

## T10.1 VEGETATION CHANGE

The plant life of Nova Scotia includes representatives of all main groups: algae, lichens, fungi, mosses, liverworts, and vascular plants (the seed-bearing plants, conifers, ferns and fern allies). Most plants are autotrophic, producing food material for energy and growth by trapping sunlight (photosynthesis), but some are heterotrophic, getting at least some of their energy by feeding on dead plant or animal material or by parasitizing other living organisms. The vascular plants are the most conspicuous group, found principally on land and providing the main energy and food supply to terrestrial ecosystems. In marine ecosystems, the algae are the essential elements of primary production and fill the role which vascular plants play on land. The distribution of plant-community species in Nova Scotia is influenced by the province's geographic configuration, its climate, geology and the use of plants as a resource. Some species are better studied than others, and gaps in distribution often indicate a lack of study.



### HISTORIC VEGETATION OF NOVA SCOTIA

The primary sources of recorded information about the early vegetation of Nova Scotia are the notes of Nicholas Denys (1600s) and Titus Smith, Jr. (1801–02). The maps in the report *Forest Conditions of Nova Scotia*, compiled by Fernow,<sup>1</sup> provide a further important source of historic information. Pollen-profile analysis from peat bogs and lake-bottom sediments has allowed researchers like Livingstone,<sup>2</sup> Railton,<sup>3</sup> Deevey,<sup>4</sup> and Ogden<sup>5</sup> to document major changes in the province's vegetation during interglacial and post-glacial times.

The major types of forest and non-forest plant communities in Nova Scotia have probably not changed dramatically during the past several hundred years. They were, in all likelihood, similar to those listed in Tables T10.4.1 and T10.4.2 for the present-day vegetation. But the proportion of the overall vegetation mosaic occupied by each of these vegetation types has undoubtedly changed markedly as a result of human settlement, insects, disease, fire (or in some cases, such as in pine forest, fire suppression) and forestry practice. Most of the

province's forests are now of early-successional status following fire, cutting or agricultural activity.

The role of individual species within some forest types (e.g., American Beech, Hemlock, White Pine) may be less significant now because they have been affected by insects, disease or have been removed through selective cutting.

### FACTORS CAUSING CHANGE

Many factors have caused change in the province's vegetation. Two major groups are evident:

1. those generally considered to be natural (e.g., wind, insects and disease, fire and natural succession)
2. those attributable primarily to human activity (e.g., most fires, harvesting and afforestation, agricultural use and land clearing, and urbanization)

The natural agents of change are discussed in this Topic. The following Topic, Successional Trends in Vegetation, describes the successional sequence of vegetation affected by these agents and anthropogenic agents. T12.10 provides the historical context for anthropogenic change.

### WIND

Winds strongly influence forest habitats. They cause the stunted and sculptured growth (krummholz effect) evident in trees in coastal or highland areas. Wind-caused dessication probably limits growth of many upland forests. Strong winds can blow down individual old and shallow-rooted trees during storms. Occasionally, storm events are so severe that massive windfall occurs in certain forest types. Stanley et al.<sup>6</sup> drew attention to the possibility of an eighty-year cycle for this massive destruction. Titus Smith frequently mentioned the tangle of wind-thrown trees in southern and eastern Nova Scotia through which he had to make his way in the early 1800s. The "Saxby Gale" in 1869 caused major destruction of forests. Hurricane Edna in 1954 had similar effects. Wind has been a particularly destructive force in the shallow-rooted coniferous forests of Nova Scotia.

## INSECTS AND DISEASES

Every tree species has its insect pests. These are generally species specific and may eliminate their host species selectively from a forest. Sustained insect infestations can be catastrophic when forests are monospecific and have limited diversity. This phenomenon has occurred in Nova Scotia with the recent Spruce Budworm infestation of the boreal Balsam Fir forests of the Cape Breton highlands (District 210), where a very high degree of mortality in the forests has brought about massive changes in the vegetation structure. During the 1920s, beech trees throughout the province fell prey to the Beech Bark disease which eliminated most American Beech and left a legacy of cankered small trees. Both Beech Bark disease and Dutch Elm disease are caused by fungi transported by insects (see T11.16).

In the 1930s, White and Yellow Birch were destroyed in much of the province by the birch dieback disease. Red Oak was host to an infestation of the European Winter Moth during the 1940s. White Pine trees are deformed by the White Pine Weevil. The Larch Sawfly has regularly destroyed pure larch stands. Balsam Fir trees are frequently weakened by the Balsam Woolly Aphid and the Hemlock Looper, which is a serious defoliator to Balsam Fir stands.

