

H4.1 BOG

A bog is defined as a mossy, peat-covered or peat-filled wetland (peatland), that develops on open terrain with restricted drainage (i.e., where the amount of water going in exceeds the amount of water going out). The

water supply of a bog comes almost exclusively from precipitation, resulting in a nutrient-poor, acidic environment. As a bog has limited external drainage, the surface is frequently covered with small ponds.

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Plate H4.1.1: A raised bog (ombrotrophic bog) near Ingramport in Halifax County (sub-Unit 451a) with developing Black Spruce, Larch forest (H6.2.5). Photo: R. Merrick.

FORMATION

Bogs form either on an undulating rocky substratum consisting of ridges and depressions of glacial origin or as a result of the infilling of a pond or lake basin with sediment and organic matter. They form in a climate where precipitation is greater than evaporation. When these circumstances occur, an unbalanced system is created, as the rate of production of organic matter is greater than the rate of decomposition. The anaerobic or poor oxygen conditions allow only limited decomposition in a process referred to as humification.¹ The result is the building of layer upon layer of acidic sphagnum moss, commonly known as peat moss. (Peat can also contain other organic material, such as graminoids and woody plants.) The thickness of peat at the bottom of bogs can be substantial, often reaching several metres in depth.

PHYSICAL ASPECTS

1. *Bedrock*: variable, but usually hard igneous and metamorphic rocks.
2. *Soils*: organic peats
3. *Relief*: depression or flat
4. *Drainage*: very poorly drained; water table always at or near the surface.

ECOSYSTEM

The surface of a bog is sometimes flat, but may be raised towards the centre. It is virtually unaffected by the nutrient groundwaters from the surrounding mineral soils. The bog receives its nutrient input from precipitation and the very limited decomposition of the sphagnum and other plants. Water of the bog

environment is generally acidic and low in nutrients, which results in relatively low productivity. The dominant peat material is *Sphagnum* spp., with sedge peat contributing a minor portion to the bog's structure.

TYPES OF BOGS

Bogs are the most common form of wetland found in the province. There are several types of bogs, ranging from extensive blanket bogs in Cape Breton to small, flat deposits found throughout Nova Scotia.²

Raised (Domed) Bogs

Raised (domed) bogs are large bogs with convex surfaces, usually rising several metres above the surrounding terrain. The centre generally drains in all directions, with small pools often forming near the highest point. Raised bogs occur throughout the province.

A particular type of raised bog, known as "Atlantic Plateau Bog", is found only in the southern coastal regions of the province, in Yarmouth and Shelburne Counties (Units 831, 841). These bogs are unique because of the way they rise up sharply from the surrounding terrain to heights of about four metres. At the top, they are nearly flat like a plateau and often contain a number of pools.

Flat Bogs

Flat bogs have a flat, featureless surface and usually slope slightly from one margin to the next. The depth of peat is generally uniform, although less than in raised bogs. Flat bogs, which are located throughout Nova Scotia, are one to three metres deep and are often associated with high groundwater systems and flowing or open bodies of water.

