UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Environmental Classification of the Peat Deposits in the Wetlands of Maine

by

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The study of the peat deposits of Maine is a cooperative project of the Maine Geological Survey and the United States Geological Survey. To date more than 200 deposits and deposit complexes have been cored, sampled and mapped; laboratory analyses are available. Classification is now being done in order to consolidate this data in a form suitable for evaluating other wetlands of similar character.

Scope of the Environmental Classification

This classification is a system for subdividing and assigning designations to peat deposits in the wetlands of Maine.

Significance and Use

The purpose of this system is to provide a tool for interpreting the wetlands in Maine for use in determining resource evaluations, environmental impact reports, and preliminary engineering studies. The parameters selected for use in this classification are the ones which have been determined to relate to the agricultural/horticultural, geotechnical, and energy uses of peats.

Terminology and Authority for Usage

Definition of the following terms should be in accord with usage in Canada and the United States:

Wetland - Land which has the water table at, near, or above the land surface, or which is saturated for long enough periods to promote hydrophylic vegetation and various kinds of biologic activity which are adapted to the wet enviornment. Wetlands include peatlands.

Peat - Peat is a naturally occuring substance derived primarily from plant materials. It generally accumulates as the result of incomplete decomposition of dead plant material under wet conditions. Peat is distinguished from other organic soil materials by its lower ash content (less than 25 percent by dry weight) and from phytogenic material of higher rank (i.e. lignite coal) by its lower calorific value on a water-saturated basis.

Bog - Peat-covered areas with high water and a surface carpet of mosses, chiefly Sphagnum. They are wet, nutrient poor and acidic (low pH). They may be treed or treeless, with or without Ericaceous shrubs.

Marsh - Grassy wet area with standing or slowly moving water subject to periodic flooding. Characterized by grassy surface mats which are frequently interspersed with open water or by a closed canopy of grasses, sedges or reeds (shore vegetation). The substratum can vary from usually shallow, well decomposed peat to mineral soils.

Swamp - Forested wetland where standing or gently flowing water occurs seasonally or persists for long periods on the surface. The substratum usually consists of mixtures of transported material and organic sediments or peat deposited in situ.

Peat Deposit - An Accumulation of Peat

Resource - A concentration of naturally occurring solid, liquid, or gaseous material in or on the earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible (see U.S.G.S. Circular 831, 1980).

Peat Resource - A layer of peat with ash content less than 25 percent by dry weight at least 5 feet thick. Most peat producers in Maine consider 80 acres as the minimum economic size, especially if the deposit is in a cluster which can be exploited in one operation.

Justification for Using Environment as the Basis of the System: The Factors

The character of a peat deposit, including chemical and physical quality, and vertical thickness and horizontal extent, results from its development in past and present environments. Factors in the environment fundamental to development and preservation of the deposit include the following:

1. Bedrock, through its type and structure determines the shape and orientation of preglacial topography on which glacial deposits occur. Bedrock and glacial materials fashion the peat deposit settings in terms of configuration, size, and slope of the deposit's margins. Together they determine the potential quality of a deposit.

2. Glacial depositional features further define the configuration and size of the peat deposit and the slope of the deposit walls.

3. Bedrock together with glacial materials provide the parent material for soil formation which influence the physical and chemical characteristics of the base of the deposit.

4. Surface water and groundwater regimes help control soil chemistry and the growth, preservation and decay of vegetation types, as well as the amount of inorganic material brought into the deposit. Organic ash and minerals derived from plants, clays and silts are reflected in the total ash content of the deposit.

5. The past and present climates in Maine influence the growth and preservation of heath-type vegetation. This influence is reflected in the size, height and occurrence of Sphagnum or raised bogs which may be considered to be peat resources. Past and present climates in Maine together with the permeability of the materials surrounding the deposit influence water table fluctuation within the deposit. The thicker the ground water fluctuation zone, the more oxygenated water with aerobic bacteria can pass through causing an increase in the organic ash content of the deposit, thus decreasing the quality of the resource.

