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CAPE COD VEGETATION

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Cape Cod, which is approximately coextensive with Barnstable County, Massachusetts, being practically the northernmost extension of the Atlantic coastal plain of North America, and easily accessible from several large centers of population and scientific activity, has attracted the attention of many botanists, past and present. There are innumerable references to Cape Cod plants in taxonomic and floristic works, but, strange to say, comparatively few papers relating primarily to the flora of the Cape, and still fewer that contain illustrations of the vegetation as such or give any idea of the relative abundance of the species.

The earliest work that deserves to be cited in this connection perhaps is Thoreau's book, "Cape Cod," first published in 1865 (after the author's death), and reprinted in various editions. It gives a very general idea of the aspects of nature, but devotes more space to people than to plants, although the author was well acquainted with the New England flora.

The only paper on the land plants of Barnstable County cited in Miss M. A. Day's list of New England local floras* is a short one by Walter Deane, entitled "A Few Cape Cod Plants" (Bot. Gaz. **14**: 45–47. 1889). This relates to the vicinity of Hyannisport, on the south side of the Cape. In the next few years after the publication of Miss Day's list several important papers on Cape Cod vegetation (as distinguished from mere flora*) appeared.

Dr. Arthur Hollick, in his "Geological and botanical notes: Cape Cod and Chappaquiddick Island, Mass." (Bull. N. Y. Bot.

* Rhodora 1: 158. 1899.

† For a discussion of the difference between vegetation and flora see Torreya 17: 1–3. 1917.

Garden 2: 381–407. April, 1902), gives a good account of the dune vegetation around Provincetown, at the tip of the Cape (pp. 389–397). Later in the same year Charles H. Shaw published a successional study of a different type of vegetation at the opposite extremity of the county, with several illustrations, entitled "The development of vegetation in the morainal depressions of the vicinity of Woods Hole" (Bot. Gaz. 33: 437–450, *figs. 1–6.* June, 1902). A criticism of this a few years later by H. H. Bartlett (Rhodora 11: 221–235. 1909) gives some additional details about the bog and marsh vegetation of that neighborhood.

Of quite different character is a valuable contribution by J. W. Blankinship on "The plant formations of eastern Massachusetts" (Rhodora 5: 124–137. 1903). But in that Cape Cod is only a part of the area treated, and no geographical boundaries are drawn, so that a distant reader has no way of knowing just which of the plants listed grow on the Cape and which do not.

A well-known government bulletin by J. M. Westgate, "Reclamation of Cape Cod sand dunes" (U. S. Bur. Plant Industry Bull. 65, with 38 pages and 6 plates. 1904), contains a brief description of the vegetation around Provincetown, with notes on the changes it has undergone since the country was first settled. The next year appeared a somewhat similar study of a small area on the other side of the Cape, and likewise mentioning only a few species, namely, "Reforestation at Woods Hole, Massachusetts,—A study in succession," by M. A. Chrysler (Rhodora 7: 121–129. *pl. 62, 63.* 1905).

The papers on Cape Cod plants in the next ten years were almost wholly floristic. In Rhodora for July, 1909, January, 1910, and February, 1911, are three interesting articles by F. S. Collins, written in narrative style, and mostly pertaining to the flora of Eastham, on the "lower Cape" (*i.e.*, that part north of the "elbow"). A year after the last one, E. W. Sinnott published a floristic and phytogeographical paper on "The pond flora of Cape Cod" (Rhodora 14: 25–34. Feb., 1912).

This seems to bring us down to the present time, omitting a few geological and geographical works, papers on algae, descriptions of

new species, and notes on selected species found on the Cape. None of the papers cited describe the vegetation of the Cape, except in very general or indefinite terms or for very small areas, or attempt to indicate what proportion of the total is made up by any one species. For example, it is difficult to ascertain from existing literature whether the commonest tree, *Pinus rigida*, occurs only as scattered individuals or in large forests like the pine-barrens of Long Island and New Jersey.

Before discussing the plants of the Cape it will be well to sketch their environment briefly. Cape Cod is a low but not flat peninsula, underlaid at least in part by Pleistocene strata and covered with glacial boulders, gravel, dune sand, marsh muck, etc., with a somewhat "oceanic" climate on account of being nearly surrounded by the Atlantic Ocean. It is remarkably similar to Long Island in soil, topography, vegetation, and various other features, a fact which seems to be seldom mentioned, perhaps because very few geographers have explored both areas. If one wished to go into such details, it could be divided into about five subdivisions or minor regions.* Near the mainland, on the so-called "upper Cape," hills, granite boulders, deciduous forests, orchards, and pastures are common, and the country does not look very different from some places far in the interior of Massachusetts; but toward the extremity it becomes more and more sandy and devoid of rocks, trees, and farms, and the last several miles near Provincetown are all dune formation.

