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eastern Penobscot Bay region,
Maine



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THE VASCULAR FLORA OF THE EASTERN PENOBSCOT BAY REGION, MAINE

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GENERAL FEATURES OF THE REGION

LOCATION

The Penobscot Bay region in Maine is situated on the coast about midway between the eastern and western boundaries of the state. Strictly speaking, the term, "Penobscot Bay", should be used only for that portion of the region lying at the mouth of the Penobscot River. In general, however, the name is applied to all the territory between the island of Mount Desert on the east and Rockland on the west. This area lies between meridians $68^{\circ} 25'$ and $60^{\circ} 2'$ west longitude and parallels 44° and $44^{\circ} 20'$ north latitude. It contains approximately 650 square miles, about half of which is water. Of the land, about one-quarter belongs to the mainland and the remainder to islands. The latter are very numerous and vary in size from the smallest ledges to some which contain as many as twenty-five square miles. (See map.)

It is with the eastern part of this region alone that we shall be concerned. This embraces the townships of Brooklin, on the mainland, and Deer Isle, Stonington, Swans Island, and

Isle au Haut, among the islands. With the exception of the latter, which is a part of Knox County, all these towns are in Hancock County.

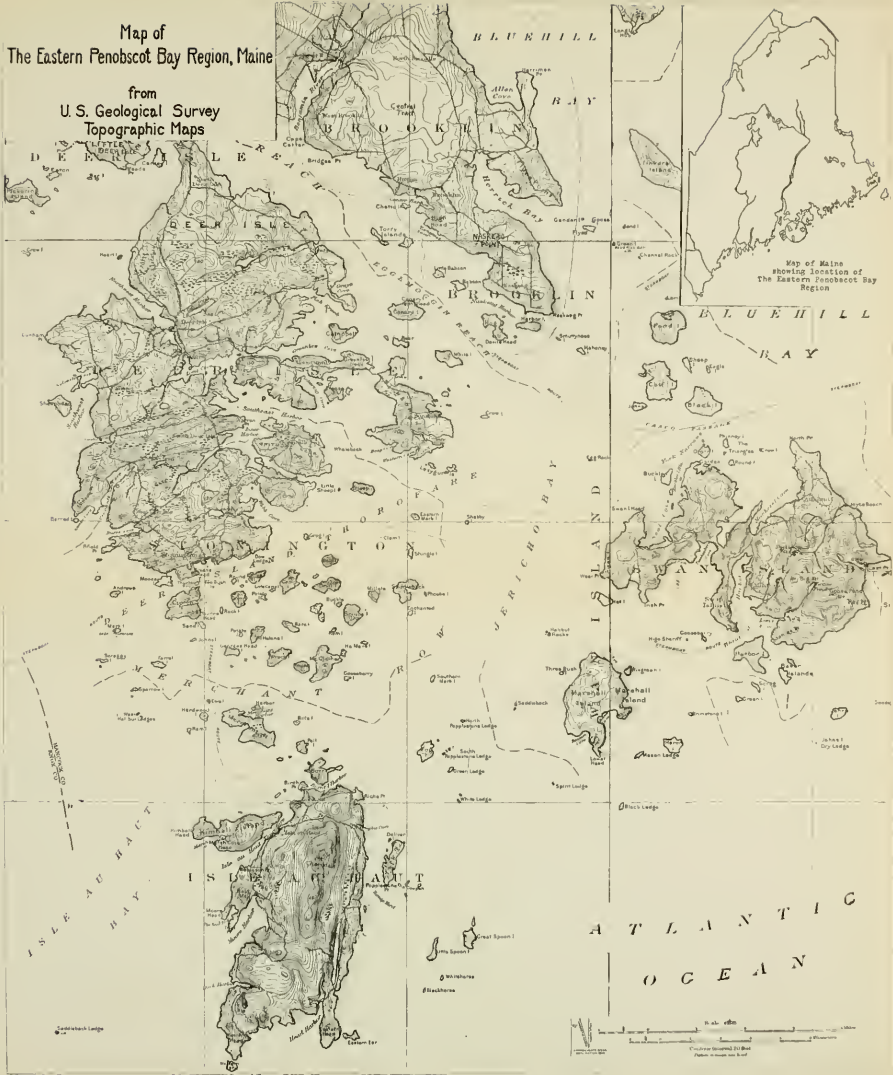
TOPOGRAPHY

In its topographical aspects the eastern Penobscot Bay region presents features more or less common to all that part of the coast of Maine which lies between Casco and Machias Bays. The great irregularity of the shore line, the presence of the numerous fjord-like indentations, the deep, narrow channels, and the innumerable islands are all characteristics of a drowned coast. In this type of topography a former land area has undergone submergence, the lower portions of the old river valleys becoming the bays and deep channels, and the hilly uplands giving rise to the many islands. The extreme irregularity of the contours of the present land areas, as well as of those now below the surface of the sea, has been caused by weathering and erosion, clearly in preglacial times. In fact, the entire region represents a peneplain worn down from former highlands by this constant denudation. As a result elevations of any considerable height are extremely rare. Only the few hills with a rock-structure resistant enough to withstand the general wearing down have persisted. Isle au Haut, so named by Champlain, one of the earliest explorers in this region, is one of these residual mountains, or monadnocks. Next to Mount Desert it is the highest island on the Atlantic coast¹ of the United States. Together with Mount Desert, and the Camden Hills on the mainland to the west, Isle au Haut constitutes the most conspicuous remnant of the old mountains formerly on

1. Shaler, N. S., *Geology of the Island of Mt. Desert*. 8th Ann. Report Dir. U. S. Geol. Survey, 1886-7, p. 994.

Map of
The Eastern Penobscot Bay Region, Maine

from
U. S. Geological Survey
Topographic Maps



Map of Maine
showing location of
The Eastern Penobscot Bay
Region

ATLANTIC
OCEAN

the shore. Because of the abruptness with which this island rises from the sea, its actual height of 556 feet is so magnified that the name of "mountain", locally applied to it, is almost justified.

The shores of the outer islands are for the most part rocky and abrupt, in many cases almost perpendicular. Sea cliffs and headlands occur, though never of any great height, wherever the shores are exposed to the constant buffeting of the waves, as on the south side of Swans Island and Isle au Haut. Beaches are common on Deer Isle and the mainland, where the surface is more level. Mud flats and salt marshes are found in tidal estuaries and other protected situations, especially in the shallower indentations. These marshes, however, are small in extent and comparatively scarce, a condition very different from that in more southern regions on the Atlantic coast.

The water courses of the region are very insignificant. At most they are small streams a few miles in length, and in the valleys usually obstructed by glacial drift. Ponds are fairly abundant and belong to three clearly defined types. The majority owe their existence to glacial activity, and these glacial ponds, with but one exception, can be further classed as morainal, a term used by Nichols¹ to distinguish those lakes "associated with accumulated glacial debris of any description." In the Penobscot Bay region such morainal ponds occupy the poorly drained depressions or occur along streams behind obstructions of glacial till. With them are universally associated peat bogs in all stages of development.

Long Pond on Isle au Haut is the only example of a rock basin or scoop lake, one which lies in a depression scooped out of the bed rock itself by the ice. Unlike the other ponds

1. Bull. Torr. Bot. Club, 42: 170 (1915).

this has rocky shores and no development of swamps or bogs about its margins.

The third type of pond is the brackish barrier beach pond, formed by the cutting off of some little indentation of the sea by the deposition of beach sands and gravels or of wave-worn rocks. They occur along the more shallow shores on the outer islands where opportunity is afforded for the necessary wave action. As in the case of the morainal ponds these show all stages of transition to swamps and uplands.

GEOLGY

The rocks¹ which underlie the eastern Penobscot Bay region are for the most part highly silicious and consequently acidic in nature.² Granite is exceedingly abundant, occupying fully three-quarters of the whole area, especially at the higher elevations. Most of the smaller islands are entirely made up of this rock, while on the larger, such as Swans Island and Deer Isle, there are areas many miles in extent. The second most abundant formation, particularly on the mainland and Deer Isle, is a sedimentary schist, "rich in micaceous minerals and quartz." On some of the outer islands there are small amounts of diorite, diabase, and gabbro. These vary in composition from a "quartz diorite only slightly different from granite to a much more basic rock." On the western side of Deer Isle and on Isle au Haut are found various volcanics, occurring as flows, breccias, pyroclastics, and other surface forms. Since these rocks,

1. Statements regarding the rocks of this region are taken from U. S. Geol. Survey, Penobscot Bay Folio 149.
2. If the chemical nature is considered, rocks are grouped as acidic (over 65% silica), basic (less than 55% silica), and intermediate (from 55%-65% silica). See Merrill, *Rocks, Rock Weathering and Soils*. New York. 1913; p. 59.

resulting from the lava flow of old volcanoes, are extremely susceptible to weathering, the ledges and cliffs thereabouts are carved into caves, pinnacles, and many fantastic shapes. The only other rock present in any abundance is serpentine, occurring in the form known as "black marble" in a large tract on the northern end of Deer Isle. This section, it is interesting to note, is the most fertile in the whole area, a condition directly opposed to that in most serpentine regions. As will be shown later, it is the sole habitat for a few of the common plants of richer soils, plants which for the most part are absent from the rest of the region, since in the sterile acid soils which prevail elsewhere they are unable to find the necessary conditions for their existence.

Unlike conditions in most glaciated districts the rock structure still controls the topography of the Penobscot Bay region, for the surface covering is very meagre and indeed entirely lacking from the higher places. The soils which do occur are chiefly of glacial origin, although there are a few post-glacial deposits. The glacial drift or till, made up of sands and gravels, is thin and irregularly distributed, occurring more abundantly in the valleys. These deposits represent the coarser parts of the sediment which was brought down by the ice and deposited on the land. The finer portions, on the other hand, were carried on into the ocean and laid down as clay. Most of the present lowlands of the region have a covering of this very fine grained marine clay, but above the 125 foot level and on the steeper slopes this deposit is lacking. Wherever it occurs the clay is a conspicuous feature of the landscape, for when dry it forms a light gray dust which covers the vegetation, and when wet it turns to a very sticky mud.

Directly following the Glacial period, during which the

foregoing surface deposits were laid down, there took place a period of submergence when the whole coast stood at a much lower elevation than at present. Shaler¹ gives three features as criteria of submergence: (1) the remains of marine animals in stratified drift; (2) the existence of stratified deposits of sands and gravels where their formation could not be attributed to fresh water lakes; and (3) a topography above high tide level due to marine action. Evidence along these lines is present in the Penobscot Bay region, but since Shaler himself states that the second is the only really acceptable evidence, that alone will be considered. On Isle au Haut beach gravels occur up to a height of 225 feet,² but above 250 feet no wave-washed stones have been found. This would indicate that the land was submerged to a depth of between 240 and 250 feet. In addition the till on the faces and angles of the hills and on the smaller islands has been extensively denuded, a phenomenon which must be referred to marine action. The above facts show that upon the withdrawal of the ice from the immediate vicinity the sea must have stood some 240 feet above its present level, and consequently much of the present land area was under water and the rest extremely isolated. Although this condition existed to some extent along the rest of the coast it must have been particularly marked in the Penobscot Bay region, because of the extreme irregularity of the shore line at this point. Both the submergence and the isolation would lead to a limitation of the flora which could reach these areas while on its northward migration after the Glacial epoch.

From its submerged condition the land has risen by a

1. Recent Changes of Level on the Coast of Maine. Mem. Bost. Soc. Nat. Hist., Vol. II, Part III, No. III, 1874.
2. See Stone, G. H., Mon. U. S. Geol. Surv., Vol. 34, 1889, p. 48.

series of uplifts, some longer than others, to its present elevation—a movement which may still be in progress. The present period of relative quiescence, however, seems to have been much longer than any of the preceding halts in the process, and there is considerable speculation as to whether the coast line may not be stationary at the present time or even slowly sinking again. Owing to the rocky nature of the shores evidence on this point is extremely slight, and the little that does exist is so controlled by local conditions as to be worthless in a consideration of the general problem. Indeed, conditions in one locality point toward the subsidence theory, while in others exactly the opposite is the case.

The post-glacial history of the region is as yet very brief. Only a few deposits are present, chiefly beach sands and gravels, swamp muck and peat. As the ocean is constantly eroding the bed-rock and the till and clay, parts of this weathered material are deposited at low elevations in shallow indentations as sand or gravel beaches or as mud flats. On the outer islands where the shores are rocky the beaches are formed, and inland, where the surficial deposits are within reach of the waves, mud flats are the rule. Sandy beaches are rare enough to be curiosities, occurring only along the shores of a very shallow bay on the southern side of Swans Island.

As has been stated previously, the swamp muck and peat have developed in the poorly drained depressions on level surfaces. Here their work of converting the ponds and swamps into dry land is constantly going on.

CLIMATE

It is not to be expected that climatic factors, which are operative only in broad areas, could render conditions in the

Penobscot Bay region any different from those in the rest of northern New England; and such is the case. The climate in this district is essentially that of any moist north temperate area, with warm days and cool nights during the summer. As is usual in coastal regions, however, the proximity of the ocean brings about a much more equable climate than is found inland, and this has an effect on the vegetation in that the growing season is prolonged. Data from three U. S. Weather Bureau stations on the coast (Eastport, Bar Harbor, Portland) for five years, 1909-1913, show an average growing season of 162 days, while a similar average for inland stations (Orono, Millinocket and Greenville) is only 111 days. Although the precipitation records show very few variations throughout the state as regards the actual rainfall, the coast of Maine, particularly from Eastport to Penobscot Bay, owing to the prevalence of fogs, is in summer an exceptionally moist area. The fogs, caused by the meeting off shore of the warm waters of the Gulf Stream and the icy waters of the Arctic Current, are almost constantly present. Situated at the entrance to the Bay of Fundy, the "fog factory," as it is called, Eastport shows a response to the excessive moisture in that it has a lower temperature in summer than any other station in the state for which records are available. The same condition occurs in the Penobscot Bay region, but no official records are available. The constant dampness of the atmosphere, together with the effect of the cold water which washes the shores, creates conditions along the outer islands and coast very similar to those in more arctic regions, and thus affords a habitat for arctic plants. This boreal region extends from Eastport to Penobscot Bay and even beyond, but it is much less marked west of our area.

PREVIOUS BOTANICAL WORK

Although the island of Mount Desert, on the eastern border of the Bay, and several regions to the westward have been carefully studied botanically, the Penobscot Bay section of the Maine Coast has been much neglected.

Previous to 1908 only desultory collections were made. Francis L. Harvey, Ora W. Knight and others of the Maine botanists made occasional trips among the islands, and a few of their plants, together with scattering specimens obtained by summer visitors, have found their way into various herbaria.

In 1908 Professor Arthur H. Graves made a study of the woody plants at Brooklin¹ and collected specimens, now deposited in the herbarium of Yale University. More recently Mr. Arthur H. Norton has collected extensively along the Maine coast², and a few specimens from eastern Penobscot Bay are to be found among his plants in the herbarium of the Portland Society of Natural History.

Several private collections have been made in the region, notably that of Mr. Nathaniel T. Kidder in the vicinity of Isle au Haut. Professor J. C. Arthur of Purdue University spent several seasons on the latter island and, although he collected but few specimens, he recorded 315 species as occurring in that locality. No systematic study of the flora, however, has been made until the present investigation.

ACKNOWLEDGMENTS

I wish at this time to express my indebtedness to Professor Merritt L. Fernald, who has kindly verified the majority of

1. Graves, A. H. Woody Plants of Brooklin, Maine. *Rhodora* 12: 173-184 (1910).
2. Norton, A. H. Some Noteworthy Plants from the Islands and Coast of Maine. *Rhodora* 15: 137-143 (1913).

determinations of specimens; to Professor Karl M. Wiegand, Doctor Ezra Brainerd, and Mr. F. Tracy Hubbard, who have kindly identified certain perplexing genera: to the curators of the Gray Herbarium and the herbarium of the Portland Society of Natural History, who have extended every courtesy to me in placing the collections under their charge at my disposal; and to Professor J. C. Arthur, Mr. Nathaniel T. Kidder, Mr. Charles L. Curtis and all others who at various times have given invaluable assistance in the securing of data or the collection of the specimens themselves.

THE VASCULAR PLANTS OF THE REGION

In the following list of the vascular plants of the eastern Penobscot Bay region in Maine, the nomenclature of the Pteridophyta follows Christensen's *Index Filicum*¹; while that of the Spermatophyta follows the Seventh Edition of Gray's *Manual*², save where new species or varieties and nomenclatorial changes have been made since its publication. In the latter instances, wherever possible, the manual name is given in brackets.

The records are based for the most part on specimens collected by the writer, a complete set of which has been deposited in the herbarium of the New England Botanical Club. Further records made by other collectors, are included whenever they are corroborated by herbarium specimens. Among these may be mentioned the collections of Graves³, Kidder, and Norton⁴, referred to previously. In

1. Christensen, C. *Index Filicum*. Copenhagen. 1906.
2. Robinson, B. L., and Fernald, M. L., *Gray's New Manual of Botany*, Ed. 7. New York. 1908.
3. Deposited in the herbarium of Yale University.
4. Deposited in the herbarium of the Portland Society of Natural History.

addition a few plants are listed of which no specimen has been seen, but which appear in well-authenticated lists, such as Arthur's unpublished list of Isle au Haut plants. These latter records are denoted by an asterisk (*).

DIVISION I

PTERIDOPHYTA

POLYPODIACEAE

ONOCLEA SENSIBILIS L. Very common in wet places. Variable in form, often approaching var. *obtusilobata* (Schkuhr.) Torr.

DRYOPTERIS THELYPTERIS (L.) Gray. [*Aspidium Thelypteris* (L.) Sw.] Common in swampy meadows and bogs.

DRYOPTERIS NOVEBORACENSE (L.) Gray. [*Aspidium noveboracense* (L.) Sw.] Common in moist open woods and along roadsides.

DRYOPTERIS MARGINALIS (L.) Gray. [*Aspidium marginale* (L.) Sw.] Rich woods near Lily Pond, South Deer Isle (No. 3070).

DRYOPTERIS CRISTATA (L.) Gray. [*Aspidium cristatum* (L.) Sw.] Abundant in wet woods.

DRYOPTERIS SPINULOSA (Müll.) Kuntze. [*Aspidium spinulosum* (O. F. Müller) Sw.] Very common in wet woods and thickets.

var. *INTERMEDIA* (Muhl.) Underw. [*Aspidium spinulosum*, var. *intermedium* (Muhl.) Eaton.] Abundant in similar situations.

var. *AMERICANA* Fernald.¹ [*A. spinulosum* var. *dilatatum* of Am. auth., not Hook.] Moist woods, Brooklin (No. 1791); Isle au Haut (No. 1708).

1. *Rhodora* 17: 48 (1915).

- DRYOPTERIS PHEGOPTERIS (L.) C. Chr. [*Phegopteris polypodioides* Fée.] Common in cool rich woods.
- DRYOPTERIS LINNAEANA C. Chr. [*Phegopteris Dryopteris* (L.) Fée.] Abundant in damp woods.
- DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore. [*Dicksonia punctilobula* (Michx.) Gray.] Abundant in open woods and fields, often growing in dense colonies several rods in diameter.
- ATHYRIUM FILIX-FEMINA (L.) Roth. [*Asplenium Filix-femina* (L.) Bernh.] Common in moist woods and thickets.
- ASPENIUM TRICHOMANES L. Crevices of serpentine cliff, Little Deer Isle, Deer Isle (No. 2580).
- ADIANTUM PEDATUM L. Rich moist woods on serpentine, Reach, Deer Isle (Nos. 1945, 2613). Although common in the western and northern parts of the state and in adjacent Canada, the maiden hair fern has not been reported previously from the coast, east of the Kennebec River.
- PTERIDIUM AQUILINUM (L.) Kuhn. [*Pteris aquilina* L.] Very common in dry open woods and clearings.
- WOODSIA ILVENSIS (L.) R. Br. Crevices of serpentine ledges and cliffs, Little Deer Isle, Deer Isle (No. 2596).
- POLYPODIUM VULGARE L. Occasional on ledges or in rocky woods.

OSMUNDACEAE

- OSMUNDA REGALIS L. Occasional in wet woods, swamp margins or thickets.
- OSMUNDA CLAYTONIANA L. Common everywhere in low ground.

OSMUNDA CINNAMOMEA L. Abundant in swampy meadows and wet woods.

OPHIOGLOSSACEAE

OPHIOGLOSSUM VULGATUM L. Deer Isle (A. H. Norton).

BOTRYCHIUM SIMPLEX E. Hitchcock. Rich woods, Gray's Cove, Reach, Deer Isle (No. 2765).

BOTRYCHIUM RAMOSUM (Roth) Aschers. Sunny hillside on serpentine, Little Deer Isle, Deer Isle (C. L. Curtis).

