



Flora of Vinalhaven Island, Maine  
Macrolichens, Liverworts, Mosses and Vascular Plants

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## 1. General Introduction

This flora began with the goal of providing checklists of the macrolichens, bryophytes and vascular plants (native and naturalized) of Vinalhaven Island in Penobscot Bay, Maine. In order to provide ecological context for the checklists the project grew to include sections on the physical setting of the island, on vegetation and community types, and on the development and diversity of the flora. Work on the checklists began around 2011 and although major fieldwork for this version of the flora was completed July 2016, I (and my friends on the island) continue to locate species to add to the checklists. Most of the species records are my own, but I have also included records from inventories conducted by others of protected properties on the island, from lists supplied by botanists visiting the island and from the specimen data bases of institutional herbaria accessible through their web-based portals. I use the term “Vinalhaven Island” in an informal way to include the island itself and many of its neighboring islands. The island is the largest island in an archipelago and I have not botanized every surrounding island. The checklists include records from Penobscot Island compiled during a natural resource inventory by Alex Jones. I inventoried Stoddard and Neck Islands but not Hurricane, Leadbetter, Green’s Islands or the offshore islands, e.g. Brimstone Island. The likely consequences of these omissions are discussed in the section “Development and Diversity of the Vinalhaven Flora” (p. 7.12).

Readers familiar with academic writing may find the style of this flora jarring at times. I began the project as a retirement project (I used to teach botany, ecology and evolution to college students) with no particular readership in mind and many of the topics and asides I include are inspired by the issues that interested me during my teaching career and by conversations with friends on island nature walks. I live part-time on the island and so I probably have a more personal attachment to its flora than a consultant from the mainland would be expected to have. So I do say things like “our flora” or “we find”, although this authorial intrusion is forbidden in typical scientific writing. Finally I need to confess that I am not a Maine botanist, I am a displaced California botanist. My botanical youth in California and my research in tropical forests in Mexico have influenced how I view the flora of New England and Vinalhaven, especially diversity and endemism issues.

I am grateful to Vinalhaven Land Trust for providing me with the opportunity to conduct floristic inventories of island preserves. Friends on Vinalhaven have found and continue to find “new” species for me and it is a pleasure to thank them here: Kirk Gentalen, Beth Gilford, Kerry Hardy, and Penelope Lord. Patricia Ledlie, Bruce Allen and Ralph Pope helped with moss identifications and Jim Hinds with lichens. Arthur Haines answered numerous questions about vascular plant taxonomy. Alison Dibble kindly provided the cryptogam species lists compiled by the 2009 Crum Workshop participants. Numerous “mainland” scientists provided advice and guidance during writing of the sections on vegetation and the development of the flora: Andrew Barton, Daniel Belknap, Charles Cogbill, Les Cwynar, Stephen Dickson, Ann Dieffenbacher-Krall, Lisa Doner, Bob McMaster, Glen Mittelhauser,

Molly Schaufler, and Jill Weber. The interlibrary loan department of Butler Library, SUNY Buffalo State College performed miracles.

The checklists include all macrolichen, bryophyte and vascular plant species recorded on Vinalhaven. The count currently stands at 95 species of macrolichens, 28 liverworts, 107 mosses, and 596 taxa of vascular plants. There are doubtless new species to be found — I add a few every year. In June 2016, *Usnea strigosa*, a species then new to the lichen checklist, literally landed on my head, falling out of a red maple in front of our house on Calderwood Neck. Nomenclatural authorities are cited in the introductions to the respective checklists. In the interests of stability I decided to use the scientific names contained in the standard technical floras for our area. Some of these names will have been superseded by more recent ones and professional botanists will know how to track these down. I do not use common names for lichens or bryophytes, as these are not genuine vernacular names but inventions. A “concordance” between common and scientific vascular plant names is provided in Appendix 2.