6. Past and present effects by man, beaver, and lightening in the region containing the bogs, swamps and marshes influences the quantity and quality of the peat deposit through fire and flood. The cycle of youth, maturity and old age of a bog, swamp or marsh may be interrupted so that any type of raised deposit may revert to a marsh or swamp. In one case the potential peat resource has vanished; in the other it is merely concealed.

7. Crustal subsidence associated with glaciation of coastal Maine both before and after peat accumulation is reflected in the occurrence and type of deposits, e.g., size, shape, plant covering, and percent ash content by affecting the glacial, groundwater, and surface water geomorphic processes.

Syntheses of the Above Factors Used to Produce this Classification System

To develop the classification scheme, the above-mentioned factors fundamental to the development and preservation of peat deposits must be synthesized using parameters such as of frequency of occurrence, acres and thickness of peat with ash content less than 25 percent, acidity, and element content. In addition, mining or harvesting factors such as stability of sediment underlying deposit, drainage characteristics, elevation of deposit surface above regional water table, availability of sand and gravel for construction of exploiting facilities, and regional drainage problems must be considered.

Data for Synthesis is Available at the Maine Geological Survey

The data available from the Maine Geological Survey includes more than 200 manuscript peat maps at scales 1:15,000 - 1:24,000 of areas throughout Maine along with laboratory analyses and sections; manuscript maps of the bedrock geology of Maine at scale 1:62,500; manuscript maps of the surficial geology of Maine at scale 1:62,500 an 1:24,000; air photos at scale 1:15,800 and 1:20,000. Also available are manuscript maps of indicators of the marine limit in southern Maine at scale 1:62,500 showing the areas that were covered by the sea that are now elevated and contain peatlands. The area between the marine limit and the shore line of Maine falls within the area in which the July average relative humidity at 8 P.M. E.S.T. is over 70 percent (Visher, S. S., 1954, Climate atlas of the United States, Harvard University press, page 186).

How Deposits are Classified

The primary classification categories I and II (see the classification and code system) are deposits within and deposits outside the region of maximum marine invasion respectively. They result from the synthesis of factors 5 and 7 mentioned above dealing with climate and coastal subsidence associated with glaciation.

The secondary classification categories A and B are deposits in areas of folded sedimentary, metasedimentary, or layered volcanic bedrock, and in areas of massive plutonic bedrock. These categories are based on the synthesis of factors 1, 2 and 3.

The tertiary categories 1 through 12 are based on the synthesis of factors 4, 5, and 6.

To provide more detailed descriptions of surface characteristics, the tertiary categories are further refined under headings a-d, which in turn may be broken down under headings (i), (ii), (iii), and (iv).

The Classification and Code System

I. Within the region of maximum marine invasion

A. Bedrock largely folded sedimentary, metasedimentary or layered volcanics

1. Deposit in glacial drift in hills and mountains at the head of a stream - IA1

2. Deposit in end or ribbed moraine - IA2

3. Deposit in kame or kettle topography - IA3

4. Deposit in till parallel to drumlins or other ice contact deposits - IA4

5. Deposit in alluvium, till or glacial outwash in valley along stream
   a. behind natural levee or on plain subject to flooding - IA5a
   b. deadwater reaches of stream flow on deposit - IA5b
   c. adjacent to esker - IA5c
   d. in drift-dammed bedrock valley; natural levees, dead water reaches or eskers not conspicuous - IA5d

6. Deposit in glacial outwash in valley remote from stream, outwash may include eskers - IA6

7. Deposit in glacial outwash and till on broad plain crossed by streams and eskers - IA7

8. Deposit on glacio-marine sediments
   a. in valleys between till ridges, glacial outwash or till-covered bedrock walls - IA8a
   b. in basins or plains between till ridges, glacial outwash or till-covered bedrock ridges - IA8b

9. Deposit in till or glacial outwash along a lake
   a. separated from lake by esker or bedrock - IA9a
   b. adjacent to lake that has been artificially dammed - IA9b
   c. adjacent to pond which deposit has incompletely filled - IA9c

