* Nodum is confined almost entirely to the damper areas of peatland with 80% of the relevés occurring in transition mire, 18% in ombrotrophic and only 2% in rheotrophic.

The Nodum is a frequent feature of mires in Nova Scotia, the Côte Nord and Lac Saint-Jean while being quite rare in New Brunswick and the Bas Saint-Laurent. Although approximately two-thirds of the mires occur in maritime areas it does not appear to have a preference for this type of environment over a continental one.

Topographically, 65% of the Nodum's relevés are located in depressions. This includes the majority of the relevés in both ombrotrophic and transition mire as well as the single relevé that occurs in rheotrophic mire. There are 35% of the relevés occurring in hummocky areas and none on distinct hummocks. When the topographical features are examined in terms of environmental regions a pattern emerges which has 30 of the 34 relevés in maritime areas located in depressions while in continental regions only three out of 17 relevés occur here, the majority (14) being found in hummocky areas.

The Nodum has a moderately developed field layer with an average cover of 44% ranging from a low of 10% to a high of 95% with the majority of the relevés having less than 50% cover. The bryophytes form the dominant layer with a very high average cover of 99.8%. Only three relevés have less than 100% cover with the lowest of these being 95%. There are just two relevés with an epiphytic cover which is very low in each case, these relevés occurring in the driest areas in which this Nodum is found.

All ten of the mire character species are present within the Nodum, 50% of which are found to a greater or lesser extent in all geographical regions, the exceptions being Drosera rotundifolia, Kalmia polifolia and Eriophorum angustifolium which are absent from New Brunswick and Sphagnum rubellum which did not occur in the Bas Saint-Laurent or Lac Saint-Jean regions, while Sphagnum recurvum is found only from the Côte Nord where it is recorded in a single relevé. None of the mire character species has high constancy and each one is present in the majority of cases with low cover values.

The nodal dominant-character species is Sphagnum pulchum always present with high cover having an importance value of 4.7. It occurs usually in loosely knit mats sometimes being the only bryophyte present. It has no constant associates.

The variants that occur within the Nodum are differentiated primarily by sedges. The exception to this is Variant A which consists of only two relevés and has Ledum groenlandicum as the differential species with moderate to low cover. Kalmia angustifolia is a constant associate while the mire character species Chamaedaphne calyculata does well here. The Variant occurs in hummocky areas of ombrotrophic mire in maritime regions and is found only in the Saint Lawrence River

Valley. The relevés are from mire sections that appear to be relic aspects of much wetter conditions that once prevailed. The average field cover is very high at 85% while the average number of species per relevé is relatively high at 13. The Variant contains the only epiphytic cover recorded for the Nodum.

Variant B is floristically related to Variant A in that it contains both Ledum and Kalmia angustifolia as associates of low cover for the differential Carex stricta which has moderately high cover values. Also, the mire character species Sphagnum magellanicum does quite well within both variants, frequently having moderate cover, while the companion species Vaccinium angustifolium is exclusive to these two variants. Variant B differs from A in that it occurs only in transition mire in maritime areas, mainly in depressions with an average field cover of 60%. The average number of species per relevé is 12.

Variant C has Rhynchospora alba as the differential with Carex exilis as a moderately frequent associate, both of low cover, with the latter confined mainly to ombrotrophic mire. There are several companion species which occur more frequently within the Variant than elsewhere in the Nodum. Included here are Vaccinium macrocarpon, Cladopodiella fluitans, Drosera intermedia and Sphagnum tenellum. The Variant is found in depressions, predominantly in maritime areas in both ombrotrophic and transition mire with the majority of the relevés located in Nova Scotia. The average field cover is low at 27% and the average number of species per relevé is 11.

Carex limosa differentiates Variant D with Scheuchzeria palustris as a frequent associate, both with predominantly low cover values. The

Variant occurs in depressions and on hummocky surfaces in transition mire with the majority of the relevés located in continental regions. It is absent from Nova Scotia and the Bas Saint-Laurent. The average field cover is 40% while the average number of species per relevé is low at seven.

Variant E has Carex oligosperma as the differential species, occurring mainly with moderate cover. There are no associate species present. The Variant occurs sometimes in maritime regions in the depressions of transition mire but is found more often on hummocky surfaces in continental areas in both transition and ombrotrophic sites (the former much more frequently than the latter). The average field cover is 42% and the average number of species per relevé is quite low at six.

Three sedges differentiate Variant F, all occurring with moderate frequency and low to moderate cover. These include Carex aquatilis, Carex lasiocarpa and Carex rostrata. There are no associate species present. The Variant occurs mainly in the depressions of transition mire in maritime regions. The only exception to this is Relevé 900 which occurs in the continental area of Lac Saint-Jean in rheotrophic mire. The field layer within the Variant has an average cover of 48% while there is an average of only eight species per relevé.

When the three differentials of Variant F are examined separately as individual variants, differences between them become more evident. The Carex aquatilis "variant" has 70% of the mire character species present and an average field cover of only 35% with an average of eight species per relevé. On the other hand, the Carex lasiocarpa "variant" has only 40% of the mire character species present. The average field cover is 56% and the average number of species per relevé is low at seven, while the Carex rostrata "variant" with 70% of the mire character species has an average field cover of 65% and an average of ten species per relevé. Within the latter "variant" the companion species Andromeda glaucophylla and Sphagnum papillosum are present constantly.

A small number of relevés are not associated with the variants. These occur in transition mire in both maritime and continental areas, being confined to depressions in the former and hummocky surfaces in the latter. The companion species Myrica gale occurs with moderate to high cover values in the majority of these relevés.

No species, aside from the nodal dominant, reach their optimum level of development within this Nodum, but Sphagnum tenellum with an importance value of 0.1 does as well here as in other noda. It is found only in Nova Scotia within the Nodum. The only species exclusive to the nodal group is Eleocharis calva which occurs in a single relevé from a Nova Scotian mire.

Sphagnum papillosum Nodum (Table 21)

The description is based on 51 sampled relevés for which 76 species are recorded, with 29% of these occurring only once. There is an average of ten species per relevé. This figure remains the same for both maritime and continental areas. In transition mire the average increases slightly to 11 while in rheotrophic and ombrotrophic sites it drops to nine and eight respectively.

The *Sphagnum papillosum* Nodum is predominantly a feature of transition mire with 82% of the relevés occurring here, while being present only occasionally in rheotrophic and ombrotrophic peatlands. It is found only in the damper sections of these mire types.

Approximately 55% of the relevés are from maritime regions while the remainder occur in continental areas. When examined in terms of mire type the same ratio applies for the relevés of transition mire while those of ombrotrophic sites are only from continental areas and those of rheotrophic mires only from maritime regions. The Bas Saint-Laurent is the only geographical area where the Nodum is not found, the mires here being generally very dry.

The relevés within the Nodum are located mainly in depressions (41%) and on hummocky surfaces (45%) with the remainder occurring on distinct hummocks. The latter situation is found only in transition and rheotrophic mire, predominantly in maritime regions.

The Nodum has a moderately developed field layer with an average cover of 45% (range 7% to 90%) with the majority of the relevés having less than 50% cover, while the ground layer is very well developed with an average cover of 99.9%. Only four relevés have less than 100%

cover with the lowest being 98%. An epiphytic cover is recorded in only three relevés, each at less than 1%.

All of the mire character species are present within the Nodum. Only Chamaedaphne calyculata and Vaccinium oxycoccos occur with moderately high frequency. The majority of these species are found in all the geographical areas where the Nodum is located, the exceptions being Drosera rotundifolia which is absent within the relevés around Lac Saint-Jean, and Sphagnum recurvum which is missing from the Côte Nord, while Eriophorum angustifolium is present only in the continental regions of New Brunswick. None of the mire character species have very high cover values.

The nodal dominant-character species is Sphagnum papillosum, constantly present with high cover, having an importance value of 4.7. It is a robust yellowish Sphagnum and plays a role in the early initiation and development of hummocks. There are no species constantly associated with it.

A single large variant is present within the Nodum which is differentiated by three species that occur together or separately and which have low to moderate cover values. These species include Andromeda glaucophylla, Sphagnum pulchrum and Myrica gale. The first two are absent in rheotrophic mire while the last is missing from ombrotrophic sites. The three occur together only in transition mire in maritime regions. The Variant is considered to be a floristic one only, as it covers a wide range of ecological conditions, occurring in all mire types as well as in maritime and continental areas.

Several sub-variants occur within the principal Variant all having one or more sedges as differentials. The first of these, Sub-variant "a" is differentiated by Sphagnum cuspidatum and Rhynchospora alba both with predominantly low cover values. The Sub-variant is found in transition mire in both maritime and continental regions while occurring in ombrotrophic mire only in continental areas. It never occurs in rheotrophic mire. The Sub-variant represents some of the dampest conditions in which the Nodum is found. The average field cover is quite low at 34% while the average number of species per relevé is ten.

Sub-variant "b" has Carex oligosperma, Carex limosa and Scheuchzeria palustris as the differentials, none of which have very high cover values. The Sub-variant is found mainly in transition mire in continental sites. It is absent entirely from Nova Scotia. Only two relevés occur in ombrotrophic mire both from continental regions. The average field cover for the Sub-variant is 42% while there is an average of ten species per relevé.

Carex lasiocarpa is the differential species of Sub-variant "c" present with moderate to low cover. It occurs only on hummocky surfaces of transition mire in continental areas. Aside from the nodal dominant, only the mire character species Chamaedaphne is present constantly. The average field cover for the Sub-variant is 50% and the average number of species per relevé is 11.

Sub-variant "d" has Carex aquatilis as the differential, generally of low cover. The differential of the principal Variant, Myrica gale, is present constantly within this Sub-variant which is found only in Nova Scotia where it occurs in both transition and rheotrophic mire. The average field cover is 47% while there is an average of ten species per relevé.

Carex brunnescens differentiates Sub-variant "e" with the mire character species Chamaedaphne and Sphagnum recurvum being present constantly. This Sub-variant is encountered only from the rheotrophic section of a single coastal mire in eastern New Brunswick. Its average field cover is relatively high at 72% while the average number of species per relevé is nine.

Sub-variant "f" has Carex exilis as the differential of moderate and very low cover. Scirpus cespitosus is a frequent associate with moderate cover values. The mire character species Drosera rotundifolia is present constantly while the companion species Sphagnum angermannicum occurs more frequently here than elsewhere within the Nodum. The Sub-variant is found only in transition mire in the maritime regions of Nova Scotia and the Côte Nord. It has an average field cover of 62% with the average number of species per relevé being comparatively high at 14.

Only one relevé (1197) is not associated with either the principal Variant or the sub-variants. It occurs in transition mire in continental New Brunswick and has Juncus filiformis as a distinguishing feature of the field layer.

Two species reach their optimum level of development within mires in this Nodum. They are, along with their importance values, Sphagnum angermannicum (0.1) and Sanguisorba canadensis (0.1), the latter occurring only from the Côte Nord in transition mire. The following species do as well here as in other noda, namely, Andromeda glaucophylla (0.5) and Carex pauciflora (0.1). Scirpus hudsonianus is the only species exclusive to this Nodum. It occurs with low cover in a transition mire in the Lac Saint-Jean area.

Sphagnum magellanicum Nodum (Table 22)

The description is based on 53 sampled quadrats for which a total of 90 species are recorded with 40% of these occurring only once. The average number of species per relevé is 11. For relevés in continental areas the average is ten while in maritime regions it is 13.

The Sphagnum magellanicum Nodum is found most frequently in transition mire with 56% of the relevés occurring here, as compared with 38% in ombrotrophic mire and only 6% in rheotrophic sites. The Nodum occurs nearly always in the damper sections of these mires and only rarely does it appear in the drier areas of ombrotrophic mire.

The majority of the sampled relevés, approximately 64%, are located in continental sites but there seems to be no evidence to indicate a preference for this type of environment over a maritime one. The Nodum is distributed throughout the study area but is a very rare feature in the Bas Saint-Laurent due mainly to the predominance in this region of dry ombrotrophic mire.

The topography within the Nodum consists primarily of hummocky or gently undulating surfaces. This is true for 55% of the relevés while 34% are found on distinct hummocks and only 11% occur in depressions. This reflects the cushion-forming nature of Sphagnum magellanicum. When the topographical features are examined in terms of mire type a pattern emerges which shows that in the 20 relevés sampled in ombrotrophic mire only 5% occur on hummocks while the vast majority (80%) are confined to hummocky surfaces, with the remaining 15% located in depressions. In transition mire, 47% of the relevés occur on hummocks, 43% in hummocky areas and 10% in depressions, whereas, in rheotrophic mire the Nodum is found only on hummocks.

Two strata exist within the Nodum. The field layer has an average cover of 59% (range 3% to 97%) with the majority of the relevés having greater than 50% cover while the average ground cover is very high at 99.8% (range 95% to 100%) with only five quadrats having less than 100% cover. The epiphytic cover for the Nodum is recorded in only six relevés the majority of these having cover of less than 1%.

All of the mire character species are present within the Nodum and two of these serve as nodal dominant-character species as well, namely, Sphagnum magellanicum and Chamaedaphne calyculata. With the exception of these two all the rest have moderate to low cover values with Vaccinium oxycoccos and Kalmia polifolia being present in all the major geographical regions. Most of the other mire character species have restricted distributions. Sarracenia purpurea and Smilacina trifolia are absent or almost completely so from the Côte Nord within this Nodum while Eriophorum angustifolium and Sphagnum recurvum show very strong preference for continental sites. Sphagnum rubellum is absent almost entirely from Lac Saint-Jean.

The nodal dominant-character species Sphagnum magellanicum is constant and has an importance value of 4.5. It distinguishes the Nodum by its robust structure and frequently occurring red coloration. The other nodal character species Chamaedaphne calyculata occurs with high constancy and low to high cover. Its highest cover values are restricted to continental sites, mainly on transition hummocks where the average number of species is low at eight per relevé.

There are four variants within the Nodum two of which are distinguished by sedges and two by woody vasculars. The former have much lower field cover averages than the latter. Variant A has Carex oligosperma as the differential species, constant and usually of low cover. It is found predominantly in transition mire in continental areas where it occurs in damper sections often on gently undulating topography. The average field cover for relevés in this Variant is 56%. Scheuchzeria palustris is associated frequently with the differential but is always of low cover.

Variant B is differentiated by Myrica gale. Twelve relevés are included in this Variant, eight of which occur in transition mire, three in rheotrophic and one in ombrotrophic. Myrica has its highest cover values in rheotrophic mire and in Relevé 1149 it completely dominates the field layer. The Variant is found in all regions except the Bas Saint-Laurent and shows no preference for either a continental or maritime environment. The average field cover is relatively high at 71%. There are no species exclusively associated with the differential.

Two members of the Ericaceae, Ledum groenlandicum and Kalmia angustifolia, differentiate Variant C, both occurring with moderate to low cover. The former species is found in all regions except the Bas Saint-Laurent while the latter occurs mainly in continental sites, especially from New Brunswick. The Variant shows no strong preference for maritime or continental areas and occurs with almost equal frequency in both transition and ombrotrophic mire. In the former mire type it is confined nearly always to hummocks while in the latter it is found mainly on hummocky surfaces sometimes in slightly drier areas. The average field cover for the relevés in this Variant is quite high at 81%.

Variant D has Eriophorum virginicum and Eriophorum spissum as the differentials, both with moderately high frequency and predominantly low cover values. Although the Variant occurs in both maritime and continental areas it is restricted in its distribution, being absent from the Bas Saint-Laurent and almost entirely so from Nova Scotia and Lac Saint-Jean. It occurs only once in each of the latter two regions where it is found on hummocks in transition mire. The overall majority of relevés in this Variant, however, occur in ombrotrophic mire where they are confined mainly to hummocky surfaces. The average field cover for the variant is 51%.

A small number of relevés do not occur within the variants. These have an average of only eight species per relevé and occur mainly in transition mire and in continental areas. In three of these relevés the mire character species Smilacina trifolia is present with moderate to high cover values.

There are no species that reach their optimum development in mires within this Nodum but a few do as well here as in other noda. These include, with their importance values, the mire character species Eriophorum angustifolium (0.3) and the differential Eriophorum virginicum (0.2) as well as the two companion species Andromeda glaucophylla (0.5), with frequent occurrence and mainly low cover in all geographical regions, and Betula glandulosa (0.1) with very infrequent and restricted distribution being recorded only from the Lac Saint-Jean area. The only species exclusive to this Nodum is Rubus hispidus which is confined to a single relevé in a transition site in Nova Scotia.

Sphagnum recurvum Nodum (Table 23)

The following description is based on a total of 47 relevés for which 100 species are recorded, with 43 of these occurring only once. The average number of species per relevé is ten. This figure remains the same for continental sites but increases to an average of 14 for maritime ones. When mire type is considered rheotrophic sites have an average of 13 species per relevé, ombrotrophic have 12 and transition only nine.

In the Sphagnum recurvum Nodum 36% of the relevés are from ombrotrophic mire, 49% from transition and 15% from rheotrophic. Most of the quadrats from the latter two mire types are located in damper sections while the majority of those from the former occur in slightly drier areas.

The Nodum shows a strong preference for a continental environment with 83% of the relevés located here. The Nodum's best development is found in the mires around Lac Saint-Jean where it often covers extensive areas of peatland (see Fig 9a). It is absent from the coastal mires of New Brunswick and almost entirely so from Nova Scotia and the Bas Saint-Laurent while occurring in only three out of 21 mires examined along the Côte Nord.

The majority of the relevés within the Nodum are found on hummocky surfaces (81%). This includes all of the quadrats from ombrotrophic mire and most of those from transition and rheotrophic mire when these occur in continental areas. In maritime regions the majority of the relevés from the latter two mire types are found in depressions. Only two relevés within the Nodum are located on distinct hummocks, both from continental sites.

The average field cover for the Nodum is moderately high at 63% ranging from a low of 25% to a high of 97% with the majority of the relevés having greater than 50% cover. The ground layer provides the dominant cover with an average of just over 99% (range 90% to 100%) with most of the relevés having complete coverage. An epiphytic cover is recorded in only 11 relevés with an average of less than 1%.

The Nodum contains all of the mire character species with Sphagnum recurvum being the nodal dominant as well. It is also the only one to occur in the single relevé from Nova Scotia. Examination of the other mire character species reveals that Chamaedaphne calyculata and Smilacina trifolia occasionally attain fairly high cover values while all the other species have only moderate to low cover. Vaccinium oxycoccos is the only species to occur with quite high frequency.

The nodal dominant species Sphagnum recurvum is present in all relevés with very high cover having an importance value of 4.8. It usually occurs in loose carpets and in 25% of the relevés is the only bryophyte present. It has no constant associates.

There are three major variants which occur within the Nodum. The first, Variant A, is differentiated by Myrica gale with low to moderately high cover values. Sphagnum papillosum is a frequent associate especially in maritime areas while the companion species Alnus rugosa is confined mainly to this Variant within the Nodum. The relevés of the Variant occur with almost equal frequency in both rheotrophic and transition mire. This is also the case for maritime and continental sites where in the former the relevés are found mainly in depressions while in the latter they are confined to hummocky surfaces. The average field cover for the Variant is very high at 87% while the average number of species per relevé is 12.

Carex oligosperma is the differential of Variant B occurring with moderate to low cover while Ledum groenlandicum is an associate of moderate frequency being confined almost entirely to ombrotrophic sites within this Variant. The relevés in the Variant are found mainly on hummocky surfaces in both transition and ombrotrophic mire and are restricted almost exclusively to continental sites, with most of them located in the Lac Saint-Jean region. The average field cover is 51% while the average number of species per relevé is comparatively low at nine.

Ledum groenlandicum which occurs as an associate of Variant B becomes the differential of Variant C where it is present with low to very high cover values. Carex oligosperma is a frequent associate while the companion species Kalmia angustifolia occurs more often in this Variant than elsewhere within the Nodum. The Variant is confined almost exclusively to the hummocky surfaces of ombrotrophic mire from continental areas. Only Relevé 936 occurs in a transition mire where it is located on a distinct hummock. The average field cover is moderately high at 69% while the Variant has an average of 13 species per relevé. Most of the recordings of epiphytic cover for the Nodum occur in this Variant.

Several sub-variants are found within the principal variants. The first of these, Sub-variant "a", occurs within Variant A and is differentiated by Carex stricta with low to moderate cover values.

It is found only in continental regions on hummocky surfaces in transition and rheotrophic mire. Sub-variants "b" and "c" occur within Variant C. The former is differentiated by Sphagnum fuscum and Pleurozium schreberi, both of low cover, and represents some of the drier areas in which the Nodum is found. The companion species Pohlia sphagnicola is present almost constantly. The Sub-variant occurs only on hummocky surfaces of ombrotrophic mire mainly in continental sites. Sub-variant "c" has Salix pedicellaris as the differential species with Drepanocladus uncinatus and Betula pumila as constant associates along with the companion species Andromeda glaucophylla and Carex exilis. All of these species are present with low cover values. This Sub-variant occurs on hummocky surfaces of ombrotrophic mire. It is found only in a single mire in the continental region of northwestern New Brunswick.

A small number of relevés are not associated with either the principal variants or the sub-variants. These occur predominantly in continental regions and are found in the different mire types. The relevés all have sedges as a noticeable feature of the field layer. Otherwise, apart from the nodal dominant, they have little else in common.

The only species to reach its optimum level of development in mires within this Nodum, aside from the nodal dominant, is Carex oligosperma with an importance value of 0.6. A small number of species do equally well here as in other noda. These include, along with their importance values, the mire character species Eriophorum angustifolium (0.3) and the companions Andromeda glaucophylla (0.5), Carex limosa (0.4), Carex pauciflora (0.1) and Betula glandulosa (0.1), the last occurring only in the Lac Saint-Jean region. Two species are exclusive to the Nodum, namely, Drepanocladus uncinatus, and

Carex chordorrhiza, the latter located in a single transition mire near Lac Saint-Jean.

Sphagnum russowii Nodum (Table 24)

The description is based on only four relevés for which 39 species are recorded. The average number of species per relevé is 15. In maritime areas the average is slightly higher at 16 while in continental regions it remains the same at 15.

The *Sphagnum russowii* Nodum is found in slightly drier areas of both rheotrophic and ombrotrophic mire. Based on extensive surveys of the mires within the study area the Nodum appears to be a very rare feature.

The Nodum is encountered only in New Brunswick and Lac Saint-Jean in both maritime and continental sites.

Topographically, the Nodum occurs only on hummocks in rheotrophic mire and on gently undulating surfaces in ombrotrophic areas.

There are only two strata within the Nodum. The field layer has a high degree of cover with an average of 77%, ranging from a low of 65% to a high of 90%. The ground layer dominates the Nodum with all the relevés having 100% cover. There is no epiphytic cover observed in any of the quadrats.

There are 80% of the mire character species present within the Nodum none of which are constant and all having generally low cover values. *Chamaedaphne calyculata*, *Sphagnum rubellum* and *Sphagnum magellanicum* occur in both rheotrophic and ombrotrophic mire while *Kalmia polifolia*, *Sarracenia purpurea*, *Vaccinium oxycoccos*, *Drosera rotundifolia* and *Eriophorum angustifolium* are found only in ombrotrophic mire, the last two occurring just once.

The nodal dominant-character species is Sphagnum russowii which is constant with high cover having an importance value of 4.8. It completely dominates the ground layer. There are two associate species, namely, Myrica gale and Ledum groenlandicum. The former is present constantly with low to high cover values, dominating the field layer in Relevé 1073, while the latter is present in the majority of the quadrats but with low cover.

There are two variants within the Nodum. Variant A is differentiated by Alnus rugosa with Calamagrostis canadensis, Spiraea latifolia and Viola pallens as constant associates. All these species are of low cover. This Variant occurs in the rheotrophic mires of continental sites. Variant B has Kalmia angustifolia as the differential with Rubus chamaemorus being the constant associate. It is found only in ombrotrophic mire in maritime areas where both species occur with moderate to low cover.

The only companion species to occur more than once is Andromeda glaucophylla. There are no species exclusive to this Nodum.

<u>Calamagrostis canadensis</u> - <u>Myrica gale</u> Nodum (Table 25)

The description is based on a total of 61 sampled relevés for which 136 species are recorded, with 32% of these occurring just once. The average number of species per relevé is nine. This figure remains the same for both maritime and continental areas, whereas, in rheotrophic mire it is slightly lower at eight and in transition mire it increases to ten per relevé.

The <u>Calamagrostis canadensis</u> - <u>Myrica gale</u> Nodum is found in the damper sections of rheotrophic and transition mire with 74% of the relevés occurring in the former and 26% in the latter. It is never found in ombrotrophic sites.

The Nodum occurs in all geographical regions except the Bas Saint-Laurent. Its best distribution is in Nova Scotia where it is found in nine out of 35 examined mires. Approximately 64% of the relevés are located in maritime regions while the remainder are from continental areas.

The Nodum is found predominantly in depressions with 97% of the relevés occurring here and only 3% located in ponds, the latter all from transition mire. These percentages remain approximately the same for both maritime and continental regions.

Structurally, the Nodum consists of a well developed field and poorly developed ground layer. The average field cover is 79% ranging from 25% to 100% with the majority of the relevés having greater than 70% cover. The average ground cover is only 90% (range nil to 60%) with this layer being absent in a third of the relevés. There is no epiphytic cover occurring within the Nodum.

All ten of the mire character species are present in the Nodum but none of them are of common occurrence and in most cases their cover is low. These species are found most frequently in Nova Scotia while being absent almost completely from New Brunswick and the Côte Nord. In the Lac Saint-Jean region only Chamaedaphne calyculata occurs regularly.

There are three nodal character species which, either together or separately, are found in two-thirds of the relevés and have mainly low to moderate cover values. These species along with their importance values are Calamagrostis canadensis (0.5), Myrica gale (0.5) and Hypericum virginicum (0.2). The first and third occur only in rheotrophic mire while the second is found predominantly in this mire type and occasionally in transition sites from maritime areas.

There are several variants within the Nodum all having Carex species as differentials. Carex lasiocarpa with low to high cover values differentiates Variant A. It is found only in Nova Scotia and Lac Saint-Jean in depressional areas of rheotrophic and transition mire. The average field cover for the Variant is 72% while the ground cover is very low at 1%. There is an average of ten species per relevé.

Variant B has Carex aquatilis as the differential with moderate to very high cover. Spiraea latifolia and Alnus rugosa are frequent associates along with the mire character species Chamaedaphne, all having low cover values. The Variant occurs only in depressions in rheotrophic mire, predominantly in continental regions. It is absent in the mires examined in New Brunswick and the Saint Lawrence River

Valley. There is an average field cover of 85% and ground cover of 2% while the average number of species per relevé is nine.

Carex paleacea is the differential of Variant C occurring with low to moderate cover. Carex limosa and Drepanocladus exannulatus are associates with high constancy, the former having low to moderately high cover and the latter only low cover values. There are no mire character species present. The Variant occurs only in depressional areas of rheotrophic mire in the maritime region of the Côte Nord always being adjacent or near to salt marshes. The average field cover is comparatively high at 93% while the ground cover is only 2%. There is an average of nine species per relevé.

Variant D is differentiated by Carex limosa with Menyanthes trifoliata as a constant associate, neither having very high cover values. There are no mire and nodal character species present within the Variant. It is found in the ponds and depressions of transition mire in the continental region of Lac Saint-Jean. The average field and ground cover is 41% and 20% respectively while the average number of species per relevé is low at five.

Two species differentiate Variant E, namely, Menyanthes trifoliata and Carex pauperoula both having low to moderately high cover. The Variant is located only in maritime regions mainly in depressions and occasionally in ponds of rheotrophic and transition mire with the majority of the relevés occurring in Nova Scotia. There is an average field cover of 73% and ground cover of 16% while the average number of species per relevé is ten.

A single sub-variant is found within the Nodum being mainly associated with Variant A. Carex stricta is the differential of this Sub-variant, having low to moderately high cover values. The associate species Spiraea latifolia has high constancy and low cover. The Sub-variant occurs only in depressions of rheotrophic mire being restricted in its distribution to single mires in Nova Scotia and Lac Saint-Jean. The average field cover is very high at 94% while the ground cover is negligible being less than 1%. There is an average of ten species per relevé.

There are five species which reach their optimum level of development within mires in this Nodum. These include along with their importance values the differential species Carex lasiocarpa (0.4) and the companions Galium tinctorium (0.2) and Carex exilis (0.2), the latter two found only in the maritime regions of Nova Scotia and the Côte Nord. Two other companion species included here are Utricularia intermedia (0.2) and Dulichium arundinaceum (0.2), the latter occurring only in New Brunswick.

A large number of species are exclusive to this Nodum. These include:

Eleocharis smallii	Rhynchospora fusca
Scirpus rubrotinctus	Scirpus validus
Juncus stygius	Plagiothecium denticulatum
Climacium dendroides	Sphagnum palustre
Carex salina	Salix discolor
Cicuta maculata	Salix pyrifolia

Only the first four species occur more than once.

Myrica gale - Chamaedaphne calyculata (Fen) Nodum (Table 26)

The following description is based on 36 sampled relevés for which 115 species are recorded, with 35% of these occurring just once. The average number of species per relevé is 11. In maritime regions the average is ten while in continental areas it reaches a high of 13. When mire type is examined the average for rheotrophic sites is 12 and for transition areas, nine per relevé.

The Myrica gale - Chamaedaphne calyculata (Fen) Nodum is located primarily in the damper sections of rheotrophic and transition mire with 67% of the relevés occurring in the former and 33% in the latter. None of the Nodum's relevés are found in ombrotrophic mire.

The Nodum occurs in all the geographical regions within the study area having its best development in Nova Scotia and the Côte Nord, while practically being absent from the Bas Saint-Laurent and Lac Saint-Jean. Approximately two-thirds of the relevés are from maritime regions and the rest from continental areas.

The Nodum is found predominantly in depressions with 34 out of 36 relevés occurring here, while the remaining ones are located on hummocks. These hummocks are found in rheotrophic and transition sections of the same mire from a coastal region in Nova Scotia.

The Nodum has a very high average field cover of 92% (range 30% to 100%) with the majority of the relevés having greater than 90% cover. The ground layer is poorly developed with an average cover of only 12% ranging from a total absence to 60%. An epiphytic cover is recorded in seven relevés nearly all having less than 1% coverage.

There are nine of the mire character species present but only Chamaedaphne calyculata occurs with regularity and because of its importance within the Nodum it is also one of the nodal dominants. The other mire character species only have sporadic occurrence and none have high cover values. Smilancina trifolia is absent while Eriophorum angustifolium and Sphagnum rubellum occur just once.

There are two nodal dominant-character species, namely, Myrica gale of high constancy and low to high cover and Chamaedaphne with frequent occurrence and low to moderately high cover values. They grow either together or separately sometimes forming a dense canopy in the field layer. There are no species that are associated constantly with the nodal dominants.

There are five variants occurring within the Nodum. Variant A has Carex rostrata as the differential with low to moderate cover. Drepanocladus fluitans is an occasional associate having very low cover values. The Variant is found only in depressions in rheotrophic mire from continental sites and in transition mire primarily from maritime areas. It is absent in Nova Scotia and the Bas Saint-Laurent. The average field and ground cover is 94% and 27% respectively. There is an average of ten species per relevé.

Aster nemoralis is the differential of Variant B while Sphagnum subsecundum and Spiraea tomentosa are constant associates. None of these species have very high cover. The Variant is found only in the depressional areas of a single rheotrophic mire in Nova Scotia. There is an average field cover of 80% and ground cover of 8% while the average number of species per relevé is 14.

Variant C has Carex aquatilis and Potentilla fruticosa as the differentials both constant with moderately high cover values. Epilobium palustre and Carex exilis are constant associates while Carex flava, Rhamnus alnifolia, Eupatorium maculatum and Salix rigida are frequently occurring associates. All these species have very low cover. The companion species Spiraea latifolia and Viola cucullata also are constant within the Variant. Except for Chamaedaphne there is a complete absence of mire character species. The Variant occurs only in the depressional areas of a single rheotrophic mire in the inland region of central Nova Scotia. The average field cover is 95% while that of the ground layer is very low at only 1%. The average number of species per relevé is comparatively high at 17.

Ledum groenlandicum is the differential of Variant D and Vaccinium angustifolium and Kalmia angustifolia are occassional associates. All these species have low to moderate cover values. The Variant is found in depressions and on hummocks in both transition and rheotrophic mire. The majority of the relevés are located in maritime regions including all those found in transition mire. The Variant is absent from New Brunswick and the Bas Saint-Laurent. The average field cover is very high at 97% while the ground cover is 13%. There is an average of nine species per relevé.

Variant E is differentiated by Potentilla palustris with low to moderate cover. Impatiens capensis is a frequent associate while the companion species Calamagrostis canadensis and Galium tinctorium are present constantly. All of these species have very low cover values. The Variant is found only in depressions in rheotrophic mire in the maritime regions of Nova Scotia and the Côte Nord. The average field and ground cover is 86% and 10% respectively while the average number of species per relevé is comparatively low at nine.

Approximately 19% of the Nodum's relevés are not associated with the principal variants. These are primarily from maritime regions in both rheotrophic and transition mire where they are found in depressions. Aside from the nodal dominants they have little else in common.

There are eight species which reach their optimim level of development within mires in this Nodum. These include along with their importance values the differential species Potentilla fruticosa (0.6) and the associates Eupatorium maculatum (0.1), Salix rigida (0.1) and Sphagnum subsecundum (0.1) along with the companions Iris versicolor (0.2), Carex brunnescens (0.2), Pellia epiphylla (0.1) and Senecio aureus (0.1), the last species occurring just once.

A large number of species are exclusive to this Nodum. These include:

Carex flava	Glyceria grandis
Rosa virginiana	Polygonum amphibium
Ilex glabra	Sphagnum girgensohnii
Lophocolea heterophylla	Thuidium recognitum
Equisetum sylvaticum	Ilex verticillata

Only the first four have more than one occurrence.

Sphagnum warnstorfii Nodum (Table 27)

The description is based on only three relevés for which 30 species are recorded. The average number of species per relevé is 18.

The Sphagnum warnstorfii Nodum is found in the damper sections of rheotrophic mire. Based on extensive survey, the Nodum, in its best developed state, appears to be a very rare feature in mires within the study area.

The Nodum has a very restricted distribution with all the sampled relevés being located in a single mire in the continental region of Lac Saint-Jean.

The topography within the Nodum consists of depressions and gently undulating surfaces, with two-thirds of the relevés having the latter topographical feature.

The average field cover for the Nodum is very high at 98%, with this figure being the same for each relevé. The average ground cover is 97% ranging from 95% to 100%, while the epiphytic cover in each relevé is less than 1%.

The only mire character species present is Chamaedaphne calyculata occurring in two of the three relevés with low cover. There are two nodal dominant-character species, namely, Sphagnum warnstorfii and Myrica gale. The former, occurring in loose mats, has very high cover with an importance value of 5.0 while the latter has moderately high cover values and an importance value of 3.3. A large number of species are constant associates, none of which have very high cover.

These include:

Aronia prunifolia
Carex stricta
Galium palustre
Ledum groenlandicum
Lonicera villosa
Spiraea latifolia
Thalictrum polygamum
Aster borealis

There are two species which are exclusive to this Nodum, namely, Viola incognita and Muhlenbergia glomerata. They both have low cover and occur only once.

Sphagnum fimbriatum Nodum (Table 28)

The data is based on a total of 11 relevés for which 42 species are recorded. The average number of species per relevé is ten. In rheotrophic mire this figure drops to eight while in transition sites it is much higher at 17 per relevé.

The *Sphagnum fimbriatum* Nodum is found in the damper sections of rheotrophic and transition mire with 82% of the relevés occurring in the former and 18% in the latter.

The Nodum, in its best developed state, is very restricted in its distribution within the study area. It occurs in only three mires from the maritime regions of Nova Scotia and the Côte Nord. Nearly all the relevés are located in sections of mire close to salt marshes. The exception is Relevé 131 which occurs in a mire that is approximately seven kilometers from the sea.

Topographically, 36% of the Nodum's relevés are found in depressions, 27% on hummocky surfaces and 36% on distinct hummocks. In transition mire the Nodum occurs only in depressions.

The average field cover for the Nodum is 66% ranging from 10% to 93% with the majority of the relevés having greater than 60% cover. The ground layer's average cover is very high at 99% (range 95% to 100%). There is no epiphytic cover present in the Nodum.

There are five mire character species found within the Nodum. Only *Drosera rotundifolia* occurs in all the mire sites but with very low cover. The other species include *Chamaedaphne calyculata*, generally with moderately high cover values, *Vaccinium oxycoccos*, restricted to a single mire along the Côte Nord and Sphagnum rubellum and Sphagnum recurvum, both confined to a transition section of mire from Nova Scotia.

The nodal dominant species, Sphagnum fimbriatum, has very high cover with an importance value of 4.9. It occurs in loose mats and occasionally forms part of the understory cover for Alnus rugosa stands.

There is a single large variant occurring within the Nodum which has Myrica gale as the differential species with low to moderately high cover. Carex paupercula, Hypericum virginicum and Carex paleacea are frequent associates with low to moderate cover values. The last species has its best development in two relevés from a transition section of mire in Nova Scotia. The Variant's other relevés are from a single rheotrophic mire from the Côte Nord. There is an average field cover for the Variant of 74% and ground cover of 99% while the average number of species per relevé is ten.

Two sub-variants occur within the principal Variant. Sub-variant "a" has Empetrum nigrum, Rhynchospora alba and Vaccinium macrocarpon as the differentials with low to moderate cover. Constant associate species include Andromeda glaucophylla, Aster nemoralis, Calopogon pulchellus and Scirpus cespitosus all with low cover values. The Sub-variant is restricted to a depressional area in a single section of transition mire adjacent to a salt marsh in Nova Scotia. The average field and ground cover is 72% and 99% respectively and the average number of species per relevé is 17.

Carex canescens is the differential of Sub-variant "b" while Iris versicolor and Calamagrostis canadensis are constant associates. None of these species have very high cover values. The Sub-variant is confined to hummocks in a rheotrophic mire along the Côte Nord. There is an average field cover of 69% and ground cover of 99% with an average of nine species per relevé.

Several species reach their optimum level of development within mires in this Nodum. These include, along with their importance values, Carex paleacea (1.1) and Hypericum virginicum (0.5), the former with a strong affinity for coastal areas; the differential species Carex canescens (0.3) and the companions Calliergon stramineum (0.2) and Sphagnum squarrosum (0.1), the latter occurring just once.

The only species exclusive to the Nodum is Prenanthes trifoliolata having a single occurrence with low cover. It is located in a transition section of mire from Nova Scotia.

Alnus rugosa Nodum (Table 29)

The following data deal mainly with the shrub layer and are based on a total of seven relevés (each $16m^2$) for which only four species are recorded. The average number of species per relevé is two.

The Alnus rugosa Nodum is found in the damper sections of rheotrophic mire often located near streams or gullies where it sometimes covers extensive areas. The understory vegetation within the Nodum consists of a mosaic of shade tolerant plants. Species occurring frequently here with moderate to high cover include Calla palustris, Carex canescens and Sphagnum fimbriatum.

The Nodum is found in all geographical regions although no sampling was done in the Lac Saint-Jean area. Despite the fact that six out of seven relevés occur in maritime regions there is no evidence indicating a preference for this type of environment over a continental one.

Topographically, the Nodum is situated primarily in depressions, the exception being Relevé 984 which is located in a hummock-hollow complex within a depressional section of mire.

The Nodum has a very well developed shrub layer with an average cover of 95% (range 85% to 100%) with the majority of the relevés having greater than 96% coverage. There is an average field cover of 58% (range 25% to 90%) and ground cover of 48% ranging from nil to 99%. The average epiphytic cover is low at 1%. The average maximum height for the shrub layer is 2.9m ranging from 2.1m to 5.4m.

The nodal dominant-character species, Alnus rugosa, is present constantly with moderate to high cover. It usually forms very dense stands and in three out of seven relevés is the only species occurring in the shrub layer. There are no species that are associated constantly with the nodal dominant.

A single variant occurs within the Nodum with Myrica gale as the differential having very low to moderate cover. It attains heights of between 1.5m and 1.8m. It is recorded only in depressional areas of rheotrophic mire from the maritime regions of Nova Scotia and the Côte Nord. The average cover values for the Variant's vegetation layers are: shrub 96%, field 53%, and ground 42%. The average epiphytic cover is less than 1% while there is an average of two species per relevé.

Relevé 984 has Larix laricina as a co-dominant with Alnus. It is the only relevé containing distinct hummocks amongst the depressional areas. It is located in a rheotrophic section of mire from the Bas Saint-Laurent region. No other species are present in the shrub layer.

There are no species exclusive to this Nodum.

Drepanocladus exannulatus - Drepanocladus fluitans Nodum (Table 30)

The description is based on a total of seven relevés for which 38 species are recorded. There is an average of eight species per relevé. In maritime regions this figure is slightly lower at seven while in continental areas it increases to ten per relevé.

The Drepanocladus exannulatus - Drepanocladus fluitans Nodum is found only in the damper sections of peatland with four out of seven relevés occurring in rheotrophic sites, two in ombrotrophic and only one in transition mire.

Based on extensive surveys of the mires examined within the study area the Nodum appears to be a rare feature on peatlands. Approximately 57% of the relevés are from maritime regions and the remaining 43% from continental sites. The Nodum is found in all geographical areas except Nova Scotia.

The Nodum is located in the depressional areas of rheotrophic and ombrotrophic mire. The exception to this is the single relevé from transition mire which is found on hummocky topography.

Structurally, the Nodum consists of two strata, a moderately well developed field layer with an average cover of 65% (range 20% to 98%) with the majority of the relevés having greater than 60% cover, and a well developed ground layer with an average cover of 93% ranging from a low of 75% to complete coverage. There is no epiphytic cover present within the Nodum.