BOTRYCHIUM OBLIQUUM Muhl. Infrequent. Dry open woods, fields and pastures.

EQUISETACEAE

EQUISETUM ARVENSE L. Common in moist, sandy or gravelly places.

EQUISETUM SYLVATICUM L. Frequent in moist woods and shaded spots.

EQUISETUM FLUVIATILE L. Rare. Shallow water. muddy shore of Torrey Pond, Deer Isle (Nos. 1987, 2564).

LYCOPODIACEAE

LYCOPODIUM SELAGO L. Rich cool woods on serpentine, Reach, Deer Isle (No. 1592). An unusual station for this arctic-alpine species of cold bogs and exposed situations.

LYCOPODIUM LUCIDULUM Michx. Occasional in low wet mossy woods.

LYCOPODIUM INUNDATUM L. Abundant on sphagnum mat, Stockbridge Pond, Swans Island (No. 2323); Marshall's Island (A. H. Norton).

LYCOPODIUM ANNOTINUM L. Common in dry woods.

var. ACRIFOLIUM Fernald¹. Dry open woods, Naskeag Point, Brooklin (Nos. 1429, 2999); damp woods on Jerusalem Mt., Isle au Haut (No. 1183).

LYCOPODIUM CLAVATUM L. Very common in dry open woods.

var. MEGASTACHYON Fernald & Bissell² [var. *monostachyon* Grev. & Hook]. Similar situations, Naskeag Point, Brooklin (No. 3003); Seal Cove, Swans Island (No. 2661); Dunham's Point, Deer Isle (Nos. 2215, 2815).

LYCOPODIUM OBSCURUM L. Abundant in rich woods. This species, the most frequent of the club mosses, is extremely variable, showing all gradations to var. *dendroideum* (Michx.) D. C. Eaton.

var. DENDROIDEUM (Michx.) D. C. Eaton. Occasional in rich woods.

LYCOPODIUM COMPLANATUM L., var. FLABELLIFORME Fernald. Occasional in open woods. Naskeag Point, Brooklin (No. 235); Little Deer Isle, Deer Isle (No. 2592); Greenlaw District, Deer Isle (No. 2835).

LYCOPODIUM TRISTACHYUM Pursh. Dry woods near Lily Pond, South Deer Isle (No. 3069); Central Tract, Brooklin (A. H. Graves); Naskeag Point, Brooklin (Miss Tyler).

SELAGINELLACEAE

SELAGINELLA RUPESTRIS (L.) Spring. Dry serpentine cliffs and outcrops, Little Deer Isle, Deer Isle (No. 2594).

1. *Rhodora* 17: 124 (1915).
2. *Rhodora* 12: 53 (1910).

DIVISION II

SPERMATOPHYTA

TAXACEAE

TAXUS CANADENSIS Marsh. Occasional in deep wet woods.

PINACEAE

PINUS STROBUS L. Frequent in dry woods. Formerly this tree was much more abundant but it has been almost exterminated by lumbermen. A few large specimens are to be found in the deeper woods, but usually the trees are young and only a few feet (10-20) in height.

PINUS RIGIDA Mill. Occasional on barren soil. The pitch pine, which is at almost its northern limit, is usually found only in small isolated areas. However, on the sterile slopes and summit of Mt. Champlain, Isle au Haut, it is very abundant.

PINUS RESINOSA Ait. Infrequent. Near Sedgwick road, Brooklin (A. H. Graves); dry barren soil, North Deer Isle (No. 2789); *Isle au Haut (N. T. Kidder).

LARIX LARICINA (DuRoi) Koch. Abundant in wet woods and sphagnum bogs.

PICEA CANADENSIS (Mill.) BSP. Common on uplands.

PICEA RUBRA (DuRoi) Dietr. Very abundant on uplands. This species together with the preceding and *Abies balsamea* make up the bulk of the forests of this region. Stunted specimens are common on the outer headlands and on Mt. Champlain, Isle au Haut.

PICEA MARIANA (Mill.) BSP. Frequent in sphagnum bogs.

ABIES BALSAMEA (L.) Mill. Abundant on uplands.

TSUGA CANADENSIS (L.) Carr. Very rare. Low woods, Gray's Cove, Deer Isle (No. 2190); Flyes Point, Brooklin (A. H. Graves).

THUJA OCCIDENTALIS L. Frequent in wet swampy woods.

JUNIPERUS COMMUNIS L., var. *DEPRESSA* Pursh. Abundant in dry sterile fields.

JUNIPERUS HORIZONTALIS Moench. Common on rocky headlands on the outer islands but rare inland. Dry fields, Naskeag Point, Brooklin (Miss Gilbert); Flyes Point, Brooklin (A. H. Graves).

TYPHACEAE

TYPHA LATIFOLIA L. Frequent in swamps and pond margins.

SPARGANIACEAE

SPARGANIUM AMERICANUM Nutt. Occasional on muddy pond shores and along streams. Deer Isle and Isle au Haut.

var. *ANDROCLADUM* (Engelm.) Fernald & Eames. Occurring with the typical form.

SPARGANIUM DIVERSIFOLIUM Gracbner. Rare. In shallow water, muddy shores of Lily Pond, South Deer Isle, Deer Isle (No. 1848); ditches in swampy meadow, North Brooklin (No. 2909).

var. *ACAULE* (Beeby) Fernald & Eames. Muddy bog hole in pasture, Brooklin (No. 1030); North Brooklin (No. 2909a).

**SPARGANIUM MINIMUM* Fries. Infrequent. Isle au Haut (J. C. Arthur).

NAJADACEAE

POTAMOGETON NATANS-L. Floating in deep water. Torrey Pond, Deer Isle (No. 2560a).

POTAMOGETON OAKESIANUS Robbins. Common in ponds in sphagnum bogs.

POTAMOGETON BUPLEUROIDES Fernald. Shallow water at edge of brackish pond, Otter Ponds, Swans Island (No. 2341).

POTAMOGETON DIMORPHUS Raf. Rare. Torrey Pond, Deer Isle (No. 1989).

RUPPIA MARITIMA L., var. LONGIPES Hagström.¹ Brackish ponds, Swans Island.

ZOSTERA MARINA L. Abundant in shallow water on muddy shores, usually below low tide level.

JUNCAGINACEAE

TRIGLOCHIN MARITIMA L. Common on muddy shores and in salt marshes.

ALISMACEAE

SAGITTARIA LATIFOLIA Willd. Rare. Shallow water, shores of Torrey Pond, Deer Isle (No. 1964). Variable, showing transitions to forma OBTUSA (Muhl.) Robinson (No. 1968), and forma GRACILIS (Pursh) Robinson (No. 1966).

*SAGITTARIA GRAMINEA Michx. Isle au Haut (N. T. Kidder).

GRAMINEAE

PANICUM CAPILLARE L. Rare. Clearing in dry woods, Brooklin (No. 1787).

PANICUM PHILADELPHICUM Bernh. Dry woods near Sunset, Deer Isle (No. 1865).

1. Botaniska Notiser (1911) 138. See Fernald, M. L., and Wiegand, K. M., Rhodora 16: 119-127 (1914).

PANICUM WERNERI Scribn. Common in open woods, clearings and along roadsides near serpentine quarry, North Deer Isle, Deer Isle.

PANICUM BOREALE Nash. Occasional in damp fields.

PANICUM HUACHUCAE Ashe. Dry clearings in rich woods, North Deer Isle (Nos. 2002, 2600).

var. FASCICULATUM (Torr.) Hubbard.¹ [var. *silvicola* Hitchc. & Chase.] Common everywhere in dry woods and clearings.

PANICUM IMPLICATUM Scribn. Abundant in meadows and dry fields.

PANICUM SUBVILLOSUM Ashe. Rare. Clearings and open woods, Brooklin.

ECHINOCHLOA CRUGALLI (L.) Beauv. Frequent in waste places and cultivated ground.

SETARIA GLAUCA (L.) Beauv. Rare. A weed in cultivated ground at Naskeag Point, Brooklin (No. 1372).

SETARIA VIRIDIS (L.) Beauv. Occasional in cultivated ground and waste places. Shore of Mill Pond, Deer Isle (No. 2212).

SETARIA ITALICA (L.) Beauv. subsp. STRAMINEOFRUCTA Hubbard, var. HOSTII Hubb., subvar. METZGERI (Körn.) Hubb.² Escaped from cultivation. Locally abundant at several places on Naskeag Point, Brooklin.

PHALARIS ARUNDINACEA L., var. PICTA L. Commonly cultivated and often an escape. Roadside thickets on Sedgwick—North Brooklin road, Brooklin.

1. *Rhodora* 14: 171 (1912).

2. *American Journal of Botany* 2: 191 (1915).

ANTHOXANTHUM ODORATUM L. Very common in meadows and fields. A peculiar autumnal form with long densely pilose leaves was collected in a dry clearing on Isle au Haut (No. 2433).

HIEROCHLOA ODORATA (L.) Wahlenb., var. FRAGRANS (Willd.) Richter.¹ Frequent in salt marshes and brackish meadows.

ORYZOPSIS ASPERIFOLIA Michx. Occasional in dry woods and clearings, Deer Isle.

BRACHYELYTRUM ERECTUM (Schreb.) Beauv. Frequent in low woods. Swans Island and Deer Isle.

PILEUM PRATENSE L. Abundant in fields, roadsides and cultivated ground.

SPOROBOLUS UNIFLORUS (Muhl.) Scribn. & Merr. Moist, open woods, North Brooklin (No. 2902); *Isle au Haut (J. C. Arthur).

AGROSTIS ALBA L. Abundant everywhere in meadows and fields.

var. VULGARIS (With.) Thurb. Common in all open places. This variety and the typical form are the most abundant of the wild meadow grasses used for hay.

var. ARISTATA Gray. Rare. Shaded bank of brook near Herricks Bay, Brooklin (No. 1109).

var. MARITIMA (Lam.) G. F. W. Mey. Frequent in salt marshes and brackish meadows.

AGROSTIS HYEMALIS (Walt.) BSP. Common in clearings and dry fields.

AGROSTIS PERENNANS (Walt.) Tuckerm. Occasional in moist woods or meadows.

1. *Plantae Europaeae* 1: 31 (1890). See Fernald, M. L., *Rhodora* 19: 152 (1917).

AGROSTIS CANINA L. Rare. Wet meadow at Swans Island Head, Swans Island (No. 756), apparently perfectly naturalized.

CALAMAGROSTIS CANADENSIS (Michx.) Beauv. Common in wet places, especially near the shore.

AMMOPHILA AREXARIA (L.) Link. Occasional. Sandy beaches on south side of Swans Island; shores of Flyes Island and Naskeag Point, Brooklin.

CINNA LATIFOLIA (Trev.) Griseb. Frequent in moist open woods.

TRISETUM SPICATUM (L.) Richter, var. MOLLE (Michx.) Piper.¹ Common on rocky headlands, Greenlaw's Neck, Deer Isle (No. 2807); dry open woods, Naskeag Point, Brooklin (No. 2980).

DESCHAMPSIA FLEXUOSA (L.) Trin. Common on headlands, exposed summits and in dry clearings. A very delicate form is occasionally found in moist woods.

AVENA SATIVA L. Frequent along roadsides and in waste places and cultivated ground.

DANTHONIA SPICATA (L.) Beauv. Very abundant in all open sterile localities. This species and *Festuca rubra* are the common grasses on headlands, exposed outcrops and other places where the soil covering is very thin.

DANTHONIA COMPRESSA Aust. Occasional on headlands or in sterile soil elsewhere.

SPARTINA MICHXAUXIANA Hitchc. Frequent at the edge of beaches or in salt marshes.

SPARTINA ALTERNIFLORA Loisel.² [*Spartina glabra* Muhl.,

1. Contrib. U. S. Nat. Herb. 11: 125 (1906). See Fernald, M. L., *Rhodora* 18: 195-198 (1916).

2. Fl. Gall. 2: 719 (1807). See Fernald, M. L., *Rhodora* 18: 178 (1916).

var. *alterniflora* (Loisel.) Merr.] Common on muddy beaches and along the edge of salt marshes.

SPARTINA PATENS (Ait.) Muhl. Abundant in salt marshes and occasionally on beaches.

DACTYLIS GLOMERATA L. Occasional in fields. Naskeag Point, Brooklin.

POA ANNUA L. Occasional in ruderal ground.

POA COMPRESSA L. Common in dry sterile soil, usually in the open. Occasionally found on sandy beaches.

POA GLAUCA Vahl. Rare. Damp rich woods near serpentine quarry, North Deer Isle (No. 2609). This plant needs further study but seems to approach most closely this species.

POA TRIFLORA Gilib. Frequent in wet meadows and along streams.

POA PRATENSIS L. Common in fields and pastures.

GLYCERIA OBTUSA (Muhl.) Trin. Rare. Swampy margin of Lily Pond, South Deer Isle (No. 1850).

GLYCERIA CANADENSIS (Michx.) Trin. Very abundant in swamps and wet meadows.

GLYCERIA LAXA Scribn. Frequent in swamps.

GLYCERIA NERVATA (Willd.) Trin. Common in moist woods and fields.

PUCCINELLIA PAUPERCUA (Holm) Fernald & Weatherby.
var. *ALASKANA* (Scribn. & Merr.) Fernald & Weatherby.¹
Abundant on beaches and in brackish meadows. Very variable in size.

1. Rhodora 18: 18 (1916).

FESTUCA RUBRA L. Very abundant in dry sterile soil.

FESTUCA ELATIOR L. Wet swampy woods, Naskeag Point, Brooklin; swampy roadsides, Reach, Deer Isle (No. 2155); *Isle au Haut (J. C. Arthur).

BROMUS CILIATUS L. Occasional in wet thickets or roadside ditches.

AGROPYRON REPENS (L.) Beauv. Very common on beaches and occasional in fields or along roadsides. In the former habitat at least this species appears indigenous. Occurring in many forms.

var. PILOSUM Scribn.¹ Occasional on muddy shores on the outer islands.

HORDEUM JUBATUM L. Frequent at the edge of beaches. Deer Isle and Isle au Haut.

HORDEUM VULGARE L. Occasional. Roadsides and waste places.

ELYMUS VIRGINICUS L. Common along shores.

var. HIRSUTIGLUMIS (Scribn.) Hitchc. Occasional in clearings and open woods.

ELYMUS ARENARIUS L., var. VILLOSUS E. Mey.² Abundant on beaches and rocky shores. In this region this species replaces *Ammophila arenaria* as the most common grass on beaches.

CYPERACEAE

DULICHNUM ARUNDINACEUM (L.) Britton. Occasional in swampy meadows or on pond shores.

ELEOCHARIS OBTUSA (Willd.) Schultes. Common in muddy ditches and bog-holes in meadows.

1. Fl. Mt. Des. Isl., 183 (1894).

2. Pl. Labrador 20 (1830). See St. John, H., *Rhodora* 17: 98-103 (1915).

ELEOCHARIS PALUSTRIS (L.) R. & S. Occasional on swampy shores, either fresh or brackish.

var. GLAUDESCENS (Willd.) Gray. Boggy meadow near Swans Island Head, Swans Island (No. 735).

ELEOCHARIS ACICULARIS (L.) R. & S. Rare. Muddy shore of Lily Pond, Deer Isle (No. 2579).

ELEOCHARIS TENUIS (Willd.) Schultes. Frequent in wet ground.

SCIRPUS AMERICANUS Pers. Infrequent. Brackish shores of the Otter Ponds, Swans Island (No. 1557); Isle au Haut (Miss Furbish, in Herb. N. E. Bot. Club).

SCIRPUS VALIDUS Vahl. Occasional in shallow water of ponds. Torrey Pond, Deer Isle (No. 1979); Long Pond, Isle au Haut (J. C. Arthur); barrier beach pond, Red Point, Swans Island (No. 2878).

SCIRPUS CAMPESTRIS Britton, var. PALUDOSUS (A. Nelson) Fernald. Abundant on brackish muddy shores and on salt marshes.

var. NOVAE-ANGLIAE (Britton) Fernald. Occasional in brackish pools. Flyes Point, Brooklin (No. 1348); Gray's Cove, Deer Isle (No. 1942).

SCIRPUS RUBROINCTUS Fernald. Rare. Swampy meadow near Duck Harbor, Isle au Haut (No. 1639).

*SCIRPUS ATROVIRENS Muhl. Isle au Haut (J. C. Arthur).

SCIRPUS GEORGIANUS Harper. Frequent in wet ground.

SCIRPUS CYPERINUS (L.) Kunth. Rare. Marshy ground near Rich's Cove, Isle au Haut.

var. PELIUS Fernald. Common in wet meadows and swamps.

var. CONDENSATUS Fernald. Swampy margin of Long Pond, Isle au Haut (No. 3055).

- SCIRPUS PEDICELLATUS Fernald. Infrequent. Isle au Haut; Swans Island (Miss Furbish, in Herb. N. E. Bot. Club).
- SCIRPUS ATROCINCTUS Fernald. Abundant in bogs and swampy places.
- ERIOPHORUM CALLITRIX Cham. Common in sphagnum bogs. Deer Isle and Swans Island.
- ERIOPHORUM TENELLUM Nutt. Frequent in bogs and wet meadows.
- ERIOPHORUM VIRIDI-CARINATUM (Engelm.) Fernald. Rare. Boggy meadow on Kimballs Island, Isle au Haut (No. 1619).
- ERIOPHORUM VIRGINICUM L. Abundant in sphagnum bogs and swamps.
- RYNCHOSPORA FUSCA (L.) Ait. f. Rare. Sphagnum bog at Stockbridge Pond, Swans Island (No. 1537).
- RYNCHOSPORA ALBA (L.) Vahl. Very common in sphagnum bogs.
- CLADIUM MARISCOIDES (Muhl.) Torr. Rare. Shallow water at outlet of Torrey Pond, Deer Isle (No. 1978).
- CAREX SCOPARIA Schkuhr. Abundant everywhere in dry soil.
- var. MONILIFORMIS Tuckerm. Occasional in similar localities.
- var. CONDENSA Fernald. Common in dry soil.
- CAREX CRAWFORDII Fernald. Frequent in dry fields.
- var. VIGENS Fernald. Dry pasture, Flies Island, Brooklin (No. 2988).
- CAREX STRAMINEA Willd. Dry rich woods, Gray's Cove, Reach, Deer Isle (No. 2758).

CAREX HORMATHODES Fernald. Frequent on brackish shores. Swans Island and Brooklin.

var. INVISA (W. Boott) Fernald. Rare Brackish soil, Warren Point, South Deer Isle (No. 864).

CAREX FOENEA Willd. Dry fields and meadows, Torrey Island, Eggemoggin Reach, Brooklin (No. 2848).

*CAREX ADUSTA Boott. Isle au Haut (J. C. Arthur).

CAREX EXILIS Dewey. Infrequent in sphagnum bogs. Swans Island and Isle au Haut.

CAREX ECHINATA Murr.¹ [*Carex stellulata* Good.] Occasional in low ground.

var. ORMANTHA Fernald.² [*C. stellulata* Good., var. *ormantha* Fernald.] Rare. Swampy meadow, Dunham's Point, Deer Isle (No. 2233).

var. EXCELSIOR (Bailey) Fernald.² [*C. stellulata* Good., var. *excelsior* (Bailey) Fernald.] Rare. Sphagnum bog, Naskeag Point, Brooklin (No. 1458).

var. CEPHALANTHA Bailey.³ [*C. stellulata* Good., var. *cephalantha* (Bailey) Fernald.] Abundant in bogs and meadows.

var. ANGUSTATA (Carey) Bailey.³ [*C. stellulata* Good., var. *angustata* Carey.] Common in moist woods and low ground.

CAREX STERILIS Willd. Common in sphagnum bogs.

CAREX CANESCENS L. Rare. Wet meadow near Swans Island Head, Swans Island (No. 755); sphagnum bog, Central Tract, Brooklin (No. 1048).

