

H2.6 DUNE SYSTEM

Dune habitats are exposed shoreline systems of one or more sand ridges derived from wind- and wave-transported material.



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Plate H2.6.1: Dune system at Dominion Beach, Cape Breton County (Unit 531). Photo: R. Merrick

FORMATION

In Nova Scotia, this is a coastal habitat resulting from the deposition of sand on beaches in areas with sufficient sediment supply. Sand is deposited on the upper levels of the beach by both wave and wind action and becomes stabilized by the growth of American Beach Grass (Marram Grass). New dune ridges are developed successively on the seaward side. The extent to which a coastal dune system will develop in Nova Scotia depends upon the sediment supply and the erosional/depositional environment, particularly the rate of sea-level rise.

PHYSICAL ASPECTS

1. *Soil*: wave- and wind-deposited sand is constantly shifting and has low nutrient levels.
2. *Relief*: topographically, the dunes are a succession of parallel ridges (dunes) and depressions (slacks). Ridges become lower and wider with age, due to compaction and spreading.
3. *Drainage*: ridges are well drained, but the leaching of material from the sand results in the eventual formation of hard pans and interrupted drainage in the slacks.
4. *Exposure*: dunes are subject to a high degree of exposure resulting from wind, blowing sand and salt spray

ECOSYSTEM

This is a natural ecosystem with low species diversity in the early stages of succession. Primary production is low, due to low nutrient levels and exposure. Diversity of consumers increases during the course of succession. The initial grassland system changes to a forest system over time.

SUCCESSIONAL SEQUENCE

On a prograding dune system, bare, loose sand of the beach is colonized and stabilized by American Beach Grass. As the stable soil increases organic (humus) content and water-retaining capability, the Beach Grass community is replaced by an increasing variety of plant species, including heath plants, before giving way to coastal spruce, fir forest. The seral stages are usually represented by dune ridges of different ages, with distinct plant communities. The details and extent of the successional sequence will depend upon local conditions. The destruction of the vegetation cover in the dune system can cause damage to the system by wind erosion (blowouts). Sand dunes often provide the shelter required for salt-marsh development.

PLANTS

There are distinct plant communities associated with the seral stages of dune succession. These are summarized on the diagram of the Pomquet dune system shown in Figure H2.6.1.

The most important species that dominates the pioneer-plant association is American Beach Grass. Colonization of new sand may be by seed or runners from the established plants on the primary ("Yellow") dune ridge. The pioneer-plant association includes typical beach plants: Sea-rocket, Sandwort and Orach.

The "Yellow dune" is also dominated by American Beach Grass but the diversity of plant species is increased to include Poison Ivy and the sedge *Carex silicea*. Beach Pea is another species of this community.

The "Grey dune" community, in which active deposition of sand has ceased, continues the basic association of "Yellow dune", but the Beach Grass

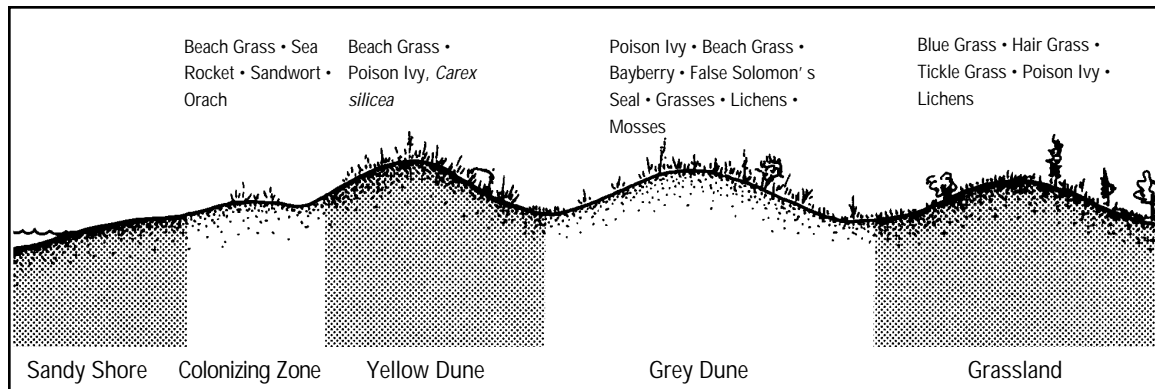


Figure H2.6.1: A diagrammatic cross section of a prograding dune system, showing the main features of succession. Based upon information from Pomquet Beach (sub-Unit 521b). Not drawn to scale. (Continued on next page).

is beginning to give way to a variety of other plants, including grasses, Scouring Rush, Bayberry and lichens. Lichens, particularly species of *Cladonia*, may be the dominant vegetation in fairly extensive patches.