Thoreau and other writers of his time describe the Cape as nearly destitute of trees, but there is considerable forest now, for two or three reasons. First, there are now railroads to bring coal from Pennsylvania, so that the inhabitants do not have to depend on wood to keep them from freezing in winter. Second, the rural population and the amount of farm land has diminished, as nearly everywhere in New England and near-by states, allowing forests to take possession of many abandoned fields.† Third, the process

* For a geographical sketch of the Cape, with bibliography, see A. P. Brigham, Geog. Review 10: 1–22. "July" [Sept.], 1920.

† See Journal of Forestry (Washington) 18: 442–452. (May) 1918.

of reforestation has been expedited in a few places by artificial planting of both native and exotic trees.

My first visit to Cape Cod was made in October, 1920, under very favorable circumstances. My life-long friend Clarence H. Knowlton, of Hingham, Mass., an amateur botanist and a frequent contributor to Rhodora, was about to make a business trip in his automobile the whole length of the Cape, and invited me to accompany him. In three days, the 13th, 14th and 15th, we passed through every one of the fifteen towns in Barnstable County, and as the roads were practically all of smooth asphalt, and our speed seldom exceeded 25 miles an hour, I was able to make legible notes practically every mile of the way. Although I had to keep my eyes on my notebook about half the time, and thus might have missed many interesting plants, Mr. Knowlton, who was already familiar with the ground, often called my attention to them. When he stopped in the towns, sometimes for an hour or more, I usually walked ahead and examined the vegetation near the road until overtaken; and at the more interesting places we both got out to reconnoiter.

In this way I secured a reasonably accurate census of the existing vegetation of the whole county, aside from the rarer species, those not recognizable in October, those chiefly confined to beaches and marshes, and the bryophytes and thallophytes (which, however, like the rare species, make up a very insignificant proportion of the total bulk of vegetation). But my notes are of course not complete enough yet for any one of the five or more geographical subdivisions (still less so for different habitats) to warrant treating them separately here; so that the following list is to be regarded as an average analysis of the native and naturalized plant covering of the whole Cape.

It is divided into trees, woody vines, shrubs, undershrubs, and herbs, and the species in each group arranged in approximate order of abundance, beginning with the most abundant (as has been my wont for about 15 years past), and omitting those seen only once. The names of evergreens are in heavy type, and of species believed not to be indigenous in parentheses. The normal mode of dissemi-

nation, where known, is indicated by more or less suggestive letters after the names, as follows: O, berries or other fleshy fruits; Q, acorns or other nuts; T, "tonoboles," a term coined by Clements to indicate plants with small dry seeds in erect capsules or receptacles borne on stiff stems which may be set in motion by the wind or passing animals; X, barbed fruits; and Y, wind-distributed fruits or seeds. (To get the proper sequence read the left-hand columns first.)

Trees

Pinus rigida Y
Quercus coccinea Q
Quercus alba Q
Acer rubrum Y
Quercus velutina Q
(*Robinia Pseudo-Acacia*) Y
Juniperus Virginiana O
Chamaecyparis thyoides
Betula populifolia Y
Nyssa sylvatica O
(*Prunus serotina*) O
Quercus stellata Q
Pinus Strobus Y
(*Populus alba*) Y
(*Sassafras variifolium*) O
(*Prunus Virginiana*) O

Woody Vines

Smilax rotundifolia O
Rubus hispidus O
Vitis Labrusca? O
Rhus radicans O

Shrubs

Gaylussacia baccata O
Quercus ilicifolia Q
*Comptonia peregrina**
Myrica Carolinensis
Prunus maritima O
Clethra alnifolia T
Rhus copallina O
Rhus typhina O
Viburnum dentatum O
Spiraea latifolia T
Rhus Vernix O
Vaccinium corymbosum O
Ilex glabra O
Viburnum cassinoides O
Rosa sp. O
Spiraea tomentosa T

* This appears to be absent from the dune area around Provincetown.