1. Prodr. Fl. Goth. 76 (1770). See Fernald, M. L., *Rhodora* 19: 154 (1917).

2. Proc. Am. Acad. 37: 483, 484 (1902).

3. Mem. Torr. Bot. Club 1: 58, 59 (1889).

- var. *SUBLIOLIACEA* Laestad. Swampy woods, East Point, Swans Island (No. 2887).
- var. *DISJUNCTA* Fernald. Very common in wet meadows and bogs.
- CAREX BRUNNESCENS* Poir. Abundant in dry woods and fields.
- CAREX TRISPERMA* Dewey. Frequent in sphagnum bogs.
- var. *BILLINGSII* Knight. Occasional. Bog at Torrey Pond, Deer Isle (Nos. 2179, 2844); near Duck Harbor, Isle au Haut (No. 1635).
- CAREX TENELLA* Schkuhr. Rare. Cool wet woods, Naskeag Point, Brooklin (No. 1436).
- CAREX STIPATA* Muhl. Frequent in wet places near shore.
- CAREX MARITIMA* O. F. Mueller. Common in salt marshes and on beaches.
- CAREX SALINA* Wahlenb., var. *KATTEGATENSIS* (Fries) Almq.¹ [*C. salina*, var. *cuspidata* Wahlenb.] Rare. Brackish marsh, Naskeag Point, Brooklin (No. 634).
- CAREX CRINITA* Lam. Infrequent in wet places.
- var. *GYNANDRA* (Schwein.) Schwein. & Torr. Common along streams and in wet meadows.
- CAREX GOODENOWII* J. Gay. Very common in wet places. An exceedingly variable species.
- CAREX STRICTA* Lam. Uncommon. Sphagnum bog, Brooklin (No. 1767); *Isle au Haut (J. C. Arthur).
- CAREX PAUCIFLORA* Lightf. Frequent in sphagnum bogs. Swans Island and Isle au Haut.

1. Hartman, C. J. Handbok i Skandinaviens Flora. ed. 11: 466 (1879). See *Rhodora* 14: 108 (1912).

- CAREX LEPTALEA Wahlenb. Occasional in moist soil. Reach, Deer Isle (No. 2164); wet meadow, East Point, Swans Island (No. 2879); *Isle au Haut (J. C. Arthur).
- CAREX GRACILLIMA Schwein. Locally common in moist woods, Deer Isle.
- *CAREX DEFLEXA Hornem. Isle au Haut (J. C. Arthur).
- CAREX COMMUNIS Bailey. Rare. Dry rich woods, Gray's Cove, Reach, Deer Isle (No. 2759).
- CAREX VARIA Muhl. Infrequent in dry open woods. Brooklin and Deer Isle. *Woodland paths, Isle au Haut (J. C. Arthur).
- CAREX NOVAE-ANGLIAE Schwein. Frequent in dry woods.
- CAREX PENNSYLVANICA Lam. Rare. Woods near Lily Pond, Deer Isle (No. 2577).
- *CAREX PANICEA L. Isle au Haut (J. C. Arthur).
- CAREX PALLESCENS L. Common in fields and meadows.
- CAREX PAUPERCULA Michx., var. IRRIGUA (Wahlenb.) Fernald. Very common in sphagnum bogs.
- CAREX LAXIFLORA Lam. Rare. Rich woods, Gray's Cove, Reach, Deer Isle (No. 2772).
- CAREX CONOIDEA Schkuhr. Occasional in dry fields.
- CAREX FLAVA L. Locally common in wet woods and meadows. Torrey Pond, Deer Isle (Nos. 2174, 2193).
- CAREX OEDERI Retz., var. PUMILA (Cosson & Germain) Fernald. Common on headlands and occasional in moist places inland.
- CAREX ARCTATA Boott. Occasional. Dry open woods, West Stonington, Deer Isle (No. 1882); woods near Torrey Pond, Deer Isle (No. 2855).
- CAREX DEBILIS Michx., var. RUDGEI Bailey. Frequent in dry woods and clearings.

- CAREX SCABRATA Schwein. Uncommon. Wet mossy woods, Naskeag Point, Brooklin (Nos. 271, 978); in leaf mould of moist woods, North Brooklin (No. 2926).
- CAREX FILIFORMIS L. Occasional. Sphagnum bog, outlet of Goose Pond, Swans Island (No. 1492); muddy shores of Torrey Pond, Deer Isle (Nos. 1983, 2165).
- CAREX PSEUDO-CYPERUS L. Rare. Wet swampy meadow, Dunham's Point, Deer Isle (No. 2167).
- CAREX LURIDA Wahlentb. Abundant in swamps and wet places generally.
- CAREX INTUMESCENS Rudge, var. FERNALDII Bailey. Common in wet mossy woods.
- CAREX FOLLICULATA L. Occasional in sphagnum bogs and meadows.
- CAREX VESICARIA L., var. JEJUNA Fernald. Rare. Swampy meadow, Gray's Cove, Deer Isle (No. 2570).
- CAREX ROSTRATA Stokes. Frequent in sphagnum bogs. Common in shallow water, Torrey Pond, Deer Isle (Nos. 1967, 2563).
- var. UTRICULATA (Boott) Bailey. Rare. Sedgy swamp, Flyes Island, Brooklin (No. 2986); sphagnum bog, Minturn, Swans Island (No. 1493); *Isle au Haut (J. C. Arthur).

ARACEAE

- ARISAEMA TRIPHYLLUM (L.) Schott. Infrequent in wet swampy woods.
- CALLA PALUSTRIS L. Occasional on boggy shores. Deer Isle; *Infrequent, Isle au Haut (J. C. Arthur).
- SYMPLOCARPUS FOETIDUS (L.) Nutt. Frequent in swampy woods.

ERIOCAULACEAE

ERIOCAULON SEPTANGULARE With.¹ [*Eriocaulon articulatum* (Huds.) Morong.] Frequent on muddy pond shores, often in deep water. Swans Island, Deer Isle, Isle au Haut.

XYRIDACEAE

XYRIS MONTANA Ries. Locally abundant in sphagnum bog at Stockbridge Pond, Swans Island (No. 2368).

PONTEDERIACEAE

PONTEDERIA CORDATA L. Rare. In shallow water, muddy shores of Lily Pond, South Deer Isle (Nos. 1814, 2841).

JUNCACEAE

JUNCUS BUFONIUS L. Common on beaches and dry soil inland.

JUNCUS GERARDI Loisel. Abundant on muddy shores and in salt marshes.

JUNCUS TENUIS Willd. Frequent in dry fields and pastures.

JUNCUS GREENEI Oakes & Tuckerm. Rare. Dry sterile soil, Naskeag Point, Brooklin (Nos. 212, 2970). *Infrequent, Isle au Haut (J. C. Arthur).

JUNCUS BALTICUS Willd., var. LITTORALIS Engelm. Frequent in brackish marshes and in damp meadows near the shore.

1. Withering's Bot. Arr. Veg. 2: 784 (1776). See Robinson, B. L., and Fernald, M. L., *Rhodora* 11: 40-41 (1909).

JUNCUS EFFUSUS L., var. *COMPACTUS* Lejeune et Courtois.
Infrequent. Swampy meadows, Deer Isle, Isle au Haut.

var. *SOLUTUS* Fernald & Wiegand.¹ Infrequent. Swans
Island (Miss Furbish in Herb. N. E. Bot. Club);
Wet meadow, Gray's Cove, Deer Isle (No. 1917).

var. *PYLAEI* (Laharpe) Fernald & Wiegand.² Common
on wet ground.

JUNCUS BREVICAUDATUS (Engelm.) Fernald. Abundant in
muddy places. A very variable species in this region.

JUNCUS CANADENSIS J. Gay. Occasional in boggy meadows.

JUNCUS PELOCARPUS Mey. Infrequent. Brackish marshes,
Brooklin and Isle au Haut.

JUNCUS MILITARIS Bigel. Uncommon. Shallow water,
Goose Pond, Swans Island (No. 2678); *Long Pond, Isle
au Haut (J. C. Arthur).

JUNCUS ARTICULATUS L. Occasional. Muddy roadside
ditches, North Brooklin (No. 2914); *Isle au Haut (J.
C. Arthur).

LUZULA SALTUENSIS Fernald. Occasional in dry open
woods, Deer Isle (Nos. 2176, 2548).

LUZULA CAMPESTRIS (L.) DC., var. *MULTIFLORA* (Ehrh.)
celak. Abundant in fields and meadows.

LILIACEAE

OAKESIA SESSILIFOLIA (L.) Wats. Infrequent. Dry open
woods, Deer Isle.

1. *Rhodora* 12: 90 (1910).

2. l. c. 92.

- HEMEROCALLIS FULVA L. Roadsides and fields. Escaped from cultivation.
- LILIUM PHILADELPHICUM L. Occasional in dry fields. Brooklin and Deer Isle.
- LILIUM CANADENSE L. Infrequent. Meadows near shore. Brooklin and Deer Isle. A form with orange colored flowers was collected in a moist alder thicket at Gray's Cove, Deer Isle (No. 2861a).
- CLINTONIA BOREALIS (Ait.) Raf. Very common in rich woods.
- SMILACINA RACEMOSA (L.) Desf. Rare. Thicket at edge of woods, Naskeag Point, Brooklin (No. 1456).
- SMILACINA STELLATA (L.) Desf. Pickerings Island, Deer Isle (F. L. Harvey in Herb. Gray).
- SMILACINA TRIFOLIA (L.) Desf. Abundant in sphagnum bogs.
- MAIANTHEMUM CANADENSE Desf. Abundant in moist open woods.
- STREPTOPUS AMPLEXIFOLIUS (L.) DC. Rare. Banks of ravine in damp woods near Eggemoggin Reach, Brooklin (No. 995).
- STREPTOPUS ROSEUS Michx. Frequent in cool rich woods.
- POLYGONATUM BIFLORUM (Walt.) Ell. Rich woods near lake, Isle au Haut (N. T. Kidder).
- MEDEOLA VIRGINIANA L. Frequent in dry open woods.
- TRILLIUM UNDULATUM L. Occasional in damp woods.

IRIDACEAE

- IRIS VERSICOLOR L. Common in wet places along shores and in meadows inland.

IRIS SETOSA Pall., var. CANADENSIS Foster. Rare. Crevices of rocks on headlands, Black Point, Swans Island (Nos. 2337, 2705). This station is a new southward extension for this arctic species. The previous southern limit has been Little Duck Island, off Mount Desert.¹

SISYRINCHIUM ANGUSTIFOLIUM Mill. Very common in fields and pastures.

SISYRINCHIUM GRAMINEUM Curtis. Rare. Sandy beach, Toothaker's Cove, Swans Island (No. 2362).

ORCHIDACEAE

CYPRIPEDIUM ACAULE Ait. Infrequent. Dry rich woods.

HABENARIA DILATATA (Pursh) Gray. Rare. Rich woods near serpentine quarry, North Deer Isle (No. 2144).

HABENARIA CLAVELLATA (Michx.) Spreng. Common in moist open ground.

HABENARIA OBTUSATA (Pursh) Richards. Cliffs near Morris' Mistake, Isle au Haut (N. T. Kidder).

HABENARIA LACERA (Michx.) R. Br. Occasional in moist fields.

HABENARIA PSYCODES (L.) Sw. Infrequent. Swampy meadows. Brooklin and Swans Island.

HABENARIA FIMBRIATA (Ait.) R. Br. Common in wet thickets and fields. A form with pure white flowers was collected in damp woods, Gray's Cove, Deer Isle (No. 2863).

POGONIA OPHIOGLOSSOIDES (L.) Ker. Abundant in sphagnum bogs.

CALOPOGON PULCHELLUS (Sw.) R. Br. Very common in sphagnum bogs.

1. See Norton, A. H., *Rhodora* 15: 138 (1913).

- ARETHUSA BULBOSA L. Infrequent in bogs, Swans Island.
*Isle au Haut (N. T. Kidder). A form with pure white
flowers was collected in the bog at Stockbridge Pond (No.
1583).
- SPIRANTHES GRACILIS (Bigel.) Beck. Common on dry open
soil.
- SPIRANTHES CERNUA (L.) Richard. Occasional in damp
meadows.
- SPIRANTHES ROMANZOFFIANA Cham. Frequent in wet fields
and meadows.
- EPIPACTIS REPENS (L.) Crantz, var. OPHIOIDES (Fernald)
A. A. Eaton. Woods, Sharks Point, Isle au Haut (N. T.
Kidder).
- CORALLORRHIZA MACULATA Raf. Rare. Rich moist woods,
Dunham's Point, Deer Isle (No. 2225).
- *CORALLORRHIZA TRIFIDA Chatelain. Isle au Haut (N. T.
Kidder).
- MICROSTYLIS UNIFOLIA (Michx.) BSP. Common in moist
fields and meadows. Very abundant in damp depressions
on the summit of Jerusalem Mountain, Isle au Haut (No.
1719).
- LIPARIS LOESELII (L.) Richard. Rare. Swampy meadow,
North Brooklin (No. 2906); *Isle au Haut (J. C.
Arthur).

SALICACEAE

- SALIX NIGRA Marsh. Rare. Near Brooklin Center (A. H.
Graves).
- SALIX LUCIDA Muhl. Occasional. Swampy roadsides, Nas-
keag Point, Brooklin (No. 930); North Brooklin (No.
2907).

- SALIX ALBA L., var. VITELLINA (L.) Koch. Frequent along roadsides often occurring spontaneously.
- SALIX CORDATA Muhl. Rare. West Brooklin (A. H. Graves).
- SALIX DISCOLOR Muhl. Common in moist open woods and fields.
- SALIX PETIOLARIS Sm. Infrequent. Damp fields and roadsides. Brooklin and Swans Island.
- SALIX HUMILIS Marsh. Frequent in wet ground.
- SALIX ROSTRATA Richards. Common in fields and open woods.
- POPULUS ALBA L. Naturalized at Brooklin Center (A. H. Graves); low ground, South Deer Isle (No. 1822).
- POPULUS TREMULOIDES Michx. Abundant in clearings and dry open woods.
- POPULUS GRANDIDENTATA Michx. Frequent in rich woods.
- POPULUS BALSAMIFERA L. Occasional. Roadsides and low woods.
- POPULUS CANDICANS Ait. Infrequent. Escaped from cultivation. Brooklin and Swans Island.
- POPULUS DELTOIDES Marsh. Rare. Escaped from cultivation. West Brooklin (A. H. Graves).

MYRICACEAE

- MYRICA GALE L. Common in sphagnum bogs and on pond margins.
- MYRICA CAROLINENSIS Mill. Frequent in moist thickets and sterile soil along the shore.
- MYRICA ASPLENIFOLIA L. Abundant in dry fields and on exposed hills.

BETULACEAE

CORYLUS ROSTRATA Ait. Occasional in moist woods. Reach, Deer Isle (Nos. 1993, 2760).

BETULA LUTEA Michx. f. Common in rich moist woods.

BETULA POPULIFOLIA Marsh. Abundant in clearings and open woods.

BETULA ALBA L., var. PAPYRIFERA (Marsh.) Spach. Common in woods.

var. CORDIFOLIA (Regel) Fernald. Frequent in woods.

ALNUS CRISPA (Ait.) Pursh, var. MOLLIS Fernald.¹ [*Alnus mollis* Fernald.] Abundant in moist woods, thickets and low ground. Also on sterile slopes and summits of hills.

ALNUS INCANA (L.) Moench. Frequent in low ground.

FAGACEAE

FAGUS GRANDIFOLIA Ehrh. Occasional in rich woods.

QUERCUS RUBRA L. Infrequent in rich soil.

var. AMBIGUA (Michx. f.) Fernald. Infrequent. All fruiting specimens of the red oak were found to be this variety and it is possible that the typical form may be absent or very rare.

URTICACEAE

ULMUS AMERICANA L. Rare. Usually escaped from cultivation. Brooklin and Deer Isle.

HUMULUS LUPULUS L. Frequent in dry thickets along roadsides.

URTICA GRACILIS Ait. Occasional on barrier beaches.

1. *Rhodora* 15: 44 (1913).

LORANTHACEAE

ARCEUTHOBIUM PUSILLUM Peck. Common on spruces. Douglas Cove, Isle au Haut. Infrequent elsewhere on the island (J. C. Arthur¹, N. T. Kidder).

POLYGONACEAE

RUMEX PATIENTIA L. Rare. Swampy meadow at head of Long Pond, Isle au Haut (No. 1259); Rich's Cove, Isle au Haut (N. T. Kidder).

RUMEX BRITANNICA L. Rare. Wet roadsides, Brooklin (No. 1045); *Isle au Haut (N. T. Kidder).

RUMEX CRISPUS L. Common in swamps and at edge of beaches.

RUMEX PALLIDUS Bigel. Frequent on sandy or gravelly beaches.

RUMEX ACETOSELLA L. Abundant in dry fields and waste places.

POLYGONUM FOWLERI Robinson. Infrequent. Sandy beaches, Gray's Cove, Deer Isle (No. 2197); Swans Island (Miss Furbish, in Herb. N. E. Bot. Club).

POLYGONUM AVICULARE L. Very common in waste places and ruderal ground. An extremely variable species. A narrow leaved form (No. 687) from sandy beaches at Swans Island Head, Swans Island, closely approaches var. *angustissimum* Meisn.

var. *VEGETUM* Ledeb. Sandy beach, Swans Island Head, Swans Island (No. 691).

POLYGONUM ALLOCARPUM Blake.² Frequent on beaches.

1. Rhodora 2: 221-223 (1900).

2. Rhodora 19: 234-235 (1917).

*POLYGONUM LAPATHIFOLIUM L. Isle au Haut (N. T. Kidder).

POLYGONUM TOMENTOSUM Schrank. Common in fields, cultivated ground and along roadsides.

*POLYGONUM CAREYI Olney. Isle au Haut (J. C. Arthur, N. T. Kidder).

POLYGONUM HYDROPIPER L. Abundant in swampy ground.

POLYGONUM PERSICARIA L. Common in moist fields, along roadsides and in cultivated ground.

*POLYGONUM HYDROPIPEROIDES Michx. Isle au Haut (N. T. Kidder).

POLYGONUM SAGITTATUM L. Abundant in wet places.

POLYGONUM CONVULVULUS. Frequent in waste places and cultivated land.

POLYGONUM CILINODE Michx. Abundant in dry clearings.

var. ERECTUM Peck. Road to village, Isle au Haut (N. T. Kidder).

FAGOPYRUM ESCULENTUM Moench. Occasional in fields and along roadsides. Swans Island and Deer Isle.

CHENOPODIACEAE

CHENOPODIUM ALBUM L. Abundant on beaches and in waste ground.

ATRIPLEX PATULA L. Swans Island (Miss Furbish, in Herb. N. E. Bot. Club).

var. HASTATA (L.) Gray. Abundant on beaches and in salt marshes.

SALICORNIA EUROPAEA L. Abundant on beaches and in salt marshes.

SUAEDA MARITIMA (L.) Dumort. Abundant on beaches of—
ten below high tide level.

SUAEDA RICHII Fernald. Shores of Thoroughfare, Isle au Haut (N. T. Kidder).

SALSOLA KALI L. Occasional on dry sandy beaches.

AMARANTHACEAE

AMARANTHUS RETROFLEXUS L. Rare. Cultivated ground, Brooklin (No. 1338).

AMARANTHUS GRAECIZANS L. Rare. Waste ground, Naskeag Point, Brooklin (No. 1337).

CARYOPHYLLACEAE

SPERGULARIA RUBRA (L.) J. & C. Presl. Frequent on sandy roadsides.

SPERGULARIA CANADENSIS (Pers.) G. Don. Common on brackish shores.

SPERGULARIA SALINA J. & C. Presl.¹ Rare. Moist depressions in sandy beach, Gray's Cove, Deer Isle (No. 1936).

SPERGULARIA LEIOSPERMA (Kindberg) F. Schmidt.² Infrequent. Beach sands. Flyes Island, Brooklin (Nos. 594, 2989); Fish Creek, Deer Isle (No. 2803); Oceanville, Deer Isle (A. H. Norton); Trial Point, Isle au Haut (N. T. Kidder).

SPERGULA ARVENSIS L. Abundant along roadsides and in cultivated ground.

SAGINA PROCUMBENS L. Frequent in springy places and on wet rocks.

1. Fl. vech. 95 (1819). See Fernald, M. L., and Wiegand, K. M., *Rhodora* 12: 162 (1910).

2. *Reisen im Amurl.* 131 (1868). See Fernald & Wiegand l. c. 162.

SAGINA NODOSA (L.) Fenzl, var. GLANDULOSA (Bess.) Asch.
Masons Ledge, near Heron Island, Swans Island (A. H. Norton); Little Spoon Island, Isle au Haut (N. T. Kidder).

ARENARIA LATERIFLORA L. Common in fields and on sunny banks near shore.

ARENARIA PEPLOIDES L., var. ROBUSTA Fernald.¹ Occasional on sandy or pebbly shores, Brooklin and Swans Island; Fog Island, Isle au Haut (A. H. Norton).²

ARENARIA GROENLANDICA (Retz.) Spreng. Oceanville, Deer Isle (A. H. Norton).² Isle au Haut (N. T. Kidder).

STELLARIA BOREALIS Bigel., var. ISOPHYLLA Fernald.³ Infrequent. Rich moist woods near serpentine quarry, North Deer Isle (Nos. 1950, 2222); Bradburys Island, Deer Isle (A. H. Norton); McGlatherys Island, Isle au Haut (N. T. Kidder).

var. FLORIBUNDA Fernald.³ Swampy ground behind barrier beach, Red Point, Swans Island (No. 2881); *Isle au Haut (N. T. Kidder).