The Nodum contains only five out of ten mire character species, with three of these occurring only once, namely, Chamaedaphne calyculata, Sphagnum magellanicum and Sphagnum rubellum, while Vaccinium oxycoccos and Drosera rotundifolia are present with moderate to low frequency respectively. All of these species have low cover values.

The nodal dominant-character species, along with their importance values, are Drepanocladus exannulatus (2.9) and Drepanocladus fluitans (1.4). The former has moderate to high cover and is found in rheotrophic and transition mire while the latter has very high cover values and only occurs in ombrotrophic sites.

There are two variants within the Nodum. Variant A has Cladopodiella fluitans as the differential occurring with low cover in transition mire and moderately high cover in ombrotrophic sites. The Variant occurs in the continental regions of Lac Saint-Jean and New Brunswick and the maritime area of the Côte Nord. Associated with the differential species are Andromeda glaucophylla and Carex limosa occurring in the relevés from continental sites and Sphagnum majus and Rhynchospora alba. The last species along with the mire character species Drosera rotundifolia are constant associates of the nodal dominant Drepanocladus fluitans. The average field cover for the Variant is 45% while the ground cover is 100%. There is an average of ten species per relevé.

Hypericum virginicum is the differential of Variant B with low cover values. Frequently associated with this species are Lysimachia terrestris, Carex canescens and Carex paleacea, the last with moderately high cover. The Variant occurs only in depressions of rheotrophic mire from the maritime region of the Côte Nord and the continental area of western New Brunswick. The average field and ground cover is 75% and 84% respectively while the average number of species per relevé is eight.

Only Relevé 982 is not associated with the principal variants. It is dominated by Calla palustris in addition to the nodal character species Drepanocladus exannulatus. There are no mire character species present. The relevé occurs in the depressional area of a rheotrophic section of mire in the Bas Saint-Laurent region.

The following species along with their importance values reach their optimum level of development within mires in this Nodum:

Lysimachia terrestris (0.4)	Galium trifidum (0.1)
Calla palustris (0.7)	Juncus bufonius (0.1)
Carex rostrata (0.6)	Sium suave (0.1)
Cicuta bulbifera (0.1)	Hydrocotyle americana (0.1)
Equisetum fluviatile (0.1)	

Only the first species occurs more than once. The only species exclusive to the Nodum is Hypericum boreale located in a rheotrophic mire in the continental region of western New Brunswick.

Sphagnum imbricatum Nodum (Table 31)

The description is based on ten sampled relevés for which 67 species are recorded. There is an average of 15 species per relevé. In maritime regions this figure increases to 17 while in continental areas it is much lower at nine per relevé.

The *Sphagnum imbricatum* Nodum is found in damper areas in rheotrophic and transition mire with 50% of the relevés occurring in the former and 30% in the latter while the remaining relevés are located in drier sections of ombrotrophic mire.

The Nodum is quite restricted in its distribution occurring in only four mires within the study area. The relevés located in rheotrophic and ombrotrophic sites are from the maritime region of Nova Scotia while those from transition mire occur in the continental area of New Brunswick.

The majority of the relevés within the Nodum occur on hummocks. This includes four of the five relevés from rheotrophic mire and all of those from ombrotrophic sites. In transition mire the Nodum is confined to hummocky surfaces. Only Relevé 190 is located in a depressional area in rheotrophic mire.

Structurally, the Nodum consists of two strata, a moderately well developed field layer with an average cover of 61% ranging from 40% to 95%, and a compact ground layer with an average cover of 99.7% (range 97% to 100%) with nearly all the relevés having complete coverage. An epiphytic cover is recorded for only one relevé.

All of the mire character species are present within the Nodum but only Chamaedaphne calyculata occurs with moderately high cover values. These species occur with regularity in ombrotrophic and transition mire while having only sparse occurrence in rheotrophic sites.

The nodal dominant-character species, Sphagnum imbricatum, is constant with very high cover having an importance value of 4.9. It usually occurs in dense cushion-forming colonies. The mire character species Vaccinium oxycoccos is the only frequently occurring associate.

There are three variants present within the Nodum. Variant A has Calamagrostis canadensis as the differential with Solidago uliginosa as a constant associate, both species having low cover values. The following species are associated frequently with the differential:

Spiraea latifolia	Dryopteris thelypteris
Aster nemoralis	Iris versicolor
Carex aquatilis	Carex lasiocarpa
Carex canescens	Aronia prunifolia

None of these species have very high cover. The mire character species do not occur very frequently here. The Variant is found only in rheotrophic mire in the maritime region of Nova Scotia where it is located mainly on hummocks with one relevé occurring in a depressional area. There is an average field cover of 47% and ground cover of 100% with an average of 15 species per relevé.

Empetrum nigrum and Polytrichum strictum are the differentials of Variant B, both with low to moderate cover. The Variant is found only in the maritime area of Nova Scotia on hummocks in rheotrophic and ombrotrophic sites. A large number of species, occurring only in the latter mire category, are frequent associates of the differentials. These include:

Aronia prunifolia	Cladonia impexa
Calopogon pulchellus	Cladonia rangiferina

Gaylussacia dumosa
Juniperus communis
Kalmia angustifolia
Microlepidozia setaceae
Odontoschisma sphagni
Sphagnum fuscum

Most of these species occur with low cover and reflect the slightly drier conditions existing within the Variant. The mire character species Vaccinium oxycoccos, Sarracenia purpurea and Drosera rotundifolia are constantly present, the last being exclusive to the Variant. The average field and ground cover is 58% and 100% respectively while the average number of species per relevé is 22.

Variant C has Larix laricina and Carex oligosperma as the differentials, neither of which have very high cover values. Rhododendron canadense is a frequent associate ranging from very low to quite high cover. The mire character species Chamaedaphne and Sphagnum recurvum are present constantly, the former having its best development within the Variant and the latter being exclusive to it. The Variant is restricted to a single transition mire in continental New Brunswick with all the relevés located on hummocky surfaces. There is an average field cover of 85% and ground cover of 99%. The average number of species per relevé is nine.

There are eight species which reach their optimum level of development within mires in this Nodum. These include along with their importance values:

Rhododendron canadense (0.5)
Aster nemoralis (0.3)
Dryopteris thelypteris (0.2)
Potentilla palustris (0.4)
Viola cucullata (0.2)
Carex folliculata (0.1)
Carex nigra (0.2)
Equisetum arvense (0.1)

The last three species occur only once. Two species are exclusive to the Nodum, namely, Bryhnia novae-angliae and Helodium blandowii both with low cover and located in a single relevé in rheotrophic mire in Nova Scotia.

After the completion of the differentiated tables for the noda, each variant that occurred in more than one nodum was extracted from them and placed in a separate table. The same methods that were applied to the noda were then used to manipulate the data in the variant tables and show the presence of vegetation units within each one. These units are more or less interpreted in the same manner as for those occurring in the noda with the exceptions being that the "nodal dominant-character species" category is omitted as well as the terms "exclusive" and "optimum" species. A total of 35 variants are extracted from the noda.

B. The Variants

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Table 32 Summary of Numerical and Percentage Values Given in the Variant Descriptions

PARAMETERS / VARIANTS (35)	Table no.	No. of relevés	No. of species	Avg. no. of species per relevé	No. of noda in which the variant occurs	% of relevés in rheotrophic mire	% of relevés in transition mire	% of relevés in ombrotrophic mire	% of relevés in maritime areas	% of relevés in continental areas
JUNI COMM	33	8	51	24	2	-	-	100	100	-
LARI LARI	34	9	49	18	3	-	33	67	56	44
RHOD CANA	35	4	22	12	2	-	50	50	-	100
PICE MARI	36	66	103	16	6	-	-	100	64	36
VACC ANGU	37	113	123	16	9	2	4	94	88	12
RUBU CHAM	38	87	98	18	7	-	-	100	100	-
EMPE NIGR	39	85	105	19	5	1	2	97	100	-
GAYL DUMO	40	41	82	21	4	-	-	100	85	15
ARON PRUN	41	58	119	20	4	9	-	91	83	17
SCIR CESP	42	75	88	16	5	-	5	95	77	23
ERIO SPIS	43	61	67	13	3	-	5	95	59	41
RHYN ALBA	44	134	88	10	7	-	25	75	61	39
DROS INTE	45	42	59	10	2	-	19	81	57	43
VACC MACR	46	17	49	11	2	-	29	71	100	-
ERIO VIRG	47	35	57	9	2	-	14	86	40	60
NUPH VARI	48	77	34	2	2	13	22	65	73	27
ANDR GLAU	49	70	84	9	6	1	49	50	47	53
MENY TRIF	50	32	58	6	3	28	72	-	78	22
CARE ROST	51	11	52	10	2	27	73	-	64	36
CARE EXIL	52	31	94	15	5	16	48	36	74	26
CARE OLIG	53	102	80	9	8	1	74	25	21	79
SCHE PALU	54	70	47	8	5	-	93	7	34	66
CARE LIMO	55	47	65	9	6	15	64	21	30	70
CARE LASI	56	25	74	9	5	44	56	-	48	52
CARE AQUA	57	31	77	11	6	77	23	-	52	48
MYRI GALE	58	126	186	12	10	49	41	10	65	35
CARE STRI	59	16	74	13	4	63	37	-	44	56
SPIR LATI	60	18	69	12	3	100	-	-	11	89
CALA CANA	61	36	103	11	5	100	-	-	47	53
ALNU RUGO	62	15	70	11	3	87	13	-	47	53
CARE PAUP	63	40	92	10	5	38	35	27	98	2
CARE PALE	64	18	47	9	3	89	11	-	100	-
CARE CANE	65	8	52	12	3	88	12	-	88	12
LONI VILL	66	4	40	15	2	100	-	-	50	50
POTE PALU	67	5	39	11	2	100	-	-	100	-

Table 32 (continued)

PARAMETERS / VARIANTS (35)	Table no.	% of relevés in ponds	% of relevés in depressions	% of relevés on hummocky surfaces	% of relevés on distinct hummocks	% of relevés in dry hollows	Avg. field cover (%)	Avg. ground cover (%)	*Avg. epiphytic cover (%)	No. of mire character species.
JUNI COMM	33	-	-	-	100	-	76	99	+	8
LARI LARI	34	-	-	56	44	-	84	90	+	10
RHOD CANA	35	-	-	50	50	-	81	99	+	9
PICE MARI	36	-	2	30	68	-	70	86	3	10
VACC ANGU	37	-	4	49	19	28	64	82	1	10
RUBU CHAM	38	-	-	38	29	33	67	87	+	9
EMPE NIGR	39	-	2	12	58	28	62	99	+	9
GAYL DUMO	40	-	-	17	61	22	62	99	+	10
ARON PRUN	41	-	2	26	45	27	64	98	+	10
SCIR CESP	42	-	17	58	25	-	59	99.8	+	10
ERIO SPIS	43	-	18	71	11	-	56	99	+	10
RHYN ALBA	44	6	76	14	4	-	39	95	+	10
DROS INTE	45	5	95	-	-	-	46	95	+	8
VACC MACR	46	-	88	12	-	-	51	90	-	7
ERIO VIRG	47	17	46	31	6	-	47	99.9	+	10
NUPH VARI	48	100	-	-	-	-	47	14	-	3
ANDR GLAU	49	27	30	37	6	-	54	92	+	10
MENY TRIF	50	41	59	-	-	-	58	26	-	5
CARE ROST	51	-	91	-	9	-	86	47	+	10
CARE EXIL	52	-	55	32	13	-	64	84	+	9
CARE OLIG	53	1	26	57	16	-	52	99.8	+	10
SCHE PALU	54	8	56	29	7	-	36	99.9	+	10
CARE LIMO	55	4	55	41	-	-	46	78	-	9
CARE LASI	56	4	64	28	4	-	63	56	-	9
CARE AQUA	57	-	81	-	19	-	73	41	+	10
MYRI GALE	58	-	54	24	22	-	80	64	+	10
CARE STRI	59	-	63	37	-	-	80	67	+	10
SPIR LATI	60	-	78	11	11	-	91	31	+	4
CALA CANA	61	-	75	6	19	-	84	31	+	8
ALNU RUGO	62	-	67	-	33	-	74	37	-	9
CARE PAUP	63	2	60	23	15	-	62	70	+	10
CARE PALE	64	-	67	16	16	-	80	50	-	4
CARE CANE	65	-	38	12	50	-	63	94	-	4
LONI VILL	66	-	-	50	50	-	71	99	+	4
POTE PALU	67	-	60	-	40	-	70	46	-	3

* "+" indicates average < 1%

Juniperus communis Variant (Table 33)

The description is based on a total of eight relevés for which 51 species are recorded. There is an average of 24 species per relevé. The Variant is found in the following noda (presented with the number of relevés in each group):

Sphagnum fuscum (6)
Sphagnum imbricatum (2)

The Juniperus communis Variant is located only in the drier sections of ombrotrophic mire. All the relevés are situated in the maritime region of Nova Scotia.

The topography within the Variant consists only of hummocks. The average field cover is 76% ranging from 60% to 85% while the ground layer has an average cover of 99% (range 95% to 100%) with the majority of the relevés having complete coverage. Epiphytes are recorded only in Relevé 127 where the cover is 1%.

There are eight out of ten mire character species in the Variant with Smilacina trifolia and Sphagnum recurvum being absent. None of the species have very high cover values but all except Eriophorum angustifolium are present in at least 50% of the relevés.

Juniperus communis, the differential of the Variant, has predominantly low cover. Several species are constant associates:

Empetrum nigrum	Spagnum fuscum
Kalmia angustifolia	Vaccinium oxycoccos
Polytrichum strictum	

Sphagnum fuscum is the dominant bryophyte in most of the relevés while in two of them it is replaced by Sphagnum imbricatum. Empetrum nigrum is occasionally the dominant in the field layer when associated with the former.

<u>Larix laricina</u> Variant (Table 34)

The description deals with the non-forest aspects of the species and, therefore, is not concerned with either the tree or shrub layers. It is based on only nine relevés for which 49 species are recorded. The average number of species per relevé is 18. This figure increases to 23 for maritime regions and ombrotrophic mire while in continental areas and transition sites it is much lower at 12 and nine per relevé respectively. The Variant is found in the following noda (presented with the number of relevés in each group):

Chamaedaphne calyculata - Myrica gale (Bog) (2)
Sphagnum fuscum - Cladonia rangiferina (3)
Sphagnum imbricatum (4)

The <u>Larix laricina</u> Variant is located in the drier sections of ombrotrophic mire and in slightly damper areas in transition sites. Two-thirds of the relevés occur in the former mire type and the rest in the latter. The Variant is present in both maritime and continental regions being recorded in Nova Scotia, New Brunswick and the Bas Saint-Laurent.

The relevés within the Variant occur with almost equal frequency on hummocky surfaces and on distinct hummocks. The average field cover is high at 84% ranging from 65% to 98% while the ground layer has an average cover of 90% (range 55% to 100%) with most of the relevés having greater than 95% coverage. Epiphytes are recorded only in those relevés from ombrotrophic mire where they have an average cover of less than 1% (range nil to 1%).

All of the mire character species are present. <u>Chamaedaphne calyculata</u> and <u>Vaccinium oxycoccos</u> have very high constancy each being absent in just one relevé. The former, plus <u>Smilacina trifolia</u>

are the only two species to occasionally attain high cover values.

The differential of the Variant, Larix laricina, is present with low to moderate cover in the field layer. Its best development occurs on hummocks. Aside from the two mire character species mentioned above there are no others constantly associated with the differential.

When the Variant occurs in ombrotrophic mire Sphagnum fuscum is a constant component in the ground layer having low to moderate cover. Constantly associated with this species are Kalmia angustifolia, Odontoschisma sphagni and Polytrichum strictum as well as the mire character species Vaccinium oxycoccos, Drosera rotundifolia and Kalmia polifolia. None of these associates have very high cover values.

In transition mire Sphagnum imbricatum is dominant in the ground layer while Chamaedaphne calyculata does well in the field layer.

Rhododendron canadense Variant (Table 35)

The following description is based on only four relevés for which 22 species are recorded. The average number of species per relevé is 12, a figure which remains the same for ombrotrophic mire while lowering slightly to 11 in transition sites. The Variant is found in the following noda (presented with the number of relevés in each group):

Polytrichum strictum (2)
Sphagnum imbricatum (2)

The Rhododendron canadense Variant as described here is located in drier sections of ombrotrophic mire and slightly damper areas in transition sites. It is recorded only in continental New Brunswick.

The topography consists of hummocks in ombrotrophic areas and hummocky surfaces in transition mire. The average field cover is high at 81% ranging from 70% to 95% while the ground layer has an average cover of 99% (range 97% to 100%) with three of the four relevés having complete coverage. Epiphytes are recorded in the two relevés from ombrotrophic mire each having less than 1% cover.

There are nine mire character species present within the Variant with only Kalmia polifolia being absent. None of the species have high cover values but the following are constant: Chamaedaphne calyculata, Smilacina trifolia, Sphagnum recurvum and Sphagnum magellanicum.

The differential of the Variant, Rhododendron canadense, is present with mainly low cover. In Relevé 1225 it dominates the field layer.

When the Variant is located on hummocks in ombrotrophic mire Polytrichum strictum is the dominant bryophyte with Kalmia angustifolia and the mire character species Eriophorum angustifolium and Sphagnum rubellum as exclusive associates that are present constantly. In transition mire on hummocky surfaces Sphagnum imbricatum dominates the ground layer. Constant and exclusive associates here include Carex oligosperma and Larix laricina as well as the mire character species Sarracenia purpurea.

<u>Picea mariana</u> Variant (Table 36)

The description deals primarily with the non-forest aspects in which <u>Picea mariana</u> is found in mires and is based on a total of 66 relevés for which 103 species are recorded with 19% of these occurring only once. There is an average of 16 species per relevé, a figure which increases slightly to 17 for maritime regions but is lower at 14 for continental areas. The Variant is found in the following noda (presented with the number of relevés in each group):

Pleurozium schreberi (7)
Picea mariana (4 x 4m) (8)
Picea mariana (1 x 1m) (11)
Kalmia angustifolia - Chamaedaphne calyculata (7)
Polytrichum strictum (4)
Sphagnum fuscum (29)

The <u>Picea mariana</u> Variant is located predominantly in the driest sections of ombrotrophic mire. It occurs in all geographical regions with 64% of the relevés situated in maritime areas and the rest in continental sites.

The topography within the Variant consists mainly of hummocks with 68% of the relevés occurring here while 30% are located on hummocky surfaces and only one relevé occurs in a depression. The field layer has an average cover of 70% ranging from 1% to 100% with the majority of the relevés having greater than 60% cover. The ground layer's average cover is 86% (range 15% to 100%) with approximately three-quarters of the relevés having greater than 90% coverage. Epiphytes are present in 58 out of the 66 relevés, having an average cover of 3% (range nil to 25%). When the Variant reaches its optimum development in mires a shrub and frequently a tree layer are present as well. Where this occurs the former layer has an average cover of

54% (based on nine relevés) ranging from 25% to 85% while the latter's average cover is 41% (based on six relevés) ranging from 35% to 50%. The average maximum height for the trees is 3.1m (range 2.7m to 3.9m).

All of the mire character species are found within the Variant. Their best concentration occurs in those relevés where Sphagnum fuscum is the dominant in the ground layer. Only Chamaedaphne calyculata is present with high constancy. This species along with Sphagnum magellanicum occasionally dominate their respective layers. None of the other mire character species have very high cover values.

Picea mariana, the differential of the Variant, is constant with low to high cover. Whenever it is dominant either in the field, shrub or tree layer it usually grows in dense clumps, reproducing itself through layering. Two Ericaceous species Kalmia angustifolia and Ledum groenlandicum are frequent associates, the former with low to high cover and the latter with mainly low cover values.

When the Variant occurs on hummocky surfaces within mire forest Pleurozium schreberi is often the dominant in the ground layer.

In those relevés where Picea mariana is dominant, forming a dense canopy, the following bryophytes and lichens are found frequently in the understory:

Lepidozia reptans	Cephalozia connivens
Pleurozium schreberi	Cladonia rangiferina
Dicranum undulatum	Cladonia chlorophaea
Mylia anomala	

These species also are present in the ground layer when Ericaceous plants form a dense cover in the driest sections of ombrotrophic mire.

Where the Variant is located primarily on hummocks in open sections of peatland either Sphagnum fuscum or Polytrichum strictum are the dominant bryophytes present, the former occurring with high cover values much more frequently than the latter.

Vaccinium angustifolium Variant (Table 37)

The description is based on 113 relevés for which 123 species are recorded with 19% of these occurring only once. The average number of species per relevé is 16, a figure which remains the same for maritime regions but lowers slightly to 15 for continental areas while in ombrotrophic mire it increases to 17 per relevé. The Variant is found in the following noda (presented with the number of relevés in each group):

Vaccinium angustifolium - Lepidozia reptans (3)
Pleurozium schreberi (8)
Picea mariana (4 x 4m) (5)
Chamaedaphne calyculata - Myrica gale (Bog) (2)
Kalmia angustifolia - Chamaedaphne calyculata (20)
Cladonia rangiferina (54)
Sphagnum rubellum - Sphagnum nemoreum (13)
Sphagnum pulchrum (3)
Myrica gale - Chamaedaphne calyculata (Fen) (5)

The Vaccinium angustifolium Variant is located predominantly in the driest sections of ombrotrophic mire with 94% of the relevés occurring here. It is only an occasional feature in transition and rheotrophic sites where it is situated in drier areas in the former and slightly damper places in the latter. The Variant occurs in all geographical regions being very common in the Saint Lawrence River Valley and rare around Lac Saint-Jean. Approximately 88% of the relevés are from maritime areas and the rest from continental sites.

Topographically, nearly half the relevés in the Variant (49%) occur on hummocky surfaces and 19% are on distinct hummocks while 28% are located in dry hollows of ombrotrophic mire and only 4% are situated in depressions in transition and rheotrophic sites. The average field cover is 64% ranging from 1% to 100%. The ground layer has an average cover of 82% (range nil to 100%) with the majority of the relevés having greater than 90% coverage. Epiphytes are present in 94 out of 113 relevés having an average cover of just over 1% (range nil to 25%). A small number of relevés have a shrub and tree layer, with the former having an average cover of 54% (based on five relevés) and the latter 42% (based on four relevés).

All of the mire character species are found within the Variant but only Chamaedaphne calyculata and Vaccinium oxycoccos are present in over 50% of the relevés, the former sometimes occurring with moderate cover. Sphagnum rubellum is the only species to frequently attain very high cover values.

Vaccinium angustifolium, the differential of the Variant, is present with mainly low cover but it occasionally becomes dominant in the field layer especially in dry hollows in ombrotrophic mire where lichens are prominent as well. The Ericaceous species Kalmia angustifolia and Ledum groenlandicum are constant associates of the differential, the former frequently occurring with moderate to high cover.

When the Variant is located in mire forest either there is little vegetation cover in the field and ground layers or Pleurozium schreberi is often the dominant species present.

In non-forested areas in the driest sections of ombrotrophic mire Picea mariana sometimes is dominant but more frequently in these areas Ericaceous species like Kalmia angustifolia, Chamaedaphne and Ledum groenlandicum are prominent members of the field layer and fruticose lichens such as Cladonia alpestris and Cladonia rangiferina often are dominant in the ground layer.

Where the lichen cover is greatly reduced or missing entirely in the drier areas of ombrotrophic mire either Sphagnum rubellum or Sphagnum nemoreum dominate the ground layer.

When the Variant occurs in transition mire with a well developed ground layer Sphagnum pulchrum is dominant. Where this layer is poorly developed in transition and rheotrophic sites, especially in depressional areas, a dense field cover usually is present frequently consisting of species like Myrica gale, Chamaedaphne and Ledum as well as the differential of the Variant.

Rubus chamaemorus Variant (Table 38)

The description is based on a total of 87 relevés for which 98 species are recorded with 17% of these occurring just once. There is an average of 18 species per relevé. The Variant is located in the following noda (listed with the number of relevés in each group):

Picea mariana (1 x 1m) (4)
Chamaedaphne calyculata - Myrica gale (Bog) (2)
Kalmia angustifolia - Chamaedaphne calyculata (19)
Cladonia rangiferina (47)
Sphagnum fuscum - Cladonia rangiferina (11)
Polytrichum strictum (2)
Sphagnum russowii (2)

The Rubus chamaemorus Variant is found only in the drier sections of peatland. All of the relevés are from ombrotrophic mire in maritime regions. The Variant occurs most frequently along the Côte Nord and from Nova Scotia while being a rare feature in mires from the Bas Saint-Laurent. It is recorded in only four relevés from the coastal areas of New Brunswick.

Topographically the Variant is situated in hollows between hummocks (33% of the relevés), on hummocky surfaces (38%) and on distinct hummocks (29%). The average field cover is moderately high at 67% ranging from 20% to 100% while the ground layer has an average cover of 87% (range 2% to 100%) with the majority of the relevés having greater than 90% coverage. Epiphytes are present in most of the relevés but their average cover is less than 1% (range nil to 5%).

There are 90% of the mire character species present with only Sphagnum recurvum being absent. Chamaedaphne calyculata and Kalmia polifolia are the most frequently occurring species. The former is the only one to occasionally attain moderately high cover values.

Rubus chamaemorus, the differential of the Variant, is present with predominantly low cover. Three associate species with very high constancy include *Kalmia angustifolia*, *Ledum groenlandicum* and *Cladonia rangiferina*, the last sometimes being the dominant in the ground layer.

When the Variant has a well developed field layer species like *Picea mariana*, *Chamaedaphne*, *Kalmia angustifolia*, *Empetrum nigrum* or *Juniperus communis* occasionally are the dominants.

In mires in the Saint Lawrence River Valley under the influence of fire species such as *Cladonia cristatella*, *Cladonia deformis* and *Cladonia gonecha* often are present in the Variant, having mainly low cover values.

Where the Variant occurs in hollows fruticose lichens are usually dominant in the ground layer. These include *Cladonia arbuscula*, *Cladonia impexa* and *Cladonia alpestris* as well as *Cladonia rangiferina*. On distinct hummocks *Sphagnum fuscum* frequently is present with moderate cover while on two hummocks *Polytrichum strictum* dominates the ground layer. Occasionally on hummocky surfaces *Sphagnum russowii* occurs with very high cover with *Myrica gale* as a frequent associate.

Empetrum nigrum Variant (Table 39)

The following description is based on 85 sampled relevés for which 105 species are recorded with 26% of these occurring only once. The average number of species per relevé is 19. This figure increases slightly to 20 in ombrotrophic mire. The Variant is found in the following noda (listed with the number of species in each group):

Cladonia rangiferina (34)
Sphagnum fuscum - Cladonia rangiferina (12)
Sphagnum fuscum (34)
Sphagnum fimbriatum (2)
Sphagnum imbricatum (3)

The Empetrum nigrum Variant is located predominantly in the drier sections of ombrotrophic mire with 97% of the relevés occurring here. It is a rare feature in both transition and rheotrophic sites where it occurs in slightly damper areas. The Variant is found only in maritime regions with the majority of the relevés occurring in Nova Scotia.

Topographically, 58% of the relevés are situated on hummocks and 12% on hummocky surfaces while most of the remaining relevés are located in dry hollows in ombrotrophic mire. Only two relevés occur in damper depressional areas. The field layer has an average cover of 62% ranging from 25% to 97%. The average ground cover is 99% (range 75% to 100%) with the majority of the relevés having greater than 95% cover. Epiphytes are present in 31 relevés with an average cover of less than 1% (range nil to 5%).

There are 90% of the mire character species present within the Variant with Sphagnum recurvum being absent. They are concentrated mainly on hummocks and hummocky surfaces. None of these species have very high cover values. Those occurring in more than 50% of the relevés include Kalmia polifolia, Chamaedaphne calyculata, Vaccinium oxycoccos and Drosera rotundifolia.

The differential of the Variant, Empetrum nigrum, is present with low to very high cover sometimes being the dominant in the field layer when it is located on distinct hummocks in ombrotrophic mire. The Ericaceous species Kalmia angustifolia and Ledum groenlandicum are associates with very high constancy and low to moderate cover values.

When the Variant occurs in dry hollows in ombrotrophic mire fruticose lichens make up the dominant component in the ground layer. Species like Cladonia impexa, Cladonia arbuscula and Cladonia alpestris as well as the companion species Cladonia rangiferina are present frequently with low to high cover.

Where the Variant occurs on hummocks in the driest sections of ombrotrophic mire the above lichens sometimes combine with Sphagnum fuscum to make up the principal part of the ground layer. In the majority of the relevés that are situated on hummocks within the Variant, however, Sphagnum fuscum is the dominant bryophyte present. Frequent associates here include Polytrichum strictum, Odontoschisma sphagni and Solidago uliginosa. Occasionally Sphagnum imbricatum replaces Sphagnum fuscum as the dominant on hummocks in ombrotrophic areas. The former is also the dominant in the single relevé from rheotrophic mire.

In the two relevés from a transition site Sphagnum fimbriatum is present with very high cover while Carex paleacea is prominent in the field layer.

Gaylussacia dumosa Variant (Table 40)

The description is based on 41 relevés for which 82 species are recorded with 16% of these occurring only once. There is an average of 21 species per relevé. This figure increases slightly to 22 for maritime regions and is lower at 17 per relevé for continental sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Cladonia rangiferina (15)
Sphagnum fuscum - Cladonia rangiferina (7)
Sphagnum fuscum (17)
Spagnum imbricatum (2)

The Gaylussacia dumosa Variant is located only in the drier sections of ombrotrophic mire. It is found predominantly in maritime regions especially from Nova Scotia with 34 out of 41 relevés occurring here. The remaining relevés are from New Brunswick, the Variant being absent in the Saint Lawrence River Valley and around Lac Saint-Jean.

The majority of the relevés (61%) are located on hummocks while 17% occur on hummocky surfaces and 22% in dry hollows. The field layer has an average cover of 62% ranging from 20% to 97%. The average ground cover is 99% (range 95% to 100%) with most of the relevés having greater than 98% coverage. Epiphytes, recorded in 15 relevés, have an average cover of less than 1% (range nil to 5%).

All ten of the mire character species are present but none of them have very high cover values. Those occurring in more than 50% of the relevés include:

Kalmia polifolia	Chamaedaphne calyculata
Vaccinium oxycoccos	Drosera rotundifolia
Sphagnum rubellum	

The differential of the Variant, Gaylussacia dumosa, is present with low to moderate cover. Its best development is on distinct hummocks and hummocky surfaces. Kalmia angustifolia is an associate species with very high constancy being absent in only one relevé.

When the Variant is situated mainly in dry hollows fruticose lichens like Cladonia rangiferina, Cladonia impexa and Cladonia arbuscula make up the dominant component in the ground layer. When these lichens occur together on hummocks, Sphagnum fuscum usually is present with moderate cover and Empetrum nigrum is a constant associate.

In the majority of relevés located on hummocks within the Variant Sphagnum fuscum is the dominant bryophyte while Empetrum and Polytrichum strictum are frequently occurring associates. Occasionally on hummocks Sphagnum imbricatum is present with very high cover values.

Aronia prunifolia Variant (Table 41)

The following data are based on a total of 58 sampled relevés for which 119 species are recorded with 26% of these occurring only once. The average number of species per relevé is 20. This figure remains the same for ombrotrophic mire while increasing slightly to 21 in maritime areas, whereas in continental regions and rheotrophic sites it drops to 17 and 16 per relevé respectively. The Variant is located in the following noda (presented with the number of relevés in each group):

Cladonia rangiferina (29)
Sphagnum fuscum (22)
Sphagnum warnstorfii (3)
Sphagnum imbricatum (4)

The Aronia prunifolia Variant is found only in the drier sections of ombrotrophic mire and in slightly damper areas in rheotrophic sites. Approximately 91% of the relevés occur in the former mire type and the rest in the latter. The Variant is located primarily in maritime regions, especially in Nova Scotia with 71% of the relevés occurring here. It is a rare feature around Lac Saint-Jean and in the Bas Saint-Laurent while being absent along the Côte Nord.

The majority of the relevés within the Variant occur on either hummocky surfaces (26%) or distinct hummocks (45%). In ombrotrophic sites 16 relevés are situated in hollows between hummocks while one relevé is found in a depressional area of rheotrophic mire. The field layer has an average cover of 64% ranging from 20% to 98%. The average ground cover is 98% (range 75% to 100%) with the majority of the relevés having greater than 95% coverage. Epiphytes, present in 25 relevés, have an average cover of less than 1% (range nil to 2%).

All of the mire character species are present within the Variant. These have their best concentration on hummocks in ombrotrophic mire while having only sporadic occurrence in rheotrophic areas. None of the mire character species have very high cover values.

Aronia prunifolia, the differential of the Variant, is constant with predominantly low cover. The associate species Kalmia angustifolia with very frequent occurrence has low to moderately high cover values.

When the Variant is situated mainly in hollows and on hummocky surfaces in ombrotrophic mire species like Cladonia impexa and Cladonia arbuscula form part of the lichen component which dominates the ground layer. A frequent associate in the field layer is Empetrum nigrum often present with moderate cover.

Where the Variant occurs on distinct hummocks in ombrotrophic mire Sphagnum fuscum is the dominant bryophyte in most of the relevés. Frequent associates include Polytrichum strictum and Empetrum, the latter occasionally occurring as a co-dominant. In two relevés Sphagnum imbricatum is present with very high cover replacing Sphagnum fuscum as the dominant.

In rheotrophic mire either Sphagnum imbricatum or Sphagnum warnstorfii are dominant in the ground layer, the latter having Myrica gale as a constant associate with moderately high cover values.

Scirpus cespitosus Variant (Table 42)

The following description is based on a total of 75 relevés for which 88 species are recorded with 21% of these occurring only once. The average number of species per relevé is 16. This figure remains the same for ombrotrophic mire while increasing slightly to 17 for transition sites and maritime regions. There is a drop to 11 per relevé for continental areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum fuscum - Cladonia rangiferina (7)
Sphagnum fuscum (17)
Spagnum rubellum - Sphagnum nemoreum (45)
Sphagnum pulchrum (3)
Sphagnum papillosum (3)

The Scirpus cespitosus Variant is located predominantly in ombrotrophic areas with 95% of the relevés occurring here. It is a rare feature in transition sites and is absent in rheotrophic mire. The majority of the relevés are found in moderately damp sections of peatland while approximately 25% occur in drier areas. The Variant is situated mainly in the maritime localities of Nova Scotia and the Côte Nord with 71% of the relevés occurring in these regions. The remaining relevés are predominantly from continental New Brunswick. The Variant appears to be absent around Lac Saint-Jean and from the Bas Saint-Laurent.

The topography within the Variant consists mainly of hummocky surfaces with 58% of the relevés having these features. Of the remaining relevés approximately 17% occur in depressions while 25% are on distinct hummocks in ombrotrophic mire from maritime regions. The average field cover is 59% ranging from 10% to 95% with the majority of the relevés having greater than 50% cover. The ground layer has an average cover of 99.8% (range 97% to 100%) with most of the relevés having complete coverage. Epiphytes are recorded in nine relevés, each having less than 1% cover.

All of the mire character species are present within the Variant. Those having very high constancy include Vaccinium oxycoccos, Drosera rotundifolia, Chamaedaphne calyculata and Sphagnum rubellum. Only the last species frequently attains high cover values.

Scirpus cespitosus, the differential of the Variant, is present with low to high cover. Its best development is on hummocky surfaces in moderately damp sections of ombrotrophic mire. The mire character species Vaccinium oxycoccos is a constant associate being absent in only three relevés.

In the drier sections of ombrotrophic mire primarily on hummocks a combination of lichens such as Cladonia rangiferina, Cladonia impexa and Cladonia arbuscula as well as the companion species Sphagnum fuscum are prominent members in the ground layer, the latter often attaining very high cover values, frequently when the lichens are absent.

Just over half the relevés in the Variant are located on damp hummocky surfaces and in depressional areas where the dominant bryophyte is Sphagnum rubellum. The mire character species Chamaedaphne does well here along with the differential of the Variant while the companion species Odontoschisma sphagni and Microlepidozia setaceae are present frequently. The liverwort Cladopodiella fluitans, occurring with low cover, appears to be a relic species here indicating much wetter conditions that once prevailed.

When the Variant occurs in wet depressional areas in ombrotrophic mire

Sphagnum pulchrum occasionally is dominant in the ground layer. A constant associate and indicator of the wetter conditions is the sedge Rhynchospora alba. On hummocky surfaces in transition mire the dominant bryophyte is Sphagnum papillosum while Carex exilis and Myrica gale are constant associates.

Eriophorum spissum Variant (Table 43)

The description is based on a total of 61 relevés for which 67 species are recorded with 24% of these occurring just once. There is an average of 13 species per relevé. This figure remains the same for ombrotrophic mire while being lower at 12 in transition sites and 11 in continental areas. There is an increase to 14 per relevé in maritime regions. The Variant is found in the following noda (presented with the number of relevés in each group):

Picea mariana (1 x 1m) (3)
Sphagnum rubellum - Sphagnum nemoreum (46)
Sphagnum magellanicum (12)

The Eriophorum spissum Variant is located predominantly in ombrotrophic mire with 95% of the relevés occurring here while only three relevés are from transition sites. Moisture conditions within the Variant range from a few dry hummocks or hummocky surfaces to damp depressional areas. The Variant occurs in both maritime and continental regions with 59% of the relevés situated in the former and 41% in the latter. The Variant is found in all geographical areas, being common in New Brunswick and the Côte Nord and rare in Nova Scotia and the Bas Saint-Laurent.

Approximately 18% of the relevés are located in depressions, with 71% occurring on hummocky surfaces and 11% on distinct hummocks. The average field cover is 56% ranging from a low of 5% to a high of 98%. The ground layer has an average cover of 99% (range 65% to 100%) with the majority of the relevés having complete coverage. Epiphytes are recorded in 14 relevés with an average cover of less than 1% (range nil to 3%).

All ten of the mire character species are present with three of these having very high constancy, namely, Chamaedaphne calyculata, Vaccinium oxycoccos and Sphagnum rubellum. The first occasionally attains high cover while the last is dominant in approximately 86% of the relevés in which it is located. The only other mire character species to have high cover values is Sphagnum magellanicum.

The differential of the Variant, Eriophorum spissum, is present with predominantly low and occasionally moderate cover. The mire character species Chamaedaphne is almost a constant associate, being absent in only two relevés.

In dry sections of ombrotrophic mire within the Variant Picea mariana sometimes is dominant in the field layer with Pleurozium schreberi as an exclusive associate. In damper areas in ombrotrophic and transition mire where the relevés are situated on hummocks or hummocky surfaces the ground layer is dominated by either Sphagnum rubellum or Sphagnum magellanicum. Frequent associates of the former include the liverworts Odontoschisma sphagni and Microlepidozia setacea. These two Sphagnum species are also the dominant bryophytes when the Variant is confined to damp depressions in ombrotrophic mire.

<u>Rhynchospora alba</u> Variant (Table 44)

The following description is based on a total of 134 relevés for which 88 species are recorded with 28% of these occurring just once. There is an average of ten species per relevé. This figure remains the same for the different mire types as well as for maritime regions while being slightly lower at nine per relevé for continental areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum rubellum - Sphagnum memoreum (17)
Rhynchospora alba - Cladopodiella fluitans (42)
Sphagnum pulchrum (10)
Sphagnum papillosum (12)
Sphagnum cuspidatum (47)
Nuphar variegatum (4)
Drepanocladus exannulatus - Drepanocladus fluitans (2)

The <u>Rhynchospera alba</u> Variant is located in the damper sections of peatland. Approximately three-quarters of the relevés are from ombrotrophic mire and the rest from transition areas. The Variant occurs in all geographical regions except the Bas Saint-Laurent. Just over 61% of the relevés are from maritime locations while 39% are situated in continental sites.

Topographically, 76% of the relevés are located in depressions and 14% on hummocky surfaces. The Variant is a rare feature in ponds and streams and on distinct hummocks. The average field cover is 39% ranging from 2% to 95% while the ground layer has an average cover of 95% (range + to 100%) with the majority of the relevés having complete coverage. Epiphytes are recorded in only three relevés all having less than 1% cover.

All of the mire character species are present within the Variant.

Vaccinium oxycoccos, Chamaedaphne calyculata and Drosera rotundifolia occur in over 50% of the relevés while Sphagnum rubellum is the only species to attain very high cover values.

The differential of the Variant, Rhynchospora alba, is constant with low to moderately high cover having its best development in depressional areas. Cladopodiella fluitans is a frequent associate often with very high cover values.

When the Variant is located on distinct hummocks or on hummocky surfaces the dominant bryophytes are either Sphagnum rubellum or Sphagnum papillosum. The former is found predominantly in ombrotrophic mire while the latter is more commonly a feature of transition sites. A constant associate of the first is the mire character species Vaccinium oxycoccos.

In depressional areas in ombrotrophic mire the companion species Drepanocladus fluitans is occasionally one of the dominants along with Cladopodiella. Where the Variant is found in depressional areas in both ombrotrophic and transition mire the dominant bryophytes in the majority of the relevés are either Cladopodiella or the companion species Sphagnum cuspidatum. They sometimes occur together as co-dominants forming dense vegetation mats. Other dominant bryophytes that occasionally are found in the depressions of these mire types are Sphagnum pulchrum and Sphagnum papillosum, the former predominantly from Nova Scotian sites.

When the Variant occurs in ponds or streams Utricularia geminiscapa often is present with moderately high cover. In Relevé 1082 located in a marginal floating vegetation mat Vaccinium macrocarpon shares dominance with Sphagnum cuspidatum.

<u>Drosera intermedia</u> Variant (Table 45)

The following data are based on a total of 42 sampled relevés for which 59 species are recorded with 41% of these occurring just once. There is an average of ten species per relevé. This figure remains the same for the different mire types while increasing slightly to 11 in maritime areas and lowering to nine per relevé in continental regions. The Variant is found in the following noda (listed with the number of relevés in each group):

Rhynchospora alba - Cladopodiella fluitans (26)
Sphagnum cuspidatum (16)

The <u>Drosera intermedia</u> Variant is located in the wetter sections of peatland with 81% of the relevés occurring in ombrotrophic mire and the remaining ones in transition sites. The Variant is found in both maritime and continental regions with 57% of the relevés situated in the former and 43% in the latter. The largest number of relevés are from New Brunswick while it is a very rare feature around Lac Saint-Jean and is absent from the Bas Saint-Laurent district.

