

## T8.3 FRESHWATER WETLANDS

Wetlands are all surface areas of land that are saturated with water for at least part of the year. They are characterized by poorly drained soils, hydrophytic vegetation and biological activity adapted to wet environments. Wetlands occupy the transitional zone on the landscape between the aquatic and upland areas and exhibit some properties of each.

The development of a wetland depends upon the climate, the surface configuration of the land, the type of bedrock and soil (mineral or organic), the degree of inundation or flooding and the nutrient status of the water supply that feeds it. Marshes are wetlands dominated by emergent aquatic vegetation such as grasses, sedges and rushes. Wetlands dominated by wooded vegetation are swamps.

The majority of wetlands in Nova Scotia are peatlands—wetlands characterized by an accumulation of peat. Those that are dependent on precipitation for moisture and nutrients are ombrotrophic bogs and are dominated by sphagnum mosses. Peatlands fed by water moving through mineral soil and dominated by sedges are known as fens.

Wetlands usually occur in areas containing a high water table or where surface-water flow becomes obstructed. A lake or pond becomes slowly infilled with organic and inorganic sediments and is then

Wetlands can also be artificially created either indirectly by construction projects, such as hydroelectric dams, or directly by the building of impoundments for wildlife habitat (see T12.8).

### ECOLOGICAL FUNCTIONS

Wetlands are environmentally important for a number of reasons: they provide natural filtration and storage of water (water recharge); they aid in flood reduction and control, acting like a sponge for releasing water in dry seasons or retarding surface flow, thus slowing down the rate of overland flow to streams; they are a natural storage base for carbon by absorbing carbon in the form of peat; they are a natural sink for pollutants; they assist in stabilizing shorelines and riverbanks, thus reducing erosion; and they provide wildlife habitat for plants and animals, including some rare and endangered species, such as the Thread-leaved Sundew and the Four-toed Salamander (see T10.12 and T11.18).

### WETLAND CLASSIFICATION

A number of wetland classification systems have been devised in order to group wetland types into units that can be defined and characterized, primarily for management and conservation purposes. Surveys can then be conducted and inventories compiled which provide important information on the size and distribution of wetlands, as well as their resource values.

#### **Wetlands Inventory**

An extensive wetlands inventory has been carried out by the Nova Scotia Department of Natural Resources, with the Canadian Wildlife Service, for the whole province. Wetlands are classified according to the dominant vegetative type and the depth and permanence of surface water and are scored according to their wildlife value.<sup>3</sup> The eight wetland categories are: bog, shrub swamp, wooded swamp, deep marsh, shallow marsh, meadows, seasonally flooded flats, and open water. All wetlands of 0.25 hectares or greater in Nova Scotia are included in the inventory and compiled into a data base. Wetlands scoring 65.0 or higher have been identified in the *Atlas of Important Freshwater Wetlands and Coastal Wildlife Habitats*.<sup>4</sup>

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*Peat is the partially decomposed remains of plants which have been accumulating in Nova Scotia since the last glacial period at an approximate rate of 0.5 mm per year. This is the source of the peat moss that we use as a soil conditioner in gardening.*

invaded by peat-forming vegetation.<sup>1</sup> (A gradual build-up of peat can eventually transform some wetlands into peatlands.) Paludification is the process where bogs expand to cover previously dry land due to a gradual rising of the water table. Another process known as primary peat production can take place where peat-forming plants establish themselves on moist but not waterlogged soils.<sup>2</sup> This is most often characteristic in areas with high rainfall and low evaporation, such as in southwestern Nova Scotia (Region 400) or the Cape Breton highlands (Region 200).