## **2. The Setting: Landscape, Geology, Soils, Climate.**

Vinalhaven Island with an area of about 16,000 acres is the largest island in Penobscot Bay. The shallow Fox Islands Thorofare to the north connects the island to North Haven. To the east is the deeper water of East Penobscot bay, Deer Isle and Isle au Haut and to the west is the still deeper water of West Penobscot Bay and the mainland of Midcoast Maine. The coastline of Vinalhaven is a drowned post-glacial coastline, very circuitous and deeply indented. Numerous islands, large and small, some connected at low tide, others not, surround the main island of Vinalhaven. Relief is moderate, with the highest elevations of about 210ft. at Middle Mountain and Fox Rocks. The original forest cover was removed during clearing for farming and pasturage in the 18th and 19th centuries, but much of the land has returned to forest, mostly maritime spruce-fir forest. Wetlands of all sizes and complexity occur throughout the island — freshwater in the interior and saline along the coast.

The bedrock geology of the southern portion of the island is dominated by the intrusive rocks granite and gabbro, while the rocks of the northern portion are primarily volcanic and meta-volcanic (Gates 2001). There are no calcareous rocks on the island. This is discussed as a factor limiting plant species diversity in Section 7 (Development and Diversity of the Vinalhaven Flora). Where bedrock is not exposed, coarse glacial till and finer glacio-marine sediments are present (Smith 1986), and in the upland these have weathered to produce spodosols, soils which are thin, well drained, acidic, leached and low in nutrients. Peat, in places to 6 feet deep, has accumulated in freshwater wetlands descended from post-glacial ponds. The thin upland soil discourages deep penetration of tree roots and blowdowns are frequent. . Soils are deeper in ravines, and in a few, hardwoods are present. However, most low-lying areas are occupied by wetlands.

The landscape, vegetation and flora of the island have been strongly influenced by the events of the most recent post-glacial period. I return to this point in Section 7 (Development and Diversity of the Vinalhaven Flora).

The climate of Vinalhaven is strongly maritime-influenced. As far as plant growth is concerned, the principal difference between the island climate and that of the near-by mainland, is that summer temperatures are markedly lower. Although measurable annual precipitation may not differ too much between Vinalhaven and the mainland, summer fogs here may reduce the impact of summer water-stress on the vegetation. The temperature impact on plant growth is immediately obvious to anyone stepping off the ferry on the Rockland side. The weedy species around the terminal are the same as on Vinalhaven, but are obviously bigger and further advanced in their development. Some visitors find our spruce-fir forest anomalous, expecting instead the hardwoods of the Camden Hills. The cooler summers (with ample moisture) year after year account for the spruce-fir island forest on Vinalhaven and other islands and the immediate coast to the east (Davis 1966).

### 3. Vegetation of Vinalhaven.

#### Vegetation: Classification or Description?

One approach to dealing with vegetation complexity is to *classify* vegetation into more or less discrete community types which are assigned formal names, for example those in the Maine Natural Areas (MNAP) classification (Gawler and Cutko 2010): “Mountain-Holly Wooded Fen,” “Bog -Moss Lawn,” “Seaside Goldenrod - Goosetongue Coastal Headland”, etc. This has been the standard approach of consultants (including myself) performing floristic and vegetation inventories on the island for Vinalhaven Land Trust (VLT) and Maine Coast Heritage Trust (MCHT). This practice has the advantage of consistency since the vegetation diversity of one inventoried parcel can be compared with another<sup>1</sup>. However, I found that a concern with vegetation classification led me to many vexing and unproductive puzzles when trying to decide whether a particular patch of woods or wetland should be named as one type of vegetation or another. So, for this flora, I have decided on using an informal approach to *describing* the vegetation. For example, I describe the upland forest as a spruce-fir forest even though there are minor patches of other conifer species (e.g. red pines) which invite assignment to the MNAP community type “Red Spruce-Mixed Conifer Woodland” and patches of hardwoods which could be identified as representing Aspen-Birch-Woodland/Forest Complex.”

#### The Trees and Shrubs.

Vinalhaven is well wooded, so it makes sense to begin with the trees and shrubs. There are twenty-five species of native trees on Vinalhaven: ten conifers and fifteen hardwoods (see Table 3.1, next page). Of these twenty-five species, only five can be considered major components of the upland forest: red and white spruce, balsam fir, red maple and paper birch. The spruces and balsam fir are co-dominant in the upland spruce-fir forest and are regenerating in most places with abundant saplings and poles in the understory. Red spruce has the widest ecological amplitude. White spruce occurs nearly everywhere that red spruce does but is most common in old fields, coastal headlands, and as occasional stems emerging above shrub thickets (described below). Of these three co-dominant conifer species, balsam fir has the greatest preference for moist soils and is common in forested wetlands as well as the upland forest.