The Variant is situated primarily in depressions while two relevés occur in ponds where they are located in marginal floating vegetation mats. The average field cover is 46% ranging from 5% to 99% while the ground layer has an average cover of 95% (range + to 100%) with the majority of the relevés having complete coverage. Epiphytes are recorded in only one relevé where the cover is less than 1%.

There are eight out of ten mire character species present, the two missing ones being <u>Eriophorum angustifolium</u> and <u>Sphagnum recurvum</u>. Those occurring within the Variant are concentrated predominantly in ombrotrophic mire. <u>Chamaedaphne calyculata</u> and <u>Vaccinium oxycoccos</u> are the only two with frequent occurrence being present in just over

50% of the relevés. The former species attains high cover values in two relevés while the rest of the time having very low cover. None of the other mire character species have very high cover values.

The differential of the Variant, Drosera intermedia, is constant with mainly low and occasionally moderate cover. This species along with the mire character species Drosera rotundifolia and Drosera anglica impart a red coloration to the Variant which helps to distinguish it (see Fig.8b page 273). Two associate species with high frequency are Rhynchospora alba and Cladopodiella fluitans.

Cladopodiella and Sphagnum cuspidatum are the two principal dominant bryophytes in the Variant. Usually when one is dominant the other is either absent or present with mainly low cover values. They occur as co-dominants in only four relevés. Other species located in depressions which occasionally have very high cover are the vasculars Rhynchospora alba and Utricularia cornuta and the bryophytes Sphagnum pulchrum, Sphagnum papillosum and Drepanocladus fluitans.

When the Variant occurs in vegetation floating mats along the edge of ponds species like Chamaedaphne and Vaccinium macrocarpon are dominants along with Sphagnum cuspidatum.

Vaccinium macrocarpon Variant (Table 46)

The following description is based on 17 sampled relevés for which 49 species are recorded. The average number of species per relevé is 11. This figure is slightly lower at ten for ombrotrophic mire and increases to 14 per relevé for transition sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Rhynchospora alba - Cladopodiella fluitans (15)
Sphagnum fimbriatum (2)

The Vaccinium macrocarpon Variant is restricted to the wetter sections of peatland. The majority of the relevés (71%) are from ombrotrophic mire with the remaining ones occurring in transition sites.

The Variant is found only in maritime regions with most of the relevés located in Nova Scotian mires. It is a rare feature in coastal mires from New Brunswick and is absent from the Bas Saint-Laurent.

Topographically, the Variant is situated mainly in depressions with 15 out of 17 relevés occurring here while the remaining two are found on hummocky surfaces in transition mire. The average field cover is 51% ranging from 10% to 75%. The ground layer has an average cover of 90% (range + to 100%) with the majority of the relevés having complete coverage.

There are 70% of the mire character species present within the Variant. None of them occur in more than 50% of the relevés and all have very low cover. Those missing from the Variant include Eriophorum angustifolium, Smilacina trifolia and Sphagnum recurvum.

Vaccinium macrocarpon, the differential of the Variant, is present with low to moderate cover values. Rhynchospora alba is a constant associate while Drosera intermedia and Cladopodiella fluitans occur with high frequency, the latter having very high cover as well.

The differential with its associate species distinguishes most of the relevés within the Variant in depressional areas. In a transition mire in Nova Scotia which is adjacent to a salt marsh Sphagnum fimbriatum is one of the dominant bryophytes while Carex paleacea is a prominent member of the field layer. Here the topography consists of hummocky surfaces.

Eriophorum virginicum Variant (Table 47)

The following data are based on 35 sampled relevés for which 57 species are recorded with 45% of these occurring only once. The average number of species per relevé is nine. This figure remains the same for both maritime and continental areas while lowering slightly to eight for ombrotrophic mire. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum magellanicum (13)
Sphagnum cuspidatum (22)

The Eriophorum virginicum Variant is located predominantly in ombrotrophic mire with 86% of the relevés occurring here. It is found only occasionally in transition sites and is absent in rheotrophic areas. The moisture conditions for the Variant within these mire types ranges from moderately damp to very wet. The Variant is situated in both maritime and continental regions, It occurs most frequently in New Brunswick and the Côte Nord while being a rare feature in mires around Lac Saint-Jean and in Nova Scotia. It is not recorded from the Bas Saint-Laurent.

Topographically, the Variant is found mainly in depressions and on hummocky surfaces with 46% of the relevés located in the former and 31% on the latter. It is situated occasionally in ponds and in two relevés in transition mire it occurs on distinct hummocks. The average field cover is 47% ranging from 7% to 98% while the ground layer has a very high average cover of 99.9% with all but one relevé having complete coverage. Epiphytes are recorded in a single relevé, having less than 1% cover.

All of the mire character species are present within the Variant.

Chamaedaphne calyculata, Vaccinium oxycoccos and Sphagnum magellanicum occur in the majority of the relevés but only the last frequently has high cover values.

The differential of the Variant, Eriophorum virginicum, is constant but with mainly low cover. It attains its best development on hummocky surfaces in ombrotrophic mire.

When the Variant is located on hummocky surfaces or distinct hummocks in ombrotrophic and transition mire the dominant bryophyte is Sphagnum magellanicum while Chamaedaphne is a constant associate. In depressional areas and ponds primarily in ombrotrophic sites Sphagnum cuspidatum is the dominant with Rhynchospora alba and Cladopodiella fluitans as frequent associates, the latter occasionally having very high cover.

Where the Variant is situated in floating vegetation mats near the margins of ponds Vaccinium macrocarpon is sometimes a co-dominant with Sphagnum cuspidatum.

Nuphar variegatum Variant (Table 48)

The description is based on a total of 77 sampled relevés for which 34 species are recorded with 47% of these occurring only once. The average number of species per relevé is low at two. This figure remains the same for continental areas and ombrotrophic mire while increasing slightly to three per relevé for maritime regions and rheotrophic and transition sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum cuspidatum (8)
Nuphar variegatum (69)

The Nuphar variegatum Variant is found in the wettest sections of peatland with the majority of the relevés (65%) occurring in ombrotrophic mire. Of the remaining relevés 22% are located in transition and 13% in rheotrophic sites. The Variant occurs in all geographical regions except the Bas Saint-Laurent. It is found most frequently in the maritime regions of the Côte Nord and Nova Scotia.

Topographically, the Variant is situated mainly in ponds with 90% of the relevés ocurring here with the remaining 10% located in streams. These ratios are approximately the same for maritime and continental regions as well as for transition mire. The Variant is found more often in streams in rheotrophic sites and occurs only in ponds in ombrotrophic areas.

The average field cover is 47% ranging from 15% to 100% with the majority of the relevés having less than 50% coverage. The ground layer has a low average cover of 14% (range nil to 100%) being absent in a total of 34 relevés.

There are only three mire character species present within the Variant. They have very low occurrence and are exclusive to ombrotrophic mire. They include *Chamaedaphne calyculata*, *Sphagnum magellanicum* and *Kalmia polifolia*.

The differential of the Variant, *Nuphar variegatum*, is constant with low to high cover. It sometimes is the only species present and has its best development in the streams of rheotrophic and transition mire. There are no species that are constantly associated with the differential.

When the Variant is confined to ponds in ombrotrophic and transition mire *Sphagnum cuspidatum* frequently is present sometimes completely dominating the ground layer but more often occurring with very low cover. *Cladopodiella fluitans* is an occasional associate.

In the ponds and streams of transition and rheotrophic mire *Utricularia vulgaris* occasionally is found with low to high cover values.

Two species which occur in all mire types include *Scirpus subterminalis* and *Utricularia geminiscapa*, the former restricted to ponds and the latter located in streams as well.

Within the Variant the following companion species are found only in streams flowing through rheotrophic mire:

Myriophyllum exalbescens	Scirpus acutus
Equisetum fluviatile	Sparganium chlorocarpum
Potamogeton epihydrus	Sagittaria cuneata
Potamogeton natans	

<u>Andromeda glaucophylla</u> Variant (Table 49)

The description is based on 70 relevés for which 84 species are recorded with 32% of these occurring just once. There is an average of nine species per relevé. In maritime areas this figure increases to ten and in transition mire to 11 while in continental regions and ombrotrophic sites it is lower at eight and seven species per relevé respectively. The Variant is found in the following noda (presented with the number of relevés in each group):

Sphagnum papillosum (28)
Sphagnum cuspidatum (30)
Nuphar variegatum (6)
Drepanocladus exannulatus - Drepanocladus fluitans (2)
Sphagnum fimbriatum (2)
Sphagnum imbricatum (2)

The <u>Andromeda glaucophylla</u> Variant is located primarily in the damper sections of peatland. It occurs with almost equal frequency in transition and ombrotrophic sites but is a very rare feature in rheotrophic mire. Approximately 47% of the relevés are from maritime regions and 53% from continental areas. The Variant is commonly found along the Côte Nord, around Lac Saint-Jean and in New Brunswick while being only an occasional feature in mires from Nova Scotia and entirely absent from the Bas Saint-Laurent.

The Variant has quite a varied topography occurring most frequently in ponds (26% of the relevés), depressions (30%) and hummocky surfaces (37%) while only rarely situated in streams and on distinct hummocks. The average field cover is 54% ranging from 10% to 99%. The ground layer has an average cover of 92% (range nil to 100%) with the majority of the relevés having complete coverage. Epiphytes are recorded in only four relevés each having very low cover.

The Variant contains all ten of the mire character species. These are concentrated more frequently in transition mire where hummocky surfaces are the predominant topographic feature within the Variant, while in ombrotrophic mire where depressions and ponds prevail their occurrence in comparison is much lower. Only Chamaedaphne calyculata attains high cover and is present in more than 50% of the relevés.

Andromeda glaucophylla, the differential of the Variant, occurs with mainly low and occasionally moderate cover values. It does well in ponds especially in floating vegetation mats near the marginal areas. There are no species that are constant associates of the differential.

When the Variant is located mainly on hummocky surfaces or distinct hummocks primarily from transition mire the most frequently occurring dominant bryophyte is Sphagnum papillosum. Two other bryophytes which occasionally occur as dominants under these conditions are Sphagnum imbricatum and Sphagnum fimbriatum, the latter having Carex paleacea as a prominent associate in the field layer.

In depressional areas and ponds predominantly from ombrotrophic mire Sphagnum cuspidatum is the dominant bryophyte in the majority of the relevés. Cladopodiella fluitans is a frequent associate and occasionally occurs as a co-dominant. In marginal floating vegetation mats Chamaedaphne and the companion species Vaccinium macrocarpon are sometimes the co-dominants. In relevés 1013 and 753 Drepanocladus fluitans and Drepanocladus exannulatus respectively are the dominant bryophytes while Sphagnum cuspidatum either is absent or has very low cover.

In ponds where the ground layer is poorly developed or nonexistent vasculars like _Nuphar variegatum_ or _Chamaedaphne_ and _Andromeda_ are the most prominent species present.

<u>Menyanthes trifoliata</u> Variant (Table 50)

The following data are based on a total of 32 relevés for which 58 species are recorded with 26% of these occurring just once. The average number of species per relevé is six. This figure remains the same for maritime regions but is slightly lower at five in continental sites and in transition mire while increasing to eight per relevé in rheotrophic areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum majus (6)
Nuphar variegatum (9)
Calamagrostis canadensis - Myrica gale (17)

The <u>Menyanthes trifoliata</u> Variant is found only in the damper sections of transition and rheotrophic mire with 72% of the relevés occurring in the former and 28% in the latter. The Variant is located primarily in maritime regions especially from Nova Scotia. It is absent from New Brunswick and the Bas Saint-Laurent.

The relevés in the Variant are located either in ponds or in depressions (41% in the former and 59% in the latter). Similar percentages occur in maritime and continental areas while those relevés located in ponds are restricted to transition mire. The average field cover is 58% ranging from 10% to 97%. The ground layer's average cover is low at 26% (range nil to 100%) being absent in 12 relevés with the majority of these occurring in ponds.

There are only five out of ten mire character species found within the Variant none of which have very common occurrence or very high cover. These are concentrated mainly in relevés from maritime areas and include:

Eriophorum angustifolium	Sarracenia purpurea
Drosera rotundifolia	Chamaedaphne calyculata
Vaccinium oxycoccos	

The last species occurs only once.

Menyanthes trifoliata, the differential of the Variant, is constant with low to very high cover values. Its best development is in depressional areas of transition and rheotrophic mire from the maritime region of Nova Scotia. There are no species which are associated constantly with the differential.

In relevés having a well developed ground layer within the Variant Sphagnum majus is the dominant. These relevés are located in transition mire in both maritime and continental regions where they occur mainly in depressions.

When the Variant is found in ponds species like Scirpus subterminalis and Utricularia intermedia often are prominent members in the field layer. Frequently associated with the former are Nuphar variegatum and Utricularia geminiscapa both with low cover values. Relevés occurring in ponds are restricted to transition mire and often have a complete absence of bryophytes.

In depressional areas in rheotrophic mire from maritime sites sedges like Carex limosa and Carex paupercula often are dominant. The ground layer in these relevés generally is poorly developed.

Carex rostrata Variant (Table 51)

The description is based on a total of 11 relevés for which 52 species are recorded. There is an average of ten species per relevé. This figure remains the same for transition mire but is lower at nine for maritime sites and increases to 12 per relevé for both continental areas and rheotrophic mire. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum pulchrum (3)
Myrica gale - Chamaedaphne calyculata (Fen) (8)

The Carex rostrata Variant is found mainly in transition mire with 73% of the relevés occurring here. It is an occasional feature of rheotrophic sites but does not occur in ombrotrophic areas. It is restricted to the damper sections of peatland. The Variant is found in all geographical regions except the Bas Saint-Laurent. Nearly all of the relevés from transition mire are located in maritime areas while those from rheotrophic sites are found in continental regions.

Topographically, 91% of the relevés are in depressional areas with a single relevé occurring on a distinct hummock. The average field cover is high at 86% (range 55% to 99%) with the majority of the relevés having greater than 90% cover. The ground layer has an average cover of 47% ranging from nil to 100%. Epiphytes are recorded in only one relevé.

All of the mire character species are present within the Variant. These are concentrated mainly in transition sites. Only Chamaedaphne calyculata, Sphagnum recurvum and Smilacina trifolia have moderate or high cover values, the rest having very low cover.

The differential of the Variant, Carex rostrata, is constant with low to moderate cover. Its best development is in transition mire. _Myrica gale_ is a frequent associate of the differential, being absent in only two relevés.

When the Variant occurs mainly in depressions with a well developed ground layer _Sphagnum pulchrum_ is the dominant with _Sphagnum papillosum_ and _Andromeda glaucophylla_ as constant associates. Relevés here are from transition mire in maritime regions. Where the ground layer has a reduced cover but a dense field layer is present _Myrica gale_ often is dominant with moderate to high cover values.

Carex exilis Variant (Table 52)

The description is based on a total of 31 relevés for which 94 species are recorded with 27% of these occurring only once. There is an average of 15 species per relevé. This figure is the same for maritime areas but increases to 16 for continental regions as well as for rheotrophic and ombrotrophic mire while being slightly lower at 14 per relevé for transition sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum rubellum - Sphagnum nemoreum (8)
Sphagnum pulchrum (7)
Sphagnum recurvum (5)
Sphagnum papillosum (6)
Myrica gale - Chamaedaphne calyculata (Fen) (5)

The Carex exilis Variant is located primarily in the damper sections of peatland. It is found most frequently in transition mire with approximately half of the relevés occurring here. Of the remaining relevés 36% are from ombrotrophic and 16% from rheotrophic sites. The Variant is mainly a feature in mires from maritime areas. In continental regions it is restricted to a single mire from northwestern New Brunswick. The Variant is absent around Lac Saint-Jean and from the Bas Saint-Laurent.

Topographically, 55% of the relevés are located in depressions, 32% occur on hummocky surfaces and 13% on distinct hummocks. The average field cover is 64% ranging from 10% to 95% while the ground layer has an average cover of 84% (range nil to 100%) with the majority of the relevés having greater than 98% coverage. Epiphytes are recorded in three relevés each at less than 1% cover.

There are 90% of the mire character species present. These are confined mainly to transition and ombrotrophic mire. Species here which have frequent occurrence include:

Vaccinium oxycoccos	Chamaedaphne calyculata
Drosera rotundifolia	Kalmia polifolia
Sarracenia purpurea	Sphagnum rubellum

The last species along with Sphagnum recurvum are the only ones to attain high cover values.

The differential of the Variant, Carex exilis, is constant with predominantly low cover. Andromeda glaucophylla is the only frequent associate.

When the Variant occurs on hummocks or hummocky surfaces with a well developed ground layer either Sphagnum rubellum, Sphagnum nemoreum or Sphagnum recurvum are dominant. All three are found in both transition and ombrotrophic mire in maritime regions but the latter also occurs in continental sites as well.

Where the Variant is confined mainly to depressions having high ground cover species like Sphagnum pulchrum or Sphagnum papillosum are the dominants. Both occur only in maritime areas, the latter found primarily in transition mire.

In relevés where the ground layer is absent or poorly developed Carex aquatilis and Potentilla fruticosa combine to make up the dominant field cover. These relevés are restricted to the depressional areas of a single rheotrophic mire from the inland region of central Nova Scotia. Constant associtès include Epilobium palustre, Spiraea latifolia and Viola cucullata none of which have very high cover.

Carex oligosperma Variant (Table 53)

The following description is based on a total of 102 sampled relevés for which 80 species are recorded with 35% of these occurring just once. The average number of species per relevé is nine. This figure remains the same for both maritime and continental areas while in transition mire it is slightly lower at eight and in ombrotrophic sites it increases to 11 per relevé. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum fuscum (11)
Sphagnum rubellum - Sphagnum nemoreum (10)
Sphagnum magellanicum (11)
Sphagnum pulchrum (15)
Sphagnum recurvum (23)
Sphagnum papillosum (12)
Sphagnum majus (5)
Sphagnum cuspidatum (15)

The Carex oligosperma Variant is located mainly in the damper sections of transition mire with 74% of the relevés occurring here. Nearly all of the remaining relevés are from ombrotrophic sites where they are found predominantly in slightly drier areas. The Variant is a very rare feature of rheotrophic mire with only one relevé situated here.

The majority of the relevés (79%) are from the continental regions of Lac Saint-Jean and New Brunswick. In maritime areas the Variant is located primarily along the Côte Nord. It is recorded in just one relevé in Nova Scotia and is absent from the Bas Saint-Laurent.

Topographically, 57% of the relevés occur on hummocky surfaces and 16% on distinct hummocks while nearly all of the remaining relevés are located in depressions, the exception being Relevé 755 which is situated in a pond.

The average field cover for the Variant is 52% ranging from 1% to 97%. The ground layer has an average cover of 99.8% (range 93% to 100%) with the vast majority of the relevés having complete coverage. Epiphytes are recorded in only ten relevés all having less than 1% cover.

All of the mire character species are present. Vaccinium oxycoccos, Chamaedaphne calyculata and Sphagnum magellanicum are found in more than 50% of the relevés. The latter two plus Sphagnum recurvum and Sphagnum rubellum have cover values ranging from low to very high while the rest have predominantly low cover.

Carex oligosperma, the differential of the Variant, is constant with mainly low to moderate cover. It usually is best developed on hummocky surfaces and in depressions rather than on distinct hummocks where it appears to be a relic indicating that damper conditions had once prevailed. There are no species constantly associated with the differential.

In ombrotrophic mire where most of the relevés occur on hummocks or hummocky surfaces bryophytes like Sphagnum fuscum, Sphagnum rubellum or Sphagnum recurvum are the dominants. Frequent associates of the first include the Ericaceous species Ledum groenlandicum and Kalmia angustifolia and the mosses Pohlia sphagnicolia and Polytrichum strictum. The mire character species Sphagnum magellanicum is present constantly as well, while two others, Vaccinium oxycoccos and Chamaedaphne calyculata are constant associates of Sphagnum rubellum.

In addition to being a dominant in ombrotrophic sites Sphagnum recurvum often occurs with very high cover values on hummocks or hummocky surfaces in transition mire, as well as Sphagnum magellanicum, Sphagnum pulchrum and Sphagnum papillosum.

Where the Variant is located in depressional areas of transition mire either Sphagnum majus or Sphagnum cuspidatum are the dominant bryophytes. There is almost a complete absence of mire character species in the relevés where the former is dominant.

<u>Scheuchzeria palustris</u> Variant (Table 54)

The description is based on a total of 70 sampled relevés for which 47 species are recorded with 15% of these occurring only once. There is an average of eight species per relevé. This figure remains the same for both maritime and continental regions as well as for transition mire while being lower at six per relevé in ombrotrophic sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum magellanicum (11)
Sphagnum pulchrum (10)
Sphagnum papillosum (14)
Sphagnum majus (7)
Sphagnum cuspidatum (28)

The <u>Scheuchzeria palustris</u> Variant is found predominantly in the damper sections of transition mire with 93% of the relevés occurring here. It is only an occasional feature in wet areas of ombrotrophic mire and is absent completely from rheotrophic sites. The Variant occurs with almost equal frequency in the continental regions of Lac Saint-Jean and New Brunswick and the maritime area of the Côte Nord. It is a rare feature in mires from the Bas Saint-Laurent and is not recorded from Nova Scotia.

Topographically, 8% of the relevés are located in ponds, 56% occur in depressions, 29% on hummocky surfaces and 7% on distinct hummocks. These percentages remain approximately the same for transition mire while in ombrotrophic sites the Variant is restricted to ponds and depressional areas.

The average field cover is low at 36% ranging from 1% to 95% with the majority of the relevés having less than 50% cover. The ground layer has a very high average cover of 99.9% (range 95% to 100%) with only three relevés having less than complete coverage. Epiphytes are recorded in two relevés each with very low cover.

All of the mire character species are present within the Variant but none are found in more than half of the relevés. They occur more frequently when the Variant is located on hummocky surfaces or on distinct hummocks. Only Sphagnum magellanicum often attains high cover, the rest of the species having predominantly low cover values.

The differential of the Variant, Scheuchzeria palustris, is present with low to moderate cover values. There are no species constantly associated with the differential.

When the Variant is located primarily on hummocks and hummocky surfaces species like Sphagnum magellanicum or Sphagnum papillosum are dominant in the ground layer. In depressions, on the other hand, either Sphagnum pulchrum, Sphagnum majus or Sphagnum cuspidatum are present with very high cover.

<u>Carex limosa</u> Variant (Table 55)

The description is based on a total of 47 sampled relevés for which 65 species are recorded with 32% of these occurring only once. There is an average of nine species per relevé. This figure remains the same for maritime areas as well as for both rheotrophic and ombrotrophic mire while it is slightly lower at eight per relevé in continental regions and in transition sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Rhynchospora alba - Cladopodiella fluitans (8)
Sphagnum pulchrum (8)
Sphagnum papillosum (14)
Sphagnum majus (5)
Calamagrostis canadensis - Myrica gale (10)
Drepanocladus exannulatus - Drepanocladus fluitans (2)

The <u>Carex limosa</u> Variant is found only in the damper sections of peatland. Approximately 64% of the relevés occur in transition mire, 21% in ombrotrophic sites and 15% in rheotrophic areas. The Variant is found frequently in the continental regions of Lac Saint-Jean and New Brunswick and the maritime area of the Côte Nord while being a rare feature in mires in Nova Scotia and absent from the Bas Saint-Laurent.

The Variant commonly is found in depressions and on hummocky surfaces and occasionally in ponds. It never occurs on distinct hummocks. The average field cover is 46% ranging from 10% to 100% while the ground layer has an average cover of 78% (range + to 100%) with the majority of the relevés having greater than 90% cover.

There are nine out of ten mire character species present within the Variant. These are confined to ombrotrophic and transition mire, being absent in rheotrophic sites. <u>Chamaedaphne calyculata</u> and

Vaccinium oxycoccos are the only species frequently present. None of the mire character species have very high cover values.

Carex limosa, the differential of the Variant, is constant with low to high cover. Its best development is in rheotrophic mire. There are no species constantly associated with the differential.

In obrotrophic mire where the Variant is confined to depressions either Cladopodiella fluitans or Drepanocladus fluitans are the dominant bryophytes. Associated with the former are Sphagnum cuspidatum which is constant and Rynchospora alba and Andromeda glaucophylla, each missing in only one relevé. When the Variant occurs on hummocky surfaces in ombrotrophic and transition mire Sphagnum papillosum is dominant in the ground layer and Andromeda glaucophylla is a frequent associate. This sub-variant is found only in continental mires. Sphagnum pulchrum is sometimes the dominant where the Variant is restricted to transition mire and the topography is either hummocky or depressional. In transition mire where the topography entirely consists of depressions Sphagnum majus occasionally is the dominant species present.

When the Variant is located in the depressions of rheotrophic mire in the maritime region of the Côte Nord the ground layer is poorly developed while the field layer is very dense and is dominated by sedges like Carex limosa and Carex paleacea. Here Drepanocladus exannulatus is a constant associate and Myrica gale is present with high frequency.

Carex lasiocarpa Variant (Table 56)

The following data are based on 25 sampled relevés for which 74 species are recorded. The average number of species per relevé is nine. This figure is the same for the different mire types in which the Variant is found as well as for maritime sites while in continental areas it is slightly lower at eight per relevé. The Variant occurs in the following noda (listed with the number of relevés in each group):

Sphagnum pulchrum (4)
Sphagnum papillosum (4)
Sphagnum cuspidatum (4)
Calamagrostis canadensis - Myrica gale (11)
Sphagnum imbricatum (2)

The Carex lasiocarpa Variant is found in the damper sections of transition and rheotrophic mire with 56% of the relevés occurring in the former and 44% in the latter. The Variant occurs with almost equal frequency in both maritime and continental areas. It is not recorded from the Saint Lawrence River Valley.

The Variant is found mainly in depressional areas with 64% of the relevés located here. It occurs occasionally on hummocky surfaces but is a rare feature in ponds and on distinct hummocks. The average field cover is 63% (range 10% to 100%) with the majority of the relevés having greater than 50% cover. The ground layer has an average cover of 56% ranging from nil to complete coverage, being absent in seven relevés.

There are 90% of the mire character species present within the Variant with Sphagnum recurvum being absent. These species are concentrated mainly in transition mire from continental sites. None of them occur in more than 50% of the relevés or have very high cover values.

Carex lasiocarpa, the differential of the Variant, is present with low to very high cover. There are no species constantly associated with the differential.

When the Variant is located on hummocky surfaces or distinct hummocks bryophytes like Sphagnum papillosum or Sphagnum imbricatum are dominant, the former occurring in transition sites from continental areas and the latter in rheotrophic mire from the maritime region of Nova Scotia.

In depressions where the ground layer is well developed either Sphagnum pulchrum or Sphagnum cuspidatum are present with high cover. The latter is found on hummocky surfaces as well and has Myrica gale as a constant associate. Both Sphagnum species are confined mainly to transition sites.

In depressional areas where the ground layer either is poorly developed or missing entirely sedges like Carex lasiocarpa, Carex stricta or Scirpus acutus are prominent members of the field layer. These species are found in rheotrophic mire with the first occurring in transition sites as well.

Carex aquatilis Variant (Table 57)

The description is based on a total of 31 relevés for which 77 species are recorded with 32% of these occurring only once. The average number of species per relevé is 11. This figure remains the same for each of the different mire types but is slightly lower at ten in maritime areas and increases to 12 per relevé for continental regions. The Variant occurs in the following noda (listed with the number of relevés in each group):

Sphagnum magellanicum (2)
Sphagnum pulchrum (3)
Sphagnum papillosum (4)
Calamagrostis canadensis - Myrica gale (11)
Myrica gale - Chamaedaphne calyculata (Fen) (8)
Sphagnum imbricatum (3)

The Carex aquatilis Variant is confined to the damper sections of rheotrophic and transition mire with 77% of the relevés occurring in the former and 23% in the latter.

The Variant is recorded from the maritime areas of Nova Scotia and the Côte Nord and the continental region of Lac Saint-Jean.

The topography consists primarily of depressions. Approximately 81% of the relevés occur here with the remaining ones located on hummocks. Nearly all of the latter are from maritime sites.

The Variant has an average field cover of 73% (range 20% to 100%) with the majority of the relevés having greater than 50% cover. The average ground cover is 41% ranging from nil to complete coverage. There are nine relevés in which this layer is absent. An epiphytic cover of less than 1% is recorded in only one relevé.

All ten of the mire character species are present within the Variant with only Chamaedaphne calyculata having frequent occurrence while Eriophorum angustifolium and Sphagnum recurvum occur just once. The mire character species are concentrated mainly in the relevés from transition mire while being present only occasionally in those from rheotrophic sites.

The differential of the Variant, Carex aquatilis, is constant with very low to very high cover values. Its best development is in depressional areas in rheotrophic mire primarily from continental sites where it often dominates the field layer. Myrica gale is a frequent associate with low to moderately high cover.

When the Variant is located mainly on hummocks in transition and rheotrophic mire the dominant bryophytes include either Sphagnum magellanicum, Sphagnum imbricatum or Sphagnum papillosum. Where the Variant has a well developed ground layer and occurs in the depressional areas of transition mire from maritime regions Sphagnum pulchrum is dominant.

In depressions primarily in rheotrophic mire from continental sites where the ground layer is either poorly developed or absent species like Carex aquatilis, Myrica gale and Potentilla fruticosa are prominent members of the field layer. Constant associates of the last species include Carex exilis and Viola cucullata.

Myrica gale Variant (Table 58)

The description is based on a total of 126 sampled relevés for which 186 species are recorded with 25% of these occurring only once. There is an average of 12 species per relevé. This figure remains the same for both maritime and continental regions as well as for transition sites while being slightly lower at 11 in rheotrophic mire and increasing to a high of 19 per relevé in ombrotrophic areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum fuscum (10)
Sphagnum magellanicum (13)
Sphagnum russowii (4)
Sphagnum recurvum (11)
Sphagnum papillosum (20)
Sphagnum cuspidatum (5)
Calamagrostis canadensis - Myrica gale (21)
Myrica gale - Chamaedaphne calyculata (Fen) (30)
Sphagnum warnstorfii (3)
Sphagnum fimbriatum (9)

The Myrica gale Variant occurs mainly in the damper sections of rheotrophic and transition mire with 49% of the relevés located in the former and 41% in the latter. It occasionally is found in drier areas of ombrotrophic mire with 10% of the relevés occurring here. The Variant is present in all geographical regions, being a rare feature only in the Bas Saint-Laurent. Approximately 65% of the relevés are found in maritime areas and 35% in continental sites.

Topographically, 54% of the relevés occur in depressions, 24% on hummocky surfaces and 22% on distinct hummocks. These ratios are roughly the same for both rheotrophic and transition mire while in ombrotrophic sites the Variant is absent in depressional areas. The average field cover is 80% (range 20% to 100%) with the majority of the relevés having greater than 65% cover. The ground layer has an average cover of 64% ranging from nil to 100%, being absent in 11 relevés. Epiphytes are recorded in only 12 relevés nearly all having less than 1% cover.

All of the mire character species are found within the Variant but only Chamaedaphne calyculata occurs in more than 50% of the relevés having low to moderately high cover. The majority of the remaining species generally have low cover values, the exceptions being Sphagnum magellanicum and Sphagnum recurvum which frequently are present as dominants.

Myrica gale, the differential of the Variant, is constant with low to very high cover. Its best development is primarily in the depressional areas of rheotrophic and transition mire. There are no species that are associated constantly with the differential.

When the Variant occurs in ombrotrophic mire it is mainly on hummocks in maritime areas (especially Nova Scotia) with Sphagnum fuscum as the dominant bryophyte. The following species are frequent associates:

Solidago uliginosa	Ledum groenlandicum
Kalmia angustifolia	Aronia prunifolia
Odontoschisma sphagni	Empetrum nigrum
Polytrichum strictum	Rubus chamaemorus
Calopogon pulchellus	

Most of these species have mainly low cover values the exceptions being the last two which frequently have moderate to high cover.

Several other bryophytes also become dominants when the Variant occurs primarily on hummocky surfaces or on distinct hummocks. Sphagnum magellanicum or Sphagnum russowii are found in both maritime and continental regions with the former occurring in all mire types and the latter being absent from transition areas. Sphagnum warnstorfii occurs in a continental rheotrophic mire while Sphagnum fimbriatum is exclusive to maritime regions in both rheotrophic and transition sites. Carex paupercula is a constant associate of the last named species.

Dominant bryophytes occurring more frequently in depressional areas within the Variant include Sphagnum recurvum, Sphagnum papillosum and Sphagnum cuspidatum. These are found in both maritime and continental regions and are confined to transition and rheotrophic mire.

Where the ground layer is poorly developed sedges like Carex limosa, Carex paleacea, Carex aquatilis and Carex stricta are prominent members of the field layer as well as woody vasculars like Myrica gale and Potentilla fruticosa. Relevés having these features are located mainly in the depressional areas of rheotrophic and transition sites.

Carex stricta Variant (Table 59)

The following data are based on a total of 16 sampled relevés for which 74 species are recorded. The average number of species per relevé is 13. This figure remains the same for both continental and maritime areas as well as for rheotrophic mire while being slightly lower at 12 per relevé in transition sites. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum pulchrum (5)
Sphagnum recurvum (3)
Calamagrostis canadensis - Myrica gale (5)
Sphagnum warnstorfii (3)

The Carex stricta Variant is located only in the damper sections of peatland with 63% of the relevés occurring in rheotrophic mire and 37% in transition areas.

The Variant is recorded from the maritime regions of Nova Scotia and the Bas Saint-Laurent and in the continental areas of New Brunswick and Lac Saint-Jean.

Topographically, the Variant is found in depressions and on hummocky surfaces with ten out of 16 relevés occurring in the former and the rest in the latter. In rheotrophic mire the Variant occasionally is found near streams flowing through the sites.

The average field cover within the Variant is high at 80% ranging from 15% to 98% with the majority of the relevés having greater than 80% coverage. The ground layer has an average cover of 67% (range nil to 100%) with most of the relevés having greater than 90% cover. Epiphytes are recorded in only three relevés each having less than 1% cover.

All of the mire character species occur within the Variant but only Chamaedaphne calyculata is present frequently. Most of the species have low cover, the exceptions being Sphagnum magellanicum and Sphagnum recurvum, the former with mainly moderate cover and the latter with high cover values. The mire character species are concentrated primarily in transition mire and only sparsely present in rheotrophic sites.

Carex stricta, the differential of the Variant, has very low to moderately high cover values. Its best development is in the depressional areas of rheotrophic mire in continental sites and transition mire in maritime regions. There are no species that are associated constantly with the differential.

When the Variant is located mainly in the depressional areas of transition mire from maritime regions Sphagnum pulchrum is the dominant species in the ground layer while Ledum groenlandicum and Kalmia angustifolia are frequent associates.

Where the Variant is found mainly on hummocky surfaces in rheotrophic mire with a well developed ground layer either Sphagnum recurvum or Sphagnum warnstorfii are dominant. Myrica gale is present constantly with both these species and is a prominent member of the field layer when associated with the latter.

In the depressional areas of rheotrophic mire with a poorly developed ground layer sedges like Carex stricta, Carex lasiocarpa and Scirpus acutus dominate the field layer. Frequent associates here include Spiraea latifolia and Calamagrostis canadensis.

Spiraea latifolia Variant (Table 60)

The description is based on a total of 18 sampled relevés for which 69 species are recorded. The average number of species for each relevé is 12. The Variant occurs in the following noda (listed with the number of relevés in each group):

Sphagnum russowii (2)
Calamagrostis canadensis - Myrica gale (13)
Sphagnum warnstorfii (3)

The Spiraea latifolia Variant is found only in the damper sections of rheotrophic mire. The majority of the relevés are from continental sites especially the Lac Saint-Jean area while only two are located in a mire from the maritime region of Nova Scotia. There are no relevés from the Saint Lawrence River Valley.

Approximately 78% of the relevés are located in depressions while the remaining ones are divided equally between hummocks and hummocky surfaces. The average field cover is high at 91% (range 65% to 100%) with the majority of the relevés having greater than 89% cover. The ground layer is poorly developed with an average cover of only 31% (range nil to 100%) being completely absent in eight relevés. When examined in terms of topography those relevés occurring in depressions have an average ground cover of 10% while those found on hummocks or hummocky surfaces have an average cover of 99% in this layer. Epiphytes are recorded in only three relevés each having less than 1% cover.

There are only 40% of the mire character species present within the Variant. Chamaedaphne calyculata occurs frequently while Kalmia polifolia, Sphagnum magellanicum and Sphagnum rubellum occur only once.

None of these species have very high cover values.

The differential of the Variant, Spiraea latifolia, is constant while Calamagrostis canadensis becomes an associate species being present in all but one relevé. Both these species have only low cover.

When the Variant occurs on hummocks or hummocky surfaces either Sphagnum russowii or Sphagnum warnstorfii are dominant in the ground layer. Myrica gale is associated constantly with both these species being a prominent member of the field layer. These sub-variants are found only in continental sites.

Where the Variant is located in depressions sedges are dominant in the field layer while the ground layer usually is poorly developed. In continental sites either Carex aquatilis, Carex stricta or Carex rostrata are dominants, the first two being recorded from mires in the Lac Saint-Jean region and the last from a site in New Brunswick. In the maritime region of Nova Scotia Carex lasiocarpa becomes one of the dominants in the field layer.

Calamagrostis canadensis Variant (Table 61)

The description is based on a total of 36 relevés for which 103 species are recorded with 31% of these occurring only once. The average number of species per relevé is 11. This figure remains the same for both maritime and continental areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum russowii (2)
Calamagrostis canadensis - Myrica gale (26)
Sphagnum warnstorfii (2)
Sphagnum fimbriatum (2)
Sphagnum imbricatum (4)

The Calamagrostis canadensis Variant is found only in the damper sections of rheotrophic mire.

The Variant is located in all the geographical regions except the Bas Saint-Laurent. Approximately 47% of the relevés occur in the maritime areas of Nova Scotia and the Côte Nord while the remaining ones are from continental sites especially the Lac Saint-Jean region.

The topography in the Variant consists mainly of depressions with 75% of the relevés occurring here, while 19% are found on hummocks and only 6% (two relevés) on hummocky surfaces.

Structurally, the Variant has a well developed field layer with an average cover of 84% ranging from 40% to 100% with the majority of the relevés having greater than 70% cover. The ground layer has an average cover of 31% (range nil to 100%). When this layer is examined in terms of topographic features those relevés occurring on hummocks and hummocky surfaces have an average ground cover of 99% while those located in depressions have an average cover of only 5% (range nil to 25%) with ten of these relevés having a complete absence of bryophytes. Epiphytes are recorded in only three relevés each having less than 1% cover.

There are eight out of ten mire character species present within the Variant. Those missing include Smilacina trifolia and Eriophorum angustifolium. Only Chamaedaphne calyculata occurs with moderate frequency, the rest being present sporadically. None of the mire character species have very high cover values.

The differential of the Variant, Calamagrostis canadensis, is constant with predominantly low cover, the exception being Relevé 1216 where it dominates the field layer. This species appears to be a relic in mires, having its best development in floodplains adjacent to rheotrophic sites where it often covers extensive areas. There are no species constantly associated with the differential. The two companion species Myrica gale and Spiraea latifolia are present frequently, the former with low to high cover and the latter with only low cover values.

Where the Variant is located in the depressional areas of mires adjacent to salt marshes along the Côte Nord Carex paleacea is present constantly with moderate cover. Frequently associated with this species are Drepanocladus exannulatus, Carex limosa, Galium tinctorium and Rumex orbiculatus. In depressional areas of maritime mires not in the vicinity of salt marshes species like Carex lasiocarpa and Salix pedicellaris sometimes are prominent in the field layer. This is the case in a mire from Nova Scotia.

When the Variant occurs on hummocks in maritime areas the ground layer is dominated by either Sphagnum imbricatum or Sphagnum fimbriatum. The former, occurring in Nova Scotian sites, has Aster nemoralis, Solidago uliginosa, Carex aquatilis and Aronia prunifolia as frequent associates. The latter, restricted to a single mire from the Côte Nord, has Hypericum virginicum as a constant associate while Carex canescens is common to both. Where the Variant occurs on hummocks or hummocky surfaces in continental sites the ground layer is dominated by Sphagnum russowii or Sphagnum warnstorfii.

In depressional areas of continental mires sedges like Carex aquatilis, Carex rostrata and Carex stricta often are dominant in the field layer.

Alnus rugosa Variant (Table 62)

The following description deals with the non-shrub aspects of the species and is based on a total of 15 relevés for which 70 species are recorded. There is an average of 11 species per relevé. This figure remains the same for continental sites but is slightly lower at ten for maritime areas. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum rubellum - Sphagnum nemoreum (3)
Sphagnum russowii (2)
Calamagrostis canadensis - Myrica gale (10)

The Alnus rugosa Variant is found mainly in the damper sections of rheotrophic mire and in slightly drier areas in transition sites. Approximately 87% of the relevés occur in the former and 13% in the latter. The Variant is present in all geographical regions except the Bas Saint-Laurent occurring with almost equal frequency in both continental and maritime areas.

Topographically, 67% of the relevés are located in depressions while the remaining ones occur on distinct hummocks. Similar ratios are found in rheotrophic mire while the relevés in transition sites occur only on hummocks. The average field cover is 74% (range 35% to 100%) with the majority of the relevés having greater than 60% cover. The ground layer has an average cover of 37% ranging from nil to 100% being absent in five relevés. In terms of topographic features the ground layer has complete coverage in those relevés located on hummocks while having an average cover of only 5% when the relevés occur in depressions.

There are 90% of the mire character species found within the Variant with only Eriophorum angustifolium being absent. Chamaedaphne calyculata is present frequently while the other species have only sporadic occurrence.