The "Grassland" community shows the final replacement of the Beach Grass by other grass species and the last stage before the "Heath and Scrub" ecotone that borders the White Spruce/fir, maple, birch forest association (H6.3). This community commonly includes Wild Rose and various heath plants, as well as individuals of the pioneer conifers.

In the depressions between beach ridges, known as "slacks", poor drainage and low nutrients support a plant association of a "bog" character, with *Myrica gale* and Cranberry. In later stages of succession, these may become alder swamp or pond habitat.

ANIMALS

The development of fauna relates to the stage of succession. Improved, stable soil and plant-species diversity support more diversified fauna. The upper sand, beach community of amphipods (*Talorchestia*), tiger beetles, flies and spiders (see H2.3) extends into the colonizing zone of the Beach Grass. At later seral stages, the diversity of insects increases and other groups of soil organisms, such as snails and slugs, become established. Vertebrates include snakes, small mammals and birds (Savannah Sparrow [Ipswich Sparrow on Sable Island] and Snow-buntings in winter).

SPECIAL FEATURES

- Pioneering role and adaptation of American Beach Grass
- Classic features of sand-dune succession
- Fragility of the system
- Special case of Sable Island-Ipswich Sparrow
- Dune-restoration programs in Nova Scotia include using discarded Christmas trees to stabilize the mobile sand prior to the Beach Grass establishment.

DISTRIBUTION IN NOVA SCOTIA

Sand-dune systems occur in exposed coastal areas where there is adequate sediment supply. The Northumberland Strait (District 520), Cape Breton (Districts 530 and 550), and the Atlantic Coast (Districts 830, 840 and 890) have the best examples. Pomquet Beach, Antigonish County, is the best provincial example of a prograding dune system. Management of sand dunes is an essential part of recreation-beach development. There are only a few sand dunes in the Bay of Fundy (for example, Apple River [Unit 532]).

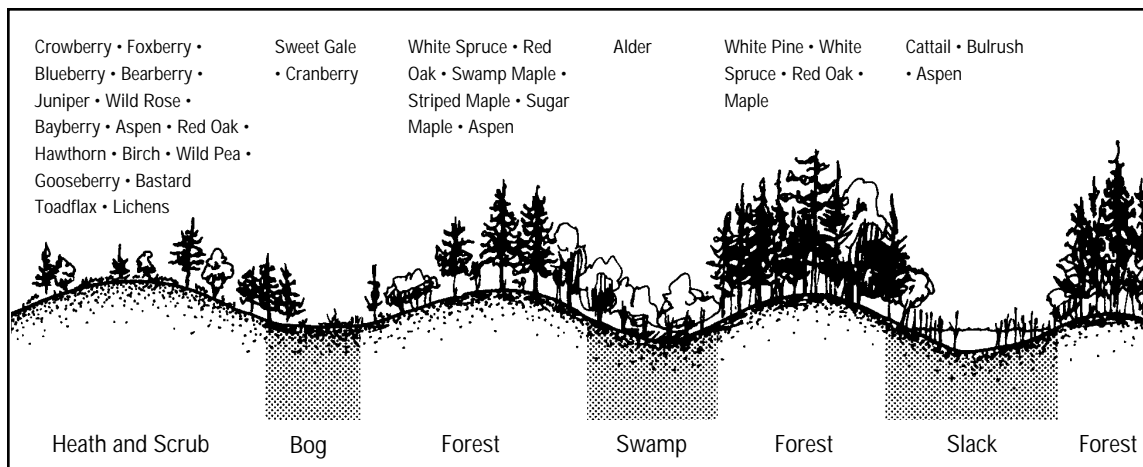


Associated Topics

T7.1 Modifying Forces, T7.3 Coastal Landforms, T10.2 Successional Trends in Vegetation, T10.5 Seed-bearing Plants, T10.11 Lichens, T12.7 The Coast and Resources

Associated Habitats

H2.3 Sandy Shore, H2.5 Tidal Marsh, H6.3 Mixedwood Forest



Additional Reading

- Hales, W. (1992) *Sand Dunes of Nova Scotia*. M.Sc. thesis, McMaster University, Hamilton, Ont.
- Institute for Environmental Studies (c. 1976) *Maintenance of Beaches: Technical Report*. Dalhousie University, Halifax.
- Taylor, R.B. and D. Frobel (1990) "Approaches and results of a coastal dune restoration program on Sable Island, Nova Scotia." Proceedings Canadian Symposium on Coastal Sand Dunes 1990. Atlantic Geoscience Centre, Geological Survey of Canada, Dartmouth.

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Plate H2.6.2: Freshwater Cattail marsh in a slack between wooded dune ridges inland from Pomquet Beach, Antigonish County (sub-Unit 521b). The photograph corresponds to the cross section at the far right of Figure H2.6.1. Photo: D. Davis