With regard to the remaining conifer species, pitch pine is mostly restricted to localized woodlands at high elevations (described below), while red and white pines occur here and there. Black spruce is restricted to peaty wetlands, and larch (tamarack, hackmatack) is also mostly a wetland species with an occasional individual or grove occurring in dry upland soils. Northern white cedar has a curious distribution pattern. An occasional tree pops up here and there in the spruce-fir forest in well drained soils, but its most dramatic expression is in white cedar swamps

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<sup>1</sup>A list of MNAP community types recorded by consultants on Vinalhaven is provided in Appendix 1.

where it is the dominant tree. These swamps are described below. Hemlock is very rare - a few old trees here and there with apparently no regeneration.

<b>Hardwoods</b>		<b>Conifers</b>	
<i>Acer pensylvanicum</i>	striped maple	<i>Abies balsamea</i>	balsam fir
<i>Acer rubrum</i>	red maple	<i>Larix laricina</i>	larch (tamarack)
<i>Acer saccharum</i>	sugar maple	<i>Picea glauca</i>	white spruce
<i>Acer spicatum</i>	mountain maple	<i>Picea mariana</i>	black spruce
<i>Betula alleghaniensis</i>	yellow birch	<i>Picea rubens</i>	red spruce
<i>Betula caerulea</i>	blue birch	<i>Pinus resinosa</i>	red pine
<i>Betula papyrifera</i>	paper birch	<i>Pinus rigida</i>	pitch pine
<i>Betula populifolia</i>	gray birch	<i>Pinus strobus</i>	white pine
<i>Fagus grandifolia</i>	American beech	<i>Thuja occidentalis</i>	northern white cedar
<i>Fraxinus americana</i>	white ash	<i>Tsuga canadensis</i>	hemlock
<i>Populus balsamifera</i>	balsam poplar		
<i>Populus grandidentata</i>	big-tooth aspen		
<i>Populus tremuloides</i>	quacking aspen		
<i>Quercus rubra</i>	red oak		
<i>Sorbus americana</i>	mountain-ash		

**Table 3.1 Vinalhaven tree species**

Red maple is the most common and widespread hardwood tree. One does not go very far in spruce-fir forest without seeing a red maple. However, the species is not regenerating in mature spruce-fir forest: first-year seedlings of red maples are often abundant on the forest floor but they fail to survive to their second year. “Young” red maple stems almost always prove to be stump sprouts of old trees felled decades ago. In forest edges and in wooded wetlands with thin canopy coverage red maple can regenerate and there will be numerous saplings and young trees. The other maple species occur so infrequently that it is difficult to generalize about their habitat preferences.

Of the birches, paper birch is the most abundant. It establishes in clear cuts and burnt over areas but (like red maple) does not regenerate in the deep shade of the spruce-fir forest. It is not a very long-lived species, and standing dead paper birches are common, signaling an old forest gap. It



does not stump-sprout with the vigor of red maple. Yellow birch is uncommon, but a few can be seen in moist ravines (described below). Gray birch, like paper birch a pioneer species, also has some presence in dry, rocky shrub-dominated high points. The aspens, trembling and big-tooth, have similar habitat preferences to gray birch. Balsam poplar is so far only known from two roadside populations, but it is to be sought on disturbed sites in the forest.

Beeches, in groves, occur throughout Vinalhaven, but are uncommon and are generally pointed out as “something special” on local nature walks.

Some ancient red oaks are to be seen around old homesteads, but the most frequent occurrence of the species is along the shore. For example, red oaks are a common shoreline species in parts of the Mill River, especially at its head near the Carrying Place Bridge and over into Winter Harbor. From the water this gives the forest an unjustified aspect of a forest rich in hardwoods. Although the oaks are regenerating along the shore, they are less frequent inland. The remaining hardwood species — white ash, American beech, American mountain-ash— are occasional species in spruce-fir forest, in openings and along roads in the interior. They are not major components of the forest<sup>2</sup>.