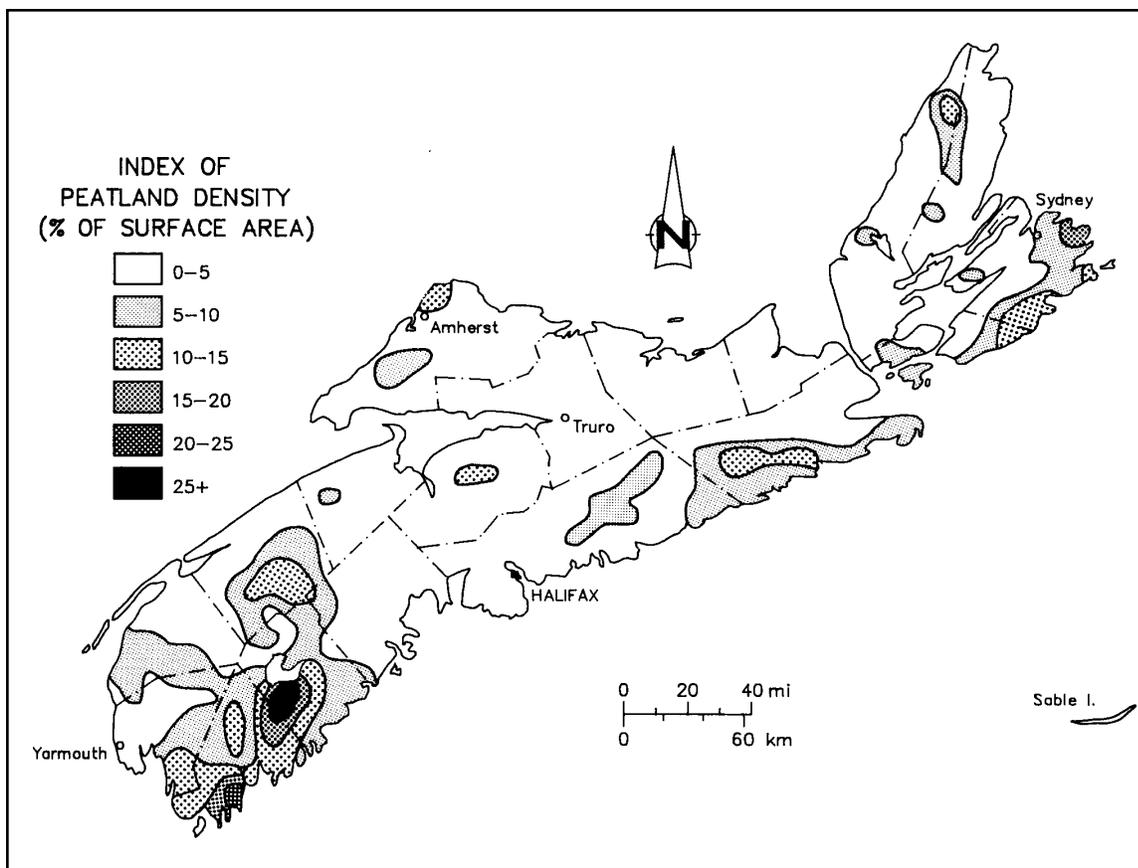


Figure T8.3.1: Peatland density of Nova Scotia.<sup>5</sup>

### **Peatlands Inventory**

The Nova Scotia Peatland Inventory was compiled by the Nova Scotia Department of Natural Resources in response to a need for information on potentially valuable peat resources throughout the province. Peatlands greater than 10 hectares were mapped and each area coded to reflect the dominant peatland form. Information on peat quality, quantity and composition was collected. The inventory has been divided into three main classes: bog (raised, sloping or flat), fen (sloping or flat) and swamp (flat). Figure T8.3.1 shows the distribution of peatlands in Nova Scotia.<sup>5</sup>

### **Canadian Wetland Classification System**

The Canadian Wetland Classification System represents a synthesis at the national level of existing classification systems which have been devised across Canada. It is based on ecological parameters that influence wetlands. It consists of five wetland classes (bog, fen, marsh, swamp and shallow water), which have been further subdivided into two more specific levels: wetland form and wetland type.<sup>6</sup> Within Nova Scotia, two wetland regions (including four subregions) have been identified. These are

described in detail in the *Wetlands of Canada*, published by the National Wetlands Working Group.<sup>7</sup>

### **Other Classification Systems**

Another relevant document concerning wetland classification in Nova Scotia assesses wetlands in relation to their landscape context. "A Landscape Approach to the Interpretation, Evaluation and Management of Wetlands"<sup>8</sup> regionalizes wetlands based on the Peatland Areas of Nova Scotia<sup>5</sup> and divides the province into fourteen wetland regions (six of these have been subdivided). The dominating wetland type determines the region. Subregions are delineated based on changes in the amount of landscape covered by wetlands and major differences in geology.

*The Natural History of Nova Scotia* divides freshwaters into several habitat types. Lakes and ponds are represented by open water-lentic, bottom-lentic and edge-lentic. Rivers and streams are categorized as open water-lotic, bottom lotic and edge-lotic. Peatlands are defined as either bogs or fens. Other wetlands described are swamps and freshwater marshes (see H3 and H4).

The terminology used by the various classification systems is not always consistent. Table H.1 in the Introduction to **Habitats** compares the terms employed in this document with those found in the Nova Scotia Wetland Inventory, the Nova Scotia Peatland Inventory and the Canadian Wetland Classification System.

#### WATER QUALITY OF WETLANDS

The water quality of wetlands can be affected by inflowing water and runoff, groundwater inflow, precipitation, vegetation and the relative contributions of all these factors.