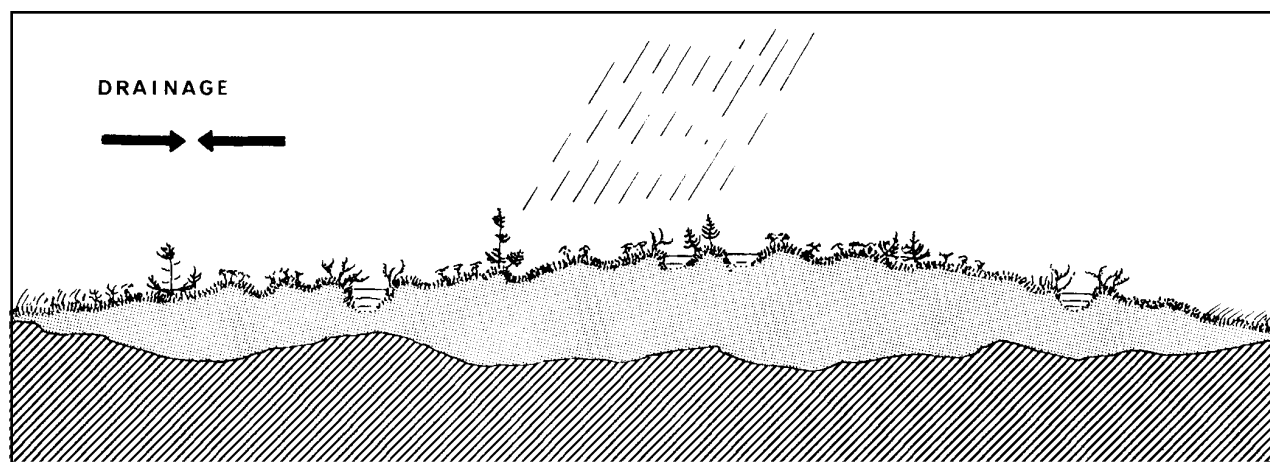


Figure H4.1.1: Diagrammatic section of an ombrotrophic (raised) bog, showing the elevated surface and internal drainage

Sloped Bogs

Sloped bogs occur on sloping land surfaces, primarily in areas of high rainfall and poor drainage. These bogs usually have a uniform peat depth (one to three metres) and can often develop striking surface patterns of vegetation and ponding.² Sloped bogs are most prevalent in Cape Breton and Guysborough County.

Blanket Bogs

Blanket bogs have extensive peat deposits that occur more or less uniformly over the landscape. They differ from sloped or flat bogs in that they follow the contour of the land, have fairly constant depths, and cover the mineral terrain like a “blanket”.² Blanket bogs are characterized by protruding rocks and have numerous ponds. They are common along the eastern portions of the Atlantic coast (Region 800) and the Cape Breton highlands (Regions 100, 200).

SUCCESSIONAL SEQUENCE

The process of progressive infilling of depressional areas in bedrock or of shallow lakes and ponds has resulted in the formation of bogs throughout the province. The climax plant communities are sustained by certain environmental factors, such as high water levels and high acidity, which can often prevent these communities from becoming forests. Under these conditions, bogs are considered to be a late-successional stage of the aquatic-terrestrial process.

In the damp, poorly drained depressions, the peat-forming mosses of the Sphagnaceae family become established. As the layers of peat (i.e., the decomposed remains of the moss and other organic matter) begin to accumulate, the water table rises and the surface vegetation of the depressional areas expands laterally (the process of paludification). With the accumulation of or-

ganic matter, vascular plants invade the habitat, especially the bulrush (*Scirpus cespitosus*). Once this species becomes entrenched, bog development really begins. A layer of compact sedge and sphagnum peat impedes the local drainage and thus produces a “bog meadow”, which is an early-successional stage in bog development. As the damp conditions continue, so does the vigorous and robust growth of the sphagnum mosses. *Sphagnum tenellum* is one of the first colonizers of the damp depressions. This species forms low-lying mats upon which the cushion-forming species (*S. capillaceum*, *S. magellanicum*, and *S. pulchrum*) become established. At this point, these cushion-forming species bring about important changes. This new peat becomes waterlogged, which in turn causes a restriction in air circulation. This results in the process of humification, during which the decaying vegetation breaks down very slowly. Peat accumulation is therefore greatly accelerated and the area takes on the appearance of a “wet bog”. This is characterized by very wet surface conditions maintained by the abundance of cushion-forming *Sphagnum*.

Since the various *Sphagnum* species have different growth rates, the surface of the bog starts to take on a hummocky appearance and produces a corresponding rise in the water table. The hummocks may eventually unite to form ridges with an enclosed depressional area. Because of the increasing water level, the impermeable layer of sedge peat beneath eventually forms a pond.