Alnus rugosa, the differential of the Variant, is present with predominantly low cover values. There are no species that are constant associates.

When the Variant occurs on hummocks with a well developed ground layer either Sphagnum russowii, Sphagnum rubellum or Sphagnum nemoreum are the dominants, the last species being confined to transition mire. Where the relevés are located in depressions with a poorly developed ground layer sedges like Carex rostrata, Carex aquatilis, Carex canescens or Carex limosa dominate the field layer.

<u>Carex pauperoula</u> Variant (Table 63)

The description is based on a total of 40 relevés for which 92 species are recorded with 28% of these occurring only once. There is an average of ten species per relevé. In rheotrophic mire this figure is lower at eight while in transition and ombrotrophic mire it increases to 12 per relevé. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum rubellum - Sphagnum nemoreum (11)
Rhynchospora alba - Cladopodiella fluitans (5)
Calamagrostis canadensis - Myrica gale (14)
Drepanocladus exannulatus - Drepanocladus fluitans (3)
Sphagnum fimbriatum (7)

The <u>Carex paupercula</u> Variant is confined to the damper sections of peatland. Approximately 38% of the relevés occur in rheotrophic mire, 35% in transition and 27% in ombrotrophic sites.

Within the study area the Variant is found predominantly in the maritime regions of Nova Scotia and the Côte Nord. Only Relevé 1132 is from a continental site in New Brunswick. The Variant is absent from the Bas Saint-Laurent and Lac Saint-Jean area.

Sixty percent of the relevés within the Variant occur in depressions while 23% are located on hummocky surfaces and 15% on distinct hummocks. One relévé is situated in a pond.

Structurally, the Variant has a moderately well developed field layer with an average cover of 62% (range 15% to 93%) with the majority of the relevés having greater than 50% cover. The average ground cover is 70% ranging from nil to 100%. Epiphytes are recorded in only two relevés, each having less than 1% cover.

All of the mire character species are present within the Variant. These species are concentrated mainly in ombrotrophic mire and less frequently in transition sites while being present only occasionally in rheotrophic areas. The only mire character species occurring in the latter category are Vaccinium oxycoccos, Drosera rotundifolia, Chamaedaphne calyculata and Eriophorum angustifolium.

The differential of the Variant, Carex paupercula, is constant with very low to moderately high cover. Its best development is in rheotrophic mire in Nova Scotia. There are no species constantly associated with the differential.

When the Variant has a well developed ground layer and is located in ombrotrophic and transition mire the dominant species are Sphagnum rubellum, Sphagnum nemoreum and Cladopodiella fluitans. Associated with the first two are Odontoschisma sphagni, Mylia anomala, Eriophorum spissum and Andromeda glaucophylla while Drosera anglica and Rhynchospora alba are frequent associates of the latter.

Where the Variant has a poorly developed ground layer and occurs in rheotrophic and transition mire, sedges like Carex exilis and Carex paupercula form a significant part of the field cover. Species such as Menyanthes trifoliata and Utricularia intermedia are co-dominant with these sedges. The last named species is found in very damp sections of transition mire and has Drosera intermedia, Carex vesicaria and Juncus stygius as frequent associates.

Where the relevés have a well developed ground layer but are found primarily in rheotrophic mire the dominant species are either Drepanocladus exannulatus or Sphagnum fimbriatum. A constant associate with the latter is Myrica gale.

Carex paleacea Variant (Table 64)

The following description is based on a total of 18 sampled relevés for which 47 species are recorded. The total number of species per relevé is nine. The Variant is found in the following noda (listed with the number of relevés in each group):

Calamagrostis canadensis - Myrica gale (9)
Drepanocladus exannulatus - Drepanocladus fluitans (2)
Sphagnum fimbriatum (7)

The Carex paleacea Variant occurs in the damper sections of rheotrophic and transition mire with 89% of the relevés located in the former and 11% in the latter. It always is situated near or adjacent to salt marshes.

The Variant is found only in maritime regions with all of the relevés from rheotrophic mire located along the Côte Nord and those from transition mire occurring in a Nova Scotian site.

Topographically, 67% of the relevés are found in depressions while the remaining ones are divided equally, occurring either on hummocky surfaces or distinct hummocks.

The Variant has a well developed field layer with an average cover of 80% (range 10% to 100%) with the majority of the relevés having greater than 70% cover. The average ground cover is 50% ranging from nil to 100%. Those relevés occurring in depressions with a dense field cover have a poorly developed ground layer (average cover only 2%).

Only 40% of the mire character species are present within the Variant none having very frequent occurrence. They are restricted to the relevés having a well developed ground layer. They include Vaccinium oxycoccos, Drosera rotundifolia, Sphagnum rubellum and Chamaedaphne calyculata, the last occurring just once.

Carex paleacea, the differential of the Variant, is present with low to moderate cover values. There are no species constantly associated with it.

When the Variant occurs in depressions in rheotrophic mire along the Côte Nord, where the relevés have a very dense field layer with very low ground cover, Carex limosa and Drepanocladus exannulatus are present constantly, the former with low to moderately high cover and the latter with only low cover values. Other species frequently present include Myrica gale, Galium tinctorium and Rumex orbiculatus. In rheotrophic depressions from the same region having a well developed ground layer Drepanocladus exannulatus is the dominant with very high cover.

Where the Variant occurs on hummocky surfaces or on distinct hummocks Sphagnum fimbriatum dominates the ground layer. This is the case in rheotrophic mire along the Côte Nord and in transition mire from Nova Scotia. Frequently occurring species here include Carex paupercula, Myrica gale and Hypericum virginicum, the last being absent in the transition site.

<u>Carex canescens</u> Variant (Table 65)

The following description is based on a total of eight relevés for which 52 species are recorded. There is an average of 12 species per relevé. The Variant is found in the following noda (listed with the number of relevés in each group):

Drepanocladus exannulatus - Drepanocladus fluitans (2)
Sphagnum fimbriatum (3)
Sphagnum imbricatum (3)

The <u>Carex canescens</u> Variant is found in the damper sections of rheotrophic and transition mire with nearly all the relevés occurring in the former.

The Variant is located primarily in the maritime regions of Nova Scotia and the Côte Nord with a single relevé occurring in the continental area of New Brunswick.

Topographically, 50% of the relevés are situated on hummocks and 38% occur in depressions while only one relevé is located on a hummocky surface.

The average field cover is 63% ranging from 40% to 93% while the ground layer is well developed with an average cover of 94% (range 75% to 100%) with the majority of the relevés having greater than 97% cover.

There are only 40% of the mire character species present within the Variant. These include <u>Vaccinium oxycoccos</u>, <u>Drosera rotundifolia</u>, <u>Kalmia polifolia</u> and <u>Sphagnum rubellum</u>. All have low cover values with the last three occurring only once.

Carex canescens, the differential of the Variant, is present in all relevés with low to moderate cover. There are no species that are constant associates.

When the Variant occurs in depressions Drepanocladus exannulatus is the dominant species in the ground layer with sedges like Carex rostrata or Carex paleacea as prominent members of the field layer.

Where the relevés are situated on hummocks or hummocky surfaces either Sphagnum fimbriatum or Sphagnum imbricatum dominates the ground layer with Myrica gale always associated with the former and the following as constant associates of the latter:

Solidago uliginosa	Aster nemoralis
Carex aquatilis	Calamagrostis canadensis
Aronia prunifolia	

Lonicera villosa Variant (Table 66)

The description is based on only four relevés for which 40 species are recorded. There is an average of 15 species per relevé. The Variant is found in the following noda (listed with the number of relevés in each group):

Sphagnum warnstorfii (2)
Sphagnum imbricatum (2)

The Lonicera villosa Variant occurs in slightly damp areas in rheotrophic mire. Its geographical distribution is restricted to two mires, one in the continental area of Lac Saint-Jean and the other from the maritime region of Nova Scotia.

The topography within the Variant consists of hummocks and hummocky surfaces. The average field cover is 71% ranging from 40% to 98% while the ground layer has a very high cover of 99% (range 98% to 100%). Epiphytes are recorded from two relevés each having less than 1% cover.

The Variant contains four out of ten mire character species all having low cover values. These include Vaccinium oxycoccos, Chamaedaphne calyculata, Drosera rotundifolia and Sarracenia purpurea, the last three occurring only once.

The differential of the Variant Lonicera villosa is present with low cover. Frequent associates include Calamagrostis canadensis, Ledum groenlandicum and Spiraea latifolia all having low cover values.

In the continental site the Variant has a well developed field and ground layer with species like Myrica gale and Sphagnum warnstorfii being dominant. In the maritime site where the Variant is located on hummocks the field layer only has moderate cover while *Sphagnum imbricatum* is the dominant species in the ground layer with very high cover. Constant associates here include *Potentilla palustris* and *Solidago uliginosa*.

Potentilla palustris Variant (Table 67)

The description is based on only five sampled relevés for which 39 species are recorded. The average number of species per relevé is 11. The Variant is found in the following noda (listed with the number of relevés in each group):

Myrica gale - Chamaedaphne calyculata (Fen) (3)
Sphagnum imbricatum (2)

The Potentilla palustris Variant is confined to the damper sections of rheotrophic sites and is located only in the maritime regions of Nova Scotia and the Côte Nord in mires adjacent to salt marshes.

The topography consists of depressions and hummocks with three of the five relevés occurring in the former and the remaining ones on the latter.

The average field cover is moderately high at 70% ranging from 40% to 100% while the ground layer has an average cover of 46% (range 5% to 100%). When examined in terms of topographic features those relevés occurring in depressions have high field cover and low ground cover while the reverse occurs in the relevés located on hummocks.

Only three out of ten mire character species are present within the Variant and these are confined to hummocks. They include Vaccinium oxycoccos, Sarracenia purpurea and Drosera rotundifolia all with very low cover values.

The differential of the Variant, Potentilla palustris, is constant with low to moderate cover values. It appears to do equally well on both hummocks and in depressions. There are no constant associates but

Calamagrostis canadensis frequently is present with low cover.

Those relevés occurring in depressions have either Myrica gale or Alnus rugosa as dominant species in the field layer. When located on hummocks the Variant has a well developed ground layer with Sphagnum imbricatum being the dominant species. Constant associates here include Lonicera villosa and Solidago uliginosa and the mire character species Vaccinium oxycoccos, all with low cover.

V SYNTAXONOMIC CATEGORIES

Following the construction of the phytosociological tables found in Chapter IV the data was then examined with the purpose of demonstrating floristic similarity between closely related noda and variants. This was done by expressing the presence of each variant within the noda as a percentage of the total number of relevés of the variant. When the noda and the variants were grouped according to the mire types to which each belonged, clusters of these percentage values, representing floristic similarity, resulted (see Table 68 page 242). A Constancy Table also was produced by listing species from the noda having a constancy value of three or greater. In addition, an "index of similarity" was determined for closely related noda (as indicated by the clusters in the Nodal-Variant Table) by noting the number of species common to at least half the noda in each cluster and expressing this figure as a percentage of the species total for the noda involved. The amount by which this percentage was greater or less than 50% was recorded as a positive or negative value respectively. These tables, together with the evidence of floristic similarity shown in the Nodal Amplitude Table (see inside Back Cover) provided the basis for a classification scheme to be developed, employing wherever possible the hierarchical units of the Zürich-Montpellier system. These units along with their appropriate suffixes descend in sequence as follows:

Class	-etea
Order	-etalia
Alliance	-ion
Association	-etum
Sub-association	-etosum

(Nodum)
Variant
Sub-variant
Facies

} (specific names used)

"Nodum" does not occur normally in the scheme but is inserted here to demonstrate its rank in the present study.

The noda that are described in this study represent different stages of change which can be observed in the vegetation cover on peatlands. The basis upon which these noda are established centres mainly around dominance, usually by a single species in a particular vegetation layer or by a combination of two species from the same or from different layers. This is an easily observable feature in the field and together with a characteristic combination of species make each nodum a distinct focal point in the total vegetation spectrum, always bearing in mind that a blending of these distinct features occurs between closely related noda. It must be emphasized that all statements concerning these noda apply only to mires as they are defined in this study (see page 301). What is described here as unique or characteristic may no longer be the case when mires beyond the study area (as well as closely related vegetation systems on non-peat terrain within the study area) are examined.

When all of the species encountered during the study (along with the noda in which they occur) are included in a single table and the importance values recorded for each species in each nodum, and when the noda are rearranged so that those that appear to be closely related are grouped together, it can be readily seen that some species have similar distribution patterns across the noda. When these species are brought together, clusters of groupings of the importance values result and a Nodal-Amplitude Table is produced (see Table 2, inside Back Cover).

The following discussion deals with these clusters and provides evidence to show:

1) that they form part of the basis for a phytosociological classification of the mires of eastern Canada, and

2) that some of them are readily recognizable in the field.

Later in this chapter these vegetation clusters are placed into syntaxonomic categories and then examined in connection with previous phytosociological work done in Canada and Europe. For the present, in order to facilitate the discussion, the clusters are simply labeled as "groups" in a numerical sequence. Table 2 should be referred to when reading the following group discriptions.

Group 1

The mires of eastern Canada appear to have the following plants as character species:

Chamaedaphne calyculata	Sphagnum rubellum
Vaccinium oxycoccos	Sarracenia purpurea
Drosera rotundifolia	Smilacina trifolia
Sphagnum magellanicum	Eriophorum angustifolium
Kalmia polifolia	Sphagnum recurvum

The majority of the noda have at least 50% or more of these species present. The exceptions to this are:

Nodum	No. of Mire Character Species
Vaccinium-Lepidozia	0
Sphagnum warnstorfii	1
Nuphar	4

In the case of the first two noda very little sampling was done with only three relevés being recorded for each. Based on such limited data the above figures are no real indication of the number of mire character species that might be present within these noda had more sampling been carried out. The figure for the Nuphar variegatum Nodum, on the other hand, is based on a large number of sampled relevés (106) and is, therefore, much more reliable as an indication of the number of mire character species present. Due to the paucity of these species in this aquatic Nodum it may be more practical, from a floristic standpoint, to regard it separately from the other noda. For the present, however, it is left in Group 1.

The field layer in the group is characterized mainly by Ericaceous species such as Chamaedaphne calyculata, Vaccinium oxycoccos and Kalmia polifolia while mosses like Sphagnum magellanicum, S. rubellum and S. recurvum are the only regular members in the ground layer. All the different mire types are included in the group. There is a tendency, however, for the majority of the mire character species to occur more frequently in ombrotrophic than in rheotropic areas.

In addition to the mire character species there are eight others which can be placed into three sub-groups within Group 1. While showing a tendency towards an ubiquitous distribution across the noda (which represent the variety of conditions within the mires) they are, nevertheless, treated separately from the group because they do not occur either in the wettest sites or in mire forest, or in a combination of the two. Each of the sub-groups contains only a small number of species.

Sub-group 1A (non-mire forest)

This includes two species, Myrica gale and Andromeda glaucophylla which are excluded from those noda that occur in mire forest on ombrotrophic peatland. They are absent as well from the Polytrichum strictum Nodum where only a limited amount of sampling was done (five relevés). Both of these species do well in the damper sections on mires with Myrica having its best development in rheotrophic sites.

Sub-group 1B (non-aquatic)

The species that belong here avoid the wettest sections of mire and are poorly developed in damper areas. They include Ledum groenlandicum, Aronia prunifolia, Rhododendron canadense and Aulacomnium palustre.

Sub-group 1C (non-aquatic and non-mire forest)

This Sub-group displays more restrictions than the other two, being absent in both the very wet sites and in mire forest. It includes only two species, Larix laricina and Solidago uliginosa. These plants are missing also from the Sphagnum russowii nodum where only a limited number of relevés were sampled.

It must be emphasized that by themselves the sub-groups do not stand out as important vegetation units on peatland. It is only when they are combined with the mire character species that they help to provide for a better understanding of the floristic nature of Group 1.

Within Group 1 there are two major groups which are quite distinct as regards their species composition but which show some degree of similarity in their nodal component, having several noda that are common to both.

Group 2A (sedge-rich)

This group occurs mainly in the damper sections of all the major mire types while being absent almost completely from the driest parts of ombrotrophic mire, as well as mire forest. The most distinguishing feature about the group is the large number of sedges that are present. Included here are various species of Carex in addition to Rhynchospora alba, Dulichium arundinaceum, Eriophorum tenellum and E. virginicum. Most of the sedges attain their best development in rheotrophic mire where Carex species predominate with C. paupercula, C. aquatilis, C. lasiocarpa and C. paleacea often forming dense swards covering extensive sections of peatland. In these areas the ground cover is poorly developed. The only sedge in the group to do well in ombrotrophic sites is Rhynchospora alba where it occurs mainly in the depressional areas of filled-in ponds, while Carex oligosperma has its best development in transition mire especially from continental regions. Where the ground layer is well developed in the group "hydrophilous" and "hygrophilous" (Crum, 1973) Sphagnum species are present. Included here are S. papillosum, S. cuspidatum, S. pulchrum and S. majus. Other mosses to be found are Drepanocladus exannulatus and D. fluitans as well as the liverwort Cladopoliella fluitans. The latter frequently is associated with Rynchospora alba.

Group 2B (sedge-poor)

The species that make up this group are concentrated mainly in drier habitats in transition and ombrotrophic mire. They do very poorly in the wettest areas on peatland. In contrast with Group 2A only a few sedges are present while woody vasculars are the most prominent species in the field layer. Included here are three members of the Ericaceae: Kalmia angustifolia, the only species which is present constantly, Vaccinium angustifolium and Gaylussacia dumosa. In addition to these several other woody vasculars occur frequently in the group, namely, Picea mariana, Nemopanthus mucronata, Empetrum nigrum and Viburnum cassinoides. The ground layer is characterized by Sphagnum species that are mainly hummock-formers such as S. fuscum, S. russowii and S. imbricatum, and by fruticose lichens and Pleurozium schreberi that prefer the driest sites. The lichens include Cladonia impexa, C. arbuscula and C. rangiferina.

The above two groups are composed predominantly of species that occur in more than one mire type (the exceptions are found in Group 2B where Nemopanthus mucronata, Melampyrum lineare, Cladonia impexa and C. rangiferina occur only in ombrotrophic sites). It is in their habitat preference across the mire types that the species tend to show a greater degree of selectivity, those in Group 2A generally being much more tolerant of wetter conditions than those of Group 2B. The species that make up the following groups (with the exception of Group 4B) display a greater tendency of being confined to only one mire type, be it ombrotrophic, transition or rheotrophic, with some plants even being exclusive to a single nodum.

Group 3A (lichen-poor)

Most of the species that form this group are confined mainly to rheotrophic mire. Notable exceptions to this are Carex rostrata and Aster radula both of which are found frequently in the damper areas of transition mire in maritime regions, and Rosa nitida and Calliergon stramineum which occur with almost equal frequency in both transition and rheotrophic sites. The group as a whole consists of species that are present with primarily low cover. They often occur in association with the dominant Carex species mentioned in Group 2A as well as with woody vasculars like Myrica gale and Chamaedaphne calyculata.

Group 3B (lichen-rich)

The species occurring within this group are found predominantly in the driest parts of ombrotrophic mire and mire forest. They are not recorded in the Polytrichum strictum Nodum where only a limited amount of sampling was done. Fifty percent of the species in the group are lichens with nearly all of these belonging to the genus Cladonia. The group represents the senescent stage in ombrotrophic mire succession. Once these species become established hummock growth is retarded with Sphagnum ceasing to be dominant in the ground layer. Almost all of the species in the group form part of the understory vegetation for the taller woody vasculars (the Ericaceae and *Picea mariana*) that are the most prominent members in the field layer.

Group 3C (hydrophilous-rich)

Included here are a large number of species that occur only in aquatic or semi-aquatic habitats. Most of them are vascular plants that can be labelled as "hydrophytes" according to Raunkiaer's (1934) classification. Only a few of the species in the group are found in all the mire types, namely, *Nuphar variegatum*, *Scirpus subterminalis* *Utricularia geminiscapa* and *U. minor*, while a large number are restricted to rheotrophic mire where they occur mainly in streams. These include several species of the genus *Potamogeton* and *Sparganium* as well as *Myroiphyllum exalbescens*, *Fontinalis antipyretica* and the algae *Chara foetida*.

Group 3D (hygrophilous-rich)

This is a very restricted group which includes a small number of plants that are confined to a single nodum. These species, namely, *Litorella americana*, *Xyris montana* and *Muhlenbergia uniflora*, are found in the damp depressional areas of transition and ombrotrophic mire. Together with a large number of other species in the *Rhynchospora alba-Cladopodiella fluitans* Nodum they frequently form part of the vegetation mat of filled-in ponds.

Group 4A

This group consists of species that occur almost exclusively in rheotrophic mire. Sphagnum fimbriatum, when present in maritime sites, usually is dominant in the ground layer. None of the other species attain very high cover and normally are intermingled with various sedges in meadows on rheotrophic peatland. Potentilla palustris, Juncus balticus, Equisetum arvense and the members of the genus Sphagnum are found predominantly in maritime regions and all of these, except Sphagnum riparium, occur mainly in mires adjacent to salt marshes. The majority of the remaining species in the group show a similar distribution pattern in maritime areas but these latter plants are all found on inland sites as well.

Group 4B

The species in this group have little in common aside from being present in the same noda. Betula glandulosa, Calamagrostis pickeringii and Sphagnum flavicomans occur predominantly in transition mire, while Leptodictyum trichopodium is exclusive to rheotrophic mire in continental regions. Carex pauciflora and Osmunda cinnamomea are found more frequently in ombrotrophic sites. None of the species attain very high cover. They all show preference for habitats that are generally damp and have the genus Sphagnum as the dominant species in the ground layer.

Group 4C

This group is found in the driest sections of ombrotrophic mire and mire forest. It is characterized by the constant presence of Lepidozia reptans in addition to several species of the genus Dicranum. All of the species in the group form part of the understory vegetation of woody vasculars such as Kalmia angustifolia, Chamaedaphne calyculata and Picea mariana.

Group 5A

This is a very large group of species that is restricted primarily to rheotrophic mire. The only exceptions to this are Juncus stygius, Rhynchospora fusca, and Ilex verticillata which occur in transition sites. Nearly all of the species in the group are present with low to moderate cover being intermingled with the dominant sedges and woody vasculars, such as Myrica gale and Chamaedaphne calyculata, that are found on rheotrophic peatland. Two species in the group that are sometimes dominant in their respective layers are Sphagnum warnstorfii and Potentilla fruticosa.

Group 5B

Lichens dominate this group of species that is confined to the driest sections of ombrotrophic mire in predominantly maritime regions. The majority of the species are present with low to moderate cover with only Juniperus communis and Cetraria islandica occasionally dominating the field and ground layers respectively. The group as a whole is indicative of a senescent stage in hummock development while species like Cladonia deformis and C. gonecha frequently occur in mires under the influence of fire.

Group 5C

This small group of species forms part of the ground cover of dense Picea mariana clumps on ombrotrophic mire and is characterized by the presence of the liverworts Cephalozia media and Lophozia attenuata. All of the species, except Cladonia bacillaris, occur in maritime sites.

Group 5D

This group is confined to Picea mariana forest on ombrotrophic mire where is forms part of the understory vegetation mosaic. None of the species have very high cover values and Abies balsamea is the only member of the group to be constantly present.

Species having a scattered distribution across the noda or being present very sporadically and not fitting into any of the above groups are listed in descending order of "number of occurrences" at the end of the Nodal-Amplitude Table. These number 33 out of the 292 species listed or approximately 11% of the total.

The variants that are present within the noda provide the means for determining floristic relationships between the noda. Each nodum, having been established on the basis of dominance by a single or group of species, may appear superficially to be a distinct vegetation entity. Those variants which cross nodal boundaries reveal that this is not always the case as some noda will have similar variants and thus be closely related.

These relationships are shown by placing the noda and those variants that occur in more than one nodum in a table and expressing the presence of a variant within a nodum as a percentage of the total number of relevés of the variant. When the noda and variants are arranged or grouped into the three mire categories of ombrotrophic, transition and rheotrophic, clusters of these percentage values (representing floristic relationships between the variants and the noda) immediately become apparent (see Table 68 page 242).

These clusters are tentatively called "units" so they will not be confused with the "groups" described above in connection with the Nodal-Amplitude Table. In the following descriptions attention is focused on any correlation that exists between units and groups. There are seven distinct units occurring in the Nodal-Variant Table.

Unit A (mire forest)

This unit is confined to mire forest as it occurs on ombrotrophic peatland. It includes the following noda:

Vaccinium angustifolium-Lepidozia reptans
Pleurozium schreberi
Picea mariana (4 x 4 m)

together with the variants:

Picea mariana
Vaccinium angustifolium

neither of which attain their best development in this unit. It also includes the Picea mariana (Mire Forest) Nodum which is not shown on the Nodal-Variant Table. (This Nodum is concerned primarily with the tree layer in Picea mariana stands.)

Table 68 Nodal-variant Interrelations

NODA (28) (with table numbers) / VARIANTS (35) (with table nos.)	5 VACC-LEPI	6 PLEUROZIUM	7 PICEA (4 x 4)	9 CHAM-MYRI (BOG)	8 PICEA (1 x 1)	11 POLYTRICHUM	10 KALM-CHAM	12 C.RANGIFERINA	13 S.FUSCUM	14 S.FUSC-C.RANG	15 S.RUBE-S.NEMO	16 RHYN-CLAD	17 NUPHAR	18 S.CUSPIDATUM	22 S.MAGELLANICUM	20 S.PULCHRUM	21 S.PAPILLOSUM	19 S.MAJUS	23 S.RECURVUM	24 S.RUSSOWII	25 CALA-MYRI	26 MYRI-CHAM (FEN)	27 S.WARNSTORFII	28 S.FIMBRIATUM	30 D.EXAN-D.FLUI	31 S.IMBRICATUM
33 JUNIPERUS									75																	25
34 LARIX				22						33																45
35 RHODODENDRON						50																				50
36 PICEA		11	12		17	6	11		43																	
37 V.ANGUSTIFOLIUM	3	7	4	2			18	48			11					3						4				
38 R.CHAMAEMORUS				2	5	2	22	54		13										2						
39 EMPETRUM								40	40	14														2		4
40 GAYLUSSACIA								37	41	17																5
41 ARONIA								50	38														5			7
42 SCIRPUS									23	9	60					4	4									
43 E.SPISSUM					5						75				20											
44 RHYNCHOSPORA											13	31	3	35		8	9								1	
45 DROSERA												62		38												
46 V.MACROCARPON												88												12		
47 E.VIRGINICUM														63	37											
48 NUPHAR													90	10												
49 ANDROMEDA													8	43			40							3	3	3
50 MENYANTHES													28					19			53					
51 C.ROSTRATA																27						73				
52 C.EXILIS											26					23	19		16			16				
53 C.OLIGOSPERMA									11		10			15	11	15	11	5	22							
54 SCHEUCHZERIA														40	16	14	20	10								
55 C.LIMOSA												17				17	30	11			21				4	
56 C.LASIOCARPA														16		16	16				44					8
57 C.AQUATILIS															6	10	13				35	26				10
58 MYRICA									8					4	10		16		9	3	17	24	2	7		
59 C.STRICTA																31			19		31		19			
60 SPIRAEA																				11	72		17			
61 CALAMAGROSTIS																				6	72		6	6		10
62 ALNUS											20									13	67					
63 C.PAUPERCULA											28	12									35			18	7	
64 C.PALEACEA																					50			39	11	
65 C.CANESCENS																								38	24	38
66 LONICERA																							50			50
67 POTENTILLA																						60				40

ombrotrophic — trans — rheo

The numbers in the table express the presence of each variant within the noda as a percentage of the total number of relevés of the variant. Those colour coded yellow are predominantly (> 50%) ombrotrophic; white - transition; red - rheotrophic.

The unit is found in all the geographical regions and is distinguished by having Picea mariana as the dominant in the tree and shrub layers. In very dry sections of ombrotrophic mire in Québec Pinus banksiana sometimes occurs as a co-dominant with Picea. The former species is completely absent in similar mire conditions in Nova Scotia even though it is present in the province. These species are replaced by Larix laricina in transition and rheotrophic sites. The field and ground layers in the unit vary in degree of cover depending on the density of the tree layer. Usually an increase in canopy cover results in a decrease in understory vegetation. Characteristic species for the unit are confined to the field and ground layers and include Abies balsamea, Plagiothecium laetum, Ptilium crista-castrensis and Tetraphis pellucida. These species all belong to Group 5D in the Nodal-Amplitude Table. Ericaceous species like Vaccinium angustifolium, Kalmia angustifolia, Ledum groenlandicum and Chamaedaphne calyculata occur frequently along with the mosses Pleurozium schreberi, Dicranum undulatum, D. fuscescens and the liverwort Lepidozia reptans. The unit also contains all of the mire character species.

Unit B (still stand)

The noda and variants that make up this unit are confined to the driest sections of ombrotrophic mire where hummock development has practically ceased. The noda include:

Chamaedaphne calyculata-Myrica gale (Bog)
Picea mariana (1 x 1 m)
Polytrichum strictum
Kalmia angustifolia-Chamaedaphne calyculata

while the following variants are present:

Picea mariana
Vaccinium angustifolium
Rubus chamaemorus

None of the variants attain their best development in this unit with the first two also occurring in Unit A and the last in Unit C.

The unit is found in all the geographical regions in the study area and is characterized by the retardation of the hummock-forming Sphagnum species and the constant presence of Ericaceous plants like Kalmia angustifolia, Ledum groenlandicum and Chamaedaphne calyculata. In addition to these Vaccinium oxycoccos and Drosera rotundifolia occur with regular frequency in the field layer while Pohlia sphagnicola and the liverworts Cephalozia connivens, Mylia anomala and Odontoschisma sphagni often are present in the ground layer. Polytrichum strictum sometimes replaces Sphagnum fuscum as the dominant bryophyte. The unit contains some of the species found in Group 5B and all of those from Group 5C in the Nodal-Amplitude Table. All of the mire character species are present as well.

Unit C (hummocks and dry hollows)

This unit commonly is found on hummocks and in hollows in the dry sections of ombrotrophic mire. It includes the following noda:

Cladonia rangiferina
Sphagnum fuscum
Sphagnum fuscum-Cladonia rangiferina

and the variants:

Rubus chamaemorus
Empetrum nigrum
Gaylussacia dumosa
Aronia prunifolia
Scirpus cespitosus

the first four attaining their best development within this unit where they principally occur in maritime areas.

The unit is characterized by having most of the hummocks dominated by Sphagnum fuscum and the hollows by fruticose lichens like Cladonia rangiferina, C. alpestris, C. impexa and C. arbuscula. Ericaceous species are present with constant regularity in the field layer and Empetrum nigrum frequently is found in maritime regions. In the ground layer Sphagnum magellanicum, S. rubellum, Polytrichum strictum and Pohlia sphagnicola are common associates of Sphagnum fuscum but all have low cover while Odontoschisma sphagni is a frequent associate of the fruticose lichens as well. The unit most closely correlates with Group 5B on the Nodal-Amplitude Table and contains all of the mire character species.

The above three units are located in purely ombrotrophic mire where the peat surface is above the influence of ground water inflow. The following unit, although included in the category of ombrotrophic mire, receives some of its water supply from the surrounding (ombrotrophic) mire.

Unit D (ombrotrophic mire depressions)

The unit is predominantly a feature of ombrotrophic mire where it is situated in wet depressions and ponds. It includes the following noda:

Rhynchospora alba–Cladopodiella fluitans
Nuphar variegatum
Sphagnum cuspidatum

plus the variants:

Rhynchospora alba
Drosera intermedia
Vaccinium macrocarpon
Eriophorum virginicum
Nuphar variegatum
Andromeda glaucophylla

These variants reach their best development within this unit with the Drosera intermedia and Nuphar variegatum being exclusive to it.

The unit occurs in all geographical regions except the Bas Saint-Laurent and is distinguished by the frequent dominance of Sphagnum cuspidatum and Cladopoliella fluitans in the wet depressions, with Rhynchospora alba commonly being present in the field layer while Nuphar variegatum usually is found in the ponds where the ground layer is poorly developed. The unit includes species that are found in Group 3C and Group 3D in the Nodal-Amplitude Table. It also contains all of the mire character species.

Unit E (transition mire)

The noda and variants that make up this unit are found mainly in damp sections of transition mire but never in open ponds. The following noda are present:

Sphagnum cuspidatum
Sphagnum magellanicum
Sphagnum pulchrum
Sphagnum papillosum
Sphagnum majus
Sphagnum recurvum

Together with the variants:

Carex exilis
Carex oligosperma
Scheuchzeria palustris
Carex limosa
Carex lasiocarpa
Carex aquatilis
Myrica gale

The *Scheuchzeria palustris*, *Carex oligosperma* and *Carex limosa* Variants are the only ones to reach their best development within the unit with the former being exclusive to it while the latter plus the last three listed above are included in Unit F as well.

The unit occurs in all the geographical regions but is a rare feature in mires from the Bas Saint-Laurent. It is distinguished by having "hydrophilous" and "hygrophilous" (Crum, 1973) *Sphagnum* species dominating the ground layer. Two of these species are important hummock-formers, namely, *Sphagnum magellanicum* and *S. papillosum*. The field layer is characterized by a combination of sedges and woody vasculars. The latter include *Chamaedaphne calyculata*, *Vaccinium oxycoccos* and *Andromeda glaucophylla* which occur quite frequently. The unit partially correlates with Group 3C and Group 4B in the Nodal-Amplitude Table and contains all of the mire character species.

Unit E belongs in an intermediate position between ombrotrophic and rheotrophic mire, the latter occurring in areas where the entire peat surface is normally under the influence of ground water inflow. Based on this criterion the remaining units are included within the category of rheotrophic mire.

Unit F (fen meadow)

This unit is located primarily in the damp depressional areas of rheotrophic mire. It includes the following noda:

Calamagrostis canadensis-Myrica gale
Myrica gale-Chamaedaphne calyculata (Fen)
Sphagnum warnstorfii

plus a large number of variants:

Carex limosa
Carex lasiocarpa
Carex aquatilis
Myrica gale
Carex stricta
Spiraea latifolia
Calamagrostis canadensis
Alnus rugosa
Carex paupercula
Carex paleacea

All of these variants except the first attain their optimum level of development within this unit. The last two also occur in Unit G.

The unit is present in all geographical regions but is very rare in the Bas Saint-Laurent. It is distinguished by having a dense field cover and a poorly developed ground layer. In addition to a large number of sedges, species like Calamagrostis canadensis and woody vasculars such as Chamaedaphne calyculata and Myrica gale frequently are present. The following species are characteristic of the unit although quite restricted in their distribution:

Aster crenifolius
Eupatorium maculatum
Galium palustre
Impatiens capensis
Rumex orbiculatus

Salix rigida
Bryum pseudotriquetrum
Sphagnum subsecundum
Sphagnum warnstorfii

They are found in Group 5A in the Nodal-Amplitude Table which correlates completely with the unit. All of the mire character species are present with most having only sporadic occurrence.

Unit G

The noda and variants that make up this unit are confined to the damp sections of rheotrophic mire. The noda include:

Sphagnum fimbriatum
Drepanocladus exannulatus-Drepanocladus fluitans

while for following variants are present:

Carex paupercula
Carex paleacea
Carex canescens

Only the last variant reaches its optimum level of development within the unit while the first two occur in Unit F as well.

The unit is located in all the geographical regions within the study area but is found more often in maritime sites where it occurs mainly in mires adjacent to salt marshes. It is distinguished by having a well developed ground layer while sedges usually are present in the field layer. Species like Vaccinium oxycoccos, Carex paupercula and Hypericum virginicum occur with constant regularity. The unit shows some correlation with Group 4A on the Nodal-Amplitude Table and contains 60% of the mire character species. Those missing are Kalmia polifolia, Sarracenia purpurea, Smilacina trifolia and Eriophorum angustifolium.

There are three noda and eight variants which do not have a strong correlation with the above units. The noda include:

Sphagnum rubellum-Sphagnum nemoreum
Sphagnum russowii
Sphagnum imbricatum

while the variants are:

Juniperus communis
Larix laricina
Rhododendron canadense
Eriophorum spissum
Menyanthes trifoliata
Carex rostrata
Lonicera villosa
Potentilla palustris

These are dealt with in the following section where they are included in the proposed classification for the mires.

Based upon the data presented above for the "groups" and "units" as well as that shown in the Constancy Table (page 251) and the Index of Similarity Table (page 264) the following classification is proposed for the mires that were examined in Eastern Canada. The outline presented below is summarized in Fig. 10 page 254.

Class: OXYCOCCO-SPHAGNETEA Br.-Bl. ex Tx. 1943

The mires of eastern Canada appear to belong to a single class of vegetation in which the mire character species listed in Group 1 (page 231) may be regarded as characteristic for the Class. These species display the least amount of restriction in their distribution as they are found in all the different mire types in both maritime and continental areas, while the majority of them also occur in each of the hydroseral stages within ombrotrophic, transition and rheotrophic

Table 69 Constancy Values for Key Nodal Species.

SPECIES

NODA (with Table Nos.)	PICE MARI	LARI LARI	VACC ANGU	LEPI REPT	PLEU SCHR	KALM ANGU	LEDU GROE	CHAM CALY *	DICR UNDU	VACC OXYC *	DICR FUSC	CEPH CONN	SPHA RUSS	DROS ROTU *	KALM POLI *	RUBU CHAM	CLAD CHLO	MYLI ANOM	ODON SPHA	POHL SPHA	SPHA FUSC	CLAD RANG	MICR SETA	SPHA RUBE ☆	POLY STRI	SPHA MAGE ☆	CLAD IMPE	EMPE NIGR	CLAD ARBU	ERIO SPIS	SOLI ULIG
4 PICEA (10x10)	5	3																													
5 VACC-LEPI			5	5	3																										
6 PLEUROZIUM	4		4	4	5	5	5	3	3	3	3																				
7 PICEA (4x4)	5		4	5	4	5	5	4	5		5	4	4	3	3	4	3	3	3	3											
8 PICEA (1x1)	5			5	4	5	4	5	3	3		3		3			3	4	4	3	4	3	3								
9 CHAM-MYRI (BOG)						5	5	5		3		3		4	5			4	4		3			4	3	3					
10 KALM-CHAM			5			5	5	5		3		3		3	4	4	3	3	5	3		4			4		3				
11 POLYTRICHUM	4					5	4	5		5				4	3					4	4			4	5	4					
12 C.RANGIFERINA			4			5	5	4		3					4	3			3			5					3	3	3		
13 S.FUSCUM						5	4	5		5				3	4					3	5			4	4	4				3	
14 S.FUSC-C.RANG			4			5	5	4		5				5	5	5			5	3	5	5	5	3	5	4	4	5	4		5
15 S.RUBE-S.NEMO						3		5		5				4	4				3					5		4					
16 RHYN-CLAD								3		4				3																	
17 NUPHAR																															
18 S.CUSPIDATUM								3																							
22 S.MAGELLANICUM								5		4														3		5					
20 S.PULCHRUM								3		3				3																	
21 S.PAPILLOSUM								4		4				3																	
19 S.MAJUS										3																					
23 S.RECURVUM								3		4					3											3					
24 S.RUSSOWII						3	4	4		3			5		3	3								4		3					
25 CALA-MYRI																															
26 MYRI-CHAM (FEN)								4																							
27 S.WARNSTORFII	4						5	4																							
28 S.FIMBRIATUM										3				4																	
29 ALNUS (4x4)																															
30 D.EXAN-D.FLUI										3																					
31 S.IMBRICATUM										4																					3

NODA (with Table Nos.)	ARON PRUN	GAYL DUMO	SARR PURP *	JUNI COMM	SCIR CESP	CLAD FLUI	RHYN ALBA	DROS INTE	SPHA CUSP	ANDR GLAU	NUPH VARI	SPHA PULC	SPHA PAPI	MYRI GALE	SPHA MAJU	MENY TRIF *	SCHE PALU	SPHA RECU *	CARE OLIG	ALNU RUGO	CALA CANA	SPIR LATI	CARE STRI	LONI VILL	SPHA WARN	SPHA FIMB	CARE PAUP	CARE PAIE	HYPE VIRG	DREP EXAN	SPHA IMBR
4 PICEA (10x10)																															
5 VACC-LEPI																															
6 PLEUROZIUM																															
7 PICEA (4x4)																															
8 PICEA (1x1)																															
9 CHAM-MYRI (BOG)																															
10 KALM-CHAM																															
11 POLYTRICHUM																															
12 C.RANGIFERINA																															
13 S.FUSCUM																															
14 S.FUSC-C.RANG	4	4	4	3	3																										
15 S.RUBE-S.NEMO			3																												
16 RHYN-CLAD						5	5	4	3	3																					
17 NUPHAR											4																				
18 S.CUSPIDATUM						3	3		5																						
22 S.MAGELLANICUM										3																					
20 S.PULCHRUM										3		5																			
21 S.PAPILLOSUM										3		3	5	3																	
19 S.MAJUS															5	3	3														
23 S.RECURVUM										3								5	3												
24 S.RUSSOWII			3							3				5						3	3	3									
25 CALA-MYRI																					3										
26 MYRI-CHAM (FEN)														5																	
27 S.WARNSTORFII	5													5							4	5	5	5	5						
28 S.FIMBRIATUM														5												5	4	4	3		
29 ALNUS (4x4)														3						5											
30 D.EXAN-D.FLUI						3																					3		3	4	
31 S.IMBRICATUM	3		3																												5

*Mire character species.

The numbers in the table are derived from the constancy scale found on page 46 . Thus 3 = 41% to 60% occurrence, 4 = 61% to 80%, and 5 = 81% to 100%. The species with their constancy values blocked off are alliance, order or class character species.

mire. They all are present as well in almost every unit (except Unit G) described above in connection with the Nodal-Variant Table. Vaccinium oxycoccos and Chamaedaphne calyculata are the most constant of these species (see Table 69 page 251). Additional information on the class (or mire) character species is found in the description of Group 1 on page 231 .