Collectively, these insect pests and diseases have been major agents for change within forest stands in Nova Scotia and on occasion have greatly influenced forest types over large areas.

*Beech Bark disease came to North America via Nova Scotia in the 1920s. The scale insect responsible for the disease had been detected in Halifax some thirty years previously and had apparently been imported with stocks of European Beech. Landscape specimens of American and European Beech often escape infestation because they offer a less favourable habitat for the insect.*

## FIRE

Fire from lightning strikes has been an agent for natural vegetation change in certain parts of the province. Evidence of charcoal in lake sediment and peat profiles throughout Nova Scotia indicate that fire, whether human induced or natural, has been a major causative factor for vegetation change for thou-

sands of years. Some species have adapted to frequent fires by root sprouting (e.g., aspen and beech) or by opening cones when a certain heat is reached (e.g., Jack Pine). There is a feedback link between the fire and the vegetation.

Natural fires played a major role in the vegetation patterns of the fire-prone landscapes of southwestern Nova Scotia (in particular in District 410). Most upland areas of the province do not exhibit an extensive fire history. During the past 250 years, however, fires caused by humans have, at one time or another, burned over much of the province. Fire has become a dominant causative factor leading to the development of a number of our present early-successional plant communities.

The suppression of fire now being undertaken by government agencies promises to result in vegetation changes in these fire-originated communities. Fernow determined that 20 per cent of the Nova Scotia land base of his day was old burns and barren, and that recent burns covered 5 per cent of the land.<sup>1</sup> Hawboldt and Bulmer indicate that, in 1958, only 8 per cent of the province's land base was in the "old burn and barren" class and that an insignificant portion was recently burned.<sup>7</sup> A continuation of these trends will, over time, lessen the importance of fire as a change agent in Nova Scotia.

## NATURAL SUCCESSION

Every plant community inherently grows toward change. In forest stands, seeds germinate, trees grow and become decadent, other trees replace them. If unaffected by other agents, forest stands will change naturally, with species which are better adapted to the site and its environment replacing their predecessors. The main shade-tolerant species will, over time, replace the shade-intolerant ones.

In the long term, as moisture conditions change from wet (hydric) and dry (xeric) toward moist, the more mesic species replace the hydric and xeric species. If left undisturbed, this process results in a forest type which changes little. At this late stage in succession, individual species reproduce themselves but the species mix remains relatively constant.

Marine vegetation changes primarily as a response to the environment in which it grows. Over a period of time, change can result from erosion or deposition of the substrate. Significant natural changes to marine vegetation can occur as a result of sea-level rise and ice-scouring. Anthropogenic influences include conditions generated by causeways, such as at Windsor (Sub-Unit 511a). Short-term changes in

marine vegetation are generally a result of changes in water temperature, salinity or the availability of nutrients (e.g., red tide; see T6.2 and T10.9).



#### **Associated Topics**

T4.1 Post-glacial Climatic Change, T4.2 Post-glacial Colonization by Plants, T6.2 Oceanic Environments, T10.2 Successional Trends in Vegetation, T10.3 Vegetation and The Environment, T10.4 Plant Communities in Nova Scotia, T10.12 Rare and Endangered Plants, T11.16 Land and Freshwater Invertebrates, T12.10 Plants and Resources

#### **Associated Habitats**

H1 Offshore, H2 Coastal, H3 Freshwater, H4 Freshwater Wetlands, H5 Terrestrial Unforested, H6 Forests

#### **References**

- 1 Fernow, B.E. (1912) *Forest Conditions of Nova Scotia*. Canada, Commission of Conservation, Ottawa.
- 2 Livingstone, D.A. (1968) Some Interstadial and Postglacial Pollen Diagrams from Eastern Canada. (*Ecological Monographs* No. 38).
- 3 Railton, J.B. (1975) "The postglacial history of Nova Scotia." In *Environmental Changes in the Maritimes*. Nova Scotian Institute of Science, Halifax.
- 4 Deevey, E.S. (1951) "Late-glacial and post-glacial pollen diagrams from Maine." *Science* 249.
- 5 Ogden, J.G. III (1960) "Recurrence surfaces and pollen stratigraphy of a post-glacial raised bog, Kings County, Nova Scotia." *Science* 258.
- 6 Stanley, J.M., P.L. Comeau and D.G. Dodds (1973) *The Vegetation of Kejimikujik National Park*. Parks Canada.
- 7 Hawboldt, L.S., and R.M. Bulmer (1958) *The Forest Resources of Nova Scotia*. Nova Scotia Department of Lands and Forests, Halifax.

#### **Additional Readings**

- Sinclair, W.A., H.H. Lyon and W.T. Johnson (1987) *Diseases of Trees and Shrubs*. Cornell University Press.