As the bog surface is continuously being raised, due to the growth of the sphagnum hummocks, drier surfaces occur, with *Sphagnum capillaceum* and later *Sphagnum fuscum* being established. These two species form very dense, compact clumps and eventually replace the cushion-forming species. At this point, the climax stage of bog develop-

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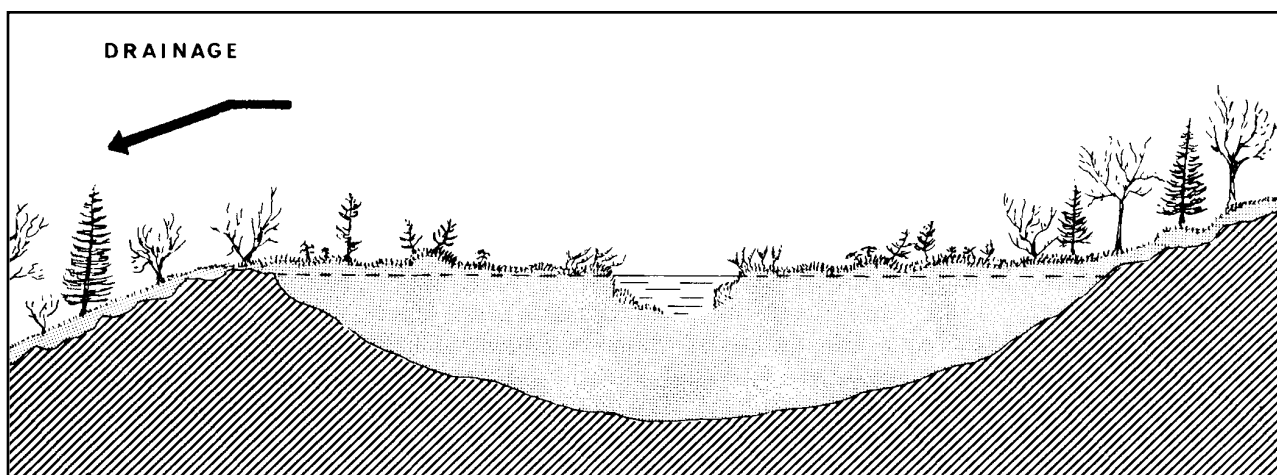


Figure H4.1.2: Diagrammatic section of a flat bog, showing the level surface and external drainage.

ment has been reached and is commonly known as a “dry bog”.

As this habitat is drier than the other successional stages, a variety of vascular plants can begin to grow. Larch and, later, stunted Black Spruce, as well as several ericaceous shrubs, such as Sheep-laurel and Leatherleaf, become established.

The continued upward growth of the hummocks results in further drying of the bog surface and in the replacement of sphagnum mosses with lichens, such as *Cladonia rangiferina* and *Cladonia stellaris*. Once these lichen colonies become established, the hummock-forming process slows. The surface of the bog becomes relatively stabilized and eventually can often support a Black Spruce, Larch forest habitat.

PLANTS

The vegetation of ombrotrophic (rain-fed) bogs can be grouped under the plant association Sphagnum–Cranberry. This large association can be divided into three subassociations: *Sphagnum fuscum*; Beakrush–*Sphagnum cuspidatum*; and *Scirpus cespitosus*–*Sphagnum*.

The *Sphagnum fuscum* association occurs over a broad expanse of a bog’s surface and is generally responsible for the hummocky appearance. The association is characterized by three layers: a poorly developed dwarf-shrub layer consisting of Black Spruce, Larch and heath vegetation; a moderately-well-developed herbaceous layer containing Crowberry, Bunchberry, Blueberry, Goldthread and Starflower; and, finally, a well-developed moss and lichen layer consisting of Schreber’s Moss (*Pleurozium schreberi*), *Sphagnum fuscum*, and the Reindeer mosses, *Cladonia rangiferina* and *Cladonia stellaris*, as the dominant plant species.