In the phytosociological classification of the mires of Europe Moore (1968) included only ombrotrophic mire and wet heath in his description of the Class OXYCOCCO-SPHAGNETEA whereas Duvigneaud (1949) placed all mire types into the Class SPHAGNO-CARICETEA FUSCAE. The category of "rich fen" (sensu Du Rietz, 1949) is included within Duvigneaud's classification. As this type of mire appears to be absent in the areas examined in eastern Canada it was decided to place all the mire types that are present, which includes the category of "poor fen" (sensu Du Rietz, 1949), within the Class OXYCOCCO-SPHAGNETEA. The Class as defined in this study contains only one of Moore's character species, namely, Drosera rotundifolia which he considers to be the most constant. He also gives Aulacomnium palustre the rank of a class character species which in the present study is placed just below the class level occurring as it does in all but the wettest mire sites (see Sub-group 1B page 233). Three other species that Moore recognises as class characters, namely Sphagnum tenellum, Microlepidozia (=Lepidozia) setacea and Sphagnum nemoreum (= capillaceum) are much more restricted in their distribution on mires in eastern Canada and are therefore placed in syntaxa below the class level. Duvigneaud lists only one species that is treated as a class character in the present study, namely, Sphagnum recurvum. He also includes the following as being characteristic of the Class SPHAGNO-CARICETEA FUSCAE:

Carex lasiocarpa
Carex panicea
Carex limosa
Menyanthes trifoliata
Aulacomnium palustre
Calliergon stramineum
Drosera anglica
Carex chordorrhiza

all of which are found in eastern Canadian mires but either occur very sporadically or are restricted in varying degrees in their distribution.

In Canada very little work has been done in classifying syntaxa above the association level. Fabiszewski (1975) recognizes three classes of vegetation based on ten selected mire sites he examined in Ontario, Québec and Prince Edward Island. These include the Class SPHAGNO-CLADONIETEA AMERICANA (stagnant stage of ombrotrophic mire hummocks); Class LEDO (GROENLANDICI)-SPHAGNETEA (growth stage of ombrotrophic mire hummocks); and the class of mire depressions represented by the Order ERIOPHORO (VIRGINICI)-SPHAGNETALIA. The second Class contains one of the species recognized as a class character in the present study, namely Vaccinium oxycoccos while the Order contains two: Sphagnum recruvum (= fallax) and S. rubellum. All the other class character species are treated only as association characters, sub-association differentials or companions by Fabiszewski.

Two orders are proposed for the Class OXYCOCCO-SPHAGNETEA in eastern Canada, namely, the KALMIO-SPHAGNETALIA FUSCI and the SPHAGNO-CARICETALIA (see page 269).

Order: KALMIO-SPHAGNETALIA FUSCI

This includes the vegetation of ombrotrophic mire and corresponds with Units A, B and C discussed previously in connection with the Nodal-Variant Table. The Order is characterized by the frequent presence of

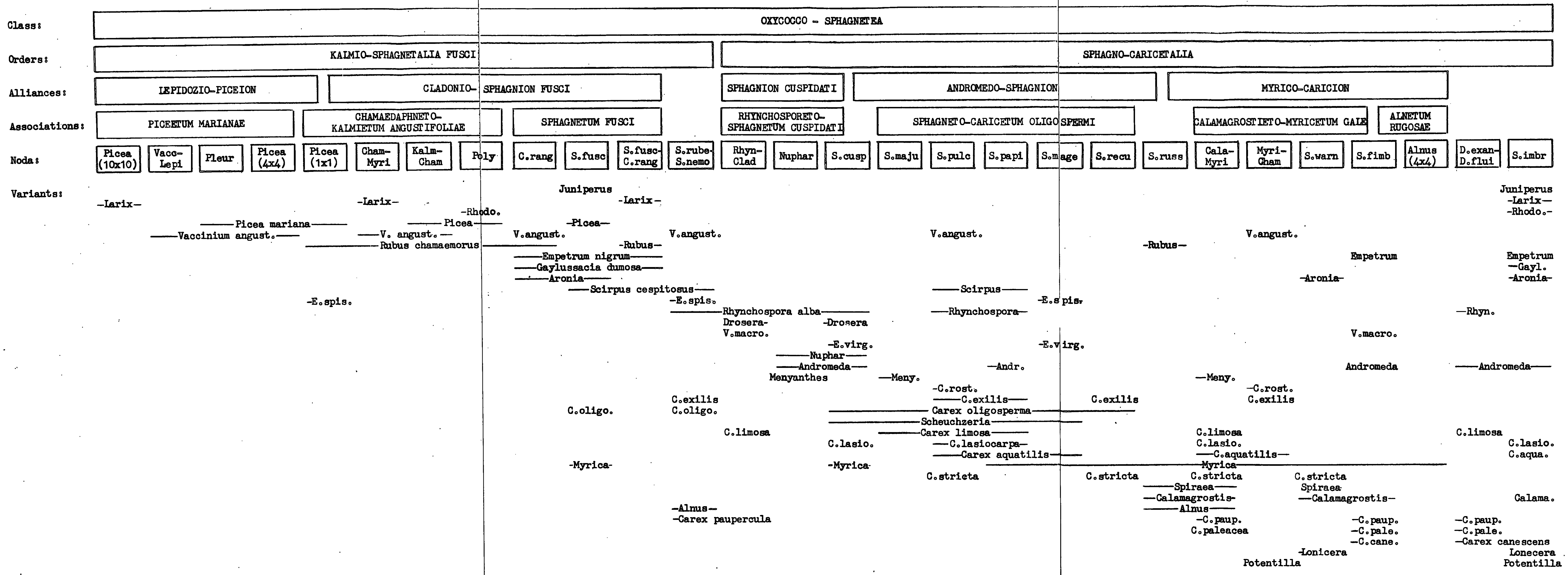

Fig. 10 Syntaxonomic Categories for the Proposed Classification of Eastern Canadian Mires

Kalmia angustifolia and Picea mariana in the field layer and Sphagnum fuscum, Pohlia sphagnicola and Polytrichum strictum in the ground layer. All these species are found in Group 2B on the Nodal-Amplitude Table and are distributed throughout the study area.

The Order is confined more to drier habitats than either Moore's (1968) SPHAGNETALIA MAGELLANICI or Duvigneaud's (1949) Alliance VAGINATO-SPHAGNION EUROPAEAE, both of which roughly correspond with it. Some of Moore's characteristic species for the Order include Vaccinium oxycoccos (= Oxycoccus quadripetalus), Sphagnum magellanicum, S. rubellum and S. recurvum (all of which are treated in the present study as class characters) as well as Carex pauciflora, Cephalozia connivens, Mylia anomala and Polytrichum strictum. These are found in eastern Canadian mires but only the last is a character species for the order. Duvigneaud also includes Vaccinium oxycoccos and Sphagnum rubellum as character species for the VAGINATO-SPHAGNION EUROPAEAE, in in addition to Cephalozia connivens, Microlepidozia setacea, Riccardia latifrons and Rubus chamaemorus. The last species which is characteristic of the Alliance in continental sites in Europe is found only in maritime mires within the study area in eastern Canada.

In Fabiszewski's (1975) classification the Order SPHAGNETALIA FUSCI AMERICANA (which belongs in the Class LEDO GROENLANDICI-SPHAGNETEA) contains Sphagnum fuscum as a character species but he excludes the driest ombrotrophic sites from this Order and places them in a separate Class (SPHAGNO-CLADONIETEA AMERICANA) thus making direct comparisons difficult. This latter Class contains Polytrichum strictum and Pohlia sphagnicola as characteristic species.

The Order KALMIO-SPHAGNETALIA FUSCI contains two alliances: the LEPIDOZIO-PICEION and the CLADONIO-SPHAGNION FUSCI (see page 258).

Alliance: LEPIDOZIO-PICEION

The Alliance includes a single Association, the PICEETUM MARIANAE (see Fig. 11 page 257). The two syntaxa, therefore, have the same character species and the following outline applies to both. The Association corresponds with Unit A in the Nodal-Variant Table which has already been described on page 241. The noda that are included in this Association have an "index of similarity" value of minus four (see Table 70 page 264) indicating that 46% of the species are found in two or more noda. When the unit is compared on the same basis with Unit B, both having common variants (see Table 68 page 242), the index value is minus 14 suggesting a greater contrast with the noda in this unit.

The Association is characterized by Picea mariana in the tree and shrub layers and by Lepidozia reptans in the ground layer. Vaccinium angustifolium and Pleurozium schreberi, although frequently present, are not included as character species as they sometimes do well in other associations.

The Association is comparable with Grandtner's (1960) SPHAGNO-PICEETUM MARIANAE and Dansereau's (1959) PICEETUM MARIANAE both of which are based on studies of the forests of the Saint Lawrence River Valley. In the early stages of mire forest development Dansereau and Segadas-Vianna (1952) recognize a PICEETUM ERICACEUM Association consisting of clumps of Picea mariana trees isolated on open ombrotrophic mire.

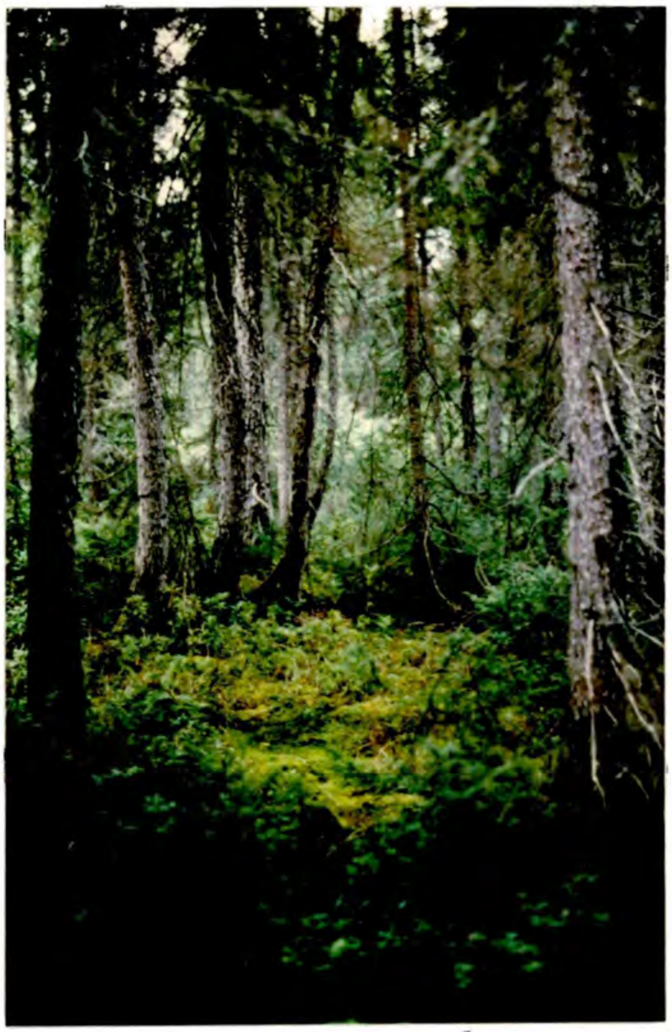

Fig 11. PICEETUM MARIANAE Association. (a) Above: The Picea mariana (Mire Forest) Nodum. (b) Below: The Picea mariana (4 x 4m) Nodum.

This is similar to the *Picea mariana* (4 x 4 m) nodum described on page 60 and which is included in the PICEETUM MARIANAE Association of this study. Osvald (1970) placed mire forest into the PICEA MARIANA-LEDUM GROENLANDICUM-SPHAGNUM MAGELLANICUM Sociation in his description of North American mire communities.

The Association as outlined in the present study includes within the tree layer one Variant, the *Larix laricina*, and two Sub-variants, the *Pinus banksiana* and the *Betula papyrifera* with the latter two occurring only in Québec. These are described in more detail on page 53. Dansereau (1959) places both the *Larix laricina* and the *Betula papyrifera* in separate Associations, the LARICETUM LARICINAE and the BETULETUM ABIETOSUM respectively, while Grandtner and Gauthier (1966) put the *Pinus banksiana* into the SPHAGNO-PINETUM BANKSIANAE Association.

Moore (1968) does not define any associations dealing with mire forest but his comments on this vegetation type are included in his discussion of the Alliance SPHAGNION FUSCI. Duvigneaud's (1949) Sub-association PINETOSUM UNCINATAE MEDIOEUROPAEUM and the CHAMAEDAPHNETO-SPHAGNETUM MEDII ROSSICO-SIBIRICUM and EMPETRO-SPHAGNETUM FUSCI Associations are concerned with ombrotrophic mire forest dominated by *Pinus sylvestris* and *P. montana*. These species appear to fill the same ecological niche in Europe as *Picea mariana* and *Larix laricina* in eastern Canadian mires.

Alliance: CLADONIO-SPHAGNION FUSCI

This Alliance is found in the dry sections of ombrotrophic mire in non-forested areas and includes Units B and C in the Nodal-Variant

Table (page 242). It is characterized in the ground layer by the frequent presence and sometimes dominance of members of the genus Cladonia and/or Sphagnum fuscum (which is also a character species for the Order to which this alliance belongs) and in the field layer by the prevalence of Ericaceous species. The Alliance contains all of the plants listed in Groups 5B and 5C on the Nodal-Amplitude Table with the majority of these being exclusive to it.

The Alliance can be compared with the SPHAGNION FUSCI Alliance in Moore's (1968) classification and with Duvigneaud's (1949) Sub-alliance SPHAGNION MEDIO-FUSCI. Some of Moore's character species include:

Sphagnum fuscum	Cephalozia media
Rubus chamaemorus	Cetraria islandica
Dicranum undulatum (= bergeri)	Cladonia alpestris
Chamaedaphne calyculata	

along with the following differentials:

Empetrum nigrum	Cladonia arbuscula (= sylvatica)
Cladonia rangiferina	Vaccinium vitis-idaea

His inclusion of Sphagnum fuscum and the fruticose lichens correlates closely with the importance of these species in the CLADONIO-SPHAGNION FUSCI Alliance. Duvigneaud does not have any members of the genus Cladonia in his list of character species for the Sub-alliance SPHAGNION MEDIO-FUSCI but he does include Sphagnum fuscum along with S. magellanicum, S. rubellum, S. russowii and Empetrum nigrum.

Fabiszewski (1975) has two Alliances belonging to the Class SPHAGNO-CLADONIETEA AMERICANA which taken together can be compared with the CLADONIO-SPHAGNION FUSCI Alliance. These are the SPHAGNO-CLADINION and the LECIDEO-COCCIFERION. The former has the following as character and differential species:

Cladonia mitis
Cladonia arbuscula
Cladonia rangiferina
Sphagnum fuscum
Dicranum undulatum (= bergeri)
Vaccinium myrtilloides

while the latter has:

Lecidea uliginosa
Cladonia pleurota
Cladonia bacillaris
Cladonia deformis
Andromeda glaucophylla

The CLADONIO-SPHAGNION FUSCI Alliance contains two Associations: the CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE and the SPHAGNETUM FUSCI (see page 263).

The CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE Association correlates with Unit B on the Nodal-Variant Table and the description for this unit on page 243 can apply to the Association as well. The noda which form part of this Association have an "index of similarity" value of plus ten indicating that 60% of the species occur in more than one noda.

The most characteristic feature about the Association is the dense cover of the field layer and the constant presence of Kalmia angustifolia and Chamaedaphne calyculata. This Association, unlike the others found in ombrotrophic mire, can be aided in its development by fire and artificial drainage. As a result it is often remarkably uniform in appearance when covering extensive areas of peatland (see Fig. 12a, 12b page 261).

Other associations showing some similarities to the CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE have been described for mires in eastern Canada by several authors. These include two Associations proposed by Fabiszewski (1975), the CHAMAEDAPHNO-CLADONIETUM and the LECIDEO

Fig 12. CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE Association. (a) Above: The effects of fire. (b) Below: The effects of artificial drainage.

(ULIGINOSI)-CLADONIETUM which he places within the Class SPHAGNO-CLADONIETEA AMERICANA (stagnant stage of ombrotrophic mire hummocks); the Sub-association SPHAGNO-CHAMAEDAPHNETUM CALYCULATAE KALMIETOSUM (Gauthier and Grandtner, 1975) and the corresponding Association KALMIETUM ANGUSTIFOLIAE (Dansereau and Segadas-Vianna, 1952); and the naked CHAMAEDAPHNE CALYCULATA and the KALMIA ANGUSTIFOLIA as well as the CHAMAEDAPHNE CALYCULATA-POLYTRICHUM AFFINE Sociations of Osvald (1970). In Newfoundland Pollett's (1972) VACCINIETO-CLADONIETUM BORYI and the KALMIETO-SPHAGNETUM FUSCI Associations contain a variant and a sub-association respectively that show some resemblance to the CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE. The Variant has a field layer consisting of Ericaceous species and <u>Rubus chamaemorus</u> while the Sub-association's field layer includes dense clumps of <u>Picea mariana</u>.

In Europe Duvigneaud (1949) includes a <u>Calluna-Cladina</u> climax stage within the CALLUNETO-SPHAGNETUM MEDII Association but apart from this there appears to be little else to compare with the CHAMAEDAPHNETO-KALMIETUM ANGUSTIOLIAE Association.

The <u>Polytrichum strictum</u> and the <u>Picea mariana</u> (1 x 1 m) Noda may be regarded as variants within the Association. They are described in detail on pages 71 and 63 . The former is similar to Osvald's CHAMAEDAPHNE CALYCULATA-POLYTRICHUM AFFINE (= STRICTUM) Sociation while the latter can be compared with Pollett's <u>Picea mariana</u> dominated Sub-association mentioned above in connection with the KALMIETO-SPHAGNETUM FUSCI Association. The <u>Picea mariana</u> (1 x 1 m) Nodum shows some correlation with the LEPIDOZIO-PICEION Alliance in having the character species for the latter present with very high constancy. When compared floristically, however, with the <u>Picea</u>

mariana (4 x 4 m) Nodum (the most closely related Nodum in the LEPIDOZIO-PICEION) the "index of similarity" value is minus seven, indicating that only 43% of the species are common to both.

The SPHAGNETUM FUSCI Association corresponds with Unit C on the Nodal-Variant Table with the unit being described on page 244. The noda included within the Association have an "index of similarity" value of plus 19, indicating that 69% of the species occur in more than one noda. When Unit C is compared in this same manner with the noda from Unit B the "index of similarity" value is minus seven (43% of the species are common to more than 50% of the noda). The species dissimilarity between the two units is great enough to justify their treatment as separate associations but not as separate alliances, as is the case with Unit A. Unit A has a much greater species contrast with Unit B than the latter does with Unit C (see Table 70 page 264).

In addition to those species already mentioned in the description of Unit C two others occur frequently in the Association, namely, Drosera rotundifolia and in maritime areas Rubus chamaemorus. The Association is widespread in its distribution in eastern Canada occurring in all geographical regions. In continental areas there is a reduction in the number of species and the lichen component usually is poorly developed.

Different aspects of the SPHAGNETUM FUSCI Association have been examined and classified by other authors working in eastern Canadian mires but none correspond completely with it (as defined in this study). The Association is included within Grandtner's (1960) SPHAGNO-CHAMAEDAPHNETUM CALYCULATAE Association which was first

Table 70 Index of Similarity Values for Various Nodal Combinations

(numbers in brackets represent the actual no. of species occurrences)

PARAMETERS / NODAL COMBINATIONS	I Units	II 3 or more noda having the same species	III 2 noda having the same species	IV Combined total of parameters "II" & "III"	V Single or less than 50% nodal occurrence	VI Total no. of species occurrences	VII Index of similarity (± 50%)
Picea (10x10) Vacc-Lepi Pleurozium Picea (4x4)	A	13% (10)	33% (26)	46% (36)	54% (42)	78	-4
Picea (10x10) Vacc-Lepi Pleurozium Picea (4x4) Picea (1x1) Cham-Myri Kalm-Cham Polytrichum	A B	36% (38)			64% (69)	107	-14
Picea (1x1) Cham-Myri Kalm-Cham Polytrichum	B	31% (29)	29% (26)	60% (55)	40% (36)	91	+10
Picea (4x4) Picea (1x1)			43% (34)		57% (46)	80	-7
C.rangiferina S.fuscum S.fusc-C.rang	C	44% (51)	25% (29)	69% (80)	31% (36)	116	+19
Picea (1x1) Cham-Myri Kalm-Cham Polytrichum C.rangiferina S.fuscum S.fusc-C.rang	B C	43% (56)			57% (74)	130	-7
S.fuscum S.rube-S.nemo			57% (70)		43% (53)	123	+7
S.rube-S.nemo S.magellanicum			53% (68)		47% (61)	129	+3

Table 70 - Continued

PARAMETERS / NODAL COMBINATIONS	I Units	II 3 or more noda having the same species	III 2 noda having the same species	IV Combined total of parameters "II" & "III"	V Single or less than 50% nodal occurrence	VI Total No. of species occurrences	VII Index of similarity (± 50%)
Rhyn-Clad Nuphar S. cuspidatum	D	22% (21)	22% (21)	44% (42)	56% (53)	95	-6
Rhyn-Clad *Nuphar S. cuspidatum		26% (21)	28% (23)	54% (44)	46% (37)	81	+4
S. cuspidatum S. majus			53% (29)		47% (26)	55	+3
S. cuspidatum S. magellanicum S. pulchrum S. papillosum S. majus		37% (50)			63% (84)	134	-13
S. magellanicum S. pulchrum S. papillosum S. majus		35% (44)	24% (30)	59% (74)	41% (51)	125	+9
S. recurvum S. magellanicum S. pulchrum S. papillosum S. majus	E	44% (64)			56% (80)	144	-6
S. magellanicum S. pulchrum S. papillosum S. recurvum		43% (61)	24% (35)	67% (96)	33% (47)	143	+17
Rhyn-Clad Nuphar S. cuspidatum S. majus		30% (29)	21% (20)	51% (49)	49% (48)	97	+1

* Includes only those relevés with Nuphar present

Table 70 - Continued

PARAMETERS / NODAL COMBINATIONS	I Units	II 3 or more noda having the same species	III 2 noda having the same species	IV Combined total of parameters "II" & "III"	V Single or less than 50% nodal occurrence	VI Total No. of species occurrences	VII Index of similarity (± 50%)
Rhyn-Clad *Nuphar S.cuspidatum S.majus		36% (29)	24% (20)	60% (49)	40% (33)	82	+10
Cala-Myri Myri-Cham S.warnstorfii S.fimbriatum		23% (40)	31% (56)	54% (96)	46% (82)	178	+4
Cala-Myri Myri-Cham S.warnstorfii	F	11% (18)	42% (73)	53% (91)	47% (81)	172	+3
S.fimbriatum D.exan-D.flui	G		33% (20)		67% (40)	60	-17

* Includes only those relevés with Nuphar present

described for mires under the influence of fire (Anctil, 1956), and within Pollett's (1972) KALMIETO-SPHAGNETUM FUSCI for the mires of central Newfoundland. Dansereau and Segadas-Vianna (1952) define three Associations which show some relationship to the SPHAGNETUM FUSCI but do not include the lichen component. These include the CHAMAEDAPHNETUM CALYCULATAE, the LEDETUM GROENLANDICI and the NEMOPANTHETUM MUCRONATAE. Osvald (1970) describes several Sociations which can all be included within the SPHAGNETUM FUSCI. These are the -

CHAMAEDAPHNE CALYCULATA - SPHAGNUM FUSCUM
KALMIA ANGUSTIFOLIA - SPHAGNUM FUSCUM
GAYLUSSACIA DUMOSA - SPHAGNUM FUSCUM
EMPETRUM NIGRUM - SPHAGNUM FUSCUM
CLADONIA ARBUSCULA

while three of Fabiszewski's (1975) Associations, namely, the SPHAGNETUM FUSCI ET LINDBERGI, the CHAMAEDAPHNO-CLADONIETUM and the ODONTOSCHIZMO-CLADONIETUM all show varying degrees of similarity to it.

In the classification of European mires Moore (1968) places communities with Sphagnum fuscum as a dominant species within the Alliance SPHAGNION FUSCI but he does not define any associations within it. Some of the character and differential species of this Alliance are regularly found in the SPHAGNETUM FUSCI Association in eastern Canada and are listed on page 245. Duvigneaud's (1949) classification includes one Sub-association, the SPHAGNETOSUM FUSCI and two Associations, the CALLUNETO-SPHAGNETUM MEDII and the EMPETRO-SPHAGNETUM FUSCI (all belonging in the SPHAGNION MEDIO-FUSCI Sub-alliance) which may be compared with the SPHAGNETUM FUSCI.

In eastern Canada the Association can be divided into two geographical races: the Maritime and the Continental. The former is characterized by the presence of Empetrum nigrum along with:

Rubus chamaemorus	Cladonia terrae-novae
Galussacia dumosa	Juniperus communis
Aronia prunifolia	Trientalis borealis
Solidago uliginosa	Myrica gale

while in the latter these species are either absent or of rare occurrence.

The Sphagnum rubellum - Sphagnum nemoreum Nodum occurs in a variety of habitats, mainly from ombrotrophic mire, and is described in detail on page 85. The nodal dominant Sphagnum rubellum is associated with some species that are found mainly in dry sites and with others that usually grow in much damper areas. Due to this wide tolerance of moisture conditions the Nodum as a whole does not have a strong correlation with any of the units shown on Table 68 page 242. It appears to occupy an intermediate position between Units C and D. When compared floristically with the two main hummock-forming Noda, the Sphagnum fuscum of Unit C and the Sphagnum magellanicum of Unit E, there is an "index of similarity" of plus seven with the former and plus three with the latter (see Table 70 page 264). Due to the Nodum's intermediate position between other units and noda it is left at the nodal rank and not placed in either an association or an alliance. It does contain one distinctive variant which is characterized by Eriophorum spissum and Scirpus cespitosus. This includes Variants B and C in the Nodum's description on page 85. The Variant seems to correspond closely with Pollett's (1972) Sub-association SCIRPIETOSUM occurring within the KALMIETO-SPHAGNETUM FUSCI Association, and with Osvald's (1970) TRICHOPHORUM CAESPITOSUM-SPHAGNUM NEMOREUM-SPHAGNUM RUBELLUM Sociation which according to the author corresponds to the TRICHOPHORUM CAESPITOSUM-SPHAGNUM PAPILLOSUM Sociation in European mires. The latter is equivalent to Duvigneaud's (1949) Sub-association SUBARCTICUM (TRICHOPHORETOSUM AUSTRIACI) which is included in the SPHAGNETUM PAPILLOSI Association.

As the character species for the Order KALMIO-SPHAGNETALIA FUSCI have a higher frequency of occurrence than those of the SPHAGNO-CARICETALIA (see below) within the _Sphagnum rubellum-Sphagnum nemoreum_ Nodum, it is placed in the former Order.

Order: SPHAGNO - CARICETALIA

Included here is the vegetation of damp depressional areas in ombrotrophic mire, as well as the vegetation of transition and rheotrophic sites. It corresponds with Units D, E, F and G already described earlier in this chapter. The character species for the Order include the sedges _Carex paupercula_, _C. limosa_ and _C. exilis_ as well as the bryophytes _Sphagnum pulchrum_, _S. papillosum_ and _Drepanocladus exannulatus_, all of which are found within Group 2A on the Nodal-Amplitude Table. The first species appears to be confined mainly to maritime sites while the others have a wider distribution.

The Order shows some similarity to Duvigneaud's (1949) Alliances SCHEUCHZERIO-RHYNCHOSPORION ALBAE, PARVOCARICION CANESCENTIS-FUSCAE and EPIPACTO-SCHOENION FERRUGINEI, the former occurring within the Order ERICO-SPHAGNETALIA (ombrotrophic mire) and the latter two within the MOLINO-CARICETALIA FUSCAE (transition and rheotrophic mire). Duvigneaud lists the following species as characteristic of the Alliance SCHEUCHZERIO-RHYNCHOSPORION ALBAE:

Scheuchzeria palustris	Drosera intermedia
Rhynchospora alba	Lycopodium inundatum
Rhynchospora fusca	Sphagnum cuspidatum

none of which are included as characters for the Order SPHAGNO-CARICETALIA but all of which are found in the damp areas of eastern Canadian mires. Some of Duvigneaud's character species for the Alliance PARVOCARICION CANESCENTIS-FUSCAE include:

Carex canescens	Calliergon cordifolium
Juncus filiformis	Drepanocladus exannulatus
Galium palustre	

all occurring in eastern Canada but only the last being characteristic for the Order SPHAGNO-CARICETALIA. In Moore's (1968) classification of European mires the only syntaxonomic unit that shows some relationship to this Order is the Alliance ERICO-SPHAGNION which is restricted mainly to the damp sections of ombrotrophic mire. It has the following as some of the character species:

Sphagnum papillosum	Sphagnum imbricatum
Odontoschisma sphagni	Drosera intermedia
Myrica gale	

Only the first is considered as being characteristic of the SPHAGNO-CARICETALIA.

In Canada Fabiszewski's (1975) classification includes two Orders which are comparable with the damp ombrotrophic and transition mire aspects of the SPHAGNO-CARICETALIA. These are the ERIOPHORO VIRGINICI-SPHAGNETALIA and the SPHAGNETALIA PAPILLOSI AMERICANA. The former has <u>Carex limosa</u> as one of the character species and the latter <u>Sphagnum papillosum</u>. The other characteristic species of the Order SPHAGNO-CARICETALIA, namely, <u>Carex exilis</u>, <u>C. paupercula</u>, <u>Sphagnum pulchrum</u> and <u>Drepanocladus exannulatus</u> are all given lesser syntaxonomic rank within the ERIOPHORO VIRGINICI-SPHAGNETALIA.

The Order SPHAGNO-CARICETALIA includes three alliances: the SPHAGNION CUSPIDATI, the ANDROMEDO-SPHAGNION (see page 272) and the MYRICO-

CARICION (see page 278).

Alliance: SPHAGNION CUSPIDATI

The Alliance is confined mainly to the damp depressions of ombrotrophic mire and corresponds with Unit D which is described on page 245. It includes a single Association, the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI and the following outline applies to both syntaxonomic units. The noda that form part of this Association have an "index of similarity" value of minus six. When the Nuphar variegatum Nodum minus those relevés with Nuphar absent (approximately one third of the total) is compared with the other noda the index value is plus four (see Table 70 page 264). The majority of the relevés without Nuphar occur in transition and rheotrophic mire. They may form the basis for a separate aquatic association within these mire types. Based on the positive index value of plus four the Nuphar variegatum Nodum may be regarded as forming part of the spectrum of variation within the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI. Another Nodum within the Association, the Sphagnum cuspidatum, displays some affinity for the Alliance ANDROMEDO-SPHAGNION with the latter corresponding to Unit E on the Nodal-Variant Table (page 242). When the Nodum is compared floristically with the Sphagnum majus Nodum (the most closely related nodum within the ANDROMEDO-SPHAGNION) the "index of similarity" value is plus three but when compared with most of the noda in Unit E the index value is minus 13. When the Sphagnum cuspidatum Nodum is excluded from these noda in Unit E they have an index value of plus nine. This floristic dissimilarity plus the fact that the majority of the relevés in the Sphagnum cuspidatum Nodum occur in ombrotrophic mire make it seem logical to place the Nodum in the RHYNCHOSPORETO-

SPHAGNETUM CUSPIDATI Association rather then any of the associations within the ANDROMEDO-SPHAGNION. The character species for the Association include the following:

Rhynchospora alba	Sphagnum cuspidatum
Cladopodiella fluitans	Drosera intermedia

Although occurring in other associations they attain their best development in the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI (see Fig. 8).

Different aspects of the Association have been described in the literature on eastern Canadian mires, the majority of which form nodal components of the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI. These include Dansereau and Segadas-Vianna's (1952) NUPHARETUM VARIEGATI, Gauthier and Grandtner's (1975) SPHAGNETUM CUSPIDATI and Fabiszewski's (1975) SPHAGNETUM CUSPIDATI AMERICANA Associations as well as Osvald's (1970) RHYNCHOSPORA ALBA-CLADOPODIELLA FLUITANS Sociation. The Association is similar to the wet phase within Pollett's (1972) KALMIETO-SPHAGNETUM FUSCI.

In Europe the Association may be compared with the following syntaxa described by Duvigneaud (1949): the RHYNCHOSPORETO-SPHAGNETUM, the SPHAGNETUM CUSPIDATI and the LYCOPODIETO-RHYNCHOSPORETUM ALBO-FUSCAE, all of which are included within the Alliance SCHEUCHZERIO-RHYNCHOSPORION ALBAE.

Alliance: ANDROMEDO-SPHAGNION

This Alliance occurs predominantly in transition mire and includes the noda found in Unit E which is described on page 246. The following species may be regarded as characteristic:

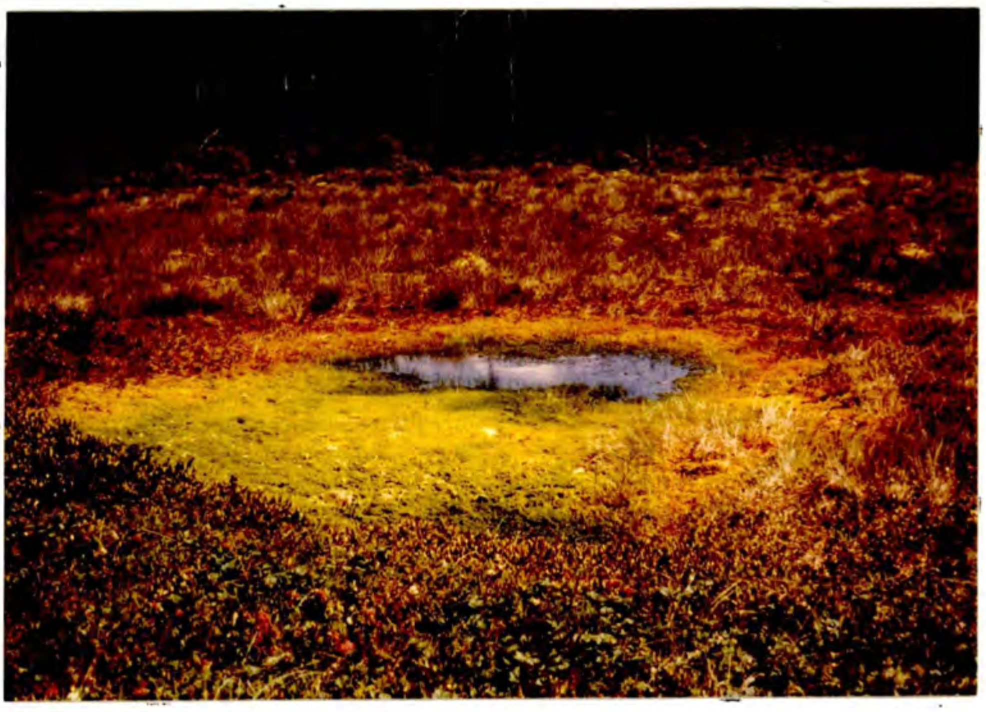

Fig 8. RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI Association.
(a) Above: The Sphagnum cuspidatum Nodum. (b) Below: The Rhynchospora alba-Cladopodiella fluitans Nodum.

Sphagnum recurvum	Carex oligosperma
Sphagnum majus	Andromeda glaucophylla

The first species along with *Sphagnum magellanicum*, *S. pulchrum* and *S. papillosum* are frequent dominants in the ground layer.

The Alliance like the Order to which it belongs shows some correlation with Duvigneaud's (1949) SCHEUCHZERIO-RHYNCHOSPORION ALBAE and PARVOCARICION CANESCENTIS-FUSCAE, and Moore's (1968) ERICO-SPHAGNION for European mires, and with Fabiszewski's (1975) ERIOPHORO VIRGINICI-SPHAGNETALIA and SPHAGNETALIA PAPILLOSI AMERICANA for eastern Canadian peatlands. The Alliance includes a single association, the SPHAGNETO-CARICETUM OLIGOSPERMI (see Fig. 9 page 275).

The Association occurs in all geographical regions within the study area where it is located mainly in transition mire, but can be found as well in the damp sections of ombrotrophic and rheotrophic peatland. The noda that are included within the Association have an "index of similarity" value of minus six indicating that 44% of the species are common to more than 50% of the noda. The Association is characterized by the dominance of *Sphagnum* species in the ground layer and the frequent presence of *Scheuchzeria palustris* and/or sedges like *Carex oligosperma* in the field layer. Commonly associated with these species are members of the Ericaceae, namely, *Chamaedaphne calyculata*, *Vaccinium oxycoccos* and *Andromeda glaucophylla*.

The Association as a whole has no closely related equivalent that has been dealt with in the literature on eastern Canadian mires. Parts of the Association, however, can be compared with syntaxa described by other authors. These include Dansereau and Segadas-Vianna's (1952)

Fig 9a. Transition mire with extensive development of the SPHAGNETO-CARICETUM OLIGOSPERMI Association.

Fig 9b. Mire lagg (rheotrophic) bordering on ombrotrophic mire (right).

ANDROMEDETUM GLAUCOPHYLLAE and LARICETUM LARICINAE Associations; Osvald's (1970) CAREX EXILIS-SPHAGNUM PULCHRUM, CAREX EXILIS-SPHAGNUM MAGELLANICUM and his ANDROMEDA GLAUCOPHYLLA-SPHAGNUM ANGUSTIFOLIUM Sociations; Pollett's (1972) SCIRPIETO-SPHAGNETUM PAPILLOSI, CARICETUM EXILII and CARICIETO-DROSERETUM INTERMEDIAE Associations all occurring in weakly minerotrophic fen; Fabiszewski's (1975) SARRACENIO-SPHAGNETUM, CARICI (OLIGOSPERMAE)-SMILACINETUM and CARICETUM PAUPERCULAE Associations; and Gauthier and Grandtner's (1975) Scheuchzeria Facies (within the SPHAGNETUM CUSPIDATI), ERIOPHORETOSUM Sub-association (within the SPHAGNO-CHAMAEDAPHNETUM CALYCULATAE) and SPHAGNO-LARICETUM LARICINAE Association.

In Europe, Duvigneaud's (1949) classification includes four associations that have varying degrees of similarity to the SPHAGNETO-CARICETUM OLIGOSPERMI. They are the SPHAGNETUM PAPILLOSI and the CARICETO LIMOSAE-SCHEUCHZERIETUM PALUSTRIS Associations both of which occur within the Order ERICO-SPHAGNETALIA (ombrotrophic mire) as well as the SPHAGNETO-CARICETUM PANICEAE and the CARICETUM LASIOCARPAE ACIDOCLINUM Associations occurring within the Order MOLINO-CARICETALIA FUSCAE (transition and rheotrophic mire). Moore's (1968) ERICO-SPHAGNETUM MAGELLANICI Association although dealing primarily with ombrotrophic mire contains species like Sphagnum magellanicum, S. papillosum and S. recurvum which are important constituents of the SPHAGNETO-CARICETUM OLIGOSPERMI Association in eastern Canadian peatlands.

The Association contains two distinct variants, one occurring primarily in continental mires and the other in the very damp depressions of transition sites. The first of these variants is distinguished by the constant presence of Sphagnum recurvum and is located predominantly in transition and ombrotrophic mire mainly from continental regions. It often is found in mires that border between transition and ombrotrophic. The Variant corresponds with the Sphagnum recurvum Nodum which is described on page 121. When the Variant is compared floristically with most of the other noda (except the Sphagnum majus) that form part of the SPHAGNETO-CARICETUM OLIGOSPERMI Association the "index of similarity" value is plus 17 indicating a close relationship. It is treated as a distinct variant on the basis of its strong preference for continental mires.

The Variant is characterized by the dominance of Sphagnum recurvum in the ground layer and the frequent presence of sedges such as Carex oligosperma in the field layer. Species like Chamaedaphne calyculata, Vaccinium oxycoccos, Kalmia polifolia, Andromeda glaucophylla and Sphagnum magellanicum occur frequently as well.

The other Variant is characterized by the dominance of Sphagnum majus in wet depressions. When it is compared floristically with the other noda (minus the Sphagnum recurvum) within the SPHAGNETO-CARICETUM OLIGOSPERMI the "index of similarity" value is plus nine. On the other hand when it is compared with the noda within the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI Association with which it is related on a hydrological basis the index value is plus one. This value increases to plus ten when those relevés within the Nuphar variegatum Nodum having Nuphar absent are excluded (see Table 70 page 264). As the Variant is exclusive to transition mire plus the fact that the character species for the SPHAGNETO-CARICETUM OLIGOSPERMI Association have a higher frequency of occurrence within it than those of the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI, it is left in the former

Association. The Variant corresponds with the Sphagnum majus Nodum described on page 105. Species like Menyanthes trifoliata and Carex limosa are frequent in the field layer. The Variant is similar to Fabiszewski's (1975) CARICI (OLIGOSPERMAE)-SMILACINETUM Association which occurs within the Order ERIOPHORO VIRGINICI-SPHAGNETALIA, and it shows some relationship to Duvigneaud's (1949) CARICETO LIMOSAE-SCHEUCHZERIETUM PALUSTRIS Association for European mires.

The Sphagnum russowii Nodum which is described in detail on page 126 consists of only four relevés. Due to this limited amount of sampling it becomes difficult to place the Nodum within the classification system as 50% of the relevés are located in rheotrophic mire and 50% in ombrotrophic. Based on the available data the Nodum is included tentatively within the Order SPHAGNO-CARICETALIA where it shows some relationship with both the ANDROMEDO-SPHAGNION and MYRICO-CARICION Alliances (see Table 68 and Fig. 10). Sphagnum russowii as a species seems to prefer ombrotrophic sites (see Nodal-Amplitude Table, Back Cover). No attempt is made at present in classifying the Nodum at the association level.