10. Deposit in till or glacial outwash on drained pond or lake floor - IA10

11. Deposit on tidal flat - IA11

12. Deposit a thin blanket over consolidated or unconsolidated rock slopes - IA12

I. Within the region of maximum marine invasion

B. Bedrock largely massive plutonics

1. Deposit in glacial drift in hills and mountains at the head of a stream - IB1

2. Deposit in end or ribbed moraine - IB2

3. Deposit in kame or kettle topography - IB3

4. Deposit in till parallel to drumlins or other ice contact deposits - IB4

5. Deposit in alluvium, till or glacial outwash in valley along stream
   a. behind natural levee or on plain subject to flooding - IB5a
   b. deadwater reaches of stream flow on deposit - IB5b
   c. adjacent to esker - IB5c
   d. in drift-dammed bedrock valley; natural levees, dead water reaches or eskers not conspicuous - IB5d

6. Deposit in glacial outwash in valley remote from stream, outwash may include eskers - IB6

7. Deposit in outwash and till on broad plain crossed by streams and eskers - IB7

8. Deposit on glacio-marine sediments
   a. in valleys between till ridges, glacial outwash or till covered bedrock walls - IB8a
   b. in basins or plains between till ridges, glacial outwash or till-covered bedrock ridges - IB8b

9. Deposit in till or glacial outwash along a lake
   a. separated from lake by esker or bedrock - IB9a
   b. adjacent to lake that has been artificially dammed - IB9b
   c. adjacent to pond which deposit has incompletely filled - IB9c

10. Deposit in till or glacial outwash on drained pond or lake floor - IB10

11. Deposit on tidal flat - IB11

12. Deposit a thin blanket over consolidated or unconsolidated rock slopes - IB12

II. Outside the region of marine maximum invasion

A. Bedrock largely folded sedimentary, metasedimentary or layered volcanics

1. Deposit in glacial drift on flat to rolling plain; bedrock limestone, dolomite or marble - IIA1

2. Deposit in ground moraine in hills and mountains at the head of a stream - IIA2

3. Deposit in end or ribbed moraine - IIA3

4. Deposit in kame or kettle topography - IIA4

5. Deposit in till parallel to drumlins or other ice contact deposits - IIA5

6. Deposit in alluvium, till or glacial outwash in valley along stream
   a. behind natural levee or plain subject to stream flooding - IIA6a
   b. deadwater reaches of stream flow on deposit - IIA6b
   c. adjacent to esker - IIA6c
   d. in drift-dammed bedrock valley; natural levees, deadwater reaches or eskers not conspicuous - IIA6d

7. Deposit in glacial outwash in valley remote from stream; outwork may include eskers - IIA7

8. Deposit in outwash and till on broad plain crossed by streams and eskers - IIA8

9. Deposit in till or glacial outwash along a lake
   a. separated from lake by esker or bedrock - IIA9a
   b. adjacent to lake that has been artificially dammed - IIA9b
   c. adjacent to pond which the deposit has incompletely filled - IIA9c

10. Deposit in till or glacial outwash on drained pond or lake floor - IIA10

11. Deposit a thin blanket over consolidated or unconsolidated rock slopes - IIA11

II. Outside the region of marine maximum invasion

B. Bedrock largely plutonics

1. Deposit in glacial drift on flat to rolling plain - IIB1

2. Deposit in ground moraine in hills and mountains at the head of a stream - IIB2

3. Deposit in end or ribbed moraine - IIB3

4. Deposit in kame or kettle topography - IIB4

5. Deposit in till parallel to drumlins or other ice contact deposits - IIB5

6. Deposit in alluvium, till or glacial outwash in valley along stream
   a. behind natural levee or plain subject to stream flooding - IIB6a
   b. deadwater reaches of stream flow on deposit IIB6b
   c. adjacent to esker - IIB6c
   d. in drift-dammed bedrock valley; natural levees, deadwater reaches or eskers not conspicuous - IIB6d