The Beakrush–*Sphagnum cuspidatum* association is commonly found in depressional areas of the bog’s surface. These habitats are usually quite small and are often referred to as “muck mats”. These mats are composed of densely interwoven roots and decomposing organic material which produces a flat, mucky, impervious surface that permits rainfall to collect there. Evaporation is the primary means for the removal of water from these depressional areas. Beak-rush (*Rhynchospora alba*) is the dominant plant species with the Narrow-leaved Sundew (*Drosera intermedia*) as a subdominant. Other common plant varieties include *Sphagnum cuspidatum*, *Sphagnum pulchrum*, Bladderwort (*Utricularia cornuta*), Large Cranberry (*Vaccinium macrocarpon*), Small Cranberry (*Vaccinium oxycoccos*), heath shrubs and the liverwort *Cladopodiella fluitans*.

The *Scirpus cespitosus*–*Sphagnum* subassociation is common on raised bogs and along the outer edge of bogs adjacent to the stunted Black Spruce forests. It often frequents small erosional channels. The dominant species are the sphagnum mosses and the bulrush *Scirpus cespitosus*. Other plants commonly found in this habitat include several of the heath plants, lichens such as *Cladonia rangiferina*, *Cladonia pleurota*, and *Cetraria islandica*, chokeberry (*Aronia* spp.), the sedge *Carex oligosperma* and the grass *Calamagrostis Pickeringii*, as well as many of the herbaceous plants represented in the previous two subassociations.

Plants that catch and digest insects are frequently found in bogs and are able to supplement the poor nutrient supply of the habitat. In addition to the previously discussed Bladderwort and Narrow-leaved Sundew, the Pitcher Plant is commonly observed.

During June and July, most bogs show a conspicu-

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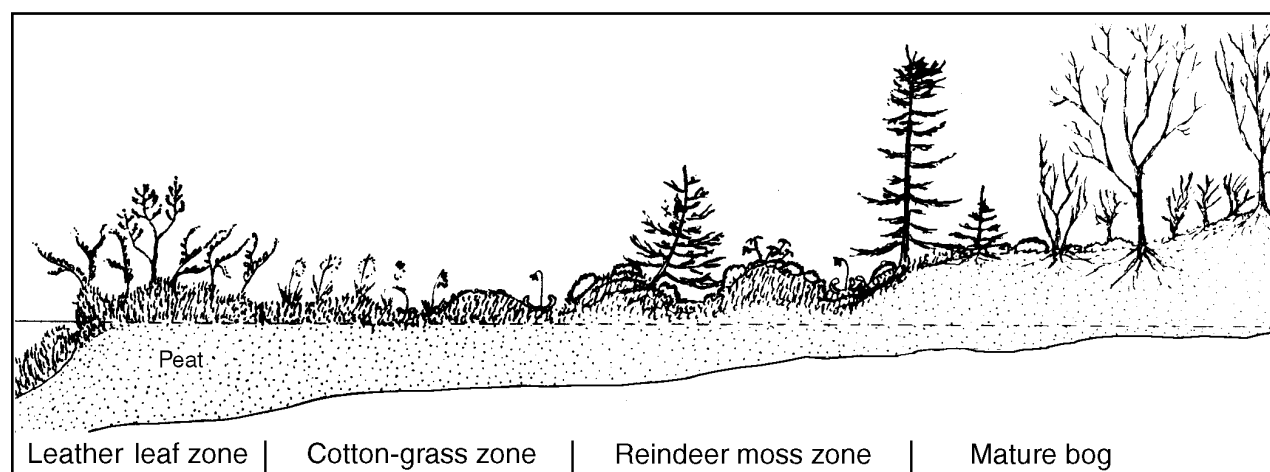


Figure H4.1.3: Zonation of vegetation reflecting successional stages in a bog

ous display of orchids. Included among these are the Paper-white Orchid (*Habenaria blephariglottis*), Swamp-pink (*Pogonia ophioglossoides*), Grass-pink (*Calopogon pulchellus*) and Bog-pink (*Arethusa bulbosa*). Although relatively rare, the last two species are widespread throughout the province.