Alliance: MYRICO-CARICION

This Alliance is confined to rheotrophic mire and is related to Units F and G on the Nodal-Variant Table which are described on pages 248 and 249. Characteristic species for the Alliance include:

Myrica gale	Calamagrostis canadensis
Spiraea latifolia	Hypericum virginicum
Carex stricta	Viola pallens
Iris versicolor	Campylium stellatum

Chamaedaphne calyculata is a frequent associate of these and sometimes is dominant in the field layer.

The Alliance shows some relationship with Duvigneaud's (1949) EPIPACTO-SCHOENION FERRUGINEI (of transition and rheotrophic mire) and the PARVOCARICION CANESCENTIS-FUSCAE. Several of the character species for the latter are present within the MYRICO-CARICION in eastern Canadian mires. These include Carex canescens, Juncus filiformis and Galium palustre in the field layer and Drepanocladus exannulatus and Calliergon cordifolium in the ground layer. There is nothing in Moore's (1968) classification of European mires to compare with the MYRICO-CARICION as this work deals primarily with ombrotrophic peatlands.

Fabiszewski (1975) makes no attempt at classifying rheotrophic mire vegetation above the association level for the sites he examined in eastern Canada. He simply groups the associations under the title of "peat-bog lagg communities".

The MYRICO-CARICION Alliance contains two associations, namely, the CALAMAGROSTIETO-MYRICETUM GALE and the ALNETUM RUGOSAE (page 282).

The CALAMAGROSTIETO-MYRICETUM GALE Association is extensively developed in rheotrophic sections of peatland within the study area (see Fig. 13a page 280). It corresponds with Unit F and part of Unit G described on pages 248 and 249. The noda that occur within the Association have an "index of similarity" value of plus four. The Association has a well developed field layer dominated by Carex species and woody vasculars like Myrica gale and Chamaedaphne calyculata while the ground layer usually is poorly developed. Characteristic species include:

Fig 13a. Rheotrophic mire covered mainly by the CALAMAGROSTIETO-MYRICETUM GALE Association.

Fig 13b. Ombrotrophic mire in the continental area of western New Brunswick.

Carex lasiocarpa	Thalictrum polygamum
Carex aquatilis	Galium palustre
Carex paleacea	

Associated with these are a large number of species that are exclusive to the Association but are generally of low cover and restricted in their distribution. They are found in Groups 4A and 5A on the Nodal-Amplitude Table (see inside Back Cover).

Parts of the Association as defined in this study are recognizable in other syntaxa described by authors working in eastern Canadian peatlands. Dansereau and Segadas-Vianna (1952) have a CARICETUM ROSTRATAE and a MYRICETUM GALEAE Association in the pioneering phase of mire development. The former contains species like Carex lasiocarpa and Iris versicolor which are characteristic of CALAMAGROSTIETO-MYRICETUM GALE Association. Osvald (1970) describes a POTENTILLA FRUTICOSA Sociation for one of the mires he examined in Nova Scotia. Pollett's (1972) work in central Newfoundland includes three associations that have similarities to the CALAMAGROSTIETO-MYRICETUM GALE. These are the CARICETUM LIVIDAE of "weakly minerotrophic" mire, the POTENTILLETO-CAMPYLIETUM STELLATAE of "euminerotrophic" sites, and the MYRICIETO-CARICETUM ROSTRATAE located in "marsh".

Several of Duvigneaud's (1949) associations in European mires show some relationship with the CALAMAGROSTIETO-MYRICETUM GALE. These are: the SPHAGNETO-MYRICETUM GALE containing a Sub-association SPHAGNETOSUM WARNSTORFII of transition mire. As this Association has an abundance of ERICO-SPHAGNETALIA (ombrotrophic mire) character species it is included within this Order; the CARICETUM ROSTRATAE, the

CALAMAGROSTIDETUM NEGLECTAE and the CARICETUM AQUATILIS Associations occurring in the PARVOCARICION CANESCENTIS-FUSCAE Alliance; and the CARICETUM DIANDRO-LASIOCARPAE BASICLINUM of the EPIPACTO-SCHOENION FERRUGINEI. The latter two Alliances form part of the Order MOLINO-CARICETALIA FUSCAE (transition and rheotrophic mire).

The CALAMAGROSTIETO-MYRICETUM GALE Association contains one distinct variant in which Sphagnum fimbriatum is dominant in the ground layer. This corresponds to the Nodum of the same name described on page 138. The "index of similarity" value for the other noda in the Association minus the Sphagnum fimbriatum Nodum is plus three which shows little change from the value obtained with this Nodum included (plus four). On the Nodal-Variant Table (page 242) this Nodum shows a relationship to the Drepanocladus exannulatus-Drepanocladus fluitans Nodum, both making up part of Unit G which is described on page 249. When these two Noda are compared floristically the "index of similarity" value is minus 17, indicating that only 33% of the species are common to both. The Sphagnum fimbriatum Nodum also shows some relationship with the ALNETUM RUGOSAE Association (which occurs within the MYRICO-CARICION Alliance) in that it sometimes forms part of the understory vegetation mosaic of mature Alnus rugosa stands.

The Variant displays a strong affinity for mires located near salt marshes (see Fig. 14b page 303) and is characterized by the frequent presence of Carex paleacea in the field layer and by having almost complete cover in the ground layer.

The ALNETUM RUGOSAE Association occurs in all geographical regions in the study area where it is located in rheotrophic mire. It corresponds with the Nodum of the same name which is described on page 141 . The Association is characterized by the density of the shrub layer which is dominated by Alnus rugosa.

The Association is similar to the ALNETUM RUGOSAE described by Dansereau and Segadas-Vianna (1952) and which is included in the "consolidation stage" of mire development. It also is related closely to Grandtner's (1960) SPHAGNO-ALNETUM RUGOSAE and CARICI-ALNETUM RUGOSAE Associations. These are dealt with in Gauthier and Grandtner's (1975) study of the mires of the Bas Saint-Laurent. The latter authors also describe a Sub-association THUJO-LARICETUM LARICINAE ALNETOSUM in which Alnus rugosa and Larix laricina form a dense canopy in the shrub and tree layers respectively. This shows some resemblance to the ALNETUM RUGOSAE of the present study, in particular to Relevé 984 which is included in the Nodum. Fabiszewski (1975) recognizes Grandtner's Associations and includes them within the category of transition mire "lagg communities". There is nothing in Duvigneaud's (1949) classification of European mires to compare with the ALNETUM RUGOSAE of the present study.

The Drepanocladus exannulatus-Drepanocladus fluitans and the Sphagnum imbricatum Noda each contain a small number of relevés which occur in the different mire categories (ombrotrophic, transition and rheotrophic). The descriptions for these noda are found on pages 143 and 146 . The former Nodum, which is found mainly in depressions, is included within Unit G (see page 249) along with the Sphagnum fimbriatum Nodum. On the basis of their floristic composition, however, these two noda are not closely related (see Table 70 page 264). The Drepanocladus exannulatus-Drepanoclatus fluitans Nodum shows some relationship to the JUNCETUM FILIFORMIS Association as described by Duvigneaud (1949) in his classification of European mires. He includes the Association within the Order MOLINO-CARICETALIA FUSCAE (transition and rheotrophic mire). The Sphagnum imbricatum Nodum, on the other hand, which is found mainly on hummocks, does not fit into any of the units on the Nodal-Variant Table. Associations which show some similarity with this Nodum have been described in the literature by several authors. These include Pollett's (1972) CALAMAGROSTIETO-SPHAGNETUM FUSCI Association on hummocks occurring in "weakly minerotrophic fen", Moore's (1968) extreme atlantic race of the ERICO-SPHAGNETUM MAGELLANICI Association, and Duvigneaud's (1949) CALLUNETO-(EMPETRETO-) SPHAGNETUM IMBRICATI Association, the latter two located in ombrotrophic mire. Based on the limited amount of data available for both these noda they are included tentatively within the Order SPHAGNO-CARICETALIA but no attempt is made at present to place them in an alliance or an association.

The list of variants on page 250 which fall outside the units on the Nodal-Variant Table are related in most cases to the syntaxa as outlined in the present chapter. The Juniperus communis Variant (page 153)is confined to hummocks of ombrotrophic mire and, therefore, is related closely to the SPHAGNETUM FUSCI Association (see page 263), while the Larix laricina and Rhododendron canadense Variants (page 154 and 156) occur frequently in the drier sections of ombrotrophic peatland and are included within the Alliance CLADONIO-SPHAGNION FUSCI. The Eriophorum spissum Variant (page 175) also is found predominantly in ombrotrophic sites where it is associated frequently with the Sphagnum rubellum-Sphagnum nemoreum Nodum (see page 85).

The *Menyanthes trifoliata* Variant (page 190) occurs mainly in transition mire (and sometimes in rheotrophic sites) where it is located in damp depressions. It is found in all the associations (except the ALNETUM RUGOSAE) within the Order SPHAGNO-CARICETALIA. It is similar to Dansereau and Segadas-Vianna's (1952) MENYANTHETUM TRIFOLIATAE Association and to the *Carex lasiocarpa* Variant within Pollett's (1972) ERIOCAULETUM SEPTANGULARE Association. The *Carex rostrata* Variant (page 192) also occurs mainly in transition mire. It is found in both the SPHAGNETO-CARICETUM OLIGOSPERMI and the CALAMAGROSTIETO-MYRICETUM GALE Associations. It shows some relationship to Dansereau and Segadas-Vianna's (1952) CARICETUM ROSTRATAE and Pollett's (1972) MYRICIETO-CARICETUM ROSTRATAE Associations in eastern Canadian mires, and to Duvigneaud's (1949) CARICETUM ROSTRATAE Association for European peatlands.

The *Lonicera villosa* and *Potentilla palustris* Variants (page 225 and 227) occur only in rheotrophic mire and are related closely to the CALAMAGROSTIETO-MYRICETUM GALE Association.

VI CHEMISTRY OF THE MIRE WATERS

First, an outline is given of the analytical procedures used in the water analysis, and this is followed by a description of the results that were obtained.

A. Water Analysis

The following procedures were carried out on the collected samples. The methods used to determine pH and the concentration of weak and strong acid salts follow those given in Mackereth (1963).

pH was determined electometrically using a glass electrode.

All samples were then filtered or carefully decanted in order to remove peat particles.

HCO_3^- The concentration of the weak acid salt bicarbonate was determined by titrating with standard acid (HCl) to pH 4.5 using B.D.H. 4.5 indicator with 0.02% methyl red and 0.1% bromocresol green in neutral 95% alcohol.

SO_4^{--} and Cl^- The concentration of the strong acid salts sulphate and chloride were determined by ion exchange using a hydrogen charged synthetic resin (Permutit ZEO-KARB 225) as an exchange surface, and then back titrating with standard KOH to pH 4.5.

Cl^- was determined separately by titration with Ag NO_3 using a potassium perchlorate indicator.

The concentration of the sulphate was then obtained by subtracting the chloride result from the combined result of the two anions. The sulphate concentrations of the water samples collected during the 1975 field season were determined simply by subracting the sum total of the values for chloride and bicarbonate (when present) from the cation total.

Total cation concentrations were obtained for sodium, potassium, calcium and magnesium using an atomic absorption spectrophotometer. (Determinations were made also for iron and lead but the results proved to be insignificant).

All the results are in parts per million (ppm). These were converted to milli-equivalents per litre (meq/litre) and both figures are included in the water analysis tables (see Appendix D page 352).

B. Results

Water samples were obtained from the majority of the mires where vegetational sampling took place (approximately 96% of the total). In all cases the samples were collected at the surface of the water table level wherever that occurred in the peat profile. The collection of these samples was undertaken with the following objectives in mind:

1) to determine the ionic composition of the mire waters (based on the "major ions" as defined by Rodhe, 1949). This would allow
2) a comparison of the water chemistry of ombrotrophic, transition and rheotrophic mire, as well as,
3) a comparison of the water chemistry of mires from the major geographical regions within the study area.

In the discussion chapter which follows comparison is made with the results obtained by European workers dealing with the chemistry of mire waters (Witting, 1947; Gorham, 1961; and Bellamy, 1967).

The results derived from the chemical analysis are summarized in Tables 76 to 81, pages 289 to 294. These tables, which present the means and extremes, of the major ions in milli-equivalents per litre (meq/litre) and which form the main basis for the following description, are derived from the detailed chemical analysis tables found in Appendix D.

The sulphate concentrations determined for the 1974 water samples are very high in some cases and this may be one of the causes for the marked discrepancies between the totals of the anions and cations for some of the samples in the tables. The reason for this remains unsolved although reanalysis confirmed all the other results obtained, hence no conclusions are drawn in the descriptive section of this chapter based on the sulphate or the total anion and cation concentrations. Two of the water analysis results from the Bas Saint-Laurent (samples 0646 and 0668) which have very high anion totals in comparison to the cations have not been included in the mean value tables pertaining to the ombrotrophic mires from this area. They have been left, however, in the detailed chemical analysis tables in Appendix D.

The following description deals with the anions bicarbonate (HCO_3^-) and chloride (Cl^-), and the cations calcium (Ca^{++}), magnesium (Mg^{++}), sodium (Na^+) and potassium (K^+), along with the pH determinations. The geographical regions considered are the maritime areas of Nova Scotia, coastal New Brunswick, the Bas Saint-Laurent and the Côte Nord and the continental regions of the interior of New Brunswick and

Tables 76 to 81. Means and Extremes Derived From the Detailed Water Analysis Tables.

Each table deals with one of the major geographical regions in eastern Canada and summarizes the chemical data presented in Appendix D.

For each mire type the top row of numbers represent extreme minimum values, the middle row the means, and the bottom row the extreme maximum values.

The pH values are based on Sorensen's scale * while the ions are in milli-equivalents per litre.

* SORENSEN, S.P.L. 1909. Biochem. Z. (Germany). 21:131.

Table 76 NOVA SCOTIA

Means and Extremes in Milli-equivalents per litre.

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.6	0	0.155	0	0.010	0.007	0.047	0.001	0.279	0.235	
OMBRO	3.8	0.001	0.346	0.145	0.096	0.032	0.182	0.006	0.455	0.481	35
	5.0	0.020	0.732	0.682	0.810	0.069	0.370	0.019	1.105	1.105	
	3.6	0	0.310	0.182	0.065	0.019	0.183	0.002	0.529	0.343	
TRANS	4.1	0.020	0.365	0.230	0.084	0.052	0.220	0.005	0.617	0.472	6
	4.6	0.070	0.450	0.285	0.095	0.070	0.287	0.007	0.715	0.690	
	5.2	0.140	0.420	0.198	0.121	0.041	0.196	0.004	0.758	0.472	
RHEO	6.1	1.603	0.844	4.893	5.711	0.216	0.362	0.018	7.339	6.309	4
	6.6	2.950	1.930	16.619	19.400	0.278	0.500	0.058	20.175	20.175	

Table 77 NEW BRUNSWICK (MARITIME)

Means and Extremes in Milli-equivalents per litre

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.4		0.169	0.182	0.003	0.004	0.054	0.003	0.470	0.470	
OMBRO	3.5		0.251	0.301	0.087	0.019	0.094	0.007	0.552	0.552	5
	3.5		0.324	0.486	0.190	0.028	0.143	0.012	0.655	0.655	

Table 78 BAS SAINT-LAURENT

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.3		0.169	0.162	0.065	0.007	0.042	0.002	0.442	0.392	
*OMBRO	3.6		0.323	0.582	0.344	0.032	0.183	0.010	0.905	0.831	6
	4.0		0.420	1.595	1.310	0.070	0.309	0.021	1.961	1.961	
RHEO	4.9		0.255	1.232	1.295	0.033	0.126	0.021	1.487	1.487	1

* minus Sample Rel. Nos. 0646 and 0668

Table 79 CÔTE NORD

Means and Extremes in Milli-equivalents per litre.

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.3		0.197	0.034	0.003	0.002	0.046	0.002	0.314	0.265	
OMBRO	3.7		0.264	0.156	0.066	0.016	0.114	0.005	0.420	0.425	24
	4.0		0.380	0.366	0.190	0.045	0.178	0.021	0.659	0.659	
	3.7		0.310	0.165	0.092	0.035	0.126	0.004	0.499	0.418	
TRANS	3.9		0.511	0.423	0.445	0.053	0.252	0.012	0.934	0.897	3
	4.3		0.873	0.914	1.150	0.086	0.487	0.017	1.787	1.787	
	4.2	0	0.280	0.132	0.098	0.052	0.152	0.004	0.412	0.346	
RHEO	4.7	0.173	0.628	0.970	0.919	0.139	0.456	0.026	1.598	1.576	3
	5.5	0.520	1.070	1.842	1.700	0.233	0.917	0.059	2.912	2.912	

Table 80 NEW BRUNSWICK (CONTINENTAL)

Means and Extremes in Milli-equivalents per litre

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.4	0	0.113	0.108	0.003	0	0.007	0.001	0.263	0.122	
OMBRO	3.7	0.010	0.168	0.416	0.317	0.007	0.024	0.006	0.577	0.587	12
	4.8	0.100	0.211	2.417	2.580	0.032	0.070	0.022	2.686	2.686	
	3.4		0.155	0.195	0.200	0.006	0.012	0.005	0.392	0.392	
TRANS	3.7		0.174	0.606	0.513	0.017	0.020	0.009	0.779	0.779	3
	4.0		0.197	0.853	0.860	0.027	0.035	0.015	1.022	1.022	
	5.2	0.095	0.169	2.119	2.280	0.056	0.031	0.010	2.383	2.383	
RHEO	5.4	0.108	0.197	2.394	2.560	0.063	0.059	0.013	2.699	2.699	2
	5.6	0.120	0.225	2.669	2.840	0.070	0.087	0.015	3.014	3.014	

Table 81 LAC SAINT-JEAN

Means and Extremes in Milli-equivalents per litre

MIRE TYPE	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	Total Anions	Total Cations	No. of Samples
	3.3		0.085	0.019	0.003	0	0	0.003	0.244	0.148	
OMBRO	3.6		0.174	0.372	0.245	0.009	0.018	0.011	0.537	0.546	18
	4.2		0.255	1.183	0.755	0.047	0.064	0.046	1.268	1.268	
	3.4	0	0.099	0.258	0.045	0	0.005	0.002	0.357	0.098	
TRANS	4.4	0.006	0.138	0.199	0.166	0.006	0.025	0.019	0.284	0.332	5
	5.4	0.020	0.183	0.453	0.325	0.018	0.040	0.042	0.636	0.636	
	4.9	0.010	0.169	1.341	1.390	0.060	0.022	0.007	1.520	1.520	
RHEO	5.4	0.135	0.169	2.099	2.262	0.067	0.053	0.016	2.404	2.404	3
	6.2	0.380	0.169	2.977	3.325	0.090	0.096	0.025	3.526	3.526	

Lac Saint-Jean (see Fig. 1 page 7).

All of the analyzed mire water samples have an acid reaction (pH < 7). The readings range from pH 3.3 in ombrotrophic sites (Saint Lawrence River Valley; Lac Saint-Jean) to pH 6.6 in rheotrophic mire (Nova Scotia). There is no significant difference in pH between maritime and continental areas when the same mire type is compared. The major variation occurs between the different mire categories (ombrotrophic, transition, rheotrophic) within each geographical region. The mean pH values for ombrotrophic mire range from 3.5 to 3.8, transition 3.7 to 4.4 and rheotrophic 4.7 to 6.1.

Bicarbonate (HCO_3^-) is present in mire waters as undissociated H_2CO_3 or dissolved CO_2 when the pH is greater than 4.5. The majority of the water samples have pH values less than 4.5 (86%). Those with pH readings greater than this have bicarbonate present in amounts ranging from 0.008 meq/litre (pH 4.5) to 2.950 meq/litre (pH 6.3). In rheotrophic mire bicarbonate has its highest concentrations in maritime areas with the highest measurements occurring in water samples from Nova Scotian sites.

The determinations for chloride show a marked difference between mires occurring in maritime areas and those of continental regions with the former having the greater concentrations of this anion. This contrast occurs in all the mire categories. Rheotrophic mires generally have higher chloride concentrations than ombrotrophic sites except in the Lac Saint-Jean area where the mean values for these two mire categories are approximately the same. The highest chloride concentrations in ombrotrophic mire occur in Nova Scotia.

Calcium is the only ion to have distinctly higher concentrations in continental regions in reference to ombrotrophic mire, despite the fact that its highest values for this mire type are found in the Bas Saint-Laurent. Calcium's highest concentrations overall occur in rheotrophic mire from all the geographical areas. Here the mean values range from 0.919 meq/litre to 5.711 meq/litre (compared with a range of 0.084 meq/litre to 0.513 meq/litre for transition mire and 0.066 meq/litre to 0.344 meq/litre for ombrotrophic sites). Calcium is the principal cation in rheotrophic mire in all the geographical regions where sampling was carried out. This is also the case in transition and ombrotrophic sites where these occur in continental areas, and in transition mire from the maritime region of the Côte Nord and ombrotrophic mire from the Bas Saint-Laurent. In all the other maritime areas where sampling was done in these latter two mire types calcium is replaced by sodium as the dominant cation.

Magnesium, like chloride, has its highest concentrations in maritime regions in all three mire categories. In relation to the other cations it usually ranks behind calcium and sodium in concentration levels. In rheotrophic mire from continental areas, however, it is second to calcium in concentration while in transition and ombrotrophic mire from the Lac Saint-Jean region it ranks last among the cations. Magnesium's highest concentration levels are in rheotrophic sites while its best levels in ombrotrophic mire occur in Nova Scotia and the Bas Saint-Laurent region.

Sodium also is present in larger quantities in the water samples collected from maritime areas as compared with those from continental mires. Its highest concentrations occur in rheotrophic sites throughout most of the study area while its highest levels in ombrotrophic mire are found in the Bas Saint-Laurent region and Nova

Scotia. In comparison with the abundance of other cations sodium places third behind calcium and magnesium in rheotrophic mire waters from continental areas while being the most abundant cation in transition mire from Nova Scotia and in ombrotrophic mire in all maritime regions except the Bas Saint-Laurent. In all other cases it ranks second to calcium in abundance.

Although occurring in all the water samples, potassium (along with bicarbonate in the majority of cases) is the least abundant ion present. Its concentrations range from a low of 0.001 meq/litre in ombrotrophic mire to a high of 0.058 meq/litre in rheotrophic sites, with the latter mire category having the highest values for this ion in all regions except the Lac Saint-Jean area. Within ombrotrophic mire, however, the highest concentrations occur around Lac Saint-Jean and along the Bas Saint-Laurent. Also, it is only in transition and ombrotrophic mire from Lac Saint-Jean that potassium is not the least abundant cation present. Here its mean concentration values are slightly higher than those for magnesium.

In summary the following patterns emerge from the examination of the water analysis data:

1) The major anions and cations generally increase in concentration in passing from ombrotrophic to rheotrophic mire, with a corresponding decrease in the hydrogen ion concentration as indicated by increasing pH values. This is the case in all the geographical regions except Lac Saint-Jean. Here both chloride and potassium do not show a significant change in their concentration levels between the three mire types. This general increase in ion concentration in rheotrophic sites reflects their more favourable hydrological position in terms

of ion input, receiving as they do ion-charged water from the surrounding catchment in addition to the precipitation falling directly on their surface.

2) Chloride, magnesium and sodium have higher concentrations in maritime areaa in each of the three mire types. This is a reflection of the proximity of these mires to the sea where the influence of sea spray containing these ions in aerosol form (Gorham, 1957) must be taken into account.

3) In ombrotrophic sites the majority of the ions have their highest concentrations in mire water samples collected from the Bas Saint-Laurent. This is the only geographical region in the study area where the mires are being used extensively in supplying peat for agriculture. Six out of nine mires examined in this area are being affected by artificial drainage. When the means of the ion concentrations for the three "non-artificially drained" mires are calculated the values contrast greatly with the means for three artificially drained sites in the Bas Saint-Laurent region while being quite similar to the means for the Côte Nord. This is illustrated in the following table.

Table 82

AREA OR MIRE GROUP	MIRE TYPE	pH	MEANS IN MILLI-EQUIVALENTS PER LITRE						No. of Samples
			Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	
* Bas Saint-Laurent	"ombro"	3.7	0.357	0.847	0.605	0.048	0.235	0.015	3
** Non-artificially Drained	"ombro"	3.6	0.289	0.293	0.083	0.015	0.131	0.005	3
Côte Nord	"ombro"	3.7	0.264	0.156	0.066	0.016	0.114	0.005	24

* Excluded are Sample-Relevé Numbers 0646 and 0668 (see page 362)

** Included here are Sample-Relevé Numbers 0674, 0696, and A-28 (0976) (see Appendix D, Table 73)

Man's disturbance of the mires along the Bas Saint-Laurent seems to be causing the increase in the concentration of the major ions.

4) In the majority of the combinations of mire type with geographical region which make up Tables 76 to 81 , pages 289 to 294, the cation concentrations occur in the following decreasing order of abundance: Ca > Na > Mg > K.

VII DISCUSSION

The main aim of this study was to describe and classify the vegetation of mire complexes in eastern Canada to allow comparison with similar vegetation types in Europe. This has been dealt with in Chapters IV and V where comparisons have been made between the syntaxonomic categories proposed and those already in existence, mainly at the association level in Canada and at this and higher (syntaxa) levels in Europe. The present chapter looks at the variation that exists between mires in eastern Canada and tries to relate this to the diverse environmental region in which they are situated. This ties in with the third major aim of the research - to demonstrate the existence of phyto or ecogeographical trends (patterns of variation) in eastern Canadian peatlands. Attention will be focused on similar patterns that have been described for European mires (Bellamy, 1967; Moore and Bellamy, 1974).

Before proceeding with this aspect of the discussion two matters need to be considered relating to the research. These can best be summed up by asking the questions: What constitutes a mire, and how do you classify its vegetation? These had to be resolved in order that meaningful data could be collected. They are considered at this point in the thesis on the basis that they will be better understood in the light of the information already presented. The second question is linked to the initial aim of the research - to test the applicability of the Zürich - Montpellier approach to phytosociology on predominantly virgin mires in a large geographical area.

A. What Constitutes A Mire?

This question needs to be resolved from the outset of the field work. The researcher must have a clear idea in mind of what is meant by the term mire. The question above can be expanded further by asking the following:

1) What should be included within the category of mire?

2) When does a mire cease to be one?

3) What selection criteria should be used?

Godwin (1941) defines "mire" as "plant communities growing on soils which are composed mainly or entirely of organic matter". His definition includes the biotic but his emphasis is on the substrate upon which it occurs. This is in agreement with Pyvachenko's (1963) definition, and is the basis upon which mires are defined in the present study, i.e., the bio-physical rather than just the biotic or physical (substrate) alone. Godwin's definition, however, could include "marshes" and "swamps" which are underlain by varying degrees of organic material together with mineral soil. Lacate (1969) carefully defines these units which along with "fens" and "bogs" are included in the category of wetlands. According to Lacate both marsh and swamp occur on a substrate composed of a mixture of mineral and organic soil with little peat accumulation while fen and bog occur on a substrate composed entirely of peat. In the present study only the latter two units fit into the definition of mire as used here. Dansereau and Segadas-Vianna (1952) also give a detailed account of what distinguishes bog from marsh and swamp.

The difference between fen and marsh or swamp is not always distinct as they sometimes grade into each other. This can best be illustrated by specific examples encountered during the field work. These examples should also help to clarify what constitutes mire in the present study. The Petit Étang marsh (lat. 46°39'N, long. 60°58'W) located near sealevel (altitude 15m) on the northwest side of Cape Breton Island in Nova Scotia contains a flora that resembles that found in rheotrophic mire. A series of soil pits across the length and breadth of the marsh revealed a mixture of organic and mineral soil with little peat accumulation. The marsh is situated on a large floodplain that grades into a salt marsh at the seaward end. The sea's influence is diminished by the presence of a barrier beach behind which occurs the confluence of the Chéticamp River and the Au Coin Brook, the latter dissecting the marsh. This brook must periodically overflow its banks and deposit large amounts of silt onto the surface of the area. Based on the definition of mire used in this study the marsh qualifies from the biotic standpoint but not from the physical (substrate). For this reason no vegetational sampling was carried out. Another rheotrophic site at Ilets-Jérémie (lat. 48°54'N, long. 68°46'W) along the Côte Nord in Québec also borders on a salt marsh (see Fig. 14b page 303). Here, however, there is enough peat accumulation on the surface of the area together with the flora to qualify it as a mire.

The problem of determining a mires's limits also occurs in some of the streams passing through rheotrophic mire. These sometimes have organic deposits on the stream bed especially where water flow is reduced or the stream expands into pond-like areas. Where water flow is more rapid there is little chance for organic matter to accumulate and the stream bed is very gravelly (see Fig. 14a page 303). Both these situations may support the same flora but because of the absence of organic matter in the latter it is considered to be outside the limits of mire.

Fig 14. Mire limits. (a) Above: A gravel-bed stream passing through rheotrophic mire. (b) Below: Rheotrophic mire (left) bordering on a salt marsh (right).

As a final example illustrating a mire's limits we can turn to one of nature's agents in initiating mires - the beaver. Through the construction of dams in valley bottoms substantial sections of forest are destroyed and large ponds created (see Fig. 15a page 305). With the passage of time these ponds build up organic deposits and mire vegetation is established (see Fig. 15b). At some point along the way the "mire limit" is reached. The first organic material deposited may have originated from beyond the immediate catchment area of the pond. At this stage without the presence of a flora the pond would not qualify as a mire in the complete bio-physical sense.

The above examples provide part of the answers to the questions posed at the beginning of this section and summed up in its title "What constitutes a mire?" In the present study it is any pure peat deposit together with the flora it supports. It must be recognized that other authors may disagree with the bio-physical definition of mire adopted in this thesis. Some might argue that the organic deposit alone is sufficient to qualify a site as mire (Radforth, 1964) while others would recognize mires mainly on the basis of their floras (Osvald, 1933; Sjörs, 1961 b). The point to be stressed is that the researcher must establish clearly from the start what is to be included within the definition of mire and then proceed on that basis to select sites for study. In the present research the definition of mire as stated above was used as the selection standard for the sites that were chosen for sampling.

B. Classifying Mire Vegetation

There are numerous accounts in the literature describing ways to do

Fig 15. Beaver activity in initiating mire development. (a) Above: Early stage. (b) Below: Advanced stage with rheotrophic mire development.

this, two of the more recent being included in works by Whittaker (1962) and Shimwell (1971). The intention here is not to review these methods but to examine the reasons behind the choice of the particular approach to classification used in the present study. The initial question posed earlier in this chapter - how do you classify (mire) vegetation? can be rephrased by asking - why do you classify in a particular way? Does the state of the mire's vegetation influence the choice that is made and if so is the resulting classification simply determined by the method used?

The vegetation of most mires consists of a mosaic of physiognomically distinct units. In describing such vegetation the first problem that arises is whether a sample should include only the distinct parts or the whole. Of the two main schools of phytosociology in Europe, the Scandinavian and the Zurich - Montpellier, the former is much more positive in its approach to this problem by selecting dominance as a criterion for sampling. The mires under study in eastern Canada are mainly virgin sites where some of the species regularly occur with high cover. In this regard the mires are similar to those studied in Scandinavia and it was decided, therefore, to sample the vegetation by using dominance as the main standard for selection. Choosing this type of sampling naturally dictated the use of dominance as the basis for the division of the relevés into "noda" (see Tables 4 to 31 in Volume 2). Once the raw noda tables had been rearranged to produce the differentiated tables it was seen that a large number of "variants" crossed nodal boundaries focusing attention on the fact that marked vegetational similarities existed between some of the noda (see Fig. 10 page 254). It was decided, therefore, to create another set of phytosociological tables based on the variants that occurred in more than one nodum (see Tables 33 to 67 in Volume 2). At this point in the vegetation analysis the emphasis had shifted from the Scandinavian to the Zürich - Montpellier approach which is based on the concept of fidelity rather than dominance. As all of the variant tables include differential species with very high fidelity, applying the Zürich - Montpellier approach at this stage seemed the logical thing to do. The dominant species which form the basis for the noda have high fidelity only in so far as they occur as dominants (greater than 60% cover), otherwise they frequently are present in other noda with low cover values.

The next step then was to evaluate the floristic relationship between noda (based on dominance) and variants (based on fidelity) and use this as the framework for developing a classification system (see Table 68 page 242). The result was a classification that naturally evolved from the data set and to which the hierarchical units of the Zürich - Montpellier School were applied (see Fig. 10 page 254). This classification system is in effect derived from an amalgamation of approaches used by the two schools of phytosociology with its basic unit - the association, being composed of noda that have a close floristic relationship. As has already been shown in Chapter V the classification allows meaningful comparisons to be made with the classifications proposed for European mires by Duvigneaud (1949) and Moore (1968) and as we shall see below, for similar conclusions to be drawn regarding the ecology of mires on both sides of the Atlantic.

These facts add weight to the validity and usefulness of the proposed classification system. Also by using dominance as the first criterion for site selection provision is made for a quick and easy approach into the study of mire vegetation. Dominance is a feature in the vegetation mosaic that is easily recognized and understood by both scientist and layman and provides the basis upon which a workable understanding of vegetation can develop.

While still on the subject of classifying mire vegetation another question can be asked, namely, why classify? The answer to this in the context of the present study is simply that it provides a way of increasing our knowledge of mires. By applying meaningful descriptive labels for the component parts of a mire's vegetation information pertaining to mires can be communicated more efficiently and understandably. This is important as the mires under study are likely to receive more attention in the near future as a possible energy source. Any increase in formalized knowledge, therefore, will enable more intelligent decisions to be made both in the utilization and the conservation of peatlands.

C. Biotic-Abiotic Interactions

The mires of eastern Canada have developed within a variety of environmental conditions which have been described in detail in Chapters II and VI. Diversity in the vegetation of these mires has been shown to exist within each variant, nodum and association described in Chapters IV and V. The following discussion attempts to demonstrate that in some cases the variation in the biotic is related to changes in the abiotic or physical environment. Evidence in support of this relationship is derived mainly from climatic records, the water chemistry data and the floristic descriptions presented above. The fact that it is backed up by evidence of a similar kind reported for European mires is of great importance.

Three different floristic categories of mire have been shown to exist in the sites examined in eastern Canada, namely, ombrotrophic, transition and rheotrophic sensu Moore and Bellamy (1974). These mire types along with the associations belonging in each one are summarized in the following table:

Table 83. The Mire Types and their Associations

Mire Type	Associations
Ombrotrophic	PICEETUM MARIANAE CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE SPHAGNETUM FUSCI RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI
Transition	SPHAGNETO-CARICETUM OLIGOSPERMI
Rheotrophic	CALAMAGROSTIETO-MYRICETUM GALE ALNETUM RUGOSAE

The three mire categories correspond to similar mire types described by Kulczynski (1949) in Poland which were derived from the hydrology of the mires. In the present study the contrast in the vegetation of ombrotrophic and rheotrophic mire is great enough to warrant the segregation of most of their associations at the "order" level. Thus most of the associations of ombrotrophic mire belong in the Order KALMIO-SPHAGNETALIA FUSCI while all of those in rheotrophic mire belong in the Order SPHAGNO-CARICETALIA. As these names imply there is a shift from the dominance of Ericaceous species to Carex species between the two mire types (see Fig. 13 page 280). This agrees with Duvigneaud's (1949) classification of European mires, with ombrotrophic sites belonging in the Order ERICO-SPHAGNETALIA and rheotrophic areas within the Order MOLINO-CARICETALIA FUSCAE. It is also in agreement with Moore's (1968) classification of mires for Europe in regard to ombrotrophic peatlands where the Class OXYCOCCO-SPHAGNETEA is characterized by the dominance of "Ericoid shrubs."

The contrast between transition mire and the other two mire types is not as great, for as the name implies this mire category is "transitional" between ombrotrophic and rheotrophic peatlands and contains a large number of species that occur in the other mire types as well (see Fig. 9a page 275). Although the change in the floristic composition of the three mire categories usually is gradual as rheotrophic sites are altered to ombrotrophic mire through the natural process of mire succession and the build up of the peat substrate above the influence of ground water inflow, sharp boundaries can exist between the extremes as shown in Fig. 9b page 275, but this is a very rare feature.

Contrast between the three mire types in eastern Canada is found also in the chemistry of their waters (see Chapter VI). Ombrotrophic sites generally have very acid waters with mean pH values ranging between 3.5 to 3.8 while rheotrophic mire water is less acid with mean values ranging from 4.7 to 6.1. In respect of the major ions the general trend is for increased concentrations to occur in passing from ombrotrophic to rheotrophic sites. This reflects the hydrological position of these mires with the former receiving its entire water supply from precipitation while the latter in addition to this source also receives water inflow from its surrounding catchment. Similar ionic compositions have been reported in the literature for European mires (Sjörs, 1950; Bellamy, 1968). The table on page 311 summarizes their mean results together with those obtained in the present study for the three different mire categories.

Table 84 Mean values of the concentrations of major ions in waters from ombrotrophic, transition and rheotrophic mire for eastern Canada, western Europe (Bellamy, 1968) and Scandinavia (Sjörs, 1950)

	Total Major Ions								
Mire Type	pH	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	H^+
Eastern Canada									
Rheotrophic	5.3	0.4	0.4	2.3	2.5	0.1	0.2	0.02	0.01
Transition	4.0	0	0.30	0.36	0.30	0.03	0.13	0.01	0.11
Ombrotrophic	3.7	0	0.25	0.33	0.19	0.02	0.10	0.01	0.23
Western Europe									
Rheotrophic	6.5	2.0	0.5	0.7	2.3	0.4	0.5	0.05	0
Transition	4.5	0.1	0.4	0.5	0.3	0.1	0.3	0.06	0.09
Ombrotrophic	3.8	0	0.3	0.3	0.1	0.1	0.2	0.04	0.16
Scandinavia									
Rheotrophic	6.0	1.0	0.1	0.1	0.9	0.2	0.1	0.01	0.01
Transition	4.2	0	0.05	0.06	0.07	0.03	0.07	-	0.27
Ombrotrophic	3.8	0	0.04	0.13	0.04	0.05	0.09	0.01	0.16

An interesting fact that emerged from the water analysis data presented in Chapter VI is the higher concentrations of calcium in continental ombrotrophic mire water compared with most of the ombrotrophic water collected from maritime areas. Bellamy's (1967) water analysis data for ombrotrophic sites across Europe showed no marked difference in calcium concentrations between maritime and continental areas.

One possible explanation for the comparatively higher calcium concentrations in some of the geographical regions in eastern Canada can be found by looking at land use in each of these areas where mires were examined. Both the Eastern Shore of Nova Scotia and the Côte Nord in Québec have only a minimal amount of land cleared for farming because of poor soil conditions that exist in these regions. On the other hand, farm lands are more extensively developed in the continental areas, especially the Lac Saint-Jean basin, where an increase in the use of chemical fertilizers, such as lime, and the naturally occurring "richer" soils could have the effect of raising calcium levels in the atmospheric dust which falls on the surface of the mires.

Support for this explanation comes from the very high calcium concentrations in mire waters from the Bas Saint-Laurent, the only maritime locality where the surrounding land is used extensively for farming. Also in the Hudson Bay lowlands a region remote from any farming areas, Sjörs (1963) found very low calcium concentrations in a water sample collected from a bog pool situated in a continental site and states that this "is typical of ombrotrophic conditions". In addition to this supporting evidence it is interesting to note that in the lowland areas of western Europe where extensive farming practices have been going on for centuries Bellamy's (1968) mean calcium concentrations for ombrotrophic mire water are higher than those reported by Sjörs (1950) for Scandinavia where good arable land for farming is minimal in comparison. The fact that many of Bellamy's samples were collected in areas of extensive agriculture may also explain why no marked gradation in calcium concentrations occurred between maritime and continental regions.

Another factor which appears to correlate with floristic and chemical variation in mires is their proximity to the sea. The water samples collected from maritime mires in eastern Canada showed higher concentrations of chloride, magnesium and sodium in all three mire types than was the case for continental mire waters. Bellamy and Bellamy (1966) in their study of the lowland mires of Ireland found that proximity to the sea caused a marked increase in the concentrations of chloride and sodium in ombrotrophic mire water samples. The effects of sea spray deposited on the mire surface by onshore winds has been suggested as the reason for the increased concentrations of these ions (Witting, 1947; Gorham, 1956). This increase in ion input in eastern Canada is accompanied by an increase in the number of species found in maritime mires compared with continental sites. This is especially the case in ombrotrophic and transition mire where approximately 40% more species are found whenever these mire types are located near the sea. This increase has been noted already in connection with the description of the SPHAGNETUM FUSCI Association on page 263. A similar increase was found to occur when Bellamy's (1967) floristic tables for transition sites from Ireland were compared with the same mire type from Germany. Gorham (1953), however, in a study of mires from the English Lake District found that although proximity to the sea caused an increase in the concentrations of chloride, potassium and sodium there was no marked changes in the flora of the mires under study. Consideration must be given to the climatic differences between eastern Canada and western Europe. The former has most of its weather systems moving in a west to east direction i.e., from the interior of North America to the Atlantic, therefore, the maritime influence is not very great. This could be in part the cause of the sudden reduction in the number of species on mires only a short distance inland from maritime areas (around 40km). In Europe, on the other hand, most weather systems move from the Atlantic into the central regions of the continent. Here the maritime influence spreads much further inland and any effect on the flora of mires would probably be much more gradual when moving away from the Atlantic.

The amount of precipitation falling on mires in maritime areas in eastern Canada was found to be much greater than that which fell on continental sites (see Table 1 page 16). Most of the sites in Nova Scotia are receiving in excess of 1300mm of precipitation annually, while those in more continental regions like Lac Saint-Jean have a yearly average of only 830mm. A similar reduction in precipitation between coastal and inland sites is shown in data reported by Bellamy and Bellamy (1966) where they were able to indicate a relationship between increasing effect of rainfall and increasing effect of sea spray, and their combined influence on the ionic makeup of mire waters. Both sulphate and hydrogen ion concentrations were found to decrease in importance with increasing amounts of rainfall. This occurred in ombrotrophic mire where these ions usually are dominant. The increased rainfall seems to have the same effect as an increase in the mobility of mire waters that occur in more rheotrophic sites. The concept of "atmospheric flushing" effecting the ionic content of the mire waters was used by Bellamy and Bellamy to explain the fact that in some maritime areas Schoenus nigricans and Myrica gale are found in abundance on ombrotrophic mire. This contrasts with their distribution on inland mires where they are confined to transition and rheotrophic sites.