There are more shrub species than tree species on Vinalhaven — about 56. The most important upland shrubs are bayberry (*Morella carolininiensis*), huckleberry (*Gaylussacia baccata*), common juniper (*Juniperus communis*), wild raisin or withe-rod (*Viburnum nudum* var. *cassinoides*) and lowbush blueberry (*Vaccinium angustifolium*). These can dominate forest openings and rocky dry high spots. Pin cherry (*Prunus pensylvanica*) occurs in similar habitats but is not as common. In wetlands and relatively moist soil in the upland forest the most important shrubs are speckled alder (*Alnus incana*), winterberry (*Ilex verticillata*), mountain holly (*Ilex mucronata*) and sweet gale (*Myrica gale*). Roadside ditches are frequently dominated by speckled alder and dry roadside banks and clearings are the habitats of staghorn sumac (*Rhus typhina*). Many other shrub species are not as frequent but are conspicuous in the Spring with their attractive flowers, for example the shadbushes (*Amelanchier* spp.) and rhodora (*Rhododendron canadense*).

## **The Forest.**

### **Upland Spruce-Fir Forest.**

As described above, the principal tree species of the upland spruce-fir forest, in order of importance, are red spruce, balsam fir, red maple, and paper birch. There are occasional white pines, red pines and white spruce, but these are not as common. The forest floor vascular flora is

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<sup>2</sup> Friends reviewing earlier versions of this flora objected to my apparent lack of appreciation of the less frequent species. It is true that there are many striking examples of striped maple, beech, mountain ash, etc. on the island. I am only emphasizing that, compared to species like the spruces and red maple, they are very infrequent.

species-poor, typically limited to regenerating conifers (red and white spruce and balsam fir, often in groves) and a few wildflower species. Where the canopy is closed and the forest floor deeply shaded Canada mayflower (*Maianthemum canadense*), starflower (*Trientalis borealis*), wild sarsaparilla (*Aralia nudicaulis*) and dwarf-dogwood (*Chamaepericlymenum canadensis*) are the principal and in some spots the only wildflowers. Where the canopy is thinner and along gap edges whorled aster (*Oclemena acuminata*) and rough-leaved goldenrod (*Solidago rugosa*) are frequent. The three-leaved rattlesnake root (*Nabalus trifoliatus*) occurs in deep shade and at forest edges. The parasitic Indian pipe (*Monotropa uniflora*) pops up mysteriously here and there. A few more species could be listed, but the understory is not rich in wildflowers and the bryolayer (mosses, liverworts and lichens) is much more diverse, with a dozen or so species to be found within a few square meters. Spots with moist deep soil (and rotting logs) are typically occupied by mosses and liverworts while in drier spots (and on outcrops) lichens are more abundant. The bryolayer is especially lush in some places (e. g. the Granite Island Preserve, along Wharff's Quarry Road, and the north shore of Neck Island. Virtually 100% of the forest floor in these and similar sites is covered with deep and extensive cushions of the mosses *Hylocomium splendens*, *Sphagnum subtile*, *Pleurozium schreberi*, *Orthodicranum flagellare*, *Polytrichum commune*, *P. pallidisetum*, *Leucobryum glaucum*, *L. albidum* and *Dicranum scoparium*, the liverwort *Bazzania trilobata*, the giant cladonia lichen, *Cladonia maxima* and many other *Cladonia* species.

In sunny forest openings shrubs and ferns dominate, with juniper, bayberry, lowbush blueberry and huckleberry the most common shrubs and hay-scented fern (*Dennstaedtia punctilobula*) and bracken (*Pteridium aquilinum*) the most common ferns. Tree regeneration in most fern glades and shrub openings is very limited and these may be fairly permanent features of the landscape. In others, occasional paper birch, spruces and balsam fir are able to punch through and give a hint of the future forest. A few forest openings are quite extensive and are major features of the landscape. A good example is the open terrain above the old Webster quarry at the south shore of the head of Winter Harbor. This extends over many acres. There is much exposed ledge, shrub and gray birch thickets, some wispy pin cherries but very limited forest tree regeneration. Its future is uncertain (as is its origin, for that matter).

