

H3.1 OPEN-WATER LOTIC (RIVERS AND STREAMS)

The open-water habitat in rivers and streams is the body of water flowing through the channel. The characteristics of the water can vary considerably in rela-

tion to the morphology of the channel. Rivers and streams in Nova Scotia are not deep enough to create layering in the water column.

H3.1
Open-water
Lotic (Rivers and
Streams)



Plate H3.1.1: Drysdale Falls, Colchester County (sub-Unit 521a). An open-water stream habitat with a waterfall and associated cliff habitat (H5.3). The forest is a spruce, hemlock, pine association (H6.2.6). Photo: R. Merrick

FORMATION

The dominant feature of all lotic environments is the continuous movement of water and currents, which cuts the channel, molds the character of the stream and influences the chemical and organic composition of the water.¹ Water running off the land follows courses of least resistance and develops these as distinct channels by erosion. Young or rejuvenated streams, with a high velocity, erode more than they deposit.

Water in slow-moving rivers reflects the characteristic of the terrain; nutrient level and sediment load vary according to region. The slow-moving stream often develops a floodplain, meanders, and associated features and terminates in a lake or estuary.

PHYSICAL ASPECTS

1. *Water conditions:* variables include conductivity, temperature, turbidity, light, seasonal variations. (Chemical composition, including dissolved nutrients, depends on bedrock in rapidly-moving streams.)
2. *Air-water interaction:* wind influences turbulence and gas exchange (O_2 and CO_2).
3. *Land-water interaction:* variable conditions are determined by enclosing land forms, turbidity, runoff with products of erosion and nutrient supply.
4. *Bottom-water interaction:* turbidity, nutrient supply.

ECOSYSTEM

The lotic is primarily determined by the velocity of the current, which can create either slow-moving or fast-moving streams; each has very distinct characteristics. The base of the food chain is dependent on detritus from upstream or from the edges. In slow-moving streams, plant and animal communities largely resemble those found in lentic (lake and pond) habitats. The significant phytoplankton populations that usually exist contribute to a higher rate of primary productivity than that found in fast-moving streams. The level of productivity is dependent upon water temperature and the amount of nutrient input received from the surrounding environment, and therefore subject to seasonal variation. The diversity of consumer organisms varies according to the physical conditions and vegetation. Planktonic populations are relatively high, although not as dense as those found in lakes.

In fast-moving streams, there is very little primary production in the open-water habitat, due to the velocity and turbulence of the current. Populations of consumer organisms (mainly particulate feeders) are low. Riffle areas provide valuable habitat for juvenile trout and salmon. Pools are important resting areas for several fish species, including Atlantic Salmon. The quality of these areas can be adversely affected when shade trees are removed from the banks.

SUCCESSIONAL SEQUENCE

The normally understood process of ecological succession does not apply to open water. In slow-moving streams, the development of habitat depends upon the depositional and erosional characteristics of the river. The fast-flowing, young stages of streams will always be present as the river erodes the landscape. Over time, the young stage will mature into a slow-moving stream, but it can be rejuvenated when a geological obstacle (e.g., a waterfall) is encountered. In mature streams, there is a progressive downstream movement of meanders, leaving shallow or deep pools, backwaters, braided channels and oxbow ponds. There is an associated change in the character of the open water.

PLANTS

Vegetation in the lotic open-water habitat consists mainly of phytoplankton found in slow-moving streams. There are no plankton species unique to rivers; those found there originate mostly from backwaters or lakes. Several species of desmids and diatoms are present in slow-moving rivers, although abundance is much lower than in lakes.

ANIMALS

Some zooplankton species and rotifers can be found in slow-moving streams. Their abundance depends on the amount of the predation from invertebrates and small fish.

Most fish inhabiting fresh water in Nova Scotia will utilize this environment at some stage in their life cycle. Fish species such as Redbelly Dace and White Sucker, and introduced species such as Brown Trout are commonly found in slow-moving streams. Fast-moving streams provide excellent habitat for many kinds of fish, including Brook Trout, Atlantic Salmon parr, Common Shiner, White Suckers and Yellow Perch.

Bird species associated with rivers include mergansers, Black Ducks, Spotted Sandpipers and Belted Kingfisher. Mammals commonly found in rivers are Water Shrews, Star-nosed Moles, Muskrats, otters, mink and beavers.

SPECIAL FEATURES

- Tidal rivers occur when the lower reaches of the habitat are influenced by the sea. The mixing of fresh and salt water creates conditions suitable for brackish water species.
- Some marine-fish species enter freshwater systems through estuaries.
- Special adaptations of stream organisms.
- The effects of acid precipitation on rivers and streams occurs mainly in southwestern Nova Scotia.
- The heating effect of shade removal due to tree cutting.
- River rejuvenation, including the occurrence of rapids and falls, especially along the Atlantic coast.
- Important recreational fisheries, particularly Atlantic Salmon and Brook Trout.
- Stream flow is harnessed for milling or hydro-electric-power generation.

DISTRIBUTION

Slow-moving streams are found in all regions of the province, except where high ground occurs close to the sea. Some of the well-developed larger river systems include the Tusket, Medway, Mersey, LaHave,

St. Marys (Region 400); the Shubenacadie and Stewiacke (Region 500); the Cornwallis and Annapolis (Region 600).

Fast-moving streams occur throughout the province in upland areas. These include the Cape Breton highlands (Regions 100 and 200), the Cobequid Hills (Region 300), North Mountain (District 710), and South Mountain (District 420). Slow-moving streams flowing to the Atlantic Ocean are often rejuvenated as they pass through the Meguma bedrock near the Atlantic Coast. Examples of this occurrence are the Musquodoboit River (Units 413a and 453) and the St. Marys River (Unit 842).



Associated Topics

T6.1 Ocean Currents, T6.4 Estuaries, T8.1 Freshwater Hydrology, T8.2 Freshwater Environments, T10.9 Algae, T11.5 Freshwater Wetland Birds and Waterfowl, T11.11 Small Mammals, T11.13 Fresh Water Fishes, T11.15 Amphibians and Reptiles, T11.16 Land and Freshwater Invertebrates, T12.8 Freshwater and Resources

Associated Habitats

H3.2 Open-water Lentic (Lakes and Ponds), H3.3 Bottom Lotic (Rivers and Streams), H3.5 Water's Edge Lotic (Rivers and Streams)

References

- 1 Smith, R.L. (1990) *Ecology and Field Biology*. Harper and Row, New York.