Bellamy (1967) in examining the broad spectrum of European mires was able to show a gradual change in the floristic makeup of ombrotrophic peatlands in passing from the central regions of the continent to the Atlantic coast. This included an increase in the importance of certain oceanic species such as Erica tetralix and Narthecium ossifragum in the mire flora. These phytogeographical differences go hand in hand with ecogeographical ones, with the latter centering on changes in the ecology of certain species. In central Europe the following species are confined to transition and rheotrophic mire:

Schoenus nigricans	Eriophorum angustifolium
Myrica gale	Carex panicea
Molinia caerulea	Sphagnum subsecundum

In passing towards the Atlantic they all spread onto ombrotrophic sites producing a cline of variation within the mire flora. The most extreme example of this occurs in western Ireland (Bellamy and Bellamy, 1966) where both Schoenus and Myrica become dominant in some ombrotrophic sites. If such floristic changes are related to climatic conditions then this provides proof of a gradual effect in passing across Europe.

It is interesting to note that similar trends have been found in the mires of eastern Canada. Part of the 40% increase in species in mires from maritime areas which was mentioned above includes those reflecting phytogeographical differences, namely:

Empetrum nigrum	**Carex paleacea**
Rubus chamaemorus	Dicranum leioneuron
Juniperus communis	

all of which are restricted entirely to maritime sites while Gaylussacia dumosa and Vaccinium angustifolium show a strong preference for these areas. Other species which have a marked increase in abundance in maritime regions include Scirpus cespitosus and Odontoschisma sphagni as well as most of the lichens.

Those species which display ecogeographical differences in eastern Canadian mires include Myrica gale and Aronia prunifolia which are found to occur on ombrotrophic and rheotrophic sites in maritime locations while in continental areas they are confined mainly to transition and rheotrophic mire.

Bellamy and Bellamy (1966) placed important emphasis on the number of rain days per year in attempting to explain the major shift in the ecology of Schoenus nigricans and Myrica gale. The areas in which they occur abundantly in ombrotrophic mire in maritime localities have more than 250 rain days per year. In no case was such a high number of rain days reported in the climatic data for eastern Canada (see Table 1 page 16) where the largest figure is 133 rain days per year along the Eastern Shore in Nova Scotia. One complicating factor in Canada is that during the winter season the mires are frozen and are thus in a completely quiescent state. The bulk of the rain days are concentrated, however, in the growing season when "atmospheric flushing" could be an effective influence. It is unfortunate that Schoenus nigricans does not occur in eastern Canadian mires or Aronia prunifolia in European peatlands.

In summary then it seems that the combined effect of increasing rainfall together with the number of rain days per year in maritime regions (atmospheric flushing) and the mineral enrichment from the effects of salt spray may be factors allowing species like Aronia, Myrica and Schoenus to grow on ombrotrophic sites.

An examination of the bedrock and soils which underlie the mires of eastern Canada generally shows an absence of limestone and an abundance of granitic material. This may be one of the reasons why species-rich rheotrophic sites are absent. Sjörs (1950) states that there is a marked increase in rich rheotrophic mire vegetation in areas underlain by calcareous bedrock compared with areas dominated by acidic material (like granite). In eastern Canada none of the rheotrophic mires examined during the study had pH values greater than seven. In Europe Witting (1948) sets the "calcareous water limit" separating transition and rheotrophic mire ("poor" and "rich fen" according to Sjörs, 1948) at pH 6.8 which is slightly higher than the best rheotrophic site sampled in eastern Canada where the pH is 6.6. This site which is situated in central Nova Scotia is underlain by limestone, gypsum, anhydrite, shale, sandstone, conglomerate and salt. In terms of Witting's "calcareous water limit" it would be labelled only as "poor fen" and, therefore, classified as transition mire (Kulczynski, 1949).

D. Man's Influence On Mires

In addition to the environmental factors described above which have been shown to correlate with variation in mire vegetation, namely, the chemistry of the mire waters, the proximity of the mires to the sea, variations in climate, and the bedrock and soils which underlie and surround the mires, there must be added the ever increasing influence of man (see Fig. 16 page 318). In the geographical areas where sampling was done, the mires of the Bas Saint-Laurent are the

Fig 16. Man's influence on mires. (a) Above: Preparing the surface for milling. (b) Below: Total excavation.

most severely affected by human disturbance. Here whole sections of mire are being artificially drained, stripped of their vegetation and the peat removed. This severely affects adjacent areas of uncut mire where the combination of a lowered water table and the precipitated dust generated by the mechanized removal of peat causes alterations in both the biotic and abiotic aspects of the mire. The vegetation responds to these changes by an increase in Ericaceous species like Kalmia angustifolia and Ledum groenlandicum, a decrease in the hummock-forming Sphagnum species which often are replaced by Polytrichum strictum, and an increase in the lichen cover in the ground layer. In the tree and shrub layers Larix laricina disappears and Pinus banksiana and to a lesser extent Betula papyrifera become established. Of the tree species Picea mariana appears to be the least affected by the change to drier conditions. With the development of a more xerophytic mire flora the mire becomes quite vulnerable to fire. This has the affect of creating very uniform vegetation cover as shown in Fig. 12 page 261 and together with artificial drainage provides the main basis for the development of the CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE Association (see page 260).

In addition to the changes in vegetation cover there are corresponding changes in the chemical composition of the mire waters as a result of man's activities. The much higher concentrations of the majority of the ions in water samples collected from the Bas Saint-Laurent seems to be related to their disturbance by man. The milling of the peat generates dust particles which when deposited on the surface of adjacent mires adds to their normal ion input coming from more natural sources (precipitation and ground water inflow). These sources together with the maritime environment (causing an increase in sodium, magnesium and chloride) and the extensive use of the land in the region for farming (possibly causing an increase in calcium) result in an overall increase in the total ionic input into these mires which has already been emphasized in Chapter VI. Changes in the ionic composition of mires as a result of human disturbance have been described in the literature by Pearsall (1950) and Gorham (1967) for European peatlands. The latter author states that "when bogs are drained and burned repeatedly, so that their Sphagnum cover is replaced by heather (Calluna vulgaris) and cottongrass (Eriophorum vaginatum), or in extreme cases by pine (Pinus silvestris), the chemical properties of their peats are greatly affected." (This situation regarding the floristic changes that disturbance brings about is remarkably similar to that described above for the Bas Saint-Laurent region). In an earlier study of mires from the English Lake District, Gorham (1961) showed increased concentrations of some of the ions in disturbed bogs by as much as 40% in comparison with undisturbed sites. A similar contrast in some of the mires from eastern Canada has already been described in Chapter VI of this thesis (see Table 82 page 298). Gorham attributes these higher ionic concentrations to an increase in "oxidative decomposition" brought about by drainage and fire.

The above examples indicate that man's activities are as influential on the biotic and abiotic aspects of a mire as are the environmental factors which were discussed earlier in this chapter. In eastern Canada the main function of the peat that is extracted from the mires is for agricultural purposes where it is used primarily as a soil conditioner. To date no large scale attempts have been made at extracting the peat for fuel whether for domestic or industrial use as is the case in Ireland and Russia (Moore and Bellamy, 1974). Some studies have been conducted in Canada, however, on the potential uses of peatlands for forestry (Heikurainen, 1968; Stanek, 1970), but there has been little practical application made of this knowledge.

Before summarizing the conclusions to be drawn from this study a brief discussion of the "sulphate problem" is necessary. As was mentioned briefly in Chapter VI a great deal of difficulty was encountered in obtaining meaningful results for sulphate in the chemical analysis of the mire waters. The concentrations for this anion were found to be disproportionately high in comparison with the other ions and as a result was one of the contributing factors to some of the large discrepancies in the anion and cation totals in the water analysis tables (see Appendix D), which according to Guggenheim (1957) must balance in a solution. The actual cause of the problem remains undetermined but several possible explanations were considered:

1) the difficulty of maintaining adequate storage facilities for the water samples while in the field. A cold storage container was used which required a constant supply of ice to maintain cool temperatures. As the field work was carried out during the warmest season of the year extreme fluctuations of temperature occurred,
2) the long distance of transport both in the field and in sending the water samples by air from Canada to England for analysis, and
3) the long delay between collection and analysis of the water samples, the minimum period being 46 days.

The question that arises then is why only the sulphate and not the other ions. No completely satisfactory answer can be given. Reanalysis confirmed the data for all the other ions. As the water analysis was not a primary aim of the project it was decided that no more time could be invested in this aspect of the study at the present moment. The fact that all the other ionic data is comparable with that obtained for European mires backs up the conclusion that something "went wrong" with the sulphate analysis alone.

In summary then, the conclusions that can be drawn from this study and which are derived from the principal aims as outlined in Chapter I are as follows:

1) that the description and classification of the vegetation of mires in eastern Canada is an important step in increasing our knowledge of these complex ecosystems. It provides the basis upon which comparisons can be made with existing classifications that have been proposed for European mires. It also adds to the evergrowing fund of information on the world's peatlands,

2) that a combination of the approaches used by the Scandinavian and Zurich - Montpellier Schools of phytosociology in describing and classifying mire vegetation is feasible and practical especially when large geographical areas are involved and time is a limiting factor, and

3) that variation in the biotic (vegetation) on mires is related closely to abiotic factors such as climate, maritime influence, chemical composition of the water supply, surrounding bedrock and soils as well as man's activities. The interaction between the biotic-abiotic is supported by similar findings in Europe.

E. Conspectus of the Proposed Syntaxonomic Units

Class: OXYCOCCO-SPHAGNETEA Br.-Bl. et Tx. 1943.

Order: KALMIO-SPHAGNETALIA FUSCI ord. nov. prov.

Alliance: LEPIDOZIO-PICEION all. nov. prov.

Association: PICEETUM MARIANAE ass. nov. prov.

Alliance: CLADONIO-SPHAGNION FUSCI all. nov. prov.

Association: CHAMAEDAPHNETO-KALMIETUM ANGUSTIFOLIAE ass. nov. prov.

Association: SPHAGNETUM FUSCI ass. nov. prov.

Order: SPHAGNO-CARICETALIA ord. nov. prov.

Alliance: SPHAGNION CUSPIDATI all. nov. prov.

Association: RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI ass. nov. prov.

Alliance: ANDROMEDO-SPHAGNION all. nov. prov.

Association: SPHAGNETO-CARICETUM OLIGOSPERMI ass. nov. prov.

Alliance: MYRICO-CARICION all. nov. prov.

Association: CALAMAGROSTIETO-MYRICETUM GALE ass. nov. prov.

Association: ALNETUM RUGOSAE ass. nov. prov.

Further phytosociological work is needed in mire complexes from other regions in North America in order to test the applicability of this proposed classification over more extensive areas. In particular attention should be focused on the factors that delimit the continental and maritime races of the SPHAGNETUM FUSCI Association as it shows a marked decrease in the number of species present in continental areas. This decrease, however, is brought about by the exclusion of species that are not characteristic of the Association and for this reason no distinction has been made at the association level. Further work may show this descision to be erroneous. Comparison of relevés from Nova Scotia (the most maritime region) and Lac Saint-Jean (the most continental area), irrespective of associations, noda or variants, revealed a contrast in the number of species between the two areas especially in regard to ombrotrophic and transition mire. It seems logical to assume, therefore, that the other associations (in addition to the SPHAGNETUM FUSCI) that occur in these mire types should show a similar contrast in species numbers between maritime and continental areas. If this contrast exists it has not revealed itself as clearly as in the case of the SPHAGNETUM FUSCI Association and more work is required involving the computer before any positive statements can be made.

In addition to more consideration being given to these geographical variations further work may show that some of the variants mentioned in connection with the description of the associations are distinct enough in their own right to be treated as separate associations. The inclusion of the vegetation of rheotrophic streams within the RHYNCHOSPORETO-SPHAGNETUM CUSPIDATI is one example that immediately comes to mind. Extended research may indicate that this vegetation should be segregated at the association level.

The above illustrations show the need for more research and the direction that it should take in phytosociological investigations of the mires examined during this study. It would be especially interesting to do a related study on the west coast of Canada to see if similar phyto and ecogeographical trends exist on both sides of the continent.

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IX APPENDICES

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APPENDIX A

CHECK LIST OF SPECIES

<u>Vasculars</u> (total: 186)

1 Abies balsamea (L.) Mill.
2 Acer rubrum L.
3 Alnus rugosa (DuRoi) Spreng.
4 Andromeda glaucophylla Link
5 Arethusa bulbosa L.
6 Aronia prunifolia (Marsh.) Rehd.
272 Aster borealis (T. & G.) Prov.
7 Aster crenifolius (Fern.) Cronq.
8 Aster nemoralis Ait.
9 Aster novi-belgii L.
10 Aster radula Ait.
11 Betula glandulosa Michx.
12 Betula papyrifera Marsh.
273 Betula pumila L.
274 Brasenia schreberi Gmel.
13 Calamagrostis canadensis (Michx.) Nutt.
14 Calamagrostis pickeringii Gray
15 Calla palustris L.
16 Calopogon pulchellus (Salisb.) R. Br.
17 Carex aquatilis Wahlenb.
18 Carex brunnescens (Pers.) Poir
19 Carex bullata Schkuhr
20 Carex canescens L.
275 Carex chordorrhiza L.
21 Carex exilis Dew.
22 Carex flava L.
23 Carex folliculata L.
24 Carex interior Bailey
25 Carex lasiocarpa Ehrh., var. americana Fern.
26 Carex limosa L.
27 Carex michauxiana Boeckl.
28 Carex nigra (L.) Reichard
29 Carex oligosperma Michx.
30 Carex paleacea Wahlenb.
31 Carex panicea L.
32 Carex pauciflora Lightf.
33 Carex paupercula Michx.
34 Carex rostrata Stokes
35 Carex salina Wahlenb.
36 Carex stricta Lam.
37 Carex trisperma Dew.
38 Carex vesicaria L.
39 Chamaedaphne calyculata (L.) Monech, var. angustifolia (Ait.) Rehd.
40 Cicuta bulbifera L.
41 Cicuta maculata L.
42 Clintonia borealis (Ait.) Raf.
43 Coptis trifolia (L.) Salisb.
44 Cornus canadensis L.
45 Drosera anglica Huds.
46 Drosera intermedia Hayne
47 Drosera rotundifolia L.
48 Dryopteris cristata (L.) Gray

270 Dryopteris simulata Davenp.
49 Dryopteris thelypteris (L.) Gray, var. pubescrns (Lawson) Nakai
50 Dulichium arundinaceum (L.) Britt.
51 Eleocharis calva Torr.
59 Eleocharis smallii Britt.
52 Empetrum nigrum L.
276 Epilobium leptophyllum Raf.
53 Epilobium palustre L.
54 Equisetum arvense L.
55 Equisetum fluviatile L.
56 Equisetum sylvaticum L.
57 Eriocaulon septangulare With.
58 Eriophorum angustifolium Honckeny
60 Eriophorum spissum Fern.
61 Eriophorum tenellum Nutt.
62 Eriophorum virginicum L.
63 Eupatorium maculatum L.
64 Galium palustre L.
65 Galium tinctorium L.
66 Galium trifidum L.
67 Gaultheria hispidula (L.) Muhl.
68 Gaultheria procumbens L.
69 Gaylussacia dumosa (Andr.) T. & G., var. bigeloviana Fern.
70 Geocaulon lividum (Richards.) Fern.
71 Glyceria canadensis (Michx.) Trin.
72 Glyceria grandis S. Wats.
277 Habenaria blephariglottis (Willd.) Hook.
278 Hydrocotyle americana L.
279 Hypericum boreale (Britt.) Bickn.
73 Hypericum virginicum L.
74 Ilex glabra (L.) Gray
271 Ilex verticillata (L.) Gray
75 Impatiens capensis Meerb.
76 Iris versicolor L.
77 Juncus balticus Willd.
78 Juncus brevicaudatus (Engelm.) Fern.
79 Juncus bufonius L.
80 Juncus filiformis L.
81 Juncus militaris Bigel.
280 Juncus pelocarpus Mey.
82 Juncus stygius L., var. americanus Buchenau
83 Juniperus communis L.
84 Kalmia angustifolia L.
85 Kalmia polifolia Wang.
86 Larix laricina (DuRoi) K. Koch
87 Ledum groenlandicum Oeder.
88 Littorella americana Fern.
89 Lonicera villosa (Michx.) R. & S.
281 Lycopodium annotinum L.
90 Lycopus uniflorus Michx.
91 Lysimachia terrestris (L.) BSP.
92 Maianthemum canadense Desf.
93 Melampyrum lineare Desr.
94 Menyanthes trifoliata L., var. minor Raf.
282 Muhlenbergia glomerata (Willd.) Trin.
283 Muhlenbergia uniflora (Muhl.) Fern.
95 Myrica gale L.
96 Myrica pensylvanica Loisel.
284 Myriophyllum exalbescens Fern.

97 Nemopanthus mucronata (L.) Trel.
98 Nuphar variegatum Engelm.
99 Nymphaea odorata Ait.
100 Osmunda cinnamomea L.
101 Osmunda regalis L., var. spectabilis (Willd.) Gray
102 Picea mariana (Mill.) BSP.
103 Pinus banksiana Lamb.
104 Pinus strobus L.
105 Polygonum amphibium L., var. stipulaceum (Coleman) Fern.
106 Potamogeton confervoides Reichenb.
107 Potamogeton epihydrus Raf.
108 Potamogeton filiformis Pers.
110 Potamogeton natans L.
109 Potamogeton oakesianus Robbins
111 Potentilla fruticosa L.
112 Potentilla palustris (L.) Scop.
113 Prenanthes trifoliolata (Cass.) Fern.
114 Rhamnus alnifolia L'Her.
115 Rhododendron canadense (L.) Torr.
116 Rhynchospora alba (L.) Vahl
117 Rhynchospora fusca (L.) Ait.
285 Ribes hirtellum Michx.
118 Rosa nitida Willd.
119 Rosa virginiana Mill.
120 Rubus chamaemorus L.
121 Rubus hispidus L.
122 Rubus pubescens Raf.
123 Rumex orbiculatus Gray
286 Sagittaria cuneata Sheldon
287 Salix discolor Muhl.
288 Salix pedicellaris Pursh
289 Salix pyrifolia Anderss.
124 Salix rigida Muhl.
125 Sanguisorba canadensis L.
126 Sarracenia purpurea L.
127 Scheuchzeria palustris L., var. americana Fern.
128 Scirpus acutus Muhl.
129 Scirpus cespitosus L., var. callosus Bigel.
290 Scirpus cyperinus (L.) Kunth, var. pelius Fern.
291 Scirpus hudsonianus (Michx.) Fern.
130 Scirpus rubrotinctus Fern.
131 Scirpus subterminalis Torr.
132 Scirpus validus Vahl, var. creber Fern.
133 Senecio aureus L.
134 Sium suave Walt.
135 Smilacina trifolia (L.) Desf.
137 Solidago uliginosa Nutt., var. linoides (T & G.) Fern.
225 Sparganium androcladum (Engelm.) Morong
138 Sparganium angustifolium Michx.
195 Sparganium chlorocarpum Rydb.
139 Sparganium fluctuans (Morong) Robins.
140 Sparganium multipedunculatum (Morong) Rydb.
141 Spiraea latifolia (Ait.) Borkh.
142 Spiraea tomentosa L.
201 Spiranthes lacera Raf.
143 Thalictrum polygamum Muhl.
144 Thuja occidentalis L.
145 Trientalis borealis Raf.

146 Typha latifolia L.
147 Utricularia cornuta Michx.
148 Utricularia geminiscapa Benj.
150 Utricularia intermedia Hayne
151 Utricularia minor L.
152 Utricularia vulgaris L.
153 Vaccinium angustifolium Ait.
154 Vaccinium boreale Hall and Aalders
155 Vaccinium macrocarpon Ait.
156 Vaccinium oxycoccos L.
157 Vaccinium vitis-idaea L., var. minus Lodd.
158 Viburnum cassinoides L.
159 Viola blanda Willd.
160 Viola cucullata Ait.
149 Viola incognita Brainerd.
161 Viola pallens (Banks) Brainerd.
203 Xyris montana Ries

<u>Mosses</u> (total: 57)

162 Aulacomnium palustre (Hedw.) Schwaegr.
166 Bryhnia novae-angliae (Sull. & Lesq. ex Sull.) Grout
167 Bryum pseudotriquetrum (Hedw.) Gärtn., Meyer & Scherb.
169 Calliergon cordifolium (Hedw.) Kindb.
168 Calliergon stramineum (Brid.) Kindb.
170 Campylium stellatum (Hedw.) C. Jens.
136 Climacium dendroides (Hedw.) Web. & Mohr
193 Dicranum drummondii C. M.
209 Dicranum flagellare Hedw.
210 Dicranum fuscescens Turn.
211 Dicranum leioneuron Kindb.
212 Dicranum majus Sm.
213 Dicranum montanum Hedw.
214 Dicranum polysetum Sw.
215 Dicranum scoparium Hedw.
216 Dicranum undulatum Brid.
217 Drepanocladus exannulatus (BSG) Warnst.
218 Drepanocladus fluitans (Hedw.) Warnst.
198 Drepanocladus uncinatus (Hedw.) Warnst.
219 Fontinalis antipyretica Hedw., var. gigantea (Sull.) Sull.
220 Helodium blandowii (Web. & Mohr) Warnst.
221 Hylocomium splendens (Hedw.) BSG.
222 Hypnum imponens Hedw.
223 Leptodictyum trichopodium (Schultz) Warnst.
197 Plagiothecium denticulatum (Hedw.) BSG
236 Plagiothecium laetum BSG
237 Pleurozium schreberi (Brid.) Mitt.
238 Pohlia nutans (Hedw.) Lindb.
239 Pohlia sphagnicola (BSG) Lindb. & H. Arnell
240 Polytrichum commune Hedw.
241 Polytrichum strictum Menz. ex Brid.
242 Ptilium crista-castrensis (Hedw.) De Not.
246 Sphagnum angermannicum Melin
247 Sphagnum cuspidatum Ehrh. ex Hoffm.
249 Sphagnum fimbriatum Wils. ex J. D. Hook. & Wils.
250 Sphagnum flavicomans (Card.) Warnst.
251 Sphagnum fuscum (Schimp.) Klinggr.

252 Sphagnum girgensohnii Russ.
253 Sphagnum imbricatum Hornsch. ex Russ.
254 Sphagnum magellanicum Brid.
255 Sphagnum majus (Russ.) C. Jens.
256 Sphagnum nemoreum Scop.
244 Sphagnum palustre L.
257 Sphagnum papillosum Lindb.
267 Sphagnum platyphyllum (Lindb. ex Braithw.) Sull. ex Warnst.
258 Sphagnum pulchrum (Lindb. ex Braithw.) Warnst.
259 Sphagnum pylaesii Brid.
248 Sphagnum recurvum P.-Beauv.
260 Sphagnum riparium Angstr.
262 Sphagnum rubellum Wils.
261 Sphagnum russowii Warnst.
264 Sphagnum squarrosum Crome
265 Sphagnum subsecundum Nees ex Strum
266 Sphagnum tenellum Ehrh. ex Hoffm.
243 Sphagnum warnstorfii Russ.
268 Tetraphis pellucida Hedw.
269 Thuidium recognitum (Hedw.) Lindb.

<u>Liverworts</u> (total: 16)

163 Bazzania trilobata (L.) Gray
164 Blepharostoma trichophyllum (L.) Dum.
172 Cephalozia connivens (Dicks.) Lindb.
173 Cephalozia media Lindb.
207 Cladopodiella fluitans (Nees) Buch
226 Lepidozia reptans (L.) Dum.
227 Lophocolea heterophylla (Schrad.) Dum.
228 Lophozia attenuata (Mart.) Dum.
171 Lophozia marchica (Nees) Steph.
229 Lophozia porphyroleuca (Nees) Schiffn.
230 Microlepidozia setacea (Web.) Joerg.
231 Mylia anomala (Hook.) Gray
233 Odontoschisma sphagni (Dicks.) Dum.
234 Pallavicinia lyellii (Hook.) Gray
235 Pellia epiphylla (L.) Lindb.
245 Riccardia latifrons Lindb.

<u>Lichens</u> (total: 32)

165 Baeomyces roseus Pers.
175 Cetraria ericetorum Opiz.
176 Cetraria islandica (L.) Ach.
177 Cladonia alpestris (L.) Rabenh.
178 Cladonia arbuscula (Wallr.) Rabenh.
174 Cladonia bacillaris (Ach.) Nyl.
179 Cladonia boryi Tuck.
180 Cladonia cenotea (Ach.) Schaer.
181 Cladonia chlorophaea (Flk.) Spreng.
182 Cladonia coniocraea (Flk.) Spreng.
183 Cladonia cornuta (L.) Hoffm.
184 Cladonia crispata (Ach.) Flot.
185 Cladonia cristatella Tuck.
187 Cladonia deformis (L.) Hoffm.

186 Cladonia fimbriata (L.) Fr.
188 Cladonia furcata (Huds.) Schrad.
189 Cladonia glauca Flk.
190 Cladonia gonecha (Ach.) Asah.
191 Cladonia gracilis (L.) Willd.
192 Cladonia impexa Harm.
194 Cladonia mitis Sandst.
196 Cladonia pityrea (Flk.) Fr.
199 Cladonia rangiferina (L.) Wigg.
200 Cladonia squamosa (Scop.) Hoffm.
202 Cladonia subsquamosa (Nyl.) Vain.
204 Cladonia terrae-novae Ahti
205 Cladonia uncialis (L.) Wigg.
206 Cladonia verticillata (Hoffm.) Schaer.
208 Cornicularia aculeata (Schreb.) Ach.
263 Hypogymnia physodes (L.) Nyl.
224 Lecidea granulosa (Ehrh.) Ach.
232 Ochrolechia frigida (Sw.) Ras.

Algae

292 Chara foetida Braun.

Additional Species (mentioned in the text)

Acer saccharum Marsh
Betula alleghaniensis. Britt. (= lutea Michx.)
Calluna vulgaris (L.) Hull
Cladonia pleurota (Flk.) Schaer.
Erica tetralix L.
Eriophorum vaginatum L.
Fagus grandifolia Ehrh.
Fraxinus americana L.
Juglans cinerea L.
Lecidea ulignosa (Schrad.) Ach.
Molinia caerulea (L.) Moench
Narthecium ossifragum (L.) Huds.
Ostrya virginiana (Mill.) K. Koch
Picea glauca (Moench) Voss
Picea rubens Sarg.
Pinus montana Miller
Pinus resinosa Ait.
Pinus sylvestris L.
Schoenus nigricans L.
Thuja occidentalis L.
Tilia americana L.
Tsuga canadensis (L.) Carr.
Vaccinium myrtilloides Michx.

APPENDIX B

LIST OF SAMPLED AND NON-SAMPLED SITES

Sampled Sites (listed in chronological sequence)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
1.	10.7.74	Polly Cove	1 - 7	15	44°29'	63°53'	0.32
2.	11.7.74	Terence Bay	8 - 13	7	44°27'	63°43'	0.48
3.	11.7.74	Drysdale Bog	14 - 17	106	44°36'	63°41'	6.91
4.	12.7.74	Hammonds Plains	18 - 25	106	44°43'	63°45'	7.07
5.	12.7.74	Cranberry Lake	26 - 31	91	44°39'	63°46'	9.65
6.	13.7.74	Indian Harbour	32 - 35	7	44°27'	63°37'	0.32
7.	13.7.74	Sambro	36 - 40	7	44°29'	63°35'	0.16
8.	14.7.74	Ketch Harbour	41 - 45	23	44°29'	63°32'	0.64
9.	14.7.74	Bear Cove	46 - 50	23	44°32'	63°33'	0.32
10.	15.7.74	Caribou Bog	51 - 56	91	44°44'	63°31'	8.52
11.	16.7.74	Lawrencetown	57 - 69	7	44°38'	63°20'	0.32
12.	17.7.74	Middle Porters Lake	70 - 81	7	44°42'	63°17'	3.21
13.	17.7.74	Three Fathom Harbour	82 - 89	7	44°39'	63°17'	0.80
14.	18.7.74	Petit Lac	90 - 98	23	44°43'	63°17'	2.09
15.	18.7.74	East Chezzetcook	99 - 103	38	44°43'	63°13'	2.09
16.	18.7.74	Ostrea Bay	104 - 110	7	44°41'	63°04'	0.16

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
17.	19.7.74	Upper Musquodoboit	111 - 118	61	45°07'	62°56'	35.39
18.	20.7.74	Musquodoboit River	119 - 131	15	44°50'	63°11'	6.75
19.	21.7.74	Clam Bay	132 - 142	23	44°44'	62°51'	1.28
20.	21.7.74	Mooseland	143 - 149	106	44°58'	62°51'	17.37
21.	22.7.74	Sheet Harbour Passage	150 - 174	7	44°52'	62°28'	0.32
22.	23.7.74	Port Dufferin	175 - 179	23	44°55'	62°22'	0.64
23.	23.7.74	Quoddy Inlet	180 - 186	15	44°54'	62°21'	0.32
24.	24.7.74	Ecum Secum	187 - 194	68	45°04'	62°14'	10.61
25.	25.7.74	Marie Joseph	195 - 198	7	44°58'	62°04'	0.32
26.	25.7.74	Little Liscomb	199 - 205	15	45°01'	61°57'	0.48
27.	25.7.74	Holland Harbour	206 - 223	30	45°06'	61°46'	1.12
28.	26.7.74	Coddles Harbour	224 - 242	15	45°10'	61°31'	1.12
29.	28.7.74	Lower St Esprit	243 - 253	15	45°40'	60°28'	3.05
30.	28.7.74	Framboise Intervale	254 - 269	15	45°41'	60°26'	4.34
31.	29.7.74	Framboise Cove	270 - 277	7	45°43'	60°20'	1.44
32.	30.7.74	Fourchu	278 - 284	15	45°43'	60°16'	0.96
33.	30.7.74	Belfry Lake	285 - 292	15	45°46'	60°13'	1.93
34.	31.7.74	Louisbourg	293 - 307	15	45°53'	60°00'	0.64
35.	11.8.74	Les Escoumins	308 - 329	61	48°19'	69°27'	3.21
36.	12.8.74	Ilets Boisés	330 - 349	45	48°25'	69°20'	0.96

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
37.	13.8.74	Petits-Escoumains	350 - 356	38	48°27'	69°17'	0.64
38.	13.8.74	Petite-Romaine	357 - 369	30	48°29'	69°17'	0.80
39.	14.8.74	Pointe au Boisvert	370 - 376	7	48°34'	69°08'	0.48
40.	14.8.74	Ste Anne de Portneuf	377 - 383	15	48°35'	69°07'	0.48
	14.8.74	Ste Anne de Portneuf (Lac)	384 - 390	23	48°36'	69°07'	0.96
41.	15.8.74	Rivière-Éperlan	391 - 400	91	48°38'	69°13'	6.43
42.	16.8.74	Rivière du Sault-aux-Cochons	401 - 408	106	48°42'	69°09'	5.79
43.	16.8.74	Petite Rivière Noire	409 - 420	91	48°41'	69°08'	4.02
44.	17.8.74	Ste-Thérèse	421 - 437 446 - 458	61	48°53'	68°48'	0.96
45.	18.8.74	Ilets-Jérémie	438 - 445	7	48°54'	68°46'	0.32
46.	19.8.74	Rivière Colombier	459 - 472	61	48°54'	68°49'	3.05
	19.8.74	Colombier (N)	473 - 479	68	48°55'	68°48'	4.02
47.	20.8.74	Pointe aux Outardes	480 - 495	7	49°03'	68°26'	0.32
48.	20.8.74	Outardes	496 - 502	15	49°03'	68°24'	1.28
	21.8.74	Outardes (St. L.)	503 - 524	15	49°03'	68°23'	0.64
49.	22.8.74	Les Buissons	525 - 550	15	49°05'	68°21'	2.09
50.	23.8.74	Pointe-LeBel	551 - 570	23	49°09'	68°16'	1.60
	24.8.74	Manicouagan Point	571 - 581	15	49°06'	68°14'	0.48
51.	25.8.74	Baie-Trinité	582 - 600 608 - 616	106	49°23'	67°25'	7.24

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
52.	25.8.74	Pointe des Monts	601 - 607	45	49°20'	67°24'	1.12
53.	27.8.74	Rivière-Pentecôte	617 - 626	114	49°48'	67°12'	3.70
54.	28.8.74	Gallix	627 - 642	30	50°09'	66°40'	2.73
55.	29.8.74	St-Ulric	643 - 649	15	48°47'	67°41'	1.12
56.	29.8.74	Pointe-au-Père	650 - 657	30	48°30'	68°26'	2.25
57.	30.8.74	Lac Malobès	658 - 665	137	48°15'	68°53'	6.27
58.	31.8.74	Cacouna-Est	666 - 673	15	47°58'	69°26'	1.93
59.	31.8.74	St-Épiphane	674 - 681	152	47°51'	69°21'	12.87
60.	01.9.74	St-Arsène	682 - 688	53	47°55'	69°26'	3.37
61.	02.9.74	St-Alexandre	689 - 700	137	47°41'	69°33'	8.52
62.	02.9.74	St-André	701 - 707	122	47°39'	69°42'	2.09
63.	13.7.75	St-Ambroise	708 - 714	122	48°32'	71°20'	128.72
64.	13.7.75	St-Charles	715 - 721	137	48°33'	71°24'	> 128.72
65.	14.7.75	Lac aux Rats	722 - 737	198	49°14'	72°17'	"
66.	16.7.75	Normandin "A"	738 - 760	183	48°51'	72°38'	"
67.	17.7.75	St-Thomas Didyme	761 - 770	213	48°56'	72°42'	231.69
68.	17.7.75	Normandin "B"	771 - 780	183	48°50'	72°38'	> 128.72
69.	18.7.75	Pemonka	781 - 790	167	48°46'	72°41'	"
70.	19.7.75	St-Méthode	791 - 800	122	48°47'	72°28'	"
71.	19.7.75	Albanel	801 - 807	183	48°57'	72°28'	"

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
72.	20.7.75	Mistassini River	808 - 817	167	48°58'	72°23'	> 128.72
73.	20.7.75	St-Eugène	818 - 827	167	48°58'	72°18'	"
74.	21.7.75	Mistassibi River	828 - 834	167	48°57'	72°11'	"
75.	21.7.75	Manigouche (Ste-Elisabeth)	835 - 841	152	48°56'	72°08'	"
76.	22.7.75	Lavoie	842 - 850	122	48°50'	72°08'	"
77.	22.7.75	Péribonka	851 - 857	106	48°47'	72°02'	"
78.	23.7.75	Lac Milot	858 - 887	183	48°55'	71°47'	"
79.	24.7.75	Belley River	888 - 897	152	48°49'	71°53'	"
80.	25.7.75	Lac St-Ludger	898 - 908	183	48°54'	71°52.5'	"
81.	25.7.75	St-Ludger	909 - 917	183	48°54'	71°53.5'	"
82.	26.7.75	Lac Proulx	918 - 924	183	48°57'	71°56'	"
83.	26.7.75	St-Augustin	925 - 931	106	48°46'	71°58'	"
84.	27.7.75	Petit lac St-Ludger	932 - 938	183	48°56'	71°50'	"
85.	27.7.75	Alex River	939 - 945	183	48°52'	71°47'	"
86.	28.7.75	St-Henri-de-Taillon	946 - 953	106	48°43'	71°55'	"
87.	28.7.75	Défricheur	954 - 960	137	48°39'	71°32'	"
88.	29.7.75	Notre-Dame-du-Rosaire	961 - 967	183	*(48°46'	71°27')	"
89.	31.7.75	Rivière Vachon	968 - 974	106	49°55'	67°02.5'	4.02
90.	02.8.75	St-Bruno	975 - 984	198	47°29'	69°45'	12.06

* approximate only

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
91.	12.8.75	McCormack	985 - 991	61	46°09.5'	61°17'	8.52
92.	14.8.75	Madawaska River	992 - 1000	152	47°29'	68°28'	91.71
93.	14.8.75	Québec Border	1001 - 1007	152	47°29.5'	68°29.5'	90.10
94.	15.8.75	Kedgwick	1008 - 1027	289	47°41'	67°19'	54.70
95.	16.8.75	Drucour	1028 - 1034	259	47°34'	67°28'	71.60
96.	18.8.75	Juniper	1035 - 1053	259	46°34'	67°11'	146.41
97.	19.8.75	Ryan Brook	1054 - 1064	244	47°09'	67°36'	112.63
98.	20.8.75	Kilmarnock	1065 - 1073	152	46°05'	67°29'	96.54
99.	21.8.75	West Waterville	1074 - 1080	213	46°05'	67°22'	94.93
100.	21.8.75	Bull Pasture	1081 - 1101	106	46°03'	66°20'	88.49
101.	23.8.75	Peter Brook	1102 - 1108	129	46°02'	66°25'	88.49
102.	24.8.75	Lower Durham	1109 - 1120	183	46°10'	66°29'	102.17
103.	26.8.75	West Gordon Brook	1121 - 1136	167	46°19'	66°13'	101.36
104.	27.8.75	Blackville	1137 - 1147	106	46°44.5'	65°56'	57.92
105.	28.8.75	Otter Brook	1148 - 1154	61	46°36.5'	65°50.5'	60.33
106.	28.8.75	Marcelville	1155 - 1161	91	46°39'	65°33'	43.44
107.	29.8.75	Acadiaville	1162 - 1185	91	46°42'	65°25'	37.00
108.	30.8.75	Laketon	1186 - 1200	61	46°51'	65°09'	12.87
109.	31.8.75	Point Sapin	1201 - 1222	15	46°59'	64°51'	2.57
110.	01.9.75	Oromocto River	1223 - 1232	15	45°45'	66°35'	67.57

(continued)

Map Ref. Number	Date Sampled	Name of Site	Relevé Numbers	Approx. Altitude (m)	Latitude North	Longitude West	Approx. Distance From the Sea (km)
111.	02.9.75	Rooth Station	1233 - 1242	106	45°43'	66°50.5'	60.33
112.	03.9.75	Lepreau	1243 - 1256 1287 - 1293	61	45°12'	66°28'	3.70
113.	04.9.75	South Oromocto Lake	1257 - 1286	137	45°23'	66°37'	27.35
114.	07.9.75	Chance Harbour	1294 - 1300	30	45°08'	66°22'	1.28

Non-sampled Sites (listed in chronological sequence)

Number	Date Examined	Name of Site	Landtype	Approx. Altitude (m)	Latitude North	Longitude West
1.	13.6.74	Petpeswick Harbour	trans mire?	45	44°43'	63°09'
2.	13.6.74	Owls Head Harbour	bog	15	44°43.5'	62°50.5'
3.	14.7.74	Purcells Pond	dry bog	38	44°36.5'	63°35'
4.	16.7.74	Morris Lake	swamp	30	44°38'	63°28'
5.	17.7.74	Seaforth	trans mire	7	44°40'	63°17'
6.	19.7.74	Elderbank	floodplain-fen	30	44°58.5'	63°14'
7.	21.7.74	DeBay Cove	trans mire?	30	44°46'	62°49'
8.	23.7.74	Quoddy River	salt marsh-floodplain	15	44°56'	62°21'
9.	30.7.74	Gabarouse	bog	15	45°50'	60°09'
10.	15.8.74	Rivière Portneuf	dry bog	76	48°39.5'	69°09'
11.	27.8.74	Clarke City	bog	76	50°12'	66°37'
12.	30.8.74	Lac Macpès	floodplain-lake	167	48°20'	68°28'
13.	30.8.74	Lac Noir	floodplain	305	48°21.5'	68°18'
14.	30.8.74	Anse à l'Orignal	saltmarsh-fen	15	48°21.5'	68°47'
15.	01.9.74	Rivière Verte	mature bog forest	106	47°54'	69°24'
16.	03.9.74	Chemin-du-Lac	bog-fen	137	47°43'	69°31'
17.	15.7.75	Notre Dame de Loretto	trans mire	198	49°06.5'	72°18'
18.	15.7.75	Melançon	dry bog	183	49°02'	72°21'

(continued)

Number	Date Examined	Name of Site	Landtype	Approx. Altitude (m)	Latitude North	Longitude West
19.	21.7.75	Rivière aux Rats	floodplain	152	48°58'	72°13.5'
20.	22.7.75	Ste-Jeanne-d'Arc	bog	137	48°53'	72°07'
21.	26.7.75	Lac Proulx Stream	floodplain	198	48°57.5'	71°56'
22.	28.7.75	Rivière des Habitants	floodplain	183	48°45.5'	71°27'
23.	12.8.75	Petit-Etang	floodplain-fen	15	46°39'	60°58'
24.	14.8.75	Trout Brook	floodplain	205	47°26.5'	68°27.5'
25.	14.8.75	Ennemond	floodplain-fen	198	47°22.5'	68°25.5'
26.	14.8.75	Moulin-Morneault	pasture-floodplain	183	47°29.5'	68°23'
27.	15.8.75	Rivière Quisibis	floodplain	152	47°18.5'	68°03'
28.	15.8.75	Sirois	cedar stand	144	47°17.5'	68°02.5'
29.	21.8.75	Phillips Creek	alder stand	152	46°09.5'	67°29'
30.	21.8.75	Bull Lake	trans mire	183	46°07'	67°24'
31.	23.8.75	Little Burpee Bank	alder floodplain	76	46°00.5'	66°21'
32.	24.8.75	Burpee Millstream	floodplain-fen	84	46°01.5'	66°22'
33.	25.8.75	Burnt Land Brook Lake	bog forest	152	46°23.5'	66°20'
34.	25.8.75	Muzroll	bog forest	122	46°29.5'	66°10'
35.	29.8.75	Noinville	floodplain-fen	84	46°39.5'	65°23'
36.	30.8.75	Rankin Brook	fen	30	46°49.5'	65°06'
37.	01.9.75	Hampton	marsh	30	45°33'	64°47'

(continued)

Number	Date Examined	Name of Site	Landtype	Approx. Altitude (m)	Latitude North	Longitude West
38.	02.9.75	Cork Station	floodplain	122	45°42'	66°58'
39.	02.9.75	Peltoma	floodplain	122	45°33'	66°52'
40.	02.9.75	Piskahegan	floodplain-fen	106	45°31.5'	66°55'
41.	06.9.75	Little Dipper Harbour	dry bog	15	45°07'	66°22.5'
42.	06.9.75	Wetmore Creek	heath bog-fen	30	45°09'	66°22.5'

APPENDIX C

LIST OF REFERENCE MAPS

Topographic Maps (scale 1: 250,000)

Map Name	Map Number	Edition	Series
Halifax	11D	2 MCE	A 501
Truro	11E	1 ASE	"
Canso	11F	"	"
Amherst	21H	3 MCE	"
Fredericton	21G	2 ASE	"
Moncton	21-I	"	"
Woodstock	21J	"	"
Campbellton	21-O	1 ASE	"
Edmundston	21N	"	"
Matane	22B	"	"
Rimouski	22C	"	"
Baie-Comeau	22F	"	"
Cap-Chat	22G	"	"
Sept-Iles	22J	"	"
Chicoutimi	22D	"	"
Roberval	32A	"	"
Rivière Mistassini-Sud	32H	"	"

Topographic Maps (scale 1: 50,000)

Map Name	Map Number	Edition	Series
Sambro	11D/5	3 MCE	A 791
Halifax	11D/12	4 MCE	"
Chezzetcook	11D/11	2 MCE	"
Upper Musquodoboit	11E/2W	2 ASE	"
Musquodoboit	11D/14	3 MCE	"
Owls Head	11D/10	"	"
Tangier	11D/15	"	"
Liscomb	11E/1E	2 ASE	"
Ecum Secum	11D/16	3 MCE	"
Country Harbour	11F/4W		
Country Harbour	11F/4E		
Framboise	11F/9	2 MCE	"
Mira	11F/16E	3 ASE	"
Chéticamp River	11K/10	2 MCE	"
Lake Ainslie	11K/3	"	"
Les Escoumins	22C/6W	1 ASE	A 761
St-Paul-du-Nord	22C/11E	"	"
Betsiamites	22C/15W	"	"
Baie-Comeau	22F/1W	"	"
Baie-Comeau	22F/1E	"	"
Baie-Trinité	22G/6	"	"
Rivière-Pentecôte	22G/14E	"	"
Clarke City	22J/2	3 MCE	"
Matane	22B/13E	1 ASE	"
Mont-Joli	22C/9W	1 MCE	"
Ste-Blandine	22C/8W	1 ASE	"
Rimouski	22C/7W	"	"
St-Modeste	21N/14W	"	"
Rivière-du-Loup	21N/13E	"	"
St. Pascal	21N/12E	"	"
St-Pacôme	21N/5W	"	"
St-Ambroise	22D/11W	2-Jan 1971	Update 71
Melançon	32H/1W	1 ASE	A 761
Normandin	32A/15E	"	"
Dolbeau	32A/16W	2 ASE	"
Dolbeau	32A/16E	"	"
Alex River	22D/13W	1 ASE	"

Map Name	Map Number	Edition	Series
Isle-Maligne	22D/12W	3-Jan 1971	Update 71
Isle-Maligne	22D/12E	"	"
Lac Vermont	22D/14W	1 ASE	A 761
Edmondston	21N/8	3 MCE	A 791
Kedgwick	21O/11W	2 ASE	"
Juniper	21J/11E	2 MCE	"
Grand Falls	21O/4E	2 ASE	"
Millville	21J/3W	1 ASE	"
Minto	21J/1	3 MCE	"
Boiestown	21J/8W	2 ASE	"
Boiestown	21J/8E	2 MCE	"
Blackville	21I/12W	1 MCE	"
Blackville	21I/12E	1 ASE	"
Rogersville	21I/11W	"	"
Kouchibouguac	21I/14E	1 MCE	"
Point Sapin	21I/15W	1 ASE	"
Fredericton Junction	21G/10E	2 ASE	"
Fredericton Junction	21G/10W	"	"
McDougall Lake	21G/7E	1 ASE	"
Musquash	21G/1W	2 ASE	"

Geological Maps

Carte géologique du Québec. 1970. Ministère des Richesses Naturelles. Gouvernement du Québec. Map No. 1500.