Tree bases in the spruce-fir forest are generally covered by mosses: typically *Hypnum cupressiforme* and *H. imponens*. These also occur on the forest floor. However, tree trunks and branches support a bryophyte and lichen flora (epiphytes) generally distinct from the forest floor bryolayer. For example standing dead balsams often have spectacular displays of the beard lichen *Usnea* and so far, 11 species of *Usnea* have been recorded on Vinalhaven. Red maples have more epiphytes and more epiphyte species than living conifers and old straggly specimens developing from stump sprouts surviving a long-ago timber harvest have the richest epiphyte flora, for example the ubiquitous moss *Ulota crispa*, several liverwort species in the genus *Frullania* and

the occasional *Lobaria pulmonaria* and *L. quercizans*. These last two lichen species have been considered “clean air indicators” as they are very sensitive to air pollution.

Local depressions, for example behind root-plates of overturned trees, support miniature wetlands. Although a root-plate depression will occupy only a few square meters it can contain a surprisingly complete suite of wetland species: several species of *Sphagnum*, cotton grasses (*Eriophorum* spp.), marsh fern (*Thelypteris palustris*), common woolsedge (*Scirpus cyperinus*), and the round-leaved sundew (*Drosera rotundifolia*).

Sunny ledge lies at the other end of the moisture spectrum. At some sites shrubs dominate but other sites are more diverse. Bare granite, flat or domed, sheds water and is often covered by lichens in the genus *Cladonia*, especially *C. stellaris*, *C. rangiferina* and *C. mitis*. The mosses *Polytrichum juniperinum* and *P. piliferum* are almost always present. Although some bare granite may have lost its soil and vegetation cover during quarrying operations, many of these lichen balds are deep in the forest, away from obvious signs of quarrying, and may have been bare since de-glaciation. If that is the case, their lichen and moss populations may very old. Thin soil on flat granite surfaces may support two native St. John’s worts: *Hypericum canadense* and *H. gentianoides* as well as the attractive golden false-heather (*Hudsonia ericoides*) and a number of grass and sedge species typical of open, dry sites. The downy goldenrod (*Solidago puberula*), one of the least common Vinalhaven goldenrod species, almost always occurs on ledge. Vertical ledge is typically colonized by rock-tripe lichens (*Umbilicaria* and *Lasallia* spp.) as well the polypody ferns (*Polypodium* spp. ) and the trailing gooseberry (*Ribes glandulosum*). The volcanic rocks in the northern half of the island are rich in lichen species, but do not develop the smooth lichen balds of the granitic landscape. However these rocks have more joints and fractures than granite, encouraging ground water to seep through to vertical surfaces. This results in a very rich moss and liverwort flora. The most dramatic example of this is in “The Gorge” on the VLT Tiptoe Mountain Preserve. The very rare filamentous lichen *Cystocoleus ebeneus* is apparently restricted to volcanic rocks on Vinalhaven, with two records on Crockett Point, one within the VLT Tiptoe Mountain Preserve. The broken, jagged volcanic rocks at the summits of Middle Mountain and Fox Rocks have a number of lichen species not common on granite, e.g. *Pycnothelia papillaria* and *Stereocaulon dactylophyllum*. These sites, although they are only a few hundred feet above sea level have an aspect reminiscent of communities developing above timberline, with cracks in the ledge occupied by dwarf shrubs like crowberry (*Corema conradii*), the three-leaved cinquefoil (*Sibbaldiopsis tridentata*) and dense cushions of the mosses *Dicranum spurium*, *Polytrichum juniperinum* and *P. piliferum*.