STELLARIA MEDIA (L.) Cyrill. Abundant in grassy places.

CERASTIUM ARVENSE L. Occasional. Grassy headlands near shore, Naskeag Point, Brooklin (Nos. 1415, 2997); Sandy Cove, Isle au Haut (N. T. Kidder); Spoon Ledge, Isle au Haut (A. H. Norton); *common at Isle au Haut (J. C. Arthur).

CERASTIUM VULGATUM L. Abundant along roadsides and in fields and waste places.

1. Rhodora 11: 114 (1909).
2. Rhodora 15: 139 (1913).
3. Rhodora 16: 150, 151 (1914).

*AGROSTEMMA GITHAGO L. Occasional. Fields and roadsides, Swans Island (Miss Kotz); Deer Isle (C. L. Curtis).

SILENE NOCTIFLORA L. Rare. Fields, Flyes Island, Brooklin (Nos. 591, 2985); waste ground, South Deer Isle (No. 3067).

SAPONARIA OFFICINALIS L. Infrequent. Fields and roadsides, Brooklin and Deer Isle.

PORTULACACEAE

PORTULACA OLERACEA L. Rare. Weed in cultivated ground, Naskeag Point, Brooklin (No. 1363).

NYMPHAEACEAE

NUPHAR VARIEGATUM Engelm.¹ [*Nymphaea advena* Ait., var. *variegata* (Engelm.) Fernald]. Common in ponds and bog holes.

NYMPHAEA ODORATA Ait.¹ [*Castalia odorata* (Ait.) Woodville & Wood.] Frequent in ponds.

RANUNCULACEAE

RANUNCULUS CYMBALARIA Pursh. Frequent on muddy shores and crevices of sea cliffs.

RANUNCULUS LAXICAULIS (T. & G.) Darby. Rare. Muddy bog hole, South Deer Isle (Nos. 892, 1819). This species was reported by A. H. Norton from apparently the same station.²

RANUNCULUS REPENS L. Frequent in wet meadows and along streams. Brooklin and Swans Island.

1. For discussion of these changes in nomenclature, see Conard, H. S., *Rhodora* 18: 161-164 (1916).

2. *Rhodora* 15: 139 (1913).

**RANUNCULUS BULBOSUS* L. South Deer Isle (A. H. Norton).

RANUNCULUS ACRIS L. Abundant. Fields, roadsides and waste places. A specimen from Deer Isle (No. 2081) has leaves which show all transitions from the typical form to var. *Steveni*, which would indicate that this variety might better be considered a form.

var. *STEVENI* (Andrz.) Lange. Occasional. Meadows and pastures. Naskeag Point, Brooklin (No. 198a).

THALICTRUM POLYGAMUM Muhl. Common in wet ground, often near shore.

var. *HEBECARPUM* Fernald. Occasional in similar places.

CLEMATIS VIRGINIANA L. Rare. Roadsides near old cellar, Naskeag Point, Brooklin (No. 1361).

COPTIS TRIFOLIA (L.) Salisb. Abundant in mossy woods.

AQUILEGIA CANADENSIS L. Rare. Dry bluff, Dunham's Point, Deer Isle (Nos. 2228, 2825).

AQUILEGIA VULGARIS L. Infrequent. Escaped from cultivation.

ACTAEA RUBRA (Ait.) Willd. Rare. Rich woods near serpentine quarry, North Deer Isle (Nos. 1952, 2852).

BERBERIDACEAE

BERBERIS VULGARIS L. Rare. Established in field near old house, Naskeag Point, Brooklin (No. 2066).

PAPAVERACEAE

PAPAVER RHOEAS L. Rare. Waste ground near shore. Atlantic, Swans Island (No. 2329).

FUMARIACEAE

- ADLUMIA FUNGOSA (Ait.) Greene. Rare. Roadsides, Naskeag Point, Brooklin (No. 2237). Escaped from cultivation.
- CORYDALIS SEMPERVIRENS (L.) Pers. Occasional in dry clearings.

CRUCIFERAE

- LEPIDIUM APETALUM Willd. Waste ground near wharves, Stonington (No. 3065).
- LEPIDIUM CAMPESTRE (L.) R. Br. Grassland near clubhouse, Point Lookout, Isle au Haut (N. T. Kidder).
- CAPSELLA BURSA-PASTORIS (L.) Medic. Abundant in fields, waste places and along roadsides.
- CAMELINA SATIVA (L.) Crantz. Rare. A weed in cultivated ground, Naskeag Point, Brooklin (No. 1367).
- CAKILE EDENTULA (Bigel.) Hook. Common on sea beaches.
- RAPHANUS RAPHANISTRUM L. Common in fields and waste places, often at edge of beaches.
- RAPHANUS SATIVUS L. Occasional as an escape from cultivation. Variable in color of flowers.
- BRASSICA ARVENSIS (L.) Ktze. Frequent in fields, pastures and waste places.
- BRASSICA JUNCEA (L.) Cosson. Occasional. Waste ground, Swans Island (No. 2399); Isle au Haut (No. 1593).
- BRASSICA NIGRA (L.) Koch. Common in waste ground.
- BRASSICA CAMPESTRIS L. Rare. Cultivated fields, Naskeag Point, Brooklin (No. 251); gravelly roadsides, Atlantic, Swans Island (No. 2874).
- CONRINGIA ORIENTALIS (L.) Dumort. Rare. Roadsides, Naskeag Point, Brooklin (No. 1798).

- SISYMBRIUM OFFICINALE (L.) Scop. Rare. Sandy beach, Swans Island Head, Swans Island (No. 694).
· var. LEOCARPUM DC. Abundant in waste ground.
- ERYSIMUM CHEIRANTHOIDES L. Occasional. Wet meadow near shore, Flyes Island, Brooklin (No. 600); *Fog Island, Isle au Haut (A. H. Norton).
- RADICULA ARMORACIA (L.) Robinson. Rare. Moist fields, Atlantic, Swans Island (No. 1520).
- CARDAMINE PARVIFLORA L. Rare. Dry soil on small island, Fish Creek, Deer Isle (No. 2801).
- CARDAMINE PENNSYLVANICA Muhl. Infrequent. Wet roadside ditches, Naskeag Point, Brooklin (No. 1449); swampy meadows, Deer Isle (Nos. 2189, 2221).
- ARABIS DRUMMONDI Gray, var. CONNEXA (Greene) Fernald. Rare, Crow Nubble, Bradburys Island, Deer Isle (A. H. Norton¹ in Herb. Port. Soc. Nat. Hist.). This station is the first in the eastern United States for this plant of western North America, although it occurs in Témiscouata County, Quebec.
- ARABIS HIRSUTA (L.) Scop. Rare. Dry fields near shore, Flyes Island, Brooklin (No. 2989a).

SARRACENIACEAE

- SARRACENIA PURPUREA L. Common in peaty swamps and sphagnum bogs.

DROSERACEAE

- DROSEROTA ROTUNDIFOLIA L. Abundant in swampy ground and sphagnum bogs.
- DROSEROTA LONGIFOLIA L. Frequent in wet depressions in sphagnum bogs and borders of ponds.

1. Rhodora 15: 139 (1913).

CRASSULACEAE

- SEDUM ACRE L. Occasional. Rocky ledges and roadsides. Escaped from cultivation.
- SEDUM PURPUREUM Tausch. Infrequent. Meadows, head of Fish Creek, Deer Isle (No. 2833). *Isle au Haut (J. C. Arthur).
- SEDUM ROSEUM (L.) Scop. Rare. Rocky shores near Duck Harbor, Isle au Haut (No. 1631). This arctic species is also very abundant on the sea cliffs of Placentia Island, two miles east of Swans Island, but has not been found on the latter island.
- SEMPERVIVUM^{*} TECTORUM L. Occasional in fields or waste ground. Escaped from cultivation.

SAXIFRAGACEAE

- RIBES HIETELLUM Michx.¹ [*Ribes oxyacanthoides* L.]
Common in dry open woods and clearings.
- var. CALCICOLA Fernald.² Infrequent. Rich woods, Dunham's Point, Deer Isle (No. 2216); swampy woods, South Deer Isle (No. 1835).
- RIBES AMERICANUM Mill.³ [*Ribes floridum* L'Her.] Rare. Near old house, Harrimans Point, Brooklin (A. H. Graves).
- *RIBES LACUSTRE (Pers.) Poir. Little Sheep Island, southwest of Eagle Island Light, Deer Isle (A. H. Norton⁴). This is the southern limit of this boreal species.
1. Fl. Bor. Am. 1: 111 (1803); see Coville, F. V., and Britton, N. L., N. A. Fl. 22³: 223, 225 (1908).
 2. Rhodora 13: 76 (1911).
 3. Gard. Dict. ed. 8 No. 4 (1768); see Coville, F. V., and Britton, N. L., l. c. 206.
 4. Rhodora 15: 140 (1913).

RIBES PROSTRATUM L'Her. Common in low moist woods.

RIBES VULGARE Lam. Rare. Fields near old house, Naskeag Point, Brooklin (No. 2065).

HAMAMELIDACEAE

HAMAMELIS VIRGINIANA L. Infrequent. Low moist woods and thickets.

ROSACEAE

SPIRAEA LATIFOLIA Borkh. Abundant in thickets and low ground.

SPIRAEA TOMENTOSA L. Very common in open fields and moist ground.

SORBARIA SORBIFOLIA (L.) A. Br. Occasional. Escaped from cultivation, Brooklin (No. 997); Swans Island (Nos. 771, 2877).

PYRUS MALUS L. Frequent. Escaped from cultivation.

PYRUS ARBUTIFOLIA (L.) L.f., var. ATROPURPUREA (Britton) Robinson. Common in wet ground and frequent on headlands.

PYRUS MELANOCARPA (Michx.) Willd. Frequent in low ground and on the barren slopes and summits of hills.

PYRUS AMERICANA (Marsh.) DC. Common in moist woods.

*PYRUS SITCHENSIS (Roem.) Piper. Isle au Haut (J. C. Arthur).

*AMELANCHIER CANADENSIS (L.) Medic. Isle au Haut (J. C. Arthur); Moores Harbor, Isle au Haut (N. T. Kidder). In Graves "Woody Plants of Brooklin, Maine,"¹ the author cites *Amelanchier canadensis* as being common. The specimens from this locality in the herbarium of Yale University, however, are hybrids between *A. laevis* and some other species.

1. *Rhodora* 12: 180 (1910).

AMELANCHIER LAEVIS Wiegand.¹ Common in moist woods and swampy thickets. This species is very variable and hybridizes freely with the other species in the region. The typical form is well shown in No. 1783, swampy woods, Sedgwick road, Brooklin; and Nos. 1480, 2507, damp cool woods, Mackerel Cove, Swans Island. The following hybrids have been found:—

A. LAEVIS \times A. OBLONGIFOLIA. Swampy roadsides, Gray's Cove, Deer Isle (No. 2087); moist thickets near shore, Reach, Deer Isle (Nos. 2095, 2099). The first two of these specimens "are almost pure *A. laevis*, while the last seems to show a little more *A. oblongifolia* tendency."

A. LAEVIS \times a hairy leaved species. Swampy woods near Lily Pond, South Deer Isle (No. 1807). "This hybrid," to quote Wiegand, "certainly has the blood of *A. laevis* in it, but there is evidence of some other blood of hairy leaved species as the leaves are, when mature, somewhat hairy beneath. The only three possibilities are *A. oblongifolia*, *A. stolonifera* and *A. canadensis*." Rocky woods on slopes of Sawyers Mt., Isle au Haut (No. 1700). This hybrid shows a similar condition "except that the shape of the leaf suggests *A. oblongifolia* or *A. stolonifera* and not *A. canadensis*."

A. LAEVIS \times A. BARTRAMIANA. Cool moist woods near head of Long Pond, Isle au Haut (No. 1614).

A. LAEVIS \times (?). Cool moist woods, Goose Pond, Swans Island (No. 1614); Brooklin (A. H. Graves).

1. *Rhodora* 14: 154 (1912).

*AMELANCHIER BARTRAMIANA (Tausch.) Roem.¹ Flye Point, Brooklin (A. H. Graves). In his list of Brooklin plants Graves includes *A. oligocarpa* (Michx.) Roem. with the remarks, "Rather common. Flye Point. Mr. W. H. Blanchard, to whom I have referred the specimens, states that it is probably this species." Wiegand cites *A. oligocarpa* as a synonym of *A. Bartramiana*. The following hybrids of *A. Bartramiana* have been collected:—
A. BARTRAMIANA × *A. LAEVIS* (see under *A. laevis*).
A. BARTRAMIANA × *A. OBLONGIFOLIA*. Rich woods near Mackerel Cove, Swans Island (No. 1475).

CRATAEGUS ROTUNDIFOLIA Moench. Open thickets near shore, Gray's Cove, Deer Isle (Nos. 1958, 1959).

CRATAEGUS JONESAE Sargent. Roadsides. Naskeag Point, Brooklin (Nos. 1026, 2070); rare, Isle au Haut village (J. C. Arthur).

CRATAEGUS MACROSPERMA Ashe, approaching var. ACUTILOBA (Sarg.) Eggleston. Rich woods, Oak Point, Reach, Deer Isle (No. 2131).

CRATAEGUS MACRACANTHA Lodd. Frequent in fields, open woods and thickets near the shore.

FRAGARIA VIRGINIANA Duchesne. Abundant in fields and meadows.

var. TERRAE-NOVAE (Rydberg) Fernald & Wiegand.²
 Dry open places in woods, Reach, Deer Isle (No. 2782a).

POTENTILLA MONSPELIENSIS L. Frequent in roadsides and fields.

var. NORVEGICA (L.) Rydb. Damp roadsides near Moore's Harbor, Isle au Haut (No. 1160).

1. Syn. Rosif. p. 145. (1847); see Wiegand, K. M., *Rhodora* 14: 158 (1912).
2. *Rhodora* 13: 106 (1911).

POTENTILLA PENNSYLVANICA L. Infrequent. Sunny hillside, Naskeag Point, Brooklin (No. 3019); open fields near serpentine quarry, Reach, Deer Isle (No. 2142); headlands, Duham's Point. Deer Isle (No. 2232); *near village, Isle au Haut (J. C. Arthur, N. T. Kidder).

POTENTILLA ARGENTEA L. Frequent on dry sterile soil.

POTENTILLA PALUSTRIS (L.) Scop., var. VILLOSA (Pers.) Lehm.¹ Very common on boggy shore of Torrey Pond, Deer Isle (No. 2183); Merchants Island, Isle au Haut (N. T. Kidder).

POTENTILLA TRIDENTATA Ait. Common in sterile fields on headlands and exposed hilltops.

POTENTILLA PACIFICA Howell.² (*Potentilla Anserina* L.) Abundant on shores and in salt marshes.

POTENTILLA CANADENSIS L., var. SIMPLEX (Michx.) T. & G. Very common in dry fields, roadsides and waste places.

GEUM RIVALE L. Occasional in wet meadows. Naskeag Point, Brooklin (No. 1450); North Brooklin (No. 2912); South Deer Isle (No. 1826).

RUBUS IDAEUS L., var. CANADENSIS Richards.³ [var. *aculeatissimus* (C. A. Mey.) Regel & Tiling.] Frequent in thickets and fields and very abundant in clearings.

RUBUS PUBESCENS Raf.⁴ [*Rubus triflorus* Richards.] Common in swampy woods.

1. Stirp. Pug. 9: 44 (1851). See Fernald, M. L., and Long, B., *Rhodora* 16: 5-11 (1914).
2. Fl. N. W. Am. 1: 179 (1898). See Robinson, B. L., and Fernald, M. L., *Rhodora* 11: 48 (1909).
3. Frankl. Jour. 739 (823). See Blanchard, W. H., *Rhodora* 11: 236 (1909).
4. Med. Repos. N. Y. Ser. III, 2: 333 (1811). See Blanchard l. c.

var. *PILOSIFOLIUS* A. F. Hill.¹ Occasional in wet woods.

RUBUS ALLEGHANIENSIS Porter. *Common at Brooklin (A. H. Graves); Isle au Haut (J. C. Arthur in Herb. Gray). Hybrids of this species, under the name *R. nigrobaccus* Bailey, have been cited by Rydberg,² based on material from Isle au Haut: *R. nigrobaccus* × *R. nigricans* (J. C. Arthur, No. 52); *R. nigrobaccus* × *R. pergratus* (J. C. Arthur, Nos. 55, 56); *R. nigrobaccus* × *R. amicalis* (J. C. Arthur).

RUBUS PERGRATUS Blanchard. Frequent in moist clearings and thickets. Deer Isle and Isle au Haut. The following hybrids occur at Isle au Haut:³ *R. pergratus* × *R. amicalis* (J. C. Arthur, No. 53); *R. pergratus* × *R. nigrobaccus* (see under *R. alleghaniensis*).

**RUBUS ELEGANTULUS* Blanchard. Isle au Haut (J. C. Arthur, No. 51), determined by Rydberg.⁴

RUBUS CANADENSIS L. Occasional in fields and pastures. This species includes *R. amicalis* Blanchard, cited from Isle au Haut by Rydberg⁴ (J. C. Arthur, Nos. 50, 58).

RUBUS RECURVICAULIS Blanchard. Rocky pasture, Babson's Ridge, Brooklin (No. 612).

RUBUS HISPIDUS L. Very common in fields and low ground.

DALIBARDA REPENS L. Infrequent. Wet mossy woods, Naskeag Point, Brooklin (No. 657); Atlantic, Swans Island (No. 2274); Reach, Deer Isle (No. 2776).

1. *Rhodora* 16: 152 (1914).

2. *N. A. Fl.* 22⁵: 463 (1913). See also *Bull. Torr. Bot. Club.* 42: 468 (1915).

3. Rydberg, l. c.

4. *Bull. Torr. Bot. Club* 42: 153, 154 (1915).

- AGRIMONIA GRYPOSEPALA Wallr. Moist thickets in woods, Gray's Cove, Reach, Deer Isle (No. 2866).
- ROSA SPINOSISSIMA L. Naturalized at Flye Point and Harri-man Point, Brooklin (A. H. Graves).
- ROSA CINNAMOMEA L. Naturalized at North Brooklin (A. H. Graves).
- ROSA RUBIGINOSA L. Pastures, Naskeag Point, Brooklin (A. H. Graves).
- ROSA NITIDA Willd. Common in bogs. Swans Island and Isle au Haut.
- ROSA VIRGINIANA Mill. Very common in swamps and road-side thickets.
- ROSA HUMILIS Marsh. Abundant. Dry fields and roadsides.
- PRUNUS SEROTINA Ehrh. Rare and local. Roadsides, North Brooklin (Nos. 2443, 2921); rich upland woods, Deer Isle (No. 2573).
- PRUNUS VIRGINIANA L. Common in woods and thickets.
- PRUNUS PENNSYLVANICA L. f. Common in dry open woods and clearings.
- PRUNUS AVIUM L. Naturalized near roadside about one-half mile north of Haven, Brooklin (A. H. Graves).

LEGUMINOSAE

- TRIFOLIUM ARVENSE L. Frequent in fields and along road-sides.
- TRIFOLIUM PRATENSE L. Abundant in meadows and fields.
- TRIFOLIUM REPENS L. Common along roadsides and in fields.
- TRIFOLIUM HYBRIDUM L. Frequent in fields and meadows.

TRIFOLIUM AGRARIUM L. Common in fields and along roadsides.

TRIFOLIUM PROCUMBENS L. Very common along roadsides.

MELILOTUS ALBA Desr. Moist roadsides near Haven, Brooklin.

ROBINIA PSEUDO-ACACIA L. Occasional. Naturalized in fields and roadsides.

ROBINIA VISCOSA Vent. Established near roadside at Flye Point, Brooklin (A. H. Graves).

VICIA ANGUSTIFOLIA (L.) Reichard, var. SEGETALIS (Thuillier) Koch. Frequent at edge of beaches, in waste ground and cultivated fields. Brooklin and Deer Isle.

VICIA CRACCA L. Occasional. Fields and meadows.

LATHYRUS MARITIMUS (L.) Bigel. Very common on beaches and shores. Occasional inland, introduced with sea weed for fertilizer.

var. GLABER (Seringe) Eames.¹ Common on beaches.

LATHYRUS PALUSTRIS L., var. PILOSUS (Cham.) Ledeb. Common in wet meadows, especially near the shore. A very variable plant with leaves often near the var. *macranthus* (T. C. White) Fernald.²

AMPHICARPA MONOICA (L.) Ell. Damp open places in woods, Gray's Cove, Reach, Deer Isle (No. 2864).

LINACEAE

LINUM USITATISSIMUM L. Gravelly roadsides near Long Pond, Isle au Haut (No. 3061).