Geological map of the Maritime Provinces. 1949. Dept. of Mines and Resources. Canada. Map 910A.

Geological map of New Brunswick. 1968. Dept. of Nat. Resources. New Brunswick. Map No. N.R.-1.

Geological map of the Province of Nova Scotia. 1965. Dept. of Mines. Nova Scotia.

Glacial Map

Glacial map of Canada. 1967. Geol. Surv. of Can., Dept. of Energy, Mines and Resources. Map 1253A.

APPENDIX D

CHEMICAL ANALYSIS OF THE MIRE WATERS (Tables 71 to 75)

The Sample Rel. No.'s (first column) in the tables are derived mainly from the relevés (i.e., their numbers) in which (or near which) the water samples were taken. Those prefixed by the letter "A" represent revisited mires, in the majority of cases, and have the site number (map reference number) listed in brackets beneath each number. For information pertaining to the mire from which the water sample was derived consult Appendix B where both the relevé numbers and the site numbers (map reference numbers) are listed.

The figures in the tables for each sample are given in parts per million (upper figure) and in milli-equivalents per litre (lower figure).

The first five samples listed for New Brunswick (Table 72) are taken from mires in maritime areas while the remaining samples are from mires in continental regions.

Table 71 NOVA SCOTIA

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE										
0015		7.50 0.210	4.76 0.099	1.40 0.070	0.38 0.031	3.20 0.139	0.14 0.004	3.8 0.158	0.309	0.402
0029		8.75 0.240	6.53 0.136	1.55 0.077	0.25 0.021	3.20 0.139	0.25 0.006	3.7 0.200	0.376	0.443
0038		12.50 0.350	13.21 0.275	1.16 0.058	0.76 0.063	6.00 0.261	0.36 0.009	3.6 0.251	0.625	0.642
0053		8.75 0.240	8.45 0.176	1.45 0.072	0.29 0.024	3.30 0.143	0.16 0.004	3.7 0.200	0.416	0.443
0089		12.50 0.350	9.85 0.205	1.46 0.073	0.56 0.046	4.90 0.213	0.16 0.004	3.8 0.158	0.555	0.494
0090		8.75 0.240	7.01 0.146	1.21 0.060	0.15 0.012	3.50 0.152	0.13 0.003	4.0 0.100	0.386	0.327
0107		8.75 0.240	10.86 0.226	1.48 0.074	0.72 0.059	6.50 0.283	0.15 0.004	3.7 0.200	0.446	0.620
0139		10.00 0.280	8.26 0.172	1.49 0.074	0.43 0.035	4.10 0.178	0.10 0.003	3.8 0.158	0.452	0.448
0149		7.50 0.210	5.72 0.119	1.35 0.067	0.25 0.021	2.90 0.126	0.09 0.002	3.9 0.126	0.329	0.342

Table 71 NOVA SCOTIA - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
0168		11.25 0.310	7.16 0.149	1.30 0.065	0.27 0.022	4.00 0.174	0.08 0.002	3.8 0.158	0.459	0.421
0169		10.00 0.280	6.34 0.132	1.33 0.066	0.28 0.023	4.10 0.178	0.16 0.004	3.6 0.251	0.412	0.522
0220		12.50 0.350	9.37 0.195	1.51 0.075	0.43 0.035	5.00 0.217	0.16 0.004	3.6 0.251	0.545	0.582
0224		10.00 0.280	8.26 0.172	1.36 0.068	0.33 0.027	4.10 0.178	0.13 0.003	3.6 0.251	0.452	0.527
0242		8.75 0.240	6.53 0.136	1.28 0.064	0.36 0.030	3.80 0.165	0.05 0.001	3.8 0.158	0.376	0.418
0257		12.50 0.350	7.93 0.165	1.76 0.088	0.69 0.057	4.30 0.187	0.14 0.004	3.9 0.126	0.515	0.462
0276		15.00 0.420	10.47 0.218	1.58 0.079	0.70 0.058	5.20 0.226	0.13 0.003	3.8 0.158	0.638	0.524
0278		16.25 0.450	10.33 0.215	1.27 0.063	0.58 0.048	5.80 0.252	0.17 0.004	3.9 0.126	0.665	0.493
0285		11.25 0.310	6.19 0.129	1.06 0.053	0.23 0.019	4.30 0.187	0.14 0.004	4.2 0.063	0.439	0.326

Table 71 NOVA SCOTIA - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
0296		20.00 0.560	10.28 0.214	1.74 0.087	0.84 0.069	6.30 0.274	0.15 0.004	3.9 0.126	0.774	0.560
A- 1 (3)		5.50 0.155	6.72 0.140	2.20 0.110	0.17 0.014	1.93 0.084	0.29 0.007	4.1 0.080	0.295	0.295
A- 2 (1)		26.00 0.732	3.02 0.063	3.80 0.190	0.81 0.066	8.50 0.370	0.43 0.011	3.8 0.158	0.795	0.795
A- 3 (2)		17.50 0.493	7.64 0.159	2.10 0.110	0.59 0.048	5.40 0.235	0.30 0.008	3.6 0.251	0.652	0.652
A- 4 (7)		19.00 0.535	2.11 0.044	3.00 0.150	0.48 0.039	5.70 0.245	0.74 0.019	3.9 0.126	0.579	0.579
A- 5 (8)		19.00 0.535		1.30 0.070	0.31 0.025	5.20 0.226	0.34 0.009	3.9 0.126		0.456
A- 6 (10)		11.00 0.310		0.25 0.010	0.09 0.007	1.83 0.080	0.45 0.012	3.9 0.126		0.235
A- 7 (12)		11.00 0.310	1.01 0.021	0.50 0.030	0.08 0.007	5.20 0.226	0.21 0.005	4.2 0.063	0.331	0.331
A- 8 (18)		8.00 0.225	2.59 0.054	0.20 0.010	0.135 0.011	1.27 0.055	0.13 0.003	3.7 0.200	0.279	0.279

Table 71 NOVA SCOTIA - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
A- 9		14.00		1.45	0.19	3.30	0.22	3.8		
(19)		0.394		0.070	0.016	0.143	0.006	0.158		0.393
A-10		9.00	3.60	0.10	0.11	1.07	0.46	3.6		
(20)		0.254	0.075	0.010	0.009	0.047	0.012	0.251	0.329	0.329
A-11		15.00	3.60	2.90	0.39	3.60	0.05	3.8		
(21)		0.423	0.075	0.150	0.032	0.157	0.001	0.158	0.498	0.498
A-12		12.00	0.34	0.10	0.14	2.70	0.29	3.7		
(22)		0.338	0.007	0.010	0.011	0.117	0.007	0.200	0.345	0.345
A-13		8.00	7.30	0.55	0.15	1.84	0.15	3.6		
(24)		0.225	0.152	0.030	0.012	0.080	0.004	0.251	0.377	0.377
A-14		14.50	4.80	2.20	0.39	3.70	0.19	3.7		
(25)		0.408	0.100	0.110	0.032	0.161	0.005	0.200	0.508	0.508
A-15		16.00	10.18	2.70	0.38	5.40	0.22	3.6		
(26)		0.451	0.212	0.140	0.031	0.235	0.006	0.251	0.663	0.663
A-16		15.00	31.79	16.10	0.61	5.10	0.48	5.0		
(29)	0.020	0.423	0.662	0.810	0.051	0.222	0.012	0.010	1.105	1.105

Table 71 NOVA SCOTIA - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
TRANSITION MIRE										
0012		12.50 0.350	13.69 0.285	1.84 0.092	0.85 0.070	5.90 0.257	0.10 0.003	3.7 0.200	0.635	0.622
0049		16.25 0.450	12.73 0.265	1.60 0.080	0.83 0.068	6.60 0.287	0.14 0.004	3.6 0.251	0.715	0.690
0078		13.75 0.380	8.74 0.182	1.49 0.074	0.44 0.036	4.20 0.183	0.29 0.007	4.0 0.100	0.562	0.400
0102	0.070	12.50 0.350	11.77 0.245	1.90 0.095	0.65 0.053	4.60 0.200	0.24 0.006	4.6 0.025	0.665	0.379
0158	0.060	12.50 0.350	8.89 0.185	1.90 0.095	0.76 0.063	4.70 0.204	0.08 0.002	4.5 0.032	0.595	0.396
0249		11.25 0.310	10.52 0.219	1.30 0.065	0.23 0.019	4.40 0.191	0.18 0.005	4.2 0.063	0.529	0.343

Table 71 NOVA SCOTIA - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
RHEOTROPHIC MIRE										
0019		15.00	9.51	2.42	0.50	6.90	0.14	5.2		
	0.140	0.420	0.198	0.121	0.041	0.300	0.004	0.006	0.758	0.472
0057		68.75	46.93	22.10	3.35	10.40	2.27	6.4		
	1.700	1.930	0.977	1.103	0.275	0.452	0.058	-	4.607	1.888
0113		15.00	85.39	44.50	3.38	4.50	0.15	6.6		
	1.620	0.420	1.778	2.221	0.278	0.196	0.004	-	3.818	2.699
A-30		21.50	798.21	389.00	3.20	11.40	0.20	6.3		
0990	2.950	0.606	16.619	19.400	0.270	0.500	0.005	-	20.175	20.175

Table 72 NEW BRUNSWICK

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE										
1194		8.00	11.77	0.05	0.05	1.26	0.31	3.4		
		0.225	0.245	0.003	0.004	0.055	0.008	0.400	0.470	0.470
1222		11.50	8.74	0.60	0.24	3.30	0.19	3.5		
		0.324	0.182	0.030	0.020	0.143	0.005	0.308	0.506	0.506
1268		6.00	23.34	3.40	0.23	1.25	0.46	3.4		
		0.169	0.486	0.170	0.019	0.054	0.012	0.400	0.655	0.655
1293		9.00	16.81	3.80	0.34	1.75	0.12	3.5		
		0.255	0.350	0.190	0.028	0.076	0.003	0.308	0.605	0.605
1294		10.00	11.62	0.850	0.34	3.30	0.21	3.5		
		0.282	0.242	0.040	0.028	0.143	0.005	0.308	0.524	0.524
0994		7.50	12.49	3.70	0.14	0.30	0.25	3.6		
		0.211	0.260	0.190	0.011	0.013	0.006	0.251	0.471	0.471
1011		5.50	5.19	0.05	< 0.01	0.16	0.09	3.6		
		0.155	0.108	0.003	–	0.007	0.002	0.251	0.263	0.263
1028		6.00	116.09	51.50	0.39	0.46	0.84	4.5		
	0.100	0.169	2.417	2.580	0.032	0.020	0.022	0.032	2.686	2.686

Table 72 NEW BRUNSWICK - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
1046		6.50		1.70	0.010	0.23	0.22	4.8		
	0.020	0.183		0.090	0.001	0.010	0.006	0.015		0.122
1099		6.50	11.58	1.60	0.11	0.55	0.13	3.5		
		0.183	0.241	0.080	0.009	0.024	0.003	0.308	0.424	0.424
1107		6.50	28.87	8.40	0.23	0.81	0.09	3.5		
		0.183	0.601	0.420	0.019	0.035	0.002	0.308	0.784	0.784
1119		6.00	12.00	2.80	0.02	0.44	0.27	3.6		
		0.169	0.250	0.140	0.002	0.019	0.007	0.251	0.419	0.419
1126		5.50	5.72	0.05	< 0.01	0.38	0.12	3.6		
		0.155	0.119	0.003	-	0.017	0.003	0.251	0.274	0.274
1143		5.00	7.59	0.05	< 0.01	0.66	0.61	3.6		
		0.141	0.158	0.003	-	0.029	0.016	0.251	0.299	0.299
1161		4.00	18.39	1.25	0.13	0.55	0.09	3.4		
		0.113	0.383	0.060	0.010	0.024	0.002	0.400	0.496	0.496
1178		5.00	11.09	0.80	0.04	0.45	0.03	3.5		
		0.141	0.231	0.040	0.003	0.020	0.001	0.308	0.372	0.372
1241		7.50	10.71	4.00	< 0.01	1.60	0.24	3.8		
		0.211	0.223	0.200	-	0.070	0.006	0.158	0.434	0.434

Table 72 NEW BRUNSWICK - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
TRANSITION MIRE										
1003		7.00 0.197	9.37 0.195	4.00 0.200	0.07 0.006	0.30 0.013	0.57 0.015	3.8 0.158	0.392	0.392
1058		5.50 0.155	36.94 0.769	9.50 0.480	0.33 0.027	0.28 0.012	0.21 0.005	3.4 0.400	0.924	0.924
1080		6.00 0.169	40.97 0.853	17.20 0.860	0.23 0.019	0.81 0.035	0.30 0.008	4.0 0.100	1.022	1.022
RHEOTROPHIC MIRE										
1068	0.095	6.00 0.169	101.78 2.119	45.50 2.280	0.68 0.056	0.72 0.031	0.38 0.010	5.2 0.006	2.383	2.383
1154	0.120	8.00 0.225	128.19 2.669	56.70 2.840	0.85 0.070	2.00 0.087	0.60 0.015	5.6 0.002	3.014	3.014

Table 73 BAS SAINT-LAURENT

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE										
0646		72.50	55.22	7.80	2.64	10.50	0.27	4.2		
		2.040	1.156	0.390	0.217	0.457	0.007	0.063	3.196	1.134
0650		13.75	12.58	2.10	0.52	5.40	0.30	4.0		
		0.380	0.262	0.105	0.043	0.235	0.008	0.100	0.642	0.491
0668		256.25	179.58	7.45	4.21	11.15	1.35	3.8		
		7.210	3.739	0.372	0.346	0.485	0.035	0.158	10.949	1.396
0674		10.00	7.78	1.30	0.19	2.50	0.07	3.7		
		0.280	0.162	0.065	0.016	0.109	0.002	0.200	0.442	0.392
0696		15.00	14.79	1.82	0.28	5.60	0.20	3.9		
		0.420	0.308	0.091	0.023	0.243	0.005	0.126	0.728	0.488
A-26		11.50	32.80	7.90	0.37	3.70	0.63	3.4		
(57)		0.324	0.683	0.400	0.030	0.161	0.016	0.400	1.007	1.007
A-27		13.00	76.61	26.20	0.86	7.10	0.80	3.6		
(60)		0.366	1.595	1.310	0.070	0.309	0.021	0.251	1.961	1.961
A-28		6.00	23.05	1.85	0.085	0.96	0.32	3.3		
0976		0.169	0.480	0.092	0.007	0.042	0.008	0.500	0.649	0.649
RHEOTROPHIC MIRE										
A-29		9.00	59.17	25.90	0.40	2.90	0.81	4.9		
0984		0.255	1.232	1.295	0.033	0.126	0.021	0.012	1.487	1.487

Table 74 CÔTE NORD QUÉBEC

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE										
0328		7.50 0.210	6.68 0.139	1.48 0.074	0.14 0.012	2.50 0.109	0.20 0.005	3.6 0.251	0.349	0.451
0332		8.75 0.240	6.53 0.136	1.61 0.080	0.17 0.014	2.90 0.126	0.17 0.004	3.8 0.158	0.376	0.382
0350		13.75 0.380	4.89 0.102	1.25 0.062	0.16 0.013	3.35 0.146	0.22 0.006	3.9 0.126	0.482	0.353
0359		10.00 0.280	6.34 0.132	1.25 0.062	0.16 0.013	3.10 0.135	0.18 0.005	3.8 0.158	0.412	0.373
0370		11.25 0.310	8.59 0.179	1.94 0.097	0.55 0.045	4.10 0.178	0.34 0.009	3.8 0.158	0.489	0.487
0378		11.25 0.310	5.72 0.119	1.53 0.076	0.28 0.023	3.60 0.157	0.12 0.003	3.7 0.200	0.429	0.459
0391		7.50 0.210	5.72 0.119	1.40 0.070	0.13 0.011	2.40 0.104	0.13 0.003	3.8 0.158	0.329	0.346
0401		8.75 0.240	8.45 0.176	1.82 0.091	0.33 0.027	2.50 0.109	0.10 0.003	3.6 0.251	0.416	0.481
0409		8.75 0.240	6.53 0.136	1.62 0.081	0.18 0.015	3.20 0.139	0.13 0.003	3.6 0.251	0.376	0.489

Table 74 CÔTE NORD QUÉBEC - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
0416		8.75 0.240	7.49 0.156	1.50 0.075	0.16 0.013	2.65 0.115	0.11 0.003	3.7 0.200	0.396	0.406
0421		8.75 0.240	6.53 0.136	1.52 0.076	0.21 0.017	2.60 0.113	0.18 0.005	3.8 0.158	0.376	0.369
0473		10.00 0.280	4.42 0.092	1.20 0.060	0.08 0.007	2.40 0.104	0.13 0.003	3.9 0.126	0.372	0.300
0507		10.00 0.280	7.30 0.152	1.49 0.074	0.20 0.016	3.30 0.143	0.11 0.003	3.8 0.158	0.432	0.394
0527		8.75 0.240	4.13 0.086	1.20 0.060	0.08 0.007	2.70 0.117	0.15 0.004	4.0 0.100	0.326	0.288
0550		10.00 0.280	2.02 0.042	0.91 0.045	0.06 0.005	2.00 0.087	0.06 0.002	3.9 0.126	0.322	0.265
0603		10.00 0.280	6.34 0.132	1.35 0.067	0.22 0.018	3.10 0.135	0.18 0.005	3.5 0.308	0.412	0.533
0608		8.75 0.240	6.53 0.136	1.34 0.067	0.29 0.024	2.50 0.109	0.08 0.002	3.6 0.251	0.376	0.453
0617		8.75 0.240	5.57 0.116	1.16 0.058	0.14 0.012	2.90 0.126	0.12 0.003	3.9 0.126	0.356	0.325

Table 74 CÔTE NORD QUÉBEC - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
A-17		8.00	16.91	0.30	0.06	1.12	0.32	3.3		
(35)		0.225	0.352	0.015	0.005	0.049	0.008	0.500	0.577	0.577
A-18		11.00	1.63	0.85	0.12	2.60	0.83	3.8		
(39)		0.310	0.034	0.042	0.010	0.113	0.021	0.158	0.344	0.344
A-19		11.00	11.86	1.10	0.19	1.90	0.11	3.4		
(40)		0.310	0.247	0.055	0.016	0.083	0.003	0.400	0.557	0.557
A-22		7.00	5.62	0.05	0.03	1.05	0.48	3.6		
(50)		0.197	0.117	0.003	0.002	0.046	0.012	0.251	0.314	0.314
A-23		8.50	17.58	0.25	0.105	1.74	0.27	3.3		
(50)		0.239	0.366	0.013	0.009	0.076	0.007	0.500	0.605	0.605
A-24		11.50	16.09	3.80	0.55	2.50	0.29	3.5		
0974		0.324	0.335	0.190	0.045	0.109	0.007	0.308	0.659	0.659

Table 74 CÔTE NORD QUEBEC - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
TRANSITION MIRE										
0609		12.50 0.350	7.93 0.165	1.84 0.092	0.46 0.038	2.90 0.126	0.17 0.004	3.8 0.158	0.515	0.418
0611		11.25 0.310	9.08 0.189	1.84 0.092	0.42 0.035	3.30 0.143	0.68 0.017	3.7 0.200	0.499	0.487
A-25 (54)		31.00 0.873	43.89 0.914	22.90 1.150	1.05 0.086	11.20 0.487	0.53 0.014	4.3 0.050	1.787	1.787
RHEOTROPHIC MIRE										
0612		10.00 0.280	6.34 0.132	1.97 0.098	0.63 0.052	3.50 0.152	0.14 0.004	4.4 0.040	0.412	0.346
A-20 (45)	0.520	38.00 1.070	63.49 1.322	33.90 1.700	2.80 0.233	21.10 0.917	2.30 0.059	5.5 0.003	2.912	2.912
A-21 (47)		19.00 0.535	44.96 0.936	19.20 0.960	1.64 0.134	6.90 0.300	0.53 0.014	4.2 0.063	1.471	1.471

Table 75 LAC SAINT-JEAN

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE										
0709		7.50 0.211	6.82 0.142	1.55 0.078	0.04 0.003	0.34 0.015	0.23 0.006	3.6 0.251	0.353	0.353
0716		8.00 0.225	0.91 0.019	0.05 0.003	0.03 0.003	0.52 0.023	0.59 0.015	3.7 0.200	0.244	0.244
0761		6.50 0.183	8.41 0.175	3.30 0.165	0.04 0.003	0.30 0.013	0.73 0.019	3.8 0.158	0.358	0.358
0781		6.50 0.183	2.93 0.061	1.40 0.070	0.02 0.019	0.67 0.029	1.80 0.046	4.1 0.080	0.244	0.244
0794		8.00 0.225	46.01 0.958	15.10 0.755	0.57 0.047	1.47 0.064	0.36 0.009	3.5 0.308	1.183	1.183
0804		5.00 0.141	31.08 0.647	7.20 0.360	0.13 0.010	0.33 0.014	0.14 0.004	3.4 0.400	0.788	0.788
0821		6.50 0.183	17.68 0.368	6.40 0.320	0.12 0.009	0.21 0.009	0.51 0.013	3.7 0.200	0.551	0.551
0833		5.50 0.155		1.05 0.052	< 0.01 -	0.34 0.015	0.70 0.018	4.2 0.063		0.148
0845		5.00 0.141	23.19 0.483	7.70 0.350	0.16 0.013	1.05 0.046	0.60 0.015	3.7 0.200	0.624	0.624

Table 75 LAC SAINT-JEAN - Continued

Sample Rel. No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
OMBROTROPHIC MIRE - Continued										
0851		5.00 0.141	33.28 0.693	7.90 0.395	0.24 0.020	0.32 0.014	0.20 0.005	3.4 0.400	0.834	0.834
0878		6.00 0.169	5.76 0.120	3.50 0.175	0.02 0.002	0.13 0.006	0.25 0.006	4.0 0.100	0.289	0.289
0892		5.50 0.155	22.14 0.461	6.80 0.340	0.14 0.011	0.11 0.005	0.37 0.009	3.6 0.251	0.616	0.616
0913		5.50 0.155	22.38 0.466	7.20 0.360	0.05 0.004	0.06 0.003	0.11 0.003	3.6 0.251	0.621	0.621
0920		5.50 0.155	5.81 0.121	0.30 0.015	$<$ 0.01 -	0.03 0.001	0.37 0.009	3.6 0.251	0.276	0.276
0931		9.00 0.255	18.88 0.393	3.40 0.170	0.16 0.013	1.36 0.059	0.25 0.006	3.4 0.400	0.648	0.648
0941		6.50 0.183	10.90 0.227	0.05 0.003	0.01 0.001	0.01 -	0.23 0.006	3.4 0.400	0.410	0.410
0949		3.00 0.085	56.82 1.183	15.10 0.755	0.07 0.006	0.09 0.004	0.11 0.003	3.3 0.500	1.268	1.268
0960		6.50 0.183	8.84 0.184	0.85 0.042	0.01 0.001	0.06 0.003	0.50 0.013	3.5 0.308	0.367	0.367

Table 75 LAC SAINT-JEAN - Continued

Sample Rel No.	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	K^+	pH	Total Anions	Total Cations
TRANSITION MIRE										
0729	0.020	4.50 0.127	13.54 0.282	6.50 0.325	0.22 0.018	0.93 0.040	1.65 0.042	5.4 0.004	0.429	0.429
0752		5.00 0.141		0.90 0.045	< 0.01 –	0.54 0.023	0.60 0.015	4.8 0.015		0.098
0773		3.50 0.099	12.39 0.258	3.70 0.185	< 0.01 –	0.63 0.027	0.73 0.019	3.9 0.126	0.357	0.357
0841	0.008	5.00 0.141		1.25 0.062	< 0.01 –	0.65 0.028	0.77 0.020	4.5 0.032		0.142
0935		6.50 0.183	21.76 0.453	4.30 0.215	0.17 0.014	0.12 0.005	0.09 0.002	3.4 0.400	0.636	0.636
RHEOTROPHIC MIRE										
0817	0.015	6.00 0.169	95.15 1.981	41.40 2.070	0.73 0.060	0.51 0.022	0.27 0.007	5.2 0.006	2.165	2.165
0901	0.010	6.00 0.169	64.41 1.341	27.80 1.390	0.63 0.052	0.95 0.041	0.96 0.025	4.9 0.012	1.520	1.520
0963	0.380	6.00 0.169	142.99 2.977	66.50 3.325	1.08 0.090	2.20 0.096	0.59 0.015	6.2 –	3.526	3.526

Table 2 Nodal-amplitudes of the Mire Species

NODA (26) / SPECIES (292)	RHYN - CLAD	S. MAJUS	S. CUSPIDATUM	NUPHAR	CALA - MYRI	MYRI - CHAM (FEN)	S. WARNSTORFII	S. FIMBRIATUM	D. EXAN - D. FLUI	S. IMBRICATUM	S. PAPILLOSUM	S. RECURVUM	S. PULCHRUM	S. RUSSOWII	S. MAGELLANICUM	S. RUBE - S. NEMO	S. FUSCUM	POLYTRICHUM	S. FUSC - C. RANG	C. RANGIFERINA	KALM - CHAM	CHAM - MYRI (BOG)	PICEA (1 x 1)	PICEA (4 x 4)	PLEUROZIUM	VACC - LEPI
Group 1																										
CHAM CALY	04	01	08	02	02	12	07	11	01	09	08	08	06	10	16	16	17	22	05	10	15	32	09	06	06	
VACC OXYC	06	03	02		x	01		07	04	05	05	06	04	05	07	10	09	09	09	03	04	04	03	01	03	
DROS ROTU	03	02	01		x	01		05	01	02	03	x	03	01	02	05	03	04	07	01	03	04	02	03		
SPHA MAGE	02	01	01	x	x	x			01	02	03	06	04	04	45	06	06	12	07	01		06	05	03	03	
KALM POLI	01		01	x	x	01				03	02	04	02	05	03	06	06	05	05	05	05	07	02	03	03	
SARR PURP	01	01	x		01	01				03	02	02	02	04	03	03	02	04	05	01	01	01	x	02		
SPHA RUBE	03		x		x	x		01	01	01	03	01	02	08	08	43	06	03	05	02	04	07		03	01	
SMIL TRIF	01	01	x	x	01					01	03	05	03		04	03	03	08		01	01	08	01		01	
ERIO ANGU			01		x	x				01	x	03	01	03	03	01	02	02		01				01	x	
SPHA RECU			x		x	02		x		04	02	48	x		03	01	02	02		x		02			05	
Sub-group 1A (non-mire forest)																										
MYRI GALE	01	01	x	01	05	24	33	12	-	03	05	04	03	25	04	02	01		01	x	x	12				
ANDR GLAU	03	01	02	01	01	01	03	01	05	04	05	05	03	05	05	03	02		03	01	x					
Sub-group 1B (non-aquatic)																										
LEDU GROE					x	03	10			01		07	01	08	02	04	09	08	08	09	11	10	06	08	07	
ARON PRUN					x	02	10	01		04		01	x	01	01	01	01		06	02	x	01		03		
RHOD CANA						01		x		05	x	01		03	01	01	01	04		01	01	02		03		
AULA PALU					x	x	05	x		01		x			x		x			x	x		x		x	
Sub-group 1C (non-aquatic and non-mire forest)																										
LARI LARI					x	-	-			03	01	01	x		01	x	01	02	04	x	01	02				
SOLI ULIG					x	01	02			03	x	x	x		01	01	01		05	01	x	01				
Group 2A (sedge-rich)																										
CARE CANE		01	x		01	01		03	02	02		x	x													
HYPE VIRG			x		02	02		05	04		x	x				x										
CARE PAUP	01	03	02		05	x		06	06	01	03	x	01		01	01	-									
CLAD FLUI	45	03	11	01	01	x		05	11		x	x	02		01	02	x			x			x			
SPHA PAPI	02	01	x	x	x	01		x			47	01	03	03	02	01	x						01			
ASTE NEMO	x	01	x		01	01		02		03	01	01	01		01	x	x									
CARE LIMO	02	04	03	x	04	x			03		03	04	02		01	x										
IRIS VERS		x	x		01	02		01	01	01	x	01	x	01	x											
RHYN ALBA	15	03	06	x	x			03	04		02	x	02		x	01	x			x						
SPHA CUSP	09	01	49	04	x	01			01		02	x	01		01	x										
CALA CANA				x	05	03	03	01		04	x	01		05	01	x										
CARE AQUA		02		-	07	07				03	01	x	01		01	-	x									
CARE STRI			x		02	02	13	02			x	01	02	01	x	x										
DREP EXAN	01		02	x	02	02		x	29		x		x		x											
DREP FLUI	02	01	01	x	x	x		x	14		x		x								x		x			
SPHA PULC	04	04	01	x	01	x					05		47		03	01	x		x							
CALL PALU				01	01	x		01	07		01	01	x			x										
CARE LASI		01	01		04	02				01	01		01		x	x										
DROS INTE	07	01	01	x	01	-		x					01			x										
VACC MACR	05		04	x	01	04		04			02		02			x										
SPHA MAJU	01	48	x	01	01	x			03		01		01													
MENY TRIF		09	x	01	07						01	x	01		x											
DULI ARUN		01	x		02	01			01		x															
EQUI FLUV			x	x	x	x			01				x													
SCHE PALU	x	05	03	x	x				01		02	01	02		02	x	x									
CARE OLIG		05	02		x	01				03	03	06	05		03	01	01			x						
CARE EXIL	x		-	x	02	01					01	01	01		01	01	x		01							
JUNC BREV	01	03	x	x	x						x		x													
DROS ANGL	03		01						01		x					x										
ERIO TENE		01	01	x		x						01														
PALL LYEL				x	x							x			x											
ACER RUBR			x			x				01		x			x	x	x									
ERIO VIRG	02		02			x					01	01	x		02	02	x	02		x						
CARE NIGR	x				x					02					01	x										
CARE PALE	x				03	01		11	07							x										
Group 2B (sedge-poor)																										
KALM ANGU						01				02	x	03	01	05	03	06	12	11	14	14	23	12	09	09	14	02
ODON SPHA	01				x					02	x	x	01		01	08	04	01	08	04	09	08	06	03	x	03
VACC ANGU					x	03				01		x	x	01	x	01	02		06	08	08	04	03	06	10	08
POHL SPHA												01	x	01	01	01	04	07	04	x	03	04	04	03	01	
SPHA FUSC										02		01	x	01	01	03	49	19	20	02	02	09	08	01		03
ERIO SPIS	01		01							01	x	01	x	01	02	03	04		x	01	x		02			
MYLI ANOM					x	x					x	x	x		x	01	x	01	02	01	03	05	04	03		
POLY STRI										04	01	01	x		02	02	07	46	08	02	10	04	01		01	
SPHA NEMO	x												x			06	x		01	01	02	02	x	04	02	
SCIR CESP	01							01		01	02	x	x	03		07	01		06	01	01					
GAYL DUMO					x					03		01		05		01	01		07	02	01	08	03			
TRIE BORE											x	x			x	x	x		03	01	x	01		01		
RUBU CHAM	x									01		x		08	01	03	04	03	08	06	08	03	03	06	01	
PICE MARI							02				-	x			01	01	02	10		02	03	01	48	48	05	02
PLEU SCHR					x	01						x			x	x	x	01	03	02	03		08	05	39	03
NEMO MUCR												x	x			x	x		01	01	x	-		02	01	-
CARE TRIS						01	03				x	x			01	x	01	02		x		02	02		02	
MICR SETA					x				01	02			x		x	03	01		06	02	03	04	03	01		
MELA LINE												x	x			x	x			01	02	01	x	01		
CLAD IMPE	x									02			x			-	x		09	11	04			03		
COPT TRIF											x		x			x	x		01	01	x					03
EMPE NIGR									03	04				03		01	05		17	06			01	03		
GEOC LIVI												x	x			x	x		x	x	01		x			
CLAD ARBU									01				x		x	x	x		10	08	x			02		
SPHA RUSS						01								48	x		x				01		05	07	01	
CLAD RANG										02		x				x	01		11	24	07		10	03	01	
VIBU CASS						x	02					x				x	x		01	x	01	-		03		
CEPH CONN					x	x						x	x			x	x	01	01	01	03	03	05	04	x	
CALO PULC	x								01	01						x	01		02	x						
SPHA IMBR					x	01				49		01				x			01	x						
Group 3A (lichen-poor)																										
LYSI TERR					02	01		01	04	01	x	x		01	x	x										
CARE ROST				-	02	03			06		x	01	01	01	x	x					-					
EPIL PALU					01	01		01		01	x	x	x		x	x										
ALNU RUGO					01	03	03			01	x	01		05	x	x										
LYCO UNIF					01	01			01	01		x		03	x	-										
SPIR LATI					02	04	08	x		01	x			05	x	x										
ROSA NITI					x	01	05			01		x	x		01	x										
CALL STRA					x	x		02	01		x		x		x											
THAL POLY					01	01	10			01		x			x											
CARE BRUN					01	02					01	x			x	x										
LONI VILL						01	07			02	x	x			x	x										
SPIR TOME						x				01	-	x		03												
VIOL BLAN					x	x	03					01			x											
CARE FOLL						x				01		x			x											
ASTE RADU					x		03				x		-		x	x										
VIOL PALL					01	x	03	x						03	x	x										
DRYO CRIS					x	x								03	x	x										
ASTE NOVI					x	x					x				x											
SPHA PLAT					x	01			01					01												
DRYO THEL					01	01				02		-			x											
Group 3B (lichen-rich)																										
DICR UNDU						x							x			x	x		05	03	03	02	06	10	06	
CLAD CHLO																x	-		01	02	02		04	03	02	
CLAD GLAU																x	x		x	01	01		x		01	
CLAD GRAC																x	x		01	x	01		01	03		
CORN CANA																x	x		03	01		01		03		
VACC VITI																	x		x	x				01	x	
CLAD TERR																x	01		06	03	x			01		
DICR LEIO					x											x	x		01	x	01		01			
CLAD ALPE																	x		01	10	01		-			
VACC BORE												x					x			x	x			01		
CLAD CRIS																x			01	03	05		x			
RICC LATI																			01	x	x		x			
CLAD SQUA	x															x	x			01				01		
CLAD CRIT																x	x			01	04					
CLAD UNCI																x			01	01				01		
CLAD CORN																				x	01		x			
CLAD PITY																x				x	x			01		
DICR POLY																				x			x		01	
DICR MONT																				x				02	x	
HYPN IMPO					x										x						x			02	x	
BLEP TRIC																				x			x			
CETR ERIC	x																			01			x			
DICR FLAG												x									x				01	
PINU BANK																x						01				
Group 3C (hydrophilous-rich)																										
NUPH VARI			01	13	-																					
SCIR SUBT			x	04	x																					
UTRI GEMI		01	x	03	x																					
NYMP ODOR				01																						
BRAS SCHR				x																						
ERIO SEPT			x	01																						
SPAR ANGU			x	x												x										
UTRI MINO				x																						
POTA CONF				01																						
POTA FILI				x																						
POTA NATA				x																						
SPAR FLUC				02																						
FONT ANTI				01																						
SPAR ANDR				01																						
CHAR FOET				01																						
JUNC MILI				x	x																					
POTA EPIH				01	x																					
POTA OAKE				x	x																					
SCIR ACUT				x	x																					
SPAR MULT				01	x																					
SAGI CUNE			x	x	-																					
UTRI VULG				02	01																					
SPAR CHLO				x	x																					
MYRI EXAL				x	x																					
UTRI INTE	x			x	02																					
SPHA PYLA	01		x	x	x																					
UTRI CORN	06		x		01																					
Group 3D (hygrophilous-rich)																										
LITT AMER	01																									
XYRI MONT	01																									
MUHL UNIF	x																									
Group 4A																										
POTE PALU				x	02	01		x		04																
JUNC BALT					x			x	01	01																
GALI TINC					02	01				01		x														
VIOL CUCU					x	01				02		x														
CAMP STEL					01	01	02			01																
CICU BULB					x				01																	
GALI TRIF					x	x			01																	
SIUM SUAV					x				01																	
HYDR AMER					x				01																	
SPHA SQUA					x	x		01																		
EQUI ARVE						-				01																
OSMU REGA					01	01				01																
SPHA RIPA					x			01	01																	
SPHA FIMB					x			49		01																
Group 4B																										
BETU GLAN					x						x	01	x		01		-									
CALA PICK					x						x		x		x	x	x									
SPHA FLAV											x				x	x										
CARE PAUC											01	01	x		x	x	x			x						
LEPT TRIC					x							x			x	x										
OSMU CINN												x			x	x	x									
Group 4C																										
LEPI REPT					x	x						x					x			01	01	01	14	09	06	07
CLAD FIMB										01										x	x		x	01	01	02
GAUL HISP												x			x		x			x	x		-	01	05	
CLAD CONI												x								x	x		01		02	05
BAZZ TRIL																				x	x		01	05	01	
DICR FUSC																					01		01	06	03	02
MAIA CANA												x					x		x					01		-
DICR SCOP																				x				01		
DICR DRUM																				x					01	
DICR MAJU																					x				01	
Group 5A																										
ASTE CREN					x	x																				
CARE FLAV						01																				
CARE MICH					01	01					x															
CARE SALI					x																					
CICU MACU					x																					
EQUI SYLV						x																				
ELEO SMAL					01																					
EUPA MACU					x	01																				
GALI PALU					x	x	03																			
GLYC GRAN						x																				
ILEX GLAB						x																				
IMPA CAPE					x	x																				
JUNC STYG					x																					
POLY AMPH						x																				