7. Deposit in glacial outwash in basin remote from stream; outwork may include eskers - IIB7

8. Deposit in outwash and till on broad plain crossed by streams and eskers - IIB8

9. Deposit in till or glacial outwash along a lake
   a. separated from lake by esker or bedrock - IIB9a
   b. adjacent to lake that has been artificially dammed - IIB9b
   c. adjacent to pond which the deposit has incompletely filled - IIB9c

10. Deposit in till or glacial outwash on drained pond or lake floor - IIB10

11. Deposit a thin a blanket over consolidated or unconsolidated rock slopes - IIB11

Surface descriptions applied to all coded classes

(i) Bog - Heath, open or partly covered with shrubs and stunted black spruce.

(1) Flat
  (a) with few or no pools
  (b) with many pools

(2) Gently sloping
  (a) with few or no pools
  (b) with many pools

(3) Moderately sloping
  (a) with few or no pools
  (b) with many pools

(4) Steeply sloping; dissected on sides of domes; pools common on summit

(ii) Bog - hardwood forest and Sphgnum moss growing on fibric (sphagnum) peat

(iii) Marsh

(1) Within tidal zone
  (a) Spartina patens
  (b) Spartina alternaifolia

(iv) Swamps

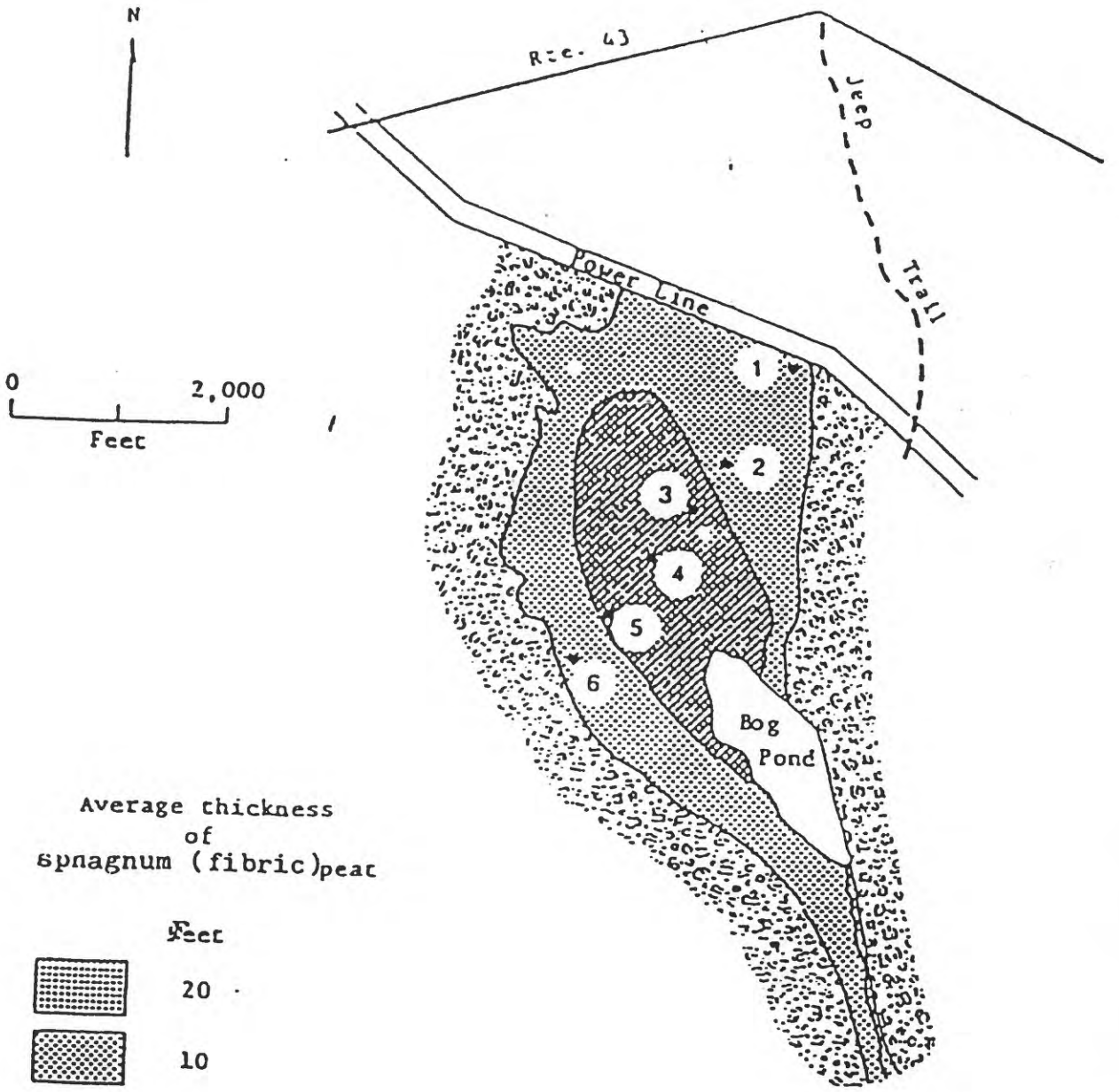
(1) alder
(2) white cedar-maple-ash
(3) mature-ash-spruce