1. Rhodora 11: 95 (1909).

2. Rhodora 13: 50 (1911).

OXALIDACEAE

OXALIS AMERICANA Bigel.¹ [*Oxalis Acetosella* of Gray's Manual, Ed. 7.] Common in cool mossy woods.

OXALIS CORNICULATA L. Abundant in fields and along roadsides.

GERANICEAE

GERANIUM ROBERTIANUM L. Occasional on barrier beaches. North Point, Swans Island (No. 1464); Hockomock Head, Swans Island (No. 2333); Isle au Haut (J. C. Arthur, A. H. Norton).

GERANIUM BICKNELLII Britton. Infrequent. Waste ground, Gray's Cove, Deer Isle (No. 2527); roadsides, Isle au Haut (No. 1607).

POLYGALACEAE

POLYGALA SANGUINEA L. Rare. Fields near Gray's Cove, Deer Isle (No. 1920).

POLYGALA VERTICILLATA L. Infrequent. Fields and meadows, Reach, Deer Isle (No. 1918); North Brooklin (No. 2913).

EUPHORBIACEAE

EUPHORBIA CYPARISSIAS L. Common. Roadsides and waste places.

CALLITRICHACEAE

CALLITRICHE PALUSTRIS L. Quiet waters of Torrey Pond, Deer Isle (C. L. Curtis).

1. Fl. Bost. Ed. 2: 258 (1824). See Fernald, M. L., *Rhodora* 20: 76 (1918).

EMPETRACEAE

EMPETRUM NIGRUM L. Common on headlands and barren outcrops.

COREMA CONRADII Torr. Frequent. Sterile outcrops and exposed summits of hills. Schist outcrops, Central Tract, Brooklin (Nos. 1053, 3012; also A. H. Graves); barren granite hills, Swans Island Head (No. 795); barren summit of Mt. Champlain, Isle au Haut (No. 1299). Some thirty years ago *Corema* was considered a great rarity in our flora and new stations for it were frequently published. Among them were two from the Penobscot Bay region. John H. Redfield writes¹ that Chas. S. Wilder found the plant on Deer Isle, "not far from Green's Landing (Stonington) on the right of the road leading to North West Harbor, on a rocky eminence in a small pasture." The same authority cites several stations on Isle au Haut,² "the barren summit of the island," "Black Dinah," a bare, round rocky knob near Moores Harbor and one or two other localities.

ANACARDIACEAE

RHUS TYPHINA L. Infrequent. Dry fields and hillsides.

RHUS TOXICODENDRON L. Occasional on headlands or in dry fields near the shore.

AQUIFOLIACEAE

ILEX VERTICILLATA (L.) Gray. Common in moist woods and roadside thickets.

var. PADIFOLIA (Willd.) T. & G. Frequent in similar habitats. The specimens referred by Graves to var. *tenuifolia* (Torr.) Wats. belong to this variety or to the type.

1. Bull. Torr. Bot. Club 13: 221 (1886).
2. Bull. Torr. Bot. Club 11: 99 (1884).

NEMOPANTHUS MUCRONATA (L.) Trel. Abundant in swampy woods.

ACERACEAE

ACER PENNSYLVANICUM L. Common in moist woods.

ACER SPICATUM Lam. Common in moist woods.

ACER SACCHARUM Marsh. Rare. Woods near Haven, Brooklin (A. H. Graves); Isle au Haut (N. T. Kidder).

ACER RUBRUM L. Frequent in swampy woods.

BALSAMINACEAE

IMPATIENS BIFLORA Walt. Abundant in wet places, especially near the shore.

VITACEAE

PSEDERA QUINQUEFOLIA (L.) Greene. Established at old house site, Harriman's Point, Brooklin (A. H. Graves).

MALVACEAE

MALVA ROTUNDIFOLIA L. Occasional about dwellings.

HYPERICACEAE

HYPERICUM PERFORATUM L. Common in dry fields and along roadsides.

HYPERICUM BOREALE (Britton) Bicknell. Isle au Haut (Miss Kate Furbish, in Herb. N. E. Bot. Club.)

HYPERICUM MUTILUM L. Frequent in low ground.

HYPERICUM MAJUS (Gray) Britton. Occasional in muddy roadside ditches, North Brooklin (No. 2920); Swans Island (Nos. 2352, 2698); Isle au Haut (No. 1757). Forms, apparently hybrids between this species and the following, sometimes occur. Muddy roadsides, Isle au Haut (No. 1757a).

HYPERICUM CANADENSE L. Common in wet soil.

HYPERICUM VIRGINICUM L. Abundant in swampy ground.

CISTACEAE

HUDSONIA ERICOIDES L. Summit of Sawyer's Mountain, Isle au Haut (N. T. Kidder).

LECHEA INTERMEDIA Leggett. Common in dry sterile soil.

var. JUNIPERINA (Bicknell) Robinson. Occasional along roadsides.

VIOLACEAE

VIOLA CUCULLATA Ait. Common in wet meadows, moist woods and swampy ground. Forma PRIONOSEPALA (Greene) Brainerd.¹ Occasional. Rich woods near Gray's Cove, Deer Isle (No. 2127); moist roadsides, Isle au Haut (No. 1641).

VIOLA SEPTENTRIONALIS Greene. Infrequent. Open woods on serpentine, Little Deer Isle (Nos. 2582, 2584); rich mossy woods near serpentine quarry, Reach, Deer Isle (No. 2619); Isle au Haut (N. T. Kidder).

VIOLA FIMBRIATULA Sm. Rare. Dry headlands, Dunham's Point, Deer Isle (No. 2229).

*VIOLA PRIMULIFOLIA L. Isle au Haut (J. C. Arthur). fields.

VIOLA PALLENS (Banks) Brainerd. Frequent in wet ground.

VIOLA INCOGNITA Brainerd. Abundant in damp mossy woods.

1. Rhodora 15: 112 (1913).

var. *FORBESII* Brainerd.¹ Rich woods near Torrey Pond, Deer Isle (No. 1988); wet mossy woods, Dunham's Point, Deer Isle (No. 2227); cool moist woods, Atlantic, Swans Island (No. 2277).

VIOLA CONSPERSA Reichenb. Rare. Rich woods near serpentine quarry, Reach, Deer Isle (Nos. 2604, 2620).

LYTHRACEAE

DECODON VERTICILLATUS (L.) Ell., var. *LAEVIGATUS* T. & G.² Occasional. Swampy margin of Torrey Pond, Deer Isle (No. 1969); edge of sphagnum mat in bog near Rich's Cove, Isle au Haut (No. 1197; also J. C. Arthur).

ONAGRACEAE

EPILOBIUM ANGUSTIFOLIUM L. Common in open fields and clearings, especially in recently burned ground.

EPILOBIUM MOLLE Torr. Frequent in wet swampy meadows.

EPILOBIUM DENSUM Raf. Common in swamps and wet ground.

EPILOBIUM PALUSTRE L. Swans Island (Miss Furbish, in Herb. N. E. Bot. Club).

var. *MONTICOLA* Haussk. Frequent in sphagnum bogs.

EPILOBIUM GLANDULOSUM Lehm., var. *ADENOCAULON* (Haussk.) Fernald.³ [*Epilobium adenocaulon* Haussk.] Very common in low ground, especially near the shore. A depauperate form of this variety, collected in springy places in a field on Hat Island, Swans Island (No. 106), was wrongly attributed in an earlier paper⁴ to *E. adenocaulon*, var. *perplexans* Trel.

1. Bull. Torr. Bot. Club 38: 8 (1911).

2. Fl. No. Am. 1: 483 (1840). See Fernald, M. L., *Rhodora* 19: 154 (1917).

3. *Rhodora* 20: 35 (1918).

4. *Rhodora* 16: 192 (1914).

OENOTHERA MURICATA L. Very common on shores, in dry fields and along roadsides.

OENOTHERA PUMILA L. Common in dry fields and pastures.

CIRCAEA ALPINA L. Common in wet mossy woods.

ARALIACEAE

ARALIA RACEMOSA L. Rare. Rich woods, South Deer Isle (No. 1842).

ARALIA HISPIDA Vent. Common in clearings and on rocky open soil.

ARALIA NUDICAULIS L. Frequent in woods.

UMBELLIFERAE

SANICULA MARILANDICA L. Rare. Dry open woods near Gray's Cove, Deer Isle (Nos. 2188, 2536).

HYDROCOTYLE AMERICANA L. Occasional. Springy places in fields and meadows.

CONIUM MACULATUM L. Waste ground, the Valley, Hoekmoek Head, Swans Island (No. 2666).

CICUTA MACULATA L. Common in wet ground.

CICUTA BULBIFERA L. Rare. Swampy margin of Lily Pond, South Deer Isle (No. 1849).

CARUM CARVI L. Very common along roadsides and in dry fields and waste places.

SIMUM CICUTAEFOLIUM Schrank. Rare. Muddy shores of Torrey Pond, Deer Isle (Nos. 1986, 2856).

ZIZIA AUREA (L.) Koch. Rare. Meadow near Gray's Cove, Deer Isle (Nos. 2110, 2545).

LIGUSTICUM SCOTHICUM L. Common on rocky shores and beaches, occasionally at edge of salt marshes.

- COELOPLEURUM ACTAEIFOLIUM (Michx.) Coult. & Rose.
Common on rocky shores and headlands on the outer islands, Swans Island and Isle au Haut, and occasionally on shores inland.
- PASTINACA SATIVA L. Occasional. Wet swampy meadow, Flyes Point, Brooklin (Nos. 962, 2969; meadows near shore, Naskeag Point, Brooklin (No. 204).
- HERACLEUM LANATUM Michx. Frequent on eroding bluffs along shore. Occasional in low marshy ground.
- CONIOSELINUM CHINENSE (L.) BSP. Moist thickets in rich woods, Gray's Cove, Reach, Deer Isle (No. 2868).
- DAUCUS CAROTA. Occasional in fields and meadows, Brooklin (Nos. 2451, 3005).

CORNACEAE

- CORNUS CANADENSIS L. Common in woods and open places.
var. INTERMEDIA Farr.¹ Very rare. Dry sterile slopes of Mt. Champlain, Isle au Haut (No. 1287). This is the first station in the East outside of Labrador and western Newfoundland for this variety.²
- CORNUS CIRCINATA L'Her. Infrequent. Wet banks of stream in rich woods, Atlantic, Swans Island (No. 2397).
- CORNUS STOLONIFERA Michx. Rare. Low wet woods near Red Point, Swans Island (No. 2885).
- CORNUS ALTERNIFOLIA L. f. Common in thickets and open woods.

ERICACEAE

- MONESES UNIFLORA (L.) Gray. Frequent in damp mossy woods.

1. Contrib. Bot. Lab. Univ. Penn. 2: 423 (1904).
2. See Fernald, M. L., and Wiegand, K. M., *Rhodora* 13: 107 (1911).

- PYROLA SECUNDA L. Rich mossy woods, Naskeag Point, Brooklin (No. 2976).
var. OBTUSATA Turcz. Rare. Rich woods near serpentine quarry, Reach, Deer Isle (No. 2667).
- PYROLA CHLORANTHA Sw. Rare. Rich open woods, Gray's Cove, Reach, Deer Isle (No. 2796).
- PYROLA ELLIPTICA Nutt. Common in dry open woods.
- PYROLA AMERICANA Sweet. Infrequent. Dry open woods, Naskeag Point, Brooklin (No. 654); dry meadow, North Point, Atlantic, Swans Island (No. 2246).
- MONOTROPA UNIFLORA L. Common in rich woods.
- LEDUM GROENLANDICUM Oeder. Common in sphagnum bogs and moist thickets.
- RHODODENDRON CANADENSE (L.) BSP. Common in swampy woods and bogs.
- KALMIA ANGUSTIFOLIA L. Abundant in dry open ground and occasional in bogs.
- KALMIA POLIFOLIA Wang. Frequent in sphagnum bogs.
- CHAMAEDAPHNE CALYCVLATA (L.) Moench. Common in bogs and swampy pond margins.
- GAULTHERIA PROCUMBENS L. Common in dry woods and open ground.
- ARCTOSTAPHYLOS UVA-URSI (L.) Spreng. Occasional. Isle au Haut; barren hillside near Duck Harbor (No. 1749); headlands at the Cliffs (No. 3054).
- CHIOGENES HISPIDULA (L.) T. & G. Common in damp mossy woods.
- GAYLUSSACIA DUMOSA (Andr.) T. & G., var. BIGELOVIANA Fernald.¹ Occasional in sphagnum bogs. Stockbridge Pond, Swans Island (No. 2320); Marsh Cove, Kimball's Island, Isle au Haut (No. 1662).

1. Rhodora 13: 99 (1911).

- GAYLUSSACIA BACCATA (Wang.) C. Koch. Common in swampy thickets and open ground.
- VACCINIUM PENNSYLVANICUM Lam. Very common in dry open ground and on sterile mountain tops.
var. NIGRUM Wood. Occasional in dry fields.
- VACCINIUM CANADENSE Kalm. Common on dry or moist ground.
- VACCINIUM CORYMBOSUM L. Rare. Swampy woods near Lily Pond, South Deer Isle (No. 1816).
- VACCINIUM ATROCOCCEUM (Gray) Heller. Occasional. Sphagnum bog near Sedgwick road, Brooklin (Nos. 1059, 1771; swampy woods near north end of Herricks Bay, Brooklin (A. H. Graves). This plant was referred in "Woody Plants of Brooklin" to *V. corymbosum*; swampy shores of Torrey Pond, Deer Isle (No. 1961).
- VACCINIUM VITIS-IDAEAE L., var. MINUS Lodd. Common in dry fields and on sterile slopes and summits of hills.
- VACCINIUM OXYCOCCUS L. Occasional in sphagnum bogs.
- VACCINIUM MACROCARPON Ait. Common in bogs and swampy ground.

PLUMBAGINACEAE

- LIMONIUM TRICHOGONUM Blake.¹ [*Limonium carolinianum* of Gray's Manual, Ed. 7.] Abundant on muddy and rocky shores and in salt marshes.

PRIMULACEAE

- *LYSIMACHIA VULGARIS L. Isle au Haut (J. C. Arthur).
- LYSIMACHIA QUADRIFOLIA L. Frequent. Dry fields and roadsides.

1. Rhodora 18: 61, 62 (1916).

×*LYSIMACHIA PRODUCTA* (Gray) Fernald. Rare. Muddy roadside ditches, Isle au Haut (No. 1612).

LYSIMACHIA TERRESTRIS (L.) BSP. Common in swampy ground.

TRIENTALIS BOREALIS Raf.¹ [*Trientalis americana* (Pers.) Pursh.] Frequent in low woods.

GLAUX MARITIMA L. Pebbly beach, Goose Island, Blue Hill Bay, Brooklin (No. 108); rare, Isle au Haut (N. T. Kidder).

var. *OBTUSIFOLIA* Fernald. Common on shores and in salt marshes.

ANAGALLIS ARVENSIS L. Infrequent. Moist fields and pastures, South Deer Isle (No. 1806); headlands, Durham's Point, Deer Isle (No. 2828).

OLEACEAE

FRAXINUS AMERICANA L. Frequent in moist woods.

FRAXINUS PENNSYLVANICA Marsh. Occasional in rich damp woods. Deer Isle and Isle au Haut.

FRAXINUS NIGRA Marsh. Infrequent. Wet places in Central Tract, Brooklin (A. H. Graves); swampy woods, South Deer Isle (No. 1832).

SYRINGA VULGARIS L. Occasional in woods, escaped from cultivation.

GENTIANACEAE

HALENIA DEFLEXA (Sm.) Griseb. Rare. Wet meadows, Naskeag Point, Brooklin (No. 2238); Brooklin (C. E. Faxon, in Herb. Gray).

1. Med. Repos. N. York Ser. II: 5 354 (1808). See Blanchard, W. H., *Rhodora* 11: 236 (1909).

MENYANTHES TRIFOLIATA L. Rare. Swampy woods, South Deer Isle (No. 1824).

NYMPHOIDES LACUNOSUM (Vent.) Fernald. Infrequent. Goose Pond, Swans Island (No. 2376).

APOCYNACEAE

APOCYNUM ANDROSAEMIFOLIUM L. Frequent in dry fields and thickets.

CONVOLVULACEAE

*CONVOLVULUS SEPIUM L. Isle au Haut (N. T. Kidder).

var. PUBESCENS (Gray) Fernald. Common at edge of gravelly beaches.

CUSCUTA GRONOVII Willd. Common in wet places.

HYDROPHYLLACEAE

PHACELIA LINEARIS (Pursh.) Holz.¹ Rare. A single plant was found in a barn yard at Tamarack Lodge, Brooklin (No. 2514), probably introduced from the West in grain. This is the first station for the plant in Maine and the second in New England. Mr. C. A. Weatherby collected it in a sandy field at Windsor, Conn.

BORAGINACEAE

MERTENSIA MARITIMA (L.) S. F. Gray. Common on barrier beaches and rocky shores on the outer islands.

LABIATAE

*TEUCRIUM CANADENSE L., var. LITTORALE (Bicknell) Fernald. Isle au Haut (N. T. Kidder).

1. Contrib. Nat. Herb. 3: 242 (1895).

TEUCRIUM OCCIDENTALE Gray, var. BOREALE (Bicknell) Fernald. Occasional. Moist ground at edge of beaches, Flies Point, Brooklin (No. 947); Fish Creek, Deer Isle No. 2804); shingle beach, Stanley Point, Minturn, Swans Island (No. 2932).

SCUTELLARIA LATERIFLORA L. Infrequent. Low wet woods near Herrick's Bay, Brooklin (No. 1091); swampy woods near Lily Pond, South Deer Isle (No. 1804).

SCUTELLARIA GALERICULATA L. Abundant at edge of beaches and in moist ground near the shore.

NEPETA CATARIA L. Occasional along roadsides and near houses.

NEPETA HEDERACEA (L.) Trevisan. Infrequent. Roadsides near houses, Naskeag Point, Brooklin.

PRUNELLA VULGARIS L., var. LANCEOLATA (Barton) Fernald.¹ Abundant in fields and meadows. Forma CANDIDA Fernald. Moist roadsides, Naskeag Point, Brooklin (No. 2241). Forma IODOCALYX Fernald. Very common in dry fields and along roadsides.

GALEOPSIS TETRAHIT L., var. BIFIDA (Boem.) Lejeune & Courtoir.² Very common in waste ground, along roadsides and in cultivated land.

LEONURUS CARDIACA L. Occasional in waste ground and about houses.

HEDEOMA PULEGIODES (L.) Pers. Common in dry fields and pastures.

LYCOPUS UNIFLORUS Michx. Very common in moist ground.

LYCOPUS AMERICANUS Muhl. Common in wet places.

1. Rhodora 15: 183, 184 (1913).

2. Compend. Fl. Belg. 2: 241 (1831). See Fernald, M. L., and Wiegand, K. M., Rhodora 12: 142 (1910).

**MENTHA PIPERITA* L. Barred Harbor, Isle au Haut (N. T. Kidder).

**MENTHA GENTILIS* L. Isle au Haut (J. C. Arthur).

MENTHA ARVENSIS L. Infrequent in moist ground.

var. *CANADENSIS* (L.) Briquet. Very common in wet places, especially near the shore.

SOLANACEAE

PETUNIA VIOLACEA Lindl. Rare, when not under cultivation. Gravelly beach, Atlantic, Swans Island (No. 2330).

SOLANUM DULCAMARA L. Infrequent. Fields and roadsides, Reach, Deer Isle (No. 2141); moist clearings near Torrey Pond, Deer Isle (No. 2551).

SOLANUM NIGRUM L. Rare. Wet ground near shore, Marsh Cove, Kimball's Island, Isle au Haut (No. 1657); * sea beaches, Isle au Haut (J. C. Arthur).

SCROPHULARIACEAE

VERBASCUM THAPSUS L. Common in fields and pastures.

LINARIA VULGARIS Hill. Occasional in fields and clearings. Naskeag Point, Brooklin (No. 1119); North Brooklin (No. 2896); Atlantic, Swans Island (No. 2263).

LINARIA CANADENSIS (L.) Dumont. Common in dry fields and sandy soil.

CHELONE GLABRA L. Frequent in wet ground.

VERONICA AMERICANA Schwein. Rare. Swampy margin of brook, Little Deer Isle (No. 2589).

VERONICA SCUTELLATA L. Infrequent in wet places. Swampy meadow, Gray's Cove, Deer Isle (No. 2568).

VERONICA SERPYLLIFOLIA L. Rare. Sunny hillside, Little Deer Isle (No. 2595); Isle au Haut (N. T. Kidder).