### **Deciduous Woodlands.**

Patches of deciduous (hardwood) woodland are occasional on Vinalhaven. Some occur on moist slopes and ravine bottoms where fractured bedrock promotes groundwater seepage to the surface. A well-developed example of this habitat is on the Eleanor Campbell (Polly Cove) VLT reserve on Calderwood Neck in the ravine connecting the Bathing Pool and Polly Cove. The relatively dry slopes above the ravine are spruce-fir forest. Trees of this community (red spruce, balsam fir and paper birch) also occur in the ravine, and these are joined by several broad-leaved species infrequent in spruce-fir forest: yellow birch and three additional maple species (sugar maple, striped maple, and mountain maple). Is this a distinct community type? The understory wildflower community and the bryolayer are virtually identical to what is encountered in spruce-fir forest and there is little sign of regeneration of the broad-leaved species—in fact the most vigorously regenerating species is balsam fir. Much of the forest floor has cover of hay-scented fern, also characteristic of spruce-fir forest where the canopy is thin. The ravine containing the headwaters of the Indian Ladder brook contains another deciduous woodland: mature paper birch, red maple (mostly old stump sprouts), a few yellow birch and bigtooth aspen. Here as well, there is a dense hay-scented fern and bracken understory and no sign of regenerating hardwoods. The future of these patches of deciduous woodland and of similar patches is uncertain.

High points in the Fox Rocks and Middle Mountain area are covered by a thin deciduous woodland, with paper and gray birch, red maple and bigtooth aspen. Approaching the Fox Rocks and Middle Mountain summits this woodland grades into a shrub-dominated community (juniper, huckleberry, bayberry) with occasional white spruce saplings poking through the shrubs. Much of this area was burned during the 1933 “2000 Acre” fire and what we have here is a post-fire successional community and not a mature vegetation type. It is nonetheless a very dramatic landscape.

### **Pitch pine woodland.**

Pitch pine is an essentially Appalachian species which barely makes it into Maine and we are near the northern limit of its geographical range. MNAP considers pitch pine woodland to be “rare in Maine but not imperiled” (rank S3), so Vinalhaven is fortunate to have many outstanding occurrences of this community type. Here pitch pines tend to occur at higher elevations and on the thinnest soils. The best developed pitch pine woodland on Vinalhaven is on Isle au Haut Mountain, contained within the Town park and VLT conservation parcels. Other examples can be found in the Basin Preserve and on the Folly Pond trail. There is considerable variation in the expression of this community type. In its most extreme form there is considerable bare ledge where the only cover is provided by crustose lichens, a few foliose and fruticose lichens (*Xanthoparmelia* spp., *Cladonia* spp., *Umbilicaria* spp., *Lasallia* spp.) and black streaks of the

moss *Andraea rothii* where there are runnels of water following rains. The pitch pines – contorted like giant bonsai trees – and accompanied by a few red spruce and red maple — are restricted to patches of very thin soil. A shrub layer (huckleberry, lowbush blueberry, common juniper, crowberry) develops under the trees. The shrub layer is often outwardly bordered by mosses, especially *Polytrichum juniperinum*. Accumulation of litter in these patches is undoubtedly contributing to soil growth. Off island, pitch pines occupy a broad range of habitat types: dune forests, bogs, and many others. The Vinalhaven “giant bonsai” expression of pitch pine woodland is probably rare within the geographic range of the species and thus globally rare.

A less extreme expression of the pitch pine woodland can be seen on the Swanson property below the motions<sup>3</sup> near the property line. The trees are taller, with nearly straight trunks and red spruce is mixed in. Canopy coverage approaches 100%, but the foliage is so thin that light penetrates to support a very dense shrub layer below (huckleberry, bayberry, common juniper). The ground is covered by reindeer lichen (*Cladonia rangiferina*) and relatives. This most “forest like” expression of pitch pine woodland grades into spruce-fir forest at lower elevations.

Since pitch pine woodland is well developed on former quarrying sites (e.g. on Isle au Haut Mountain), it is possible that the bare ledge and thin soil may be partly due to quarrying activity. However, there are patches of good pitch pine woodland elsewhere on the island where there are no obvious signs of quarrying.

### **The Shore.**

The post-glacial drowned coastline of Vinalhaven is complex. We have rocky headlands, deep coves, islands connected to the mainland at low tide, but not at high tide, and numerous islands, large and small surrounding the mainland of Vinalhaven. Consequently, there is a great variety of coastal vegetation types and plant habitats. At one extreme the spruce-fir forest stops a few feet above the high tide line and there is no transitional shore-line community. At the other extreme the sea extends well landward (e.g. at Long and Crockett Coves) and a wetland complex develops.