Wetlands can affect water quality within a watershed in a number of ways. Highly productive freshwater marshes may disperse nutrients to the rest of the drainage system. Conversely, in wetlands with low productivity, such as peatbogs, waters may become more acidified and nutrients absorbed. All wetlands generate dissolved carbon, which increases colour, thus lowering light penetration. They also provide natural organic acids which lower pH levels. This phenomenon is much more pronounced in bogs.

The effects of wetlands on water quality in Nova Scotia are substantial, considering they represent a comparatively small percentage of the total surface area of the province. Wetlands occupy about 5 per cent of the province; however, approximately 50 per cent of lakes and rivers in the region show relatively high colour levels, indicative of natural organic acids (NOA), measured as dissolved organic carbon (DOC) in wetland soils.<sup>9</sup>

*Wetlands contain some plants that function as filters and have been used as part of natural waste treatment systems.*

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#### ACID RAIN

Acidic precipitation can have a negative impact on some types of wetlands. A wetland-sensitivity rating system has been proposed by Kessel-Taylor in which wetlands are divided into four classes of sensitivity:<sup>10</sup>

1. Low sensitivity (marshes, rich fens and shallow waters): These wetlands possess adequate buffering capacity to neutralize acid precipitation
2. Moderate sensitivity (bogs): Some adverse effects from acid precipitation can be expected on some of the raised hummocks in bog systems however, since most bogs are already acid, acid precipitation would generally have no appreciable effect
3. Moderate to high sensitivity (swamps): In nutrient-poor swamps, buffering capacity is small, due to minor minerotrophic input. A high volume of acid precipitation could not be neutralized and therefore the potential for increased acidification is high
4. High sensitivity (poor fens): characterized by low alkalinity and low mineral input; consequently their buffering capacity is minimal.

A study of sources of sulphate ions and acidity in wetlands and lakes in Nova Scotia revealed that, during the ice-free period, sea-salt-corrected sulphate concentrations were nearly three times higher in the south end of the province than those found in northern areas. This reflects the atmospheric deposition of sulphate.<sup>11</sup>



#### **Associated Topics**

T3.2 Ancient Drainage Patterns, T8.1 Freshwater Hydrology, T8.2 Freshwater Environments, T10.12 Rare and Endangered Plants, T11.5 Freshwater Wetland Birds and Waterfowl, T11.13 Freshwater Fishes, T11.15 Amphibians and Reptiles, T11.16 Land and Freshwater Invertebrates, T11.18 Rare and Endangered Animals

**Associated Habitats**

H3 Freshwater, H4 Freshwater Wetlands

**References**

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- 2 Sjors, H. (1976) "Successional trends in boreal peatlands." In *Proceedings of the 5th International Peat Congress, Warsaw, Poland*, pp. 22-28.
- 3 Golet, F.C. (1973) "Classification and evaluation of freshwater wetlands as wildlife habitat in the glaciated northeast." In *Northeast Fish and Wildlife Conference, Mt. Snow, Vermont*.
- 4 Nova Scotia Department of Natural Resources, Wildlife Division (1991) *Atlas of Important Freshwater Wetlands and Coastal Wildlife Habitats for Nova Scotia*. Revised edition.
- 5 Anderson, A.R., and W.A. Broughm (1988) *Evaluation of Nova Scotia's Peatland Resources*. Nova Scotia Department of Mines and Energy. (Bulletin 6).
- 6 National Wetlands Working Group (1987) The Canadian Wetland Classification System. Environment Canada. (*Ecological Land Class Series No.21*).
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- 8 Manuel, P.M. (1992) A Landscape Approach to the Interpretation, Evaluation and Management of Wetlands. Ph.D. thesis, Dalhousie University, Halifax.
- 9 Clair, T.A. (1991) "Wetlands and water quality concerns." *Research and Information Needs for Canadian Wetlands*. Inland Waters Directorate. (*Tech. Workshop Series No.10:38-9*).

- 10 Kessel-Taylor, J.A. (1985) *Effects of Acid Precipitation on Wetlands*. Environment Canada, Lands Directorate, Ottawa, Ont.
- 11 Underwood, J.K., J.G. Ogden, J.J. Kerekes and H.H. Vaughan (1987) "Acidification of Nova Scotia Lakes." *Water, Air and Soil Pollution* 32.

**Additional Reading**

- Melanson, R., and F. Payne (1988) Wetlands Habitat Management through Nutrient Enrichment. Nova Scotia Department of Lands and Forests. Kentville, Nova Scotia. (*Occasional Paper No. 1*).
- Payne, F. (1993) Beaver and Ducks Unlimited Impoundments of the Pugwash River Watershed with Recommendations for Management. Report on file with Wildlife Division, Nova Scotia Department of Natural Resources, Kentville, N.S.