- VERONICA PEREGRINA L. Occasional in dry soil and on headlands, Black Point, Swans Island (No. 2340); small island in Fish Creek, Deer Isle (No. 2802).
- VERONICA ARVENSIS L. Common in dry fields, especially near the shore.
- VERONICA TOURNEFORTII C.C.Gmel. Infrequent. Fields and roadsides, Garden Point, Swans Island (No. 2702); Isle au Haut (J. C. Arthur).
- MELAMPYRUM LINEARE Lam. Common in dry fields and clearings.
- EUPHRASIA PURPUREA Reeks, var. RANDII (Robinson) Fernald & Wiegand.¹ [*Euphrasia Randii* Robinson.] Common on dry headlands on the outer islands. Black Point, Swans Island (No. 2332); Hoekomoek Head, Swans Island (No. 2663); Isle au Haut (N. T. Kidder). Forma ALBIFLORA Fernald & Wiegand.¹ Rare. Dry fields near shore, Duck Harbor, Isle au Haut (No. 1750).
- EUPHRASIA STRICTA Host.² Frequent in dry fields. Atlantic, Swans Island (No. 3080); Swans Island (Miss Furbish, in Herb. N. E. Bot. Club); fields and roadsides, Sunshine, Deer Isle (No. 294).
- EUPHRASIA AMERICANA Wettst. Very common in fields and pastures and along roadsides.
- ODONTITES RUBRA Gilib. Frequent in dry fields and along roadsides.
- PEDICULARIS CANADENSIS L. Frequent in fields and dry open woods.
- RHINANTHUS CRISTA-GALLI L. Very common. Fields, roadsides and near dwellings.

1. Rhodora 17: 188 (1915).

2. Fl. Austr. 2: 185 (1831). See Fernald, M. L., and Wiegand, K. M., Rhodora 17: 197 (1915).

LENTIBULARIACEAE

- UTRICULARIA VULGARIS L., var. AMERICANA Gray. Frequent in pond holes in sphagnum bogs.
- UTRICULARIA INTERMEDIA Hayne. Occasional in muddy ponds. Stockbridge Pond, Swans Island (No. 2322); Goose Pond, Swans Island (No. 2682).
- UTRICULARIA CORNUTA Michx. Occasional in wetter portions of sphagnum bogs. Stockbridge Pond bog, Swans Island (No. 2317); boggy shores of Sadler Pond, Minturn, Swans Island (No. 2670).

OROBANCHACEAE

- EPIFAGUS VIRGINIANA L. Rich woods near Lily Pond, South Deer Isle (No. 3072).
- OROBANCHE UNIFLORA L. Rich moist woods, Gray's Cove, Reach, Deer Isle (No. 2774).

PLANTAGINACEAE

- PLANTAGO MAJOR L. Very common. Fields and roadsides.
var. INTERMEDIA (Gilibert) Dene. Rare. Sandy beach, Greenlaw's Neck, Deer Isle (No. 2811).
- PLANTAGO DECIPIENS Barneoud. Abundant on beaches, rocky shores and in salt marshes.
- PLANTAGO LANCEOLATA L. Rare. Gravelly shore of Mill Pond, Deer Isle (No. 2214).

RUBIACEAE

- GALIUM APARINE L. Infrequent. Edge of pebbly beach, North Point, Swans Island (No. 2434); edge of beach, Barred Harbor, Isle au Haut (N. T. Kidder).
- *GALIUM VERUM L. Isle au Haut (N. T. Kidder).

GALIUM PALUSTRE L. Occasional in wet meadows near head of Mackerel Cove, Swans Island (No. 1471); Gray's Cove, Deer Isle (No. 2543).

GALIUM TRIFIDUM L. Frequent in wet mossy woods and low ground.

GALIUM CLAYTONI Michx. Very common in swampy meadows.

GALIUM ASPRELLUM Michx. Rare. Moist thickets near Torrey Pond, Deer Isle (No. 1975); damp thickets, Reach, Deer Isle (No. 2775).

GALIUM TRIFLORUM Michx. Common in meadows and wet mossy woods.

MITCHELLA REPENS L. Infrequent in rich woods. Near Herrick's Bay, Brooklin (No. 2995); Atlantic, Swans Island (No. 2659); Isle au Haut (N. T. Kidder).

HOUSTONIA CAERULEA L. Common in moist fields and meadows.

CAPRIFOLIACEAE

DIERVILLA LONICERA Mill. Common in roadside thickets and dry woods.

LONICERA CAERULEA L., var. *CALVESCENS* Fernald & Wiegand.¹ Frequent in sphagnum bogs.

var. *VILLOSA* (Michx.) T. & G. Infrequent. Shores of Herrick's Bay, Brooklin (No. 2973); damp woods near Mackerel Cove, Swans Island (No. 1477); boggy meadow, outlet of Goose Pond, Swans Island (Nos. 1490, 2673).

LONICERA CANADENSIS Marsh. Common in rich moist woods.

LONICERA SEMPERVIRENS L. Established near roadside, Flyes Point, Brooklin (A. H. Graves).

1. *Rhodora* 12: 210 (1910).

- SYMPHORICARPOS ALBUS (L.) Blake, var. LAEVIGATUS (Fernald) Blake.¹ [*Symphoricarpos racemosus* Michx., var. *laevigatus* Fernald.] Occasionally established in fields and roadsides.
- LINNAEA BOREALIS L., var. AMERICANA (Forbes) Rehder. Common in damp mossy woods.
- VIBURNUM ALNIFOLIUM Marsh. Frequent in moist woods.
- VIBURNUM ACERIFOLIUM L. Rich moist woods, Gray's Cove, Reach, Deer Isle (No. 2773).
- VIBURNUM DENTATUM L. Rare. Wet banks of streams in woods, Atlantic, Swans Island (No. 2395).
- VIBURNUM CASSINOIDES L. Very common in bogs, swampy woods and thickets.
- SAMBUCUS CANADENSIS L. Frequent in wet meadows and thickets.
- SAMBUCUS RACEMOSA L. Common in dry fields, clearings and open woods.

CUCURBITACEAE

- ECHINOCTYSIS LOBATA (Michx.) T. & G. Infrequent. Escaped from cultivation, Naskeag Point, Brooklin (No. 1362).

CAMPANULACEAE

- CAMPANULA RAPUNCULOIDES L. Occasional. Escaped from cultivation. Roadsides, Naskeag Point, Brooklin (No. 992); fields, South Deer Isle (No. 914).
- CAMPANULA ROTUNDIFOLIA L. Rare. Rich woods and dry open fields near serpentine quarry, Reach, Deer Isle (Nos. 1944, 2147).

1. *Rhodora* 16: 119 (1914).

LOBELIACEAE

LOBELIA SPICATA Lam. Rare. Swampy meadow, Atlantic, Swans Island (No. 2247).

LOBELIA INFLATA L. Common along roadsides and in fields.

LOBELIA DORTMANNA L. Frequent on sandy and muddy pond shores.

COMPOSITAE

EUPATORIUM PURPUREUM L., var. MACULATUM (L.) Darl. Rare. Wet swampy woods, South Deer Isle (No. 1834).

EUPATORIUM PERFOLIATUM L. Common in wet meadows and thickets.

SOLIDAGO BICOLOR L. Abundant in dry sterile soil.

*SOLIDAGO RANDII (Porter) Britton. Isle au Haut (J. C. Arthur).

SOLIDAGO PUBERULA Nutt. Frequent in open fields and clearings.

SOLIDAGO ULIGINOSA Nutt. Isle au Haut (J. C. Arthur).

SOLIDAGO SEMPERVIRENS L. Abundant on headlands, rocky shores and beaches and in salt marshes. A white-rayed form has been found at Isle au Haut by N. T. Kidder.¹

SOLIDAGO JUNCEA Ait. Frequent in dry open woods and fields.

SOLIDAGO NEGLECTA T. & G. Rare. Fields and pastures, Naskeag Point, Brooklin (No. 1329).

SOLIDAGO UNILIGULATA (DC.) Porter. Common in sphagnum bogs.

SOLIDAGO RUGOSA Mill. Abundant in fields and thickets.

1. Rhodora 19: 20 (1917).

- var. *VILLOSA* (Pursh) Fernald. Common in moist thickets and open woods.
- SOLIDAGO NEMORALIS* Ait. Abundant in dry sterile soil.
- SOLIDAGO CANADENSIS* L. Common in damp thickets and open woods.
- SOLIDAGO SEROTINA* Ait. Rare. Roadside thickets near Torrey Pond, Deer Isle (No. 3037).
- var. *GIGANTEA* (Ait.) Gray. Moist alder thicket, Gray's Cove, Deer Isle (No. 1907).
- SOLIDAGO GRAMINIFOLIA* (L.) Salisb., var. *NUTTALLII* (Greene) Fernald. Very common. Dry fields and roadsides.
- ASTER MACROPHYLLUS* L. Common in dry open woods and clearings.
- ASTER RADULA* L. Common in bogs and wet woods.
- var. *STRICTUS* (Pursh) Gray. Occasional in bogs and exposed situations along the shore.
- **ASTER CORDIFOLIUS* L. Infrequent. Wooded banks, Isle au Haut (J. C. Arthur).
- ASTER LATERIFLORUS* (L.) Britton. Very common in dry fields, clearings and thickets. A very variable species often closely approaching var. *hirsuticaulis* (Lindl.) Porter. Isle au Haut (N. T. Kidder).
- ASTER PANICULATUS* Lam., var. *BELLIDIFLORUS* (Willd.) Burgess. Rare. Open places in dry woods near Head Harbor, Isle au Haut (No. 2410).
- **ASTER LONGIFOLIUS* Lam. Isle au Haut (J. C. Arthur, N. T. Kidder).
- ASTER NOVI-BELGII* L. Very abundant in wet meadows, usually near the shore. Common on headlands, rocky shores and borders of salt marshes.

ASTER PUNICEUS L. Rare. Marshy ground by roadsides, Naskeag Point, Brooklin (No. 2442).

ASTER UMBELLATUS Mill. Common in moist thickets.

ASTER ACUMINATUS Michx. Frequent in moist woods and clearings.

ASTER NEMORALIS Ait. Frequent in sphagnum bogs.

var. BLAKEI Porter. Locally common in moist woods, Atlantic, Swans Island (Nos. 2370, 2930); near Lovers Lane, Isle au Haut (No. 3043).

ERIGERON RAMOSUS (Walt.) BSP. Occasional in fields.

var. SEPTENTRIONALIS Fernald & Wiegand.¹ Common in fields and pastures and roadside thickets.

ERIGERON CANADENSIS L. Infrequent. Gravelly bluff along shore, Irish Point, Swans Island (No. 2720); sunny hillside, Little Deer Isle (No. 2581); Oceanville, Deer Isle (A. H. Norton); Isle au Haut (J. C. Arthur).

ANTENNARIA PARLINII Fernald. Rare. Dry fields at edge of woods, Gray's Cove, Deer Isle (No. 2079).

ANTENNARIA CANADENSIS Greene. Common in dry fields and open places.

ANTENNARIA BRAINERDII Fernald. Rare. Open woods, slopes of Sawyer's Mountain, Isle au Haut (No. 1698).

ANTENNARIA NEODIOICA Greene. Common in fields and dry open woods.

ANTENNARIA NEGLECTA Greene. Rare. Fields and pastures, Naskeag Point, Brooklin (No. 1421).

ANTENNARIA PETALOIDEA Fernald. Occasional. Dry roadsides, Reach Road, Deer Isle (No. 2177).

1. *Rhodora* 15: 60 (1913).

var. SUBCORYMBOSA Fernald.¹ Rare. Dry fields and roadsides, Fish Creek, Reach, Deer Isle (No. 2207). This variety is known in Maine only from Mt. Desert, Milford and this third station at Deer Isle.

ANAPHALIS MARGARITACEA (L.) B. & H. Common in dry fields and clearings.

GNAPHALIUM OBTUSIFOLIUM L.² [*Gnaphalium polycephalum* Michx.] Occasional in fields near shore and on headlands.

GNAPHALIUM ULIGINOSUM L. Abundant along roadsides and in cultivated ground.

IVA XANTHIFOLIA Nutt. Rare. Dry fields, South Deer Isle (No. 1844).

AMBROSIA ARTEMISIFOLIA L. Common in dry soil. Roadsides and cultivated ground.

RUDBECKIA HIRTA L. Infrequent. Fields and pastures.

BIDENS FRONDOSA L. Common in muddy roadside ditches and low ground.

BIDENS CERNUA L. Frequent in wet places.

ACHILLEA MILLEFOLIUM L. Very common in dry soil. A form with rose colored petals is quite frequent.

ACHILLEA LANULOSA Nutt. Rare. Open meadow, near shore, Seal Cove, Swans Island Head, Swans Island (No. 677).

ANTHEMIS COTULA L. Common along roadsides and in waste ground.

MATRICARIA INODORA L. Roadsides. Isle au Haut (No. 3064).

1. Rhodora 16: 133 (1914).

2. Sp. Pl. 2: 851 (1753). See Blake, S. F., Rhodora 20: 71 (1918).

- MATRICARIA SUAVEOLENS (Pursh) Buchenau. Very common about dwellings and along roadsides.
- CHRYSANTHEMUM LEUCANTHEMUM L., var. PINNATIFIDUM Lecoq & Lamotte. Very common in fields and along roadsides.
- TANACETUM VULGARE L., var. CRISPUM DC. Infrequent. Fields and roadsides. Escaped from cultivation.
- ARTEMISIA VULGARIS L. Occasional in fields and waste places.
- ERECTITES HIERACIFOLIA (L.) Raf. Infrequent. Gravelly soil of upper beach. Gray's Cove, Deer Isle (No. 1935).
var. INTERMEDIA Fernald.¹ Common in moist woods and clearings.
- SENECIO SYLVATICUS L. Common on gravelly beaches.
- SENECIO ROBBINSII Oakes. Rare. Swampy meadow, Reach, Deer Isle (No. 2136).
- ARCTIUM NEMOROSUM Lejeune.² Rare. Roadsides near Long Pond, Isle au Haut (No. 1240), also (N. T. Kidder).
- ARCTIUM MINUS Bernh. Common around dwellings and on waste ground.
- CIRSIUM LANCEOLATUM (L.) Hill. Common in fields and pastures.
- CIRSIUM MUTICUM Michx. Frequent in moist woods.
- CIRSIUM ARVENSE (L.) Scop. Very common. Fields, roadsides and cultivated ground.
- CENTAUREA JACEA L. Rare. Fields and pastures. Naskaeg Point, Brooklin (No. 1023).
- CICHORIUM INTYBUS L. Rare. Waste ground near sardine factory, Center Harbor, Brooklin.

1. Rhodora 19: 27 (1917).

2. Lejeune & Courtois, Comp. Fl. Belg. 3: 129 (1836). See Fernald, M. L., and Wiegand, K. M., Rhodora 12: 45 (1910).

- LEONTODON AUTUMNALIS L. Very common in fields, waste ground and along roadsides. A form with greenish-yellow heads without ligules occurs in cultivated ground near Gray's Cove, Deer Isle (No. 2533).
- TARAXACUM OFFICINALE Weber. Frequent. Roadsides and fields.
- *var. PALUSTRE (Sm.) Blytt. Roadsides, Barter's Store, Isle au Haut (J. C. Arthur).
- TARAXACUM ERYTHROSPERMUM Andrz. Common. Fields, pastures and roadsides.
- SONCHUS ARVENSIS L. Frequent on gravelly seashores.
- SONCHUS OLERACEUS L. Common in waste ground.
- SONCHUS ASPER (L.) Hill. Occasional in waste ground, often near the shore.
- LACTUCA CANADENSIS L. Occasional. Moist woods, Atlantic, Swans Island (No. 2387); clearings, Reach, Deer Isle (No. 3038); dry roadsides near Moore's Harbor, Isle au Haut (No. 1691).
- LACTUCA HIRSDTA Muhl. Infrequent. Clearings, North Brooklin (No. 1780); open hillside, Little Deer Isle (No. 2587).
- LACTUCA SPICATA (Lam.) Hitchc. Common on low ground.
- PRENANTHES TRIFOLIOLATA (Cass.) Fernald. Abundant in dry open woods, clearings and fields.
- PRENANTHES ALTISSIMA L. Rare. Rich rocky woods, Isle au Haut (No. 1264); moist rich woods, Gray's Cove, Reach, Deer Isle (No. 2862).
- var. HIRSDULA Fernald. Infrequent. Rich moist woods, Hockomock Head, Swans Island (No. 2667); Gray's Cove, Reach, Deer Isle (No. 2865); Lovers Lane, Isle au Haut (No. 3046).

- HIERACIUM AURANTIACUM L. Common in fields and pastures.
- HIERACIUM PRATENSE Tausch. Very common. Fields and roadsides.
- HIERACIUM SCABRUM Michx. Frequent in dry woods and clearings.
- HIERACIUM CANADENSE Michx. Common in thickets at edge of woods and in clearings and fields.

SUMMARY OF THE FLORA

	<i>Species</i>	<i>Varieties</i>	<i>Forms</i>	<i>Total</i>
PTERIDOPHYTES	33	6		39
GYMNOSPERMS	12	1		13
MONOCOTYLEDONS	166	46	5	217
DICOTYLEDONS				
ARCHICHLAMYDEAE	232	34	1	267
METACHLAMYDEAE	172	33	6	211
	<hr/>	<hr/>	<hr/>	<hr/>
	615	120	12	747
	<i>Species</i>	<i>Varieties</i>	<i>Forms</i>	<i>Total</i>
NATIVE PLANTS	495	107	10	612
INTRODUCED PLANTS	120	13	2	135

PHYTOGEOGRAPHICAL ASPECTS OF THE FLORA
THE DISTRIBUTION OF THE NATIVE FLORA

An examination of the ranges of the 612 native plants of the eastern Penobscot Bay region shows that the flora falls more or less readily into six groups:

GROUP I. WIDESPREAD PLANTS, occurring throughout eastern North America.

GROUP II. BOREAL PLANTS, species which extend to Labrador, Greenland and the Far North.

GROUP III. CANADIAN-ALLEGHANIAN PLANTS, which extend northward only to eastern Quebec or Newfoundland and represent a transitional group between the boreal species and the more southern forms.

GROUP IV. ALLEGHANIAN PLANTS, southern species which reach their northern limit in eastern Maine or adjacent New Brunswick and Nova Scotia.

GROUP V. CAROLINIAN PLANTS, which represent a northward extension of the Atlantic Coastal Plain flora.

GROUP VI. LOCAL PLANTS, which are either species with a limited range or isolated varieties of more widely distributed species.

This grouping of the Penobscot Bay flora is a modification of the classification of life zones of North America, proposed by Dr. C. Hart Merriam.¹ In that part of eastern North America with which we are dealing Merriam recognizes the following regions and life zones:

BOREAL REGION: comprising the northward part of the continent with a narrow southward extension on the higher mountains.

1. *Arctic-alpine zone*—above the limit of tree growth.
2. *Hudsonian zone*—the northern part of the coniferous forest region which extends from Labrador to Alaska and south in a strip on the higher mountains.
3. *Canadian zone*—the southern part of this forest region, which comprises Canada, northern New England and New York and a greater part of the mountains.

1. Merriam. Life Zones and Crop Zones of the United States, U. S. Dept. Agr. Biol. Survey. Bull. 10. 1898.

AUSTRAL REGION: comprising practically all of the United States save the boreal mountains and the tropical lowlands.

4. *Transition zone*—where the boreal and austral regions overlap, with southern species at their northern limit and boreal species at their southern limit. In the East this zone is represented by the *Alleghanian* area which extends from New England and southern Ontario west to the Dakotas and south along the Alleghanies to Georgia.
5. *Upper austral zone*—consisting in the east of a humid area—*Carolinian*—which occupies a large part of the Middle States at low altitudes, and on the Atlantic coast extends from Chesapeake Bay to southern New England with arms up the river valleys.

In the eastern Penobscot Bay region, where these zones overlap, it is impossible in many cases to distinguish clearly between species which are Canadian and those which show an Alleghanian trend. It is equally hard to draw a definite line between the various sub-divisions of the Boreal Region as interpreted by Merriam. Consequently it has been thought best in the present discussion to consider the more northern of the boreal plants, i. e., the Arctic-alpine and Hudsonian, as distinct from the Canadian, and to place them in a group by themselves (II). The Canadian plants are united with the transitional Alleghanian forms in a second group (III). Some of the Alleghanian plants, however, are perfectly distinct from these northern species and are considered separately in Group IV. Another group (V) is composed of southern species which are clearly of Carolinian origin.

To summarize then, the native flora of the eastern Penobscot Bay region will be considered under the following heads:

- I. Widespread Plants—54 species, 9 per cent of the flora.
- II. Boreal Plants—95 species, 16 per cent of the flora.
- III. Canadian-Alleghanian Plants—383 species, 62 per cent of the flora.
- IV. Alleghanian Plants—56 species, 9 per cent of the flora.
- V. Carolinian Plants—18 species, 3 per cent of the flora.
- VI. Local Plants—6 species, 1 per cent of the flora.