The Classification Illustrated

Figure 1 - is a sketch map of a deposit coded IA1 (i) (3) (a) - It is shown as deposit 5 in graph figure 2.

Figure 2 - compares peat deposits coded IA1 and IB1 in terms of mappable thickness of peat with ash content less than 25% dry weight and ash content greater than 25%. All are heaths above the zero line. Soft organic sediments in varying thicknesses below the zero line show relative thickness of organic and inorganic accumulations in pond and marsh environments prior to development of the heath and the beginning of its elevation.

Figure 3 - is a diagram of code IAII or IB11 - Deposit on tidal flat



Classification code I A 1 (i) (3) (a)

Deposit in the region of maximum marine invasion where bedrock is largely folded sedimentary, metasedimentary or layered volcanics, located in glacial drift in hills and mountains at the head of a stream. The deposit is in the form of an open to partly covered, moderately sloping heath with few pools.

Fig. 1 - Sketch map of bog at Bog Pond southeast of Corson Corner, Hartland Twp., Skowhegan 15 minute Quadrangle, Somerset County, Maine. (Number 5 on graph, Figure 1.)

Sections and sample locations.

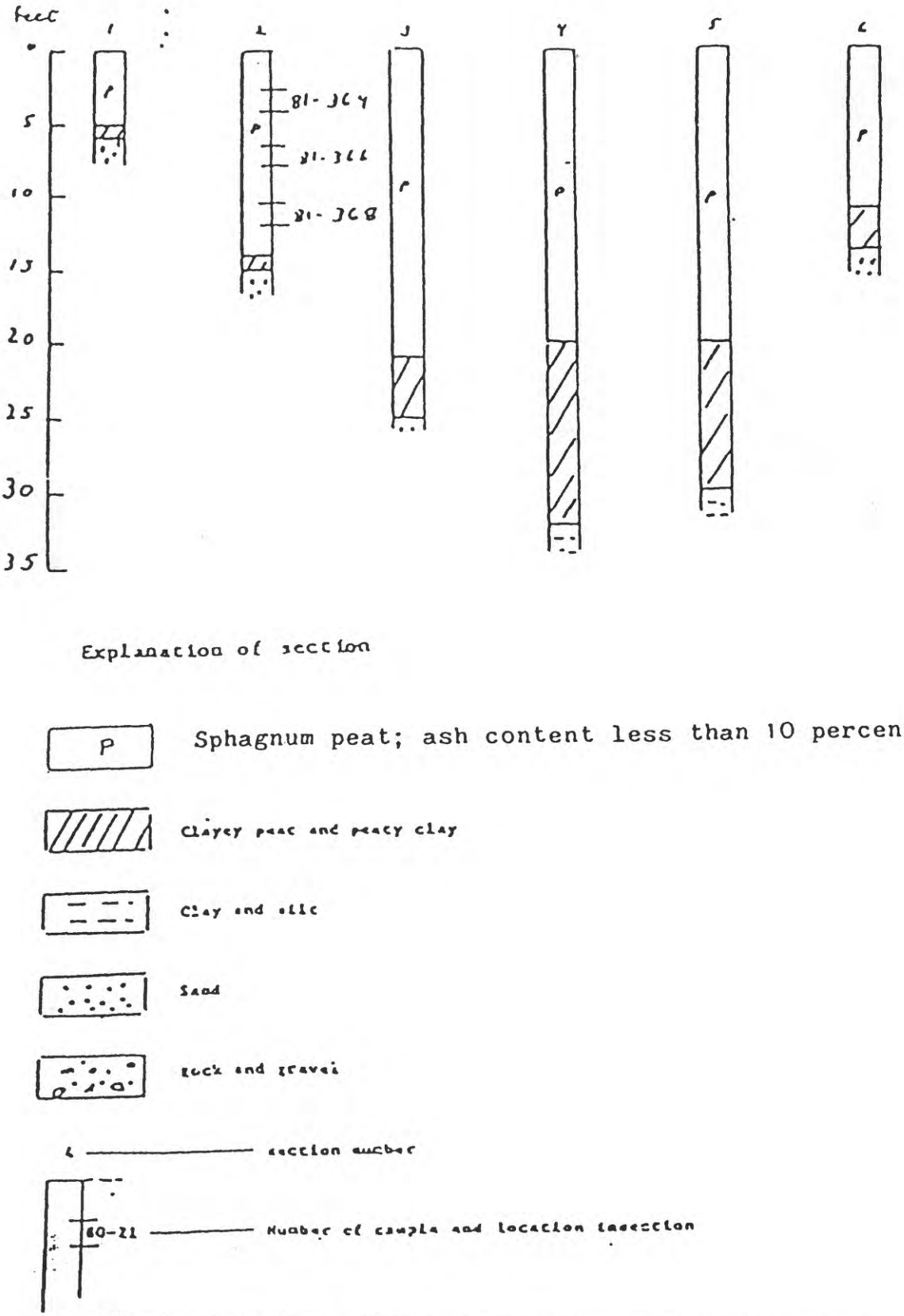


Fig. 1 - Sketch map of bog at Bog Pond southeast of Corson Corner, Hartland Twp., Skowhegan 15 minute Quadrangle, Somerset County Maine. (Number 5 on graph, Figure 1.)