### **Rocky Headlands and Beaches.**

On dry rocks above the high tide line but within reach of salt spray the native seaside plantain (*Plantago maritima*) is almost always present. On ledge, this is the most seaward flowering plant. Scotch wild lovage (*Ligusticum scoticum*) occurs in moist cracks and depressions in rocks nearly as close to the surf as the plantain. *Schistidium maritimum* is the most sea-ward moss. Lichens are conspicuous in some rocky headlands, especially the gray foliose rockshield lichens *Xanthoparmelia conspersa*, *X. viriduloumbrina*, and the easy-to-identify golden wall lichen

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<sup>3</sup> “Motions” are small quarries, usually worked by a single quarryman.

*Xanthoria parietina*. Vacationers don't come to Vinalhaven for our beaches, but we have them. Cobble beaches occur here and there and support a few wildflowers, e.g. common skullcap (*Scutellaria galericulata*) and, more rarely, red false Bartsia (*Odontites vernus*) and seaside bluebells (*Mertensia maritima*). Common plants on sandy beaches include American lyme grass (*Leymus mollis*), American sea-rocket (*Cakile maritima*), wild radish (*Raphanus raphanistrum*), three species of orache (*Atriplex acadensis*, *A. glabriuscula* and *A. prostrata*) and beach pea (*Lathyrus japonicus*). Gravelly and muddy depressions inundated at high tide are typical of rock and beach complexes and it is in these that we find common glasswort (*Salicornia depressa*), two seablite species (*Suaeda calceoliformis* and *S. maritima*), salt marsh arrowgrass (*Triglochin maritima*), and sea-lavender (*Limonium carolinianum*). These species also occur in proper salt marshes. Behind the beach berm a wetland typically develops, partly saline, partly fresh. Good examples include the beach-berm-wetland complexes can be seen at State Beach and Lane's Island.

### **Salt Marshes.**

Salt marshes range in scale from the pocket marshes which develop wherever there is a notch in the rocky coast line where marine sediments can accumulate to the extensive systems in The Basin, Crockett and Long Coves. These *Spartina* marshes, dominated by *Spartina alterniflora* and *S. patens*, are very productive but relatively species poor ecosystems. The plants are terrestrial organisms which have adapted to life in sediments which are saline and periodically inundated and anoxic. In short, an extreme environment. In major marshes open to the sea the species are arranged in a zonation which results from an interaction between the species' tolerance of inundation and competition between them. Working from the sea landward, the first species is smooth cordgrass (*Spartina alterniflora*), a tall grass inundated at every high tide. This is replaced landward by saltmeadow cordgrass (*S. patens*), a shorter grass inundated by spring high tides. Another high marsh dominant is the saltmarsh rush (*Juncus gerardii*). The seaside goldenrod (*Solidago sempervirens*) occurs in the high marsh and is spectacular in the early fall. The enigmatic (because it rarely flowers) sedge *Carex paleacea* is among the "highest" of the high marsh species. Not all salt marshes exhibit this zonation and in some (especially artificially impounded saline wetlands) the species are arranged in a more patchy fashion. Additional common and conspicuous species occurring here include threesquare bulrush (*Schoenoplectus pungens*), New York aster (*Symphyotrichum novi-belgii*), salt marsh bullrush (*Bolboschoenus maritimus*), and freshwater cordgrass (*Spartina pectinata*). In both types of marshes — the zoned and the patchy — "pannes" occur. These are bare bits of dark salt marsh peat which drain poorly. They are hypersaline and hot in the summer at low tide and are usually colonized by common glasswort.