The relative importance of the various groups in the make-up of the flora is shown graphically in Figure 1. As would be expected from the location of the eastern Penobscot Bay region the largest percentage of its flora consists of Canadian-Alleghanian species.

GROUP I. WIDESPREAD PLANTS

It will be possible to dismiss this group with but little comment. Its 54 species are very widely distributed and occur in various habitats, for the most part throughout eastern North America save in the extreme north. As examples may be cited:

<i>Polypodium vulgare</i>	<i>Cardamine pennsylvanica</i>
<i>Equisetum arvense</i>	<i>Callitriche palustris</i>
<i>Typha latifolia</i>	<i>Veronica serpyllifolia</i>
<i>Agrostis hyemalis</i>	<i>Orobanche uniflora</i>
<i>Carex scoparia</i>	<i>Plantago major</i>
<i>Juncus bufonius</i>	<i>Erigeron canadensis</i>
<i>Polygonum sagittatum</i>	<i>Achillea Millefolium</i>

GROUP II. BOREAL PLANTS

This group comprises 95 plants of the Arctic-alpine and Hudsonian zones according to Merriam's classification. In phytogeographical literature the terms arctic, sub-arctic, arctic-alpine, alpine and sub-alpine have all been used more

or less indiscriminately to apply to the flora of the northern regions. This multiplicity of terms is a result of the difficulty experienced in attempting to place these boreal plants,

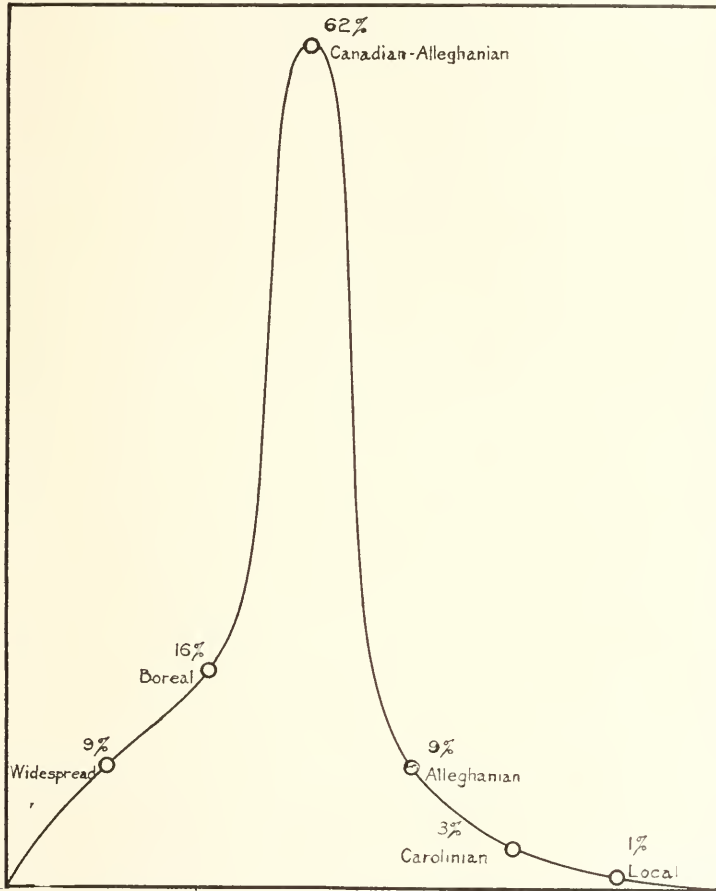


FIGURE 1.—Graph showing the relative importance of the various elements in the eastern Penobscot Bay flora.

especially those which extend to the Arctic Circle or farther north, in any arbitrary category. Since very few of these species have the same distribution, authors have been forced

to employ different terms in attempting to classify them satisfactorily, and this has led to considerable confusion. In the present discussion the term sub-arctic will be employed in referring to such of these plants as occur in the Penobscot Bay region, for no strictly arctic forms are included among them. A more southern element of the boreal flora, on the other hand, is much more definitely marked off and the term Hudsonian is universally used to refer to those species which range to the Labrador Peninsula and Hudson Bay and attain their maximum development in eastern Canada, but which fail to reach the far north.

The boreal flora as a rule is widespread in northern regions, but gradually becomes restricted toward the southern limits of its range, where it occurs only locally in the most favorable situations, such as high mountain tops, sea cliffs or cold bogs. The eastern Penobscot Bay region occupies a midway position, where the boreal plants are still fairly widely distributed, but even here certain of the more northern species are uniformly restricted to the coastal cliffs and headlands or to bogs.

Sub-ARCTIC PLANTS

The most interesting feature from a phytogeographical point of view in the Penobscot Bay region is the occurrence of several species of sub-arctic plants on the cold headlands and sea-cliffs of the outer islands. The extreme exposure of these shores, the constant drenching with cold spray to which they are subjected, and the frequent presence of fogs all combine to render conditions quite like those in arctic regions and furnish a habitat where the boreal species can exist.

The presence of this flora on the eastern Maine coast and in adjacent New Brunswick has long been recognized. As early as 1869 G. F. Matthew published an account of the

occurrence of arctic plants in New Brunswick. In 1894 Rand and Redfield emphasized the presence of boreal species on Mount Desert and the Cranberry Isles², and more recently Dr. George G. Kennedy noted their existence at Cutler.³ Careful observations on the part of other botanists have resulted in a considerable increase in the number of species and an extension of their ranges toward the south.

In 1910 Fernald and Wiegand⁴, writing of conditions in Washington County, Maine, stated that "in general this narrow coastal sub-arctic strip extends along the outer mainland and islands to Great Cranberry Isle, and in less pronounced development to Monhegan and even beyond."

The reason for this less pronounced development is readily apparent. Eastward from Mount Desert the shores of the mainland itself are bold and have a full exposure to the cold sea, while the outlying islands are comparatively near at hand. Consequently it is possible for these boreal plants to have a fairly continuous distribution along this part of the coast. West of Mount Desert, however, the mainland is many miles from the open ocean, owing to the deep indentation made by Penobscot Bay. The proper habitat for these species in this region is found only on the fringe of outer islands which are extremely isolated from the mainland and from one another. As a result, many species, such as *Scirpus caespitosus*, *Montia lamprosperma* and *Rubus Chamaemorus*, which extend to Mount Desert or the neigh-

1. Matthew. On the Occurrence of Arctic and Western Plants in Continental Acadia. Proc. Nat. Hist. Soc. New Brunswick. April 13, 1869.
2. Rand & Redfield. Flora of Mount Desert Island, Maine. p. 21. Cambridge. 1894.
3. Kennedy. The Maine Coast at Cutler. *Rhodora* 4: 23-26 (1902).
4. Fernald & Wiegand. A Summer's Botanizing in Eastern Maine and Western New Brunswick. *Rhodora* 12: 101-121, 133-146 (1910).

boring seaward islands are unable to cross the intervening space and so are absent from our area.

A considerable number of sub-arctic species, nevertheless, are to be found on the outer headlands of the Penobscot Bay islands. Growing in humus or peaty turf are such plants as: *Empetrum nigrum*, often projecting out over the exposed rocks in great mats; *Juniperus horizontalis*, frequent on the outer islands and also known from two stations at Brooklin, some ten miles up the Bay; and *Vaccinium Vitis-Idaea*, var. *minus*, common on barren hills and outerops as well. Other species are much less frequent: *Sedum roseum*, growing in great profusion on cliffs at Placentia Island near Swans Island, and on a rocky beach on Isle au Haut; *Iris setosa*, var. *canadensis*, on the crests of headlands at Black Point, Swans Island, a southward extension of range from Little Duck Island;¹ and *Arenaria groenlandica*, at a single station each on Deer Isle and Isle au Haut.

The raised bogs back of the headlands, a characteristic feature of this coastal strip to the eastward,² are lacking in Penobscot Bay or at most attain only a meagre development and so are unable to support the plants common to such a habitat. It is perhaps a significant fact that most of the sub-arctic plants which fail to reach our area are species of these raised bogs or heaths, which would be unable to find the necessary conditions for their existence even if they should bridge the gap between Mount Desert and the Penobscot Bay islands.

The rocky beaches and brackish marshes also furnish a decidedly boreal habitat for such plants as *Carex maritima*, *Carex salina*, var. *katlegatensis*, *Elymus arenarius*, var. *villosus*, *Coelopleurum actaeifolium* and *Mertensia maritima*.

1. See Norton, A. H., *Rhodora* 15: 138 (1913).

2. See Fernald & Wiegand, *Rhodora* 12: 106.

The development of this sub-arctic flora is much less pronounced west of Penobscot Bay and the few species which extend beyond this region occur only in isolated localities. As examples may be cited: , *Sedum roseum*, reaching only to Monhegan; *Carex salina*, var. *kaltegateensis*, to the Boston Basin; *Carex maritima*, to Marshfield, Mass.; and *Elymus arenarius*, var. *villosus*, to Provincetown, Mass.

The typical range of these sub-arctic species, which are widespread in the far North but restricted toward their southern limits, is well illustrated by *Empetrum nigrum* (Fig. 2).

HUDSONIAN PLANTS

The Hudsonian element of the boreal flora in the eastern Penobscot Bay region offers little of phytogeographical interest. The species are comparatively widespread throughout the area, occurring in many different habitats and forming a conspicuous part of the vegetation. The plants of this zone frequently grow in company with sub-arctic types in such habitats as sea cliffs and sphagnum bogs. Even more often they are found intermingled with Canadian or Alleghanian species and might be classified with them were it not for the fact that the Hudsonian flora ranges farther north and so is considered distinct as regards distribution.

In order to give a general impression of the Hudsonian element in the flora of the eastern Penobscot Bay region it will be sufficient to mention merely a few of the species which are the most conspicuous in each of several characteristic habitats.

UPLAND FORESTS

<i>Dryopteris spinulosa</i>	<i>Pyrus americana</i>
<i>Lycopodium annotinum</i>	<i>Rubus pubescens</i>
<i>Equisetum sylvaticum</i>	<i>Cornus canadensis</i>

*Picea canadensis**Abies balsamea* (see Fig. 3)*Clintonia borealis**Coptis trifolia**Ribes prostratum**Moneses uniflora**Trientalis borealis**Galium triflorum**Linnaea borealis*,var. *americana*

FIGURE 2.—Distribution of *Empetrum nigrum*, a representative arctic-alpine species.



FIGURE 3.—Distribution of *Abies balsamea*, a representative Hudsonion species.

OPEN HEADLANDS

- | | |
|---------------------------------|------------------------------|
| <i>Deschampsia flexuosa</i> | <i>Cerastium arvense</i> |
| <i>Festuca rubra</i> | <i>Arenaria lateriflora</i> |
| <i>Spiranthes Romanzoffiana</i> | <i>Potentilla tridentata</i> |

PEAT BOGS

- | | |
|-----------------------|----------------------------|
| <i>Larix laricina</i> | <i>Ledum groenlandicum</i> |
| <i>Picea mariana</i> | <i>Kalmia polifolia</i> |

<i>Eriophorum callitrix</i>	<i>Chamaedaphne calyculata</i>
<i>Carex paupercula</i> , var. <i>irrigua</i>	<i>Vaccinium Oxycoecus</i>
<i>Smilacina trifolia</i>	<i>Lonicera caerulea</i> , var. <i>calrescens</i>

SWAMPS

<i>Carex Goodenowii</i>	<i>Epilobium palustre</i>
<i>Myrica Gale</i>	<i>Menyanthes trifoliata</i>

GROUP III. CANADIAN-ALLEGHANIAN PLANTS

As would be expected from the location of the eastern Penobscot Bay region, the greater part of its flora consists of Canadian-Alleghanian species. The 383 plants which belong to this transitional group comprise 62 per cent of the native flora and contribute the most conspicuous features to the vegetation of the region. The two elements which go to make up this group are by no means distinct. In fact in most instances it is impossible to say with perfect accuracy whether a species is Canadian or Alleghanian since its distribution does not coincide with either of the arbitrary zones of Merriam. For the purpose of the present discussion, however, it is not necessary to draw hard and fast lines between these two elements. The significant point for us is that the species of this group extend northward to eastern Canada, northern New Brunswick and Nova Scotia, or even Newfoundland.

Although originally applied to the so-called life-zones, the terms Canadian and Alleghanian are in more frequent use at the present time in referring to two of the well marked forest areas of the United States. As Cooper emphasizes¹, eastern North America is divided into two great phytogeographical areas—the eastern deciduous forest and the north-

1. Cooper. The Climax Forest of Isle Royale, Lake Superior, and its Development. Bot. Gazette 55: 1-44, 115-140, 189-235 (1913).

eastern coniferous forest. The former is characteristic of the Alleghanian region, the latter of the Canadian region. By far the greater part of the forests of the eastern Penobscot Bay region belong to the latter type, which attains its maximum development in eastern Canada.

CANADIAN ELEMENT

Although two of the dominant trees of the Canadian forest, *Picea canadensis* and *Abies balsamea*, together with several of the associated species, are more strictly Hudsonian in nature, since they extend north into Labrador, there are a much larger number of characteristic species which answer the requirements for Canadian distribution. Among these may be mentioned the following trees and shrubs:

<i>Taxus canadensis</i>	<i>Populus tremuloides</i>
<i>Picea rubra</i>	<i>Ilex verticillata</i>
<i>Pinus resinosa</i>	<i>Acer spicatum</i>
<i>Betula alba</i> ,	<i>Cornus alternifolia</i>
var. <i>papyrifera</i>	<i>Diervilla Lonicera</i>
<i>Alnus incana</i>	<i>Viburnum cassinoides</i>

Herbaceous forms characteristic of the Canadian Forest include:

<i>Dryopteris cristata</i>	<i>Dalibarda repens</i>
<i>Lycopodium lucidulum</i>	<i>Oxalis americana</i> (see Fig. 4)
<i>Streptopus roseus</i>	<i>Viola incognita</i>
<i>Ribes hirtellum</i>	<i>Aralia nudicaulis</i>

The Canadian plants are not restricted to the woodlands, however, but occur in every possible habitat. Only a few of the more common species can be mentioned in this connection.



FIGURE 4.—Distribution of *Oralis Americana*, a representative Canadian species.

FIELDS AND CLEARINGS

<i>Panicum boreale</i>	<i>Vaccinium pensylvanicum</i>
<i>Carex pallescens</i>	<i>Euphrasia americana</i>
<i>Polygonum cilinode</i>	<i>Rhinanthus Crista-galli</i>
<i>Prunus pennsylvanica</i>	<i>Sambucus racemosa</i>
<i>Oenothera pumila</i>	<i>Prenanthes trifoliolata</i>
<i>Aralia hispida</i>	<i>Hieracium canadense</i>

SWAMPS

<i>Glyceria canadensis</i>	<i>Nemopanthus mucronata</i>
<i>Eriophorum tenellum</i>	<i>Impatiens biflora</i>
<i>Scirpus atrocinctus</i>	<i>Viola cucullata</i>
<i>Polygonum sagittatum</i>	<i>Lysimachia terrestris</i>

<i>Thalictrum polygamum</i>	<i>Scutellaria galericulata</i>
<i>Lathyrus palustris</i> ,	<i>Galium trifidum</i>
var. <i>pilosus</i>	<i>Mentha arvensis</i>

ALLEGHANIAN ELEMENT

The second of these phytogeographical regions—the eastern deciduous or Alleghanian forest—has its center of distribution in the Ohio Valley and the southern Appalachians. This Alleghanian zone proper does not extend far into New England, but under favorable environmental conditions certain of its species have been able to exceed the general limits and advance northward to eastern Maine and the Maritime Provinces, and in some cases even to Newfoundland. Only those species which extend to Cape Breton or Newfoundland are included in this group. Typical examples include:

<i>Pinus Strobus</i>	<i>Betula lutea</i>
<i>Smilacina racemosa</i>	<i>Fagus grandifolia</i>
<i>Medeola virginiana</i>	<i>Acer rubrum</i>
<i>Trillium undulatum</i>	<i>Prunus virginiana</i>

A detailed discussion of this element of the Canadian-Alleghanian flora will be taken up in connection with the more strictly Alleghanian plants in Group IV.

GROUP IV. ALLEGHANIAN PLANTS

In contrast to the species of the two previous groups, which represent for the most part a boreal flora approaching its southern limits, there exists in the eastern Penobscot Bay region another group which represents an austral flora at the northern limits of its range. This group of 56 species, 9 per cent of the flora, consists of plants which have a wide range to the southwest but northward reach only to eastern New England and adjacent Canada.

As has been stated, the Alleghanian zone proper does not extend far into New England, but the influence of the ocean renders conditions along the coast equable enough so that some of these austral forms have exceeded their general limits and pressed much farther northward. The distribution of these outpost species is by no means continuous and the plants occur in isolated localities, a behavior characteristic of species at the edge of their range.¹ As we have noted, certain of these southern forms are to be found in Cape Breton and Newfoundland. These are included in the preceding group since it is hard to distinguish them from Canadian species, and only those forms which attain their northern limit in Maine, New Brunswick or southern Nova Scotia and which show a definite Alleghanian distribution are considered as belonging here.

The habitats of these Alleghanian species in the eastern Penobscot Bay region vary. Some of them occur in wet places: *Vaccinium atrococcum*, *Fraxinus pennsylvanica*, and *Viburnum dentatum* in swampy woods; *Decodon verticillatus*, var. *laevigatus*, on pond shores; and *Ranunculus laxicaulis*, locally common in muddy bog holes at South Deer Isle, its present northern limit.

Other species frequent dry open fields: *Lilium philadelphicum*, *Polygala sanguinea*, and *P. verticillata*, *Lechea intermedia*, *Lysimachia quadrifolia*, and *Antennaria Paysonii*. Still others are found in the dry leaf mould of woods: *Oakesia sessilifolia*, *Polygonatum biflorum*, and *Pedicularis canadensis*.

The striking feature in connection with the Alleghanian flora is not the presence of these few isolated plants of swamps and dry woods but rather the almost complete absence of the

1. Griggs. Observations on the Behavior of Some Species at the Edges of their Ranges. Bull. Torr. Bot. Club 41: 25-49 (1914).

more characteristic species of the rich woods—the eastern deciduous forest. In such a forest the dominant trees are *Acer saccharum*, *Fagus grandifolia*, *Betula lutea*, *Tsuga canadensis*, and *Pinus Strobus*, and associated with them *Hamamelis virginiana*, *Prunus virginiana*, *Fraxinus americana*, with *Acer rubrum* in swampy woods.

Although these species occur northward and even attain considerable development in favorable localities, they are very infrequent in the eastern Penobscot Bay region, an area characterized by granites, schists and other rocks which, owing to their high content of silica, yield a sterile or acid rather than a basic soil.

Even more noticeable is the absence of the herbaceous types of the rich woods, the spring flowers common in leaf mould. Among such forms which are entirely missing from the eastern Penobscot Bay region may be mentioned *Erythronium*, *Urularia*, *Claytonia*, *Asarum*, *Hepatica*, *Thalictrum dioicum*, *Sanguinaria*, *Dicentra*, *Dentaria*, *Caulophyllum*, *Mitella* and *Panax*. These plants and many others extend through New England as far as the Kennebec River, leave the coast at that point and follow up the limy valley of the Kennebec to the rich Silurian limestone area of northern Maine and eastern Canada. *Viburnum dentatum* illustrates the distribution of the Alleghanian species, which extend northward only to New Brunswick (Fig. 5).

The absence of these plants of the Alleghanian forest from the eastern Penobscot Bay region has two noteworthy exceptions. In the northern part of Deer Isle there exists an area of serpentine and another of greenstone, a basic igneous rock. In these areas the vegetation is entirely different from that of the surrounding country and consists of deciduous trees and their characteristic undergrowth. *Betula lutea*, *Fagus grandifolia* and *Acer rubrum* predominate and in the deep



FIGURE 5.—Distribution of *Viburnum dentatum*, a representative Alleghenian species.

leaf mould beneath these trees occur *Adiantum pedatum*, *Actaea rubra*, *Carex novae-angliae*, and other species found nowhere else in the region. The reason for the restriction of the species to these areas is readily apparent. They are plants which require a good percentage of basic material and they are unable to obtain the necessary food in the acid or neutral silicious soils which prevail elsewhere. As will be shown later, these plants should be considered as relic rather than pioneer types, and they persist here only because of the extremely favorable environmental conditions. Other Alleghenian species are more tolerant than these rich woods

forms and can maintain themselves, and even advance, in areas with a much smaller percentage of basic material. Even these plants, however, avoid the loose soil of the dry coniferous forests and the acid bogs.