ANIMALS

Acidic conditions and low productivity make bog habitat unsuitable for many animal species. The majority of the invertebrates are aquatic insects, although worms and molluscs occur at the bog margins. The insect population is impoverished and consists mainly of water midges. Associated with sphagnum moss is a highly specialized group of beetles which comprises very small ground beetles and rove beetles. Pitcher Plants also support specialized insects, such as the Pitcher Plant midge, the Pitcher Plant mosquito, and Three Pitcher Plant moths—*Exyra rolandaria* (in pitchers), *Olethreutes daeckeaana* (in flower heads) and *Papaipema appassionata* (in roots). Ericaceous vegetation supports a variety of typically bog Lepidoptera (butterflies), including the Bog Copper Butterfly, the Bog Elfin and the Arctic Jutta Butterfly, as well as many moth species.

Several species of amphibians and reptiles inhabit bogs, especially frogs which breed in the ponds. The Four-toed Salamander breeds in wet sphagnum moss, and the rare Blanding's Turtle is associated with bogs in the Kejimikujik National Park area. Although many species of birds may be observed in bogs, only a few are truly considered residents. Eight of the nine passerine species are warblers, which require shrubs or trees at the bog margin for nesting. Yellowthroat often nest in thickets surrounding bogs, Rusty Blackbirds nest in the shrubs near open water, and Black Ducks are frequently seen in the larger bog ponds. Due to the low productivity of bogs, populations of small mammals remain relatively low. The Cinerous Shrew is a typical species. Larger mammals, such as Moose, Muskrat, and Black Bear, can sometimes be found inhabiting the perimeter of bogs.

SPECIAL FEATURES

- Alkaline bogs, such as the Black River Bog near Lake Ainslie.
- Rare plant species, such as the Thread-leaved Sundew (*Drosera filiformis*), known to exist only at four sites in Shelburne County.

- Unique habitat dominated by vegetational processes.
- Insectivorous plants (Bladderwort, sundews, Pitcher Plant).
- Habitat for the rare Blanding's Turtle.
- The preserved material found in bogs can provide a valuable record of changes in climate and vegetation.

DISTRIBUTION

Although bogs can be found scattered throughout most of the province, the southwestern (Region 400) portion has the largest concentration. Other areas that have a significant number of bogs are located in Hants County (District 540), Cumberland County (District 520), Guysborough County (District 850) and on Cape Breton Island (Regions 100, 200).



Associated Topics

T4.2 Post-glacial Colonization by Plants, T8.1 Freshwater Hydrology, T8.2 Freshwater Environments, T8.3 Freshwater Wetlands, T9.1–T9.3 Soils, T10.2 Successional Trends in Vegetation, T10.4 Plant Communities in Nova Scotia, T10.5 Seed-bearing Plants, T10.8 Bryophytes Liverworts and Mosses, T10.11 Lichens, T11.5 Freshwater Wetland Birds and Waterfowl, T11.15 Amphibians and Reptiles, T11.16 Land and Freshwater Invertebrates, T12.10 Plants and Resources

Associated Habitats

H3.2 Open-water Lentic (Lakes and Ponds), H3.4 Bottom Lentic Lentic (Lakes and Ponds), H3.6 Water's Edge (Lakes and Ponds), H4.2 Fen, H5.1 Barren, H6.2 Softwood Forest

References

- 1 Moore, P.D. and D.J. Bellamy (1974) *Peatlands*. Springer-Verlag, New York.
- 2 Anderson, A.R. and W.A. Broughm (1988) *Evaluation of Nova Scotia's Peatland Resources*. N.S. Dept. of Mines and Energy, Halifax. (Bulletin 6).

Additional Reading

- National Wetlands Working Group (1987) *The Canadian Wetland Classification System*. Environment Canada, Ottawa. (*Ecological Land Classification Series*, No. 21).
- Wright, B. (1972) *The Bog*. Nova Scotia Museum, Halifax. (*Environmental Studies Series*).