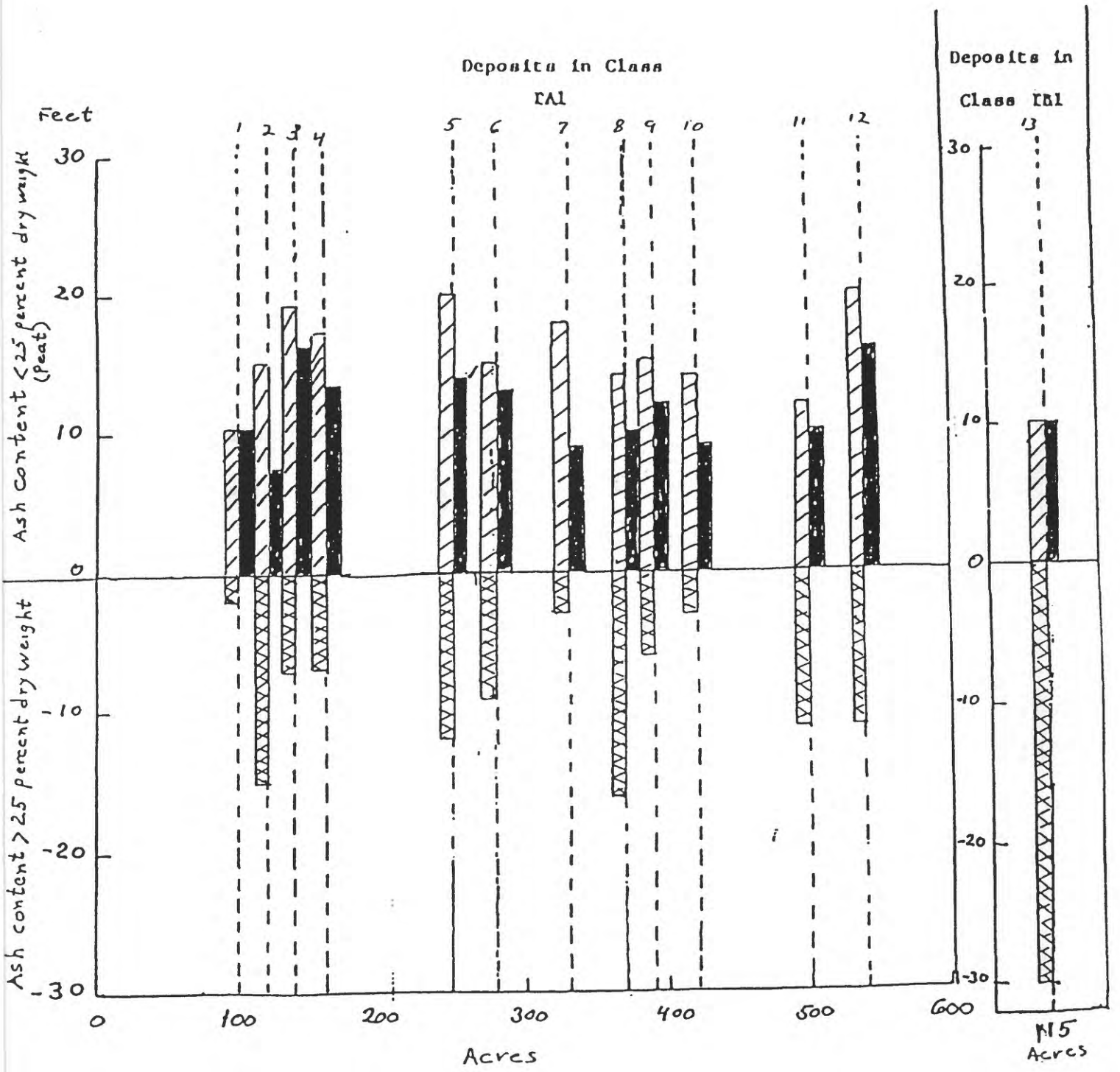


Figure 2. Graph comparing peat deposits in classes IA1 and IB1 in terms of mappable thickness of peat with ash content less than 25% dry weight (peat) and ash content greater than 25%.

// Maximum mappable thickness of ash content < 25%