The occurrence of the above mentioned species on a serpentine area brings us to another problem. Usually a serpentine region is characterized by a great paucity of vegetation and the presence of peculiar species which are able to utilize, as food, the magnesium, an element which is extremely toxic to most plants. At first sight it would appear that here was a condition directly opposed to the general rule. Far from being a sterile area almost devoid of vegetation, this area has the richest flora of any part of the region. It is apparent that some other substance must be present in the soil to counteract the effect of the magnesium. An examination of the underlying serpentine rock shows it to be filled with numerous veins of calcite which readily decomposes and furnishes lime to the soil. The work of Von Raumer¹ and of Loew² has demonstrated that calcium exerts an antagonistic action on magnesium and may even destroy its toxicity entirely. In this connection Osterhout³ states that "a single Ca ion acts as an antidote to from 20 to 100 ions of Na,K,NH₄, etc." The large amount of calcite present in this serpentine would easily be sufficient, not only to counteract the magnesium, but also to render the soil extremely basic and fertile.

1. Von Raumer. Calcium und Magnesium in der Pflanze. Landw. Versuchsst. 19: 253-280 (1883).
2. Loew & May. The Relation of Lime and Magnesia to Plant Growth. U. S. Dept. Agr. Bur. Plant Ind. Bull. 1 (1901); Loew. The Physiological Rôle of Mineral Nutrients in Plants. U. S. Dept. Agr. Bur. Plant Ind. Bull. 45 (1903).
3. Osterhout. Some Chemical Relations of Plant and Soil. Science N. S. 36: 571-576 (1912).

GROUP V. CAROLINIAN PLANTS

This small group of southern species—3 per cent of the native flora of the eastern Penobscot Bay region—affords nearly as much phytogeographical interest as do the subarctic types. These Carolinian plants, although of southern origin, are distinct from the Alleghanian. They are characteristic of the Cretaceous and Tertiary sands and clays of the New Jersey Pine Barrens and other portions of the Atlantic coastal plain. This coastal plain flora extends northward from the Gulf of Mexico along the coast to New Jersey and thence, in less pronounced development, to Staten Island, southern Long Island and southeastern New England, with arms running up the larger river valleys.

The presence of typical coastal plain species growing on granite rocks or the scantiest of soil on the Maine coast affords interesting speculation as to their geographic origin, the nature of which will be discussed later. The occurrence of Carolinian plants in such habitats, however, is not unique, for several coastal plain plants have long been known on quartzite rocks in the Kittatinny Mountains of New Jersey.¹ These quartzite rocks and the granite hills of Penobscot Bay furnish a soil which, like that of the sand plains along the coast, is very rich in silica and so is acid rather than basic. (See page 202, Note 2.)

It has been argued that species which are restricted to these acid soils are able to utilize the silica in some way as food and the term "silicophiles" has been applied to them. Contejean,² Hilgard³ and others have shown, however, that

1. Britton. On the Existence of a Peculiar Flora on the Kittatinny Mountains of Northwestern New Jersey. *Bull. Torr. Bot. Club* 11: 126-128 (1884). Note on the Flora of the Kittatinny Mountains. *Ibid.* 14: 187-189 (1887).
2. Contejean. De l'Influence du Terrain sur la Vegetation. *Ann. Sci. Nat. Bot.* V. 20: 266-304 (1874); VI. 2: 222-307 (1875).
3. Hilgard. *Soils*, pp. 521-522. New York. 1911.

these plants do not prefer the sterile soils, but rather are repelled by lime and other basic elements and so are forced to seek refuge in a soil which is neutral or even acid.

As has been stated, the majority of Carolinian species reach their northern limits in the United States in New Jersey or southeastern New England. Some, however, extend northward to the sandplains of southwestern Maine, and a few have pressed on to the sterile soils and granite rocks of the eastern coast. Among such forms may be mentioned *Pinus rigida*, which extends to Mount Desert, and *Juncus Greenei*, which reaches Roque Bluffs in Washington County.¹ Other species, such as *Corema Conradii* and *Hudsonia ericoides*, attain their northern limit in the United States in this region but reappear in Nova Scotia and Newfoundland. A few others have a continuous distribution along the coast to Newfoundland, i. e., *Aster nemoralis* (Fig. 6).

Other characteristic Carolinian species frequently found in the eastern Penobscot Bay region include:

<i>Polamogeton Oakesianus</i>	<i>Eriocaulon septangulare</i>
<i>Panicum implicatum</i>	<i>Juncus effusus</i> ,
<i>Ammophila arenaria</i>	var. <i>solutus</i>
<i>Carex hormathodes</i>	<i>Myrica carolinensis</i>

GROUP VI. LOCAL PLANTS

A very few of the native plants of the region are extremely local in distribution. *Crataegus Louesae* is clearly endemic in this general locality, ranging only from Mount Desert to Casco Bay, a distance of about one hundred miles. Other species, like *Suaeda Richii* and *Sagina nodosa*, var. *glandulosa*, extend only to Nova Scotia on the one side or Massa-

1. Knowlton, C. H. *Rhodora* 17: 154 (1915).

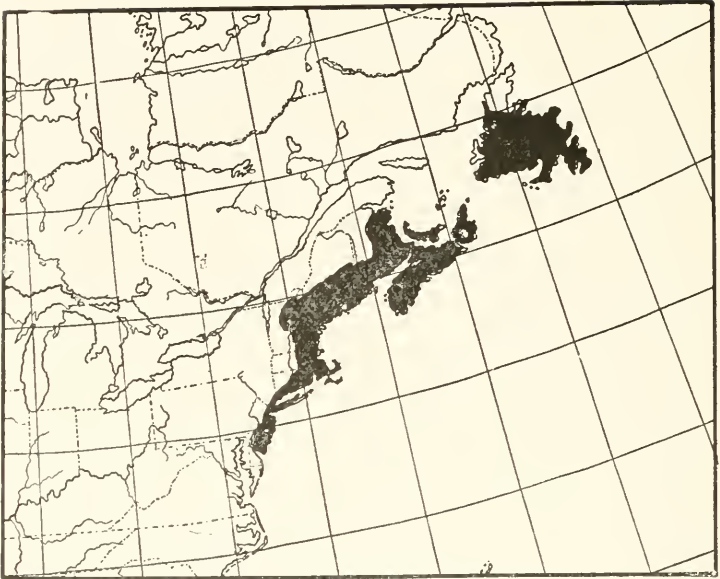


FIGURE 6.—Distribution of *Aster nemoralis*, a representative Carolinian species, extending along the coast to Newfoundland.

chusetts on the other. Still others are isolated varieties of species more abundant in other parts of North America; such as *Arabis Drummondii*, var. *connexa*, common on Crow Nubble at the eastern end of Bradbury's Island near Deer Isle. With the exception of a station at Rivière du Loup, Quebec, this is the only occurrence in the East of this plant of the mountains of western America. Another western plant, *Cornus canadensis*, var. *intermedia*, frequent on the sterile slopes of Mount Champlain, Isle au Haut, is known elsewhere in the east only from Labrador and Newfoundland.

Thus far we have been primarily concerned with the existing flora of the eastern Penobscot Bay region. It will be well at this point to again call attention to some of the more conspicuous absences among the native plants.

The most noticeable of these absences, that of the species characteristic of rich soils, has already been alluded to. Such families as the *Ranunculaceae*, *Cruciferae*, *Saxifragaceae*, *Leguminosae* and *Scrophulariaceae*, to which many of our commonest species of the rich woods belong, are scarcely represented save by introduced species. The paucity of these Alleghanian plants in our region is brought out more clearly by a comparison with a region where environmental conditions are more favorable. Kennedy's Flora of Willoughby,¹ a limestone area in northern Vermont, lists 690 plants as against 736 in eastern Penobscot Bay. Of these 690 nearly 300, or 40 per cent, are lacking in our region, which is characterized for the most part by neutral and acid rather than basic soils.

A second noteworthy absence is that of species present on the mainland to the east and west and even on Mount Desert but which have failed to reach the islands of Penobscot Bay. As examples may be cited:

<i>Agropyron caninum</i>	<i>Anemone quinquefolia</i>
<i>Triglochin palustris</i>	<i>Chrysosplenium americanum</i>
<i>Scirpus caespitosus</i>	<i>Polygala paucifolia</i>
<i>Carex norvegica</i>	<i>Ludvigia palustris</i>
<i>Carex lenticularis</i>	<i>Chimaphila umbellata</i>
<i>Juncus filiformis</i>	<i>Lobelia cardinalis</i>

These species it will be noted are not restricted to any one group, but include northern as well as southern forms. It is obvious from this fact, and from the circumstances of their occurrence in nearby localities on the mainland, where soil and climatic conditions are similar to those in Penobscot Bay, that some factor other than the character of the habitat

1. Kennedy. Flora of Willoughby, Vermont. *Rhodora* 6: 94-134 (1904).

must be responsible for their absence from our area. A glance at the map shows the answer. In the Penobscot Bay region the coast is more broken up and the islands are farther removed from the mainland and from one another than anywhere else along the Maine coast. This condition has been more pronounced in the past than it is at present and it has been impossible for many plants which are present on the mainland to bridge the gap to the outlying islands.

THE ORIGIN OF THE NATIVE FLORA

Any discussion of the origin of the native flora of the eastern Penobscot Bay region is naturally limited in scope, since all vestiges of the pre-glacial flora were presumably destroyed during the Ice Age. Whatever the nature of this pre-existing flora, whether similar to that of the present time; or showing more southern tendencies owing to a warmer climate, it must have been driven out of the region by the advent of the ice. A portion of this flora was probably forced into the sea, where it perished, but another part was driven south and had reached New Jersey and the southern Appalachians before the advance of the glaciers was checked.

Upon the retreat of the ice at the close of the Glacial Period these northern plants began to follow back to their old homes from these centers of distribution along the Appalachians, for the most part "falling back into zones which long environment had impressed upon them."¹ Adams² conceives of this northward migration as occurring in waves. The first of these waves consisted of the Arctic-alpine species which were able to live at the very edge of the ice-sheet in a

1. Bray. *The Development of the Vegetation of New York State*. N. Y. State Coll. For. Tech. Pub. 3 (1915).
2. Adams. *Postglacial Origin and Migrations of the Life of the Northeastern United States*. *Jour. Geog.* 1: 303-310, 352-357 (1902).

habitat unfavorable to most plants. In their northward journey two alternatives were open to these plants: either to follow the ice to the Far North, where many of them are widespread at the present time; or to remain behind in favorable situations, perhaps following the cold zone up the mountains or lingering in cold bogs or on exposed shores. The sub-arctic species in the eastern Penobscot Bay region belong to this latter group of relic types, which were left behind in the northward march and have been able to maintain themselves on the outer islands where conditions closely approach those in more arctic regions.

The second wave was composed of the species of the Hudsonian and Canadian zones, the plants of the great coniferous forest areas. Although these plants may occur locally in southern New England as relic species, in the Penobscot Bay region they have an environment suited to their needs and here they are widespread.

The third wave to go northward consisted of austral rather than boreal types. In all probability this southern element formed a conspicuous part of the pre-glacial flora and like the northern forms returned to its old localities upon the withdrawal of the ice. This third invasion (if it may be so termed) of the glaciated region was probably augmented by other southern species which pressed northward from the original centers of distribution for this flora in the southeast. This austral flora consisted of two elements which followed separate channels in their northward migration: the Alleghanian plants going along the Appalachians and the Mississippi and Ohio Valleys, the Carolinian plants following the Atlantic Coastal Plain.

The first of these elements—the Alleghanian—reaches its best development on the basic soils of the more temperate parts of the eastern United States, a zone which in general barely reaches New England. We have already noted, how-

ever, that certain Alleghanian species occur locally in the Penobscot Bay area and also in considerable abundance in more northern regions. How was it possible for these plants of rich soils to cross the sterile areas of southern New England and reach the localities to the north where they now occur? Fernald¹ has called attention to the fact that the glacial till left behind at the receding of the ice was a mixed soil containing all the necessary elements of plant food. The Alleghanian plants would have been able to penetrate far to the north of their general range by utilizing the basic materials of this mixed soil. Conditions of climate and the influence of the ocean also favored the advance of these southern forms so that they were able to reach to Nova Scotia and Cape Breton.

The original continuous distribution of these austral species on the drift area has been lost. As the basic elements became exhausted from the soil for one reason or another, this southern flora gradually became restricted to localities where the underlying rock furnished a soil with the proper requirements and where climatic conditions as well were particularly favorable. This gradual extinction of Alleghanian species has been pronounced in the eastern Penobscot Bay region. Originally the deciduous trees were abundant but the forests were cut off by the early settlers. The consequent exposure of the soil to the sun and the processes of erosion, or the occurrence of fires, resulted in the destruction of the layer of humus necessary for the maintenance of the rich woods types. These species were perhaps able to persist for a while in the now unfavorable environment but soon became unable to compete successfully with the coniferous types which were everywhere encroaching on them, and were

1. Fernald. *The Soil Preferences of Certain Alpine and Subalpine Plants.* *Rhodora* 9: 149-193 (1907).

soon restricted to the most favorable places. Small in his "History of Swans Island"¹ describes this change in the type of forests on that island. "When the island was discovered by Europeans it was entirely covered with a dense forest of hardwood trees which attained great size as shown by the enormous stumps found throughout the forest by the older inhabitants. After the first growth was cut off the land was burned over. This was injurious to the soil where it covered rocky land and much of its richness was washed into the valleys and thence into the ocean. The next growth on this impoverished soil was much smaller and can be remembered by many of the older inhabitants. When this forest was in turn cleared its place was taken by the stunted growth of spruce and fir which now covers the greater part of the island."

It is apparent that the Alleghanian plants, which in isolated localities have survived this extermination, represent relic species of a flora once widespread. As stated above, certain Alleghanian species, other than the rich woods types, are more widely distributed in the region. These species, however, are more tolerant of soil conditions and are able to persist in some of the acid areas.

Probably contemporaneous with the preceding element the Carolinian element of the austral flora went northward along the coastal plain from centers of distribution in the southeast. In its maximum development this coastal plain flora extends only to New Jersey. Britton² and Hollick,³ however, have shown that certain of these coastal plain plants are found on

1. Small. *A History of Swans Island, Maine.* Ellsworth, 1898.
2. Britton. *On the Northward Extension of the N. J. Pine Barren Flora on Long and Staten Islands.* *Bull. Torr. Bot. Club* 7: 81 (1880).
3. Hollick. *Annals N. Y. Acad. Sci.* 11: 55 (1892); 13: 387 (1894). *Trans. N. Y. Acad. Sci.* 12: 189 (1893); 13: 8 (1894).

Long Island and in southeastern New England; and more recently Fernald¹ has demonstrated their occurrence in Newfoundland. The arguments for this are too well known to need discussion here. Suffice it to say that there is good evidence of a land connection directly after the Glacial Period, which reached from New Jersey to Cape Cod and thence to Newfoundland and along which the coastal plain plants were able to migrate northward. This Carolinian element may have gone northward for the first time at the close of the Glacial Period, but in all probability it existed in the North previous to this period and was driven south by the ice into New Jersey where it remained until the retreat of the glacier and then returned over the land-bridge. This land-bridge has now been submerged or broken up and only isolated fragments remain, each of which has a typical coastal plain flora.

Although this explanation holds good for the presence of Carolinian species in Newfoundland and southeastern New England it does not explain the occurrence of such forms as *Corema Conradii* and *Hudsonia ericoides* on the rocky granite summits of the Penobscot Bay islands. Between the land connection above referred to and the central portion of the Maine coast there existed in early post-glacial times, as at present, a deep and wide expanse of water, the Gulf of Maine. This must have been an effectual barrier to prevent any of the coastal plain species from reaching Maine by the land bridge. The only other route for these plants was across the glaciated areas of southern New England. We have already noted that the glacial till which covered this region was a mixed soil containing a great variety of food elements. For plants which could exercise a

1. Fernald, A Botanical Expedition to Newfoundland and Southern Labrador. *Rhodora* 13: 109-163 (1911).

selective absorption and take out from the soil the necessary elements for their own maintenance, this till afforded a favorable habitat. The coastal plain plants, however, as mentioned earlier, are repelled by basic elements and are compelled to seek refuge on the most sterile soils where these elements are lacking. Such plants would obviously have been unable to cross the glacial till, and their uniform northward advance must have been checked until the basic materials had been removed from the soil. This might have been accomplished by the sinking of the coast, but we know from geological evidence that southern New England has not been under water since the Glacial Period. The solution of the problem is found by a study of the composite distribution of certain Carolinian species which have penetrated inland from the coastal region. These species extend up the river valleys and on the sand plains of eastern Massachusetts to York County, Maine. An examination of topographic maps of this general area shows that these sand plains are all old out-wash plains.¹

Hills to the north dammed up the water from the melting ice at the close of the Glacial Period until the pressure became too great. Then the barriers burst and the water rushed over the surrounding country leeching out the soil as successfully as though it had been under the ocean. The resulting out-wash plains now afforded a habitat suitable for the advance of the coastal plain species as far north as southern Maine. From there on the granite rocks of the coast furnished an equally silicious and sterile area on which the Carolinian plants pressed forward to the Penobscot Bay region.

Not all authorities agree as to the origin of the various

1. Woodworth. Some Glacial Wash—Plains of Southern New England. *Essex Inst. Bull.* 29: 71-119 (1897).

elements of the flora of northeastern America. The greatest amount of evidence, however, seems to be in favor of the theories outlined above, which are accepted by the majority of biologists, both botanists and zoologists. Among the dissenters from this view-point may be mentioned Scharff. In his "Origin of Life in America"¹ he advances the theory that the pre-glacial flora was not driven south by the advance of the ice but survived the Glacial Period in temperate islands in Labrador and Greenland which escaped glaciation, from which areas it has since spread to its present limits. The southern flora, on the other hand, according to Scharff, survived the Ice Age on the now submerged land bridge which extended from New Jersey to Cape Cod and Newfoundland and was likewise unaffected by the glaciers.

There are differences of opinion on other points as well. In referring to the presence of arctic-alpine species on the summit of Mt. Marcy in the Adirondaeks, Bray² disclaims the theory that they are relic types, stating that it is not necessary to assume that the arctic-alpine flora of the high mountains was established at a remote period such as the close of the Glacial Period, "since factors at present operative might account for the carrying of such species to any habitat suited to them."

The geographic affinities of individual species also afford opportunities for differences of opinion. In general *Corema Conradii* and *Schizaea pusilla* (to cite examples) are considered as southern coastal plain types which have pushed north. Stone, however, in his "Flora of Southern New Jersey"³ classes them as boreal species which have been driven south.

1. Scharff. Distribution and Origin of Life in America. New York, 1912.
2. Bray. l. c. pages 79-80.
3. Stone. The Plants of Southern New Jersey. Report of N. J. State Museum, 1911: 25-828.

THE INTRODUCED FLORA OF THE EASTERN PENOBSCOT BAY REGION

An account of the flora of the eastern Penobscot Bay region would not be complete without some reference to the introduced plants. These are much less abundant than in most parts of the country and comprise only 135 species. This paucity is due chiefly to the absence of railroads or large towns.

The most conspicuous of the weeds of the area are plants which have a more or less northern trend, among which may be mentioned *Carum Carvi* and *Matricaria suarcoleus* along roadsides and about houses; *Hieracium pratense* and *H. aurantiacum*, too abundant in fields and pastures; *Odontites rubra* in dry fields; and *Senecio sylvaticus*, common in gravelly soil at the edge of beaches and appearing almost indigenous.

The common weeds of the eastern United States are also represented by such species as:

<i>Rumex Acetosella</i>	<i>Verbascum Thapsus</i>
<i>Stellaria media</i>	<i>Chrysanthemum Leucanthemum</i> ,
<i>Capsella Bursa-pastoris</i>	var. <i>pinnatifidum</i>
<i>Ranunculus acris</i>	<i>Taraxacum officinale</i>
<i>Brassica nigra</i>	<i>Sonchus oleraceus</i>

Another type of introduced plants comprises fugitives from the West. The most interesting of these is *Phacelia linearis*, a species of the Rocky Mountain region found in a barn-yard at Brooklin, where it had obviously been introduced in grain.

In addition to these plants, all of which occur spontaneously, there are many garden escapes which have become well established, particularly in the neighborhood of old cellars or deserted houses. Often vigorous specimens of *Pyrus Malus* are seen in the midst of a forest which has re-

claimed a former orchard; while such species as *Syringa vulgaris* and *Sorbaria sorbifolia* frequently occur in old fields with such characteristic native plants as *Juniperus communis*, var. *depressa*, *Populus tremuloides*, *Vaccinium pennsylvanicum* and *Sambucus racemosa*.

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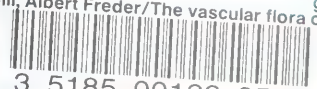
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