H3.2 OPEN WATER LENTIC (LAKES AND PONDS)

The open-water habitat of lentic environments (i.e., lakes and ponds) includes the limnetic and profundal zones of the water column (see Figure T8.2.2). The limnetic zone is the area beyond which rooted plants grow and extends vertically to the depth of maximum sunlight penetration. The profundal zone is the deeper (and often colder) water below the level of light penetration. Most lakes in Nova Scotia are deep enough to have open-water habitats. Most ponds are shallow and support submerged vegetation throughout.

Plate H3.2.1: A pond at Northport, Cumberland County (sub-Unit 521a). Aquatic plants include *Potamogeton* and *Juncus.* Photo: D.S. Davis

FORMATION

The formation of open-water habitats in lentic environments relates to the origin of the lake or pond. Lakes in Nova Scotia tend to be of glacial origin. Ice-scouring results in depressions in the bedrock or surface irregularities in glacial drift. Lakes and ponds can also be formed due to damming by landslides, flood debris, or hydroelectric dams. Ponds can form when a lake is infilled with organic debris or mineral sediment; by the natural cutoff of a meandering river (oxbow), or by solution of gypsum or limestone (sinkhole). The open water is influenced by precipitation, flushing rates, and drainage. Water levels can fluctuate seasonally.

PHYSICAL ASPECTS

1. *Water conditions:* conductivity, temperature, turbidity, light, seasonal variations. (Chemical composition, including dissolved nutrients, depends on bedrock.)
2. *Air-water interaction:* (O_2 and CO_2), wind induces mixing of water column, turbulence and gas exchange.
3. *Land-water interaction:* enclosing land forms, turbidity, runoff with products of erosion and nutrient supply, flushing rates.
4. *Drainage:* open water (lakes); poorly drained, partially open water (ponds)

ECOSYSTEM

Most primary production occurs in the limnetic zone of the open-water habitat. Phytoplankton carries out photosynthesis in the limnetic zone and produces oxygen in the water. Zooplankton consumes the phytoplankton and is, in turn, eaten by higher animals, such as insects and fish.

The amount of primary production by phytoplankton relates to the nutrients, the content morphology and the flushing rate of the lake or pond. In the spring, a large influx of nutrients can produce a rapid growth of phytoplankton, known as a "bloom". Herbivorous zooplankton responds to the increase in phytoplankton. The amount of bloom (i.e., how green the lake appears) is thought to be controlled by the amount of grazing done by the zooplankton.

The profundal zone is a cooler, low-productivity environment characterized by a high abundance and low diversity of oxygen-demanding species. These species may depend on the limnetic zone for food.

In deep lakes, vertical stratification is common in summer, and the cool-water organisms accumulate at the thermocline (see Figure T8.2.1), where they depend on the limnetic zone for their food sources. Temperature and wind changes (e.g., in fall and spring) create a mixing, and the nutrients deposited on the bottom rise and are available to phytoplankton for production.

SUCCESSIONAL SEQUENCE

The normally understood process of ecological succession does not apply to open water. In the early stages of succession, lakes slowly begin to infill from eroding shoreline materials. A vertical erosional-depositional process also takes place within the lake. Infilling of the lake basin results from suspended sediment being brought into the system by inflowing streams and rivers. This sediment is deposited in the deeper parts of the lake until the bottom is slowly built up to a flat surface. The water level then becomes so shallow that wave action decreases and erosion declines to a very slow rate. At this point, the lake begins to resemble a pond. The siltation process continues until the open-water habitat disappears, giving rise to bog, fen, swamp or marsh habitats. The rate at which this occurs depends upon the amount of siltation, the rate of production of organic material and the rate of decomposition.

PLANTS

The open water of lakes and ponds contains numerous phytoplankton species. Diatoms and desmids are common in oligotrophic and distrophic conditions, while blue-green algae are abundant in eutrophic lakes (see Topic T8.2). Duckweeds (*Lemma*) and *Spirodella*.

ANIMALS

The planktonic community of the open water consists primarily of cladocerans (water fleas), copepods, rotifers, air-breathing insects in adult form (e.g., water beetles) and larval form (e.g. mosquitoes). The zooplankton is a primary source of food for open-water fish species, such as Brook Trout, Golden Shiner and Yellow Perch. Black Duck is common in the open water during the summer. Osprey, Bald Eagles, cormorants and loons also utilize the open water for feeding.

SPECIAL FEATURES

- Amphibian populations in ponds
- Ponds are greatly affected by local climatic and geological conditions and are quite different in various regions of the province. It is important to understand the origin of a pond (e.g., sinkhole, river oxbow, beaver dam)
- Landlocked populations of marine fish species (e.g., Atlantic Salmon)
- Freshwater jellyfish in Dartmouth lakes

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Associated Topics

T8.1 Freshwater Hydrology, T8.2 Freshwater Environments, T10.2 Successional Trends in Vegetation, T10.5 Seed-bearing Plants, T11.5 Freshwater Wetland Birds and Waterfowl, T11.13 Freshwater Fishes, T11.16 Land and Freshwater Invertebrates

Associated Habitats

H3.1 Open-water Lotic (Rivers and Streams), H3.4 Bottom Lentic (Lakes and Ponds), H3.6 Water's Edge Lentic (Lakes and Ponds), H4.1 Bog, H4.2 Fen, H4.3 Swamp