XX Maximum thickness of ash content > 25%
■ Average mappable thickness

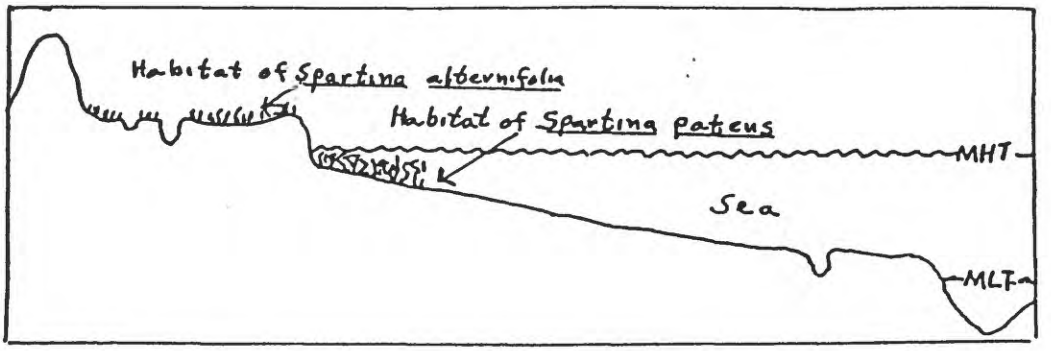


Figure 3. The environment of the Spartina patens marsh below mean high tide in relation to the environment of Spartina alternifolia above mean high tide.