UNDERSHRUBS

Arctostaphylos Uva-ursi O
Hudsonia ericoides
Hudsonia tomentosa
Corema Conradii*

Natural opening full of *Hudsonia tomentosa* and *Cladonia* sp. (both small slow-growing plants) in small barren sandy hollow in northern part of Yarmouth. Trees nearly all *Pinus rigida*. Oct. 13.

HERBS

Andropogon scoparius Y
Pteris aquilina Y
Ammophila arenaria Y
Ionactis linariifolius Y
Deschampsia flexuosa Y
Baptisia tinctoria Y
Carex Pennsylvanica
(*Daucus Carota*) X
Lysimachia quadrifolia
(*Agrostis alba*?) Y
Solidago odora Y
Scirpus cyperinus Y
Chrysopsis falcata Y
(*Ambrosia artemisiifolia*)
(*Asclepias Syriaca*) Y
Scirpus Americanus
(*Plantago lanceolata*)
Euthamia tenuifolia Y
(*Leontodon autumnalis*) Y
Eriophorum Virginicum? Y

* Comparatively little has been published about the occurrence of this rather unique plant on Cape Cod. G. B. Emerson, in his classic report on the trees and shrubs of Massachusetts (1846), had no record of it from east of Plymouth, but Thoreau found it about that time in Provincetown and near Highland Light in Truro. J. H. Redfield, in summing up the known distribution of the species in 1884 (Bull. Torrey Bot. Club 11: 99), stated that Dr. Watson had seen it near Truro and one of the coves of Buzzard Bay. Dr. Hollick reported it from Provincetown in 1902 in the paper cited, and Mr. Collins (Rhodora 11: 128. 1909) mentioned it as frequent and showy in spring in Eastham. Mr. Knowlton showed me a considerable quantity of it beside the main road in the northern edge of Eastham.

Pinus rigida is at present more abundant than all other trees combined, and although some of it is known to have been planted, it is safe to assume that it was always the Cape's commonest tree. Evergreens are therefore in the majority among the trees. The great difference in evergreenness between shrubs and undershrubs is noteworthy, and probably due to the same cause as in Michigan, namely, the latter are protected by snow in winter.* Most of the vines and shrubs have berries, while wind-borne seeds are in overwhelming majority among the herbs. Tonoboles are nearly as scarce as in northern Michigan,* and barbed fruits rare and chiefly

Barren sandy plains in north edge of Eastham, with stunted *Pinus rigida* (mostly about six feet tall), and in the foreground *Corema*, which however does not show very plainly, because the light was poor. Oct. 14.

Persons familiar with Long Island vegetation will recognize at once that nearly all of these plants grow also on that island, with approximately the same relative abundance. Most of them are common also as far south as the mountains of Georgia. A list of plants common in the interior of New England and rare or absent on the Cape would be a long one, but the following are the most confined to weeds.

* See Bull. Torrey Club 45: 41. 1918.

conspicuous examples among the woody plants that occur to me: *Pinus Strobus, Tsuga, Juniperus depressa, Hicoria, Betula* spp., *Alnus, Fagus, Castanea, Quercus montana, Ulmus, Liriodendron, Rhus glabra, Tilia, Fraxinus.* (Where a generic name stands alone it means that no species of that genus is common on the Cape.)

Most of these probably prefer richer soils than the average of those on Cape Cod, while a few are partial to rocky places. The climate may be a little too warm for *Pinus Strobus,* for that is also comparatively scarce in Connecticut and almost unknown outside of cultivation on Long Island. Although I have not visited the Cape in spring, I would expect to find most of the handsome spring flowers that are characteristic of rich shady woods nearly throughout the eastern United States rare or absent there too.

Although few species may be added to the known flora of Cape Cod hereafter by floristic botanists, and most of the vegetation has been more or less altered by civilization, there are still many problems in plant sociology, demography, geography, and ecology there that will amply repay investigation by persons interested in such matters.

OBSERVATIONS ON THE SPORES OF *SCHIZOPHYLLUM COMMUNE*

J. F. Adams

This cosmopolitan fungus is classified in the white spore group of agarics. The hymenium appears to vary in color apparently depending on age. Young sporophores have flesh-colored hymenia, while in the more mature the color may be white to purplish cinereous.

In 1917 I* observed in cultures of mature sporophores that where the spores were shed in mass upon the agar surface they were pink or distinctly salmon in color. The mass of spores making forty spore prints from material collected in the field.

* Mem. Torrey Bot. Club 17: 326–333. 1918.