The sharpness of the boundary between the salt marsh and the surrounding upland depends on how steep is the gradient between the two. In some pocket salt marshes one steps directly from salt marsh vegetation onto dry ledge. Another, more interesting, situation arises in coves where the bedrock depression associated with the cove extends landward. Under these conditions we can walk along a smooth transition from a fully marine community to a freshwater one. One of the nicest examples of this is in Marsh Cove on Crockett Point in the VLT Tiptoe Mountain Preserve. A constructed dike of rocks marks the seaward boundary of the salt marsh. Below this is a typical rocky intertidal community dominated by rockweed, bladderwrack, acorn barnacles, etc. The dike traps sediment behind it and this has facilitated the development of the salt marsh community. Most of the marsh is *Spartina* salt marsh, with saltmeadow and smooth cordgrass being the dominant species. Saltmarsh rush is also common, as is glasswort in pannes. There are occasional pools which have been colonized by the aquatic flowering plant ditchweed (*Ruppia maritima*). There are several patches of sea lavender and of seaside goldenrod. At low tide, a narrow winding creek drains the marsh. Progressing through the marsh landward (to the south) there is a transition to brackish conditions marked by the alkali bulrush and just above this a cattail marsh. The cattails (*Typha latifolia*) mark the transition to freshwater conditions as do the several peatmoss (*Sphagnum*) species underfoot and wildflowers like swamp candles (*Lysimachia terrestris*) and marsh St. Johnswort (*Triadenum fraseri*). Beyond this point the freshwater character of the wetland is very evident, with much peatmoss cover and luxuriant skunk cabbages (*Symoplocarpus foetidus*). The woodland canopy closes in, and we are in a wooded freshwater wetland, in the shade of mountain holly and alders.

Some coastal wetlands on Vinalhaven show the effects of management. Three examples:

- The saline wetland on the east side of the road to the Lane's Island Preserve. This is separated by the road (a raised causeway functioning as a dike) from a fresh to brackish wetland on the west side of the road. At one time these must have constituted a single system open to the sea. The saline portion communicates via a culvert with the seawater of Carver's Harbor and circulation is limited. The characteristic zonation of marshes open to the sea does not develop and species are distributed in a patchy fashion - the large panne is evidence of poor drainage.
- The Ballfield between East Main Street and School Street. Until the early 1970's this was in fact the town ballfield. At one point the landowner made the decision to allow the sea to come in and, to accomplish this, a culvert connecting The Ballfield with the water of the Indian Creek cove was constructed. Today The Ballfield is a complex and strange system of saline to brackish patches with dense growth of the coastal rushes *Juncus balticus* and *J. gerardii*, poorly drained pannes with glasswort (brilliant ruby red in the Fall) and a brackish to fresh water border with wooldsedge and broad-leaved cattail. The

marsh to the seaward side of School Street is a normal *Spartina* marsh and it is likely that before the “dike” of School Street allowed the development of The Ballfield, the *Spartina* marsh extended landward toward East Main Street.

- The drowned Trotting Park at the head of Vinal Cove. This embayment was opened to the sea in 2004. Before that time and during most of the last century circulation was limited and the embayment was essentially an aromatic tidal flat with a very narrow fringe of salt marsh. By 2016 the salt marsh had reclaimed the site of the Trotting Park and corpses of alders and balsam rising above the marsh give testimony to the change. The marsh is a perfectly normal *Spartina* salt marsh with all characteristic species in place and the typical zonation developing. This is an extraordinary example of rapid ecosystem recovery.

### **Shrub-dominated shoreline communities.**

Stoddard Island and much of the high-elevation portions of Lane’s Island are covered by a shrub cover which is dense and essentially impenetrable. The dominant shrubs are Virginia rose and rugosa rose (*Rosa virginiana* and *Rosa rugosa*), bayberry, red raspberry (*Rubus idaeus*), bristly gooseberry (*Ribes hirtellum*) and winterberry. There are also pockets of poison ivy (*Toxicodendron radicans*). The shrubs reach heights of 6 feet and beyond. Other especially tall shrubs include choke and pin cherry (*Prunus virginiana* and *P. pensylvanica*) and staghorn sumac (*Rhus typhina*). Cover is so complete that there is essentially no understory and little recruitment of tree species. Throughout the shrubland there are a few relatively open areas where meadowsweet (*Spiraea alba*), rough-leaved goldenrod (*Solidago rugosa*) and spotted St. Johnswort (*Hypericum punctatum*) replace the rougher shrubs.

The shrublands are interrupted by occasional habitat “islands” where the soil is either thinner or deeper than in the shrubland proper. The first type of these are “islands” of soil-free ledge which rise above the “sea” of shrubland. Some of these support colonies of the common juniper and in the cracks can be located a few individuals of yellow rattle (*Rhinanthus minor*) and several grass species. There may be a few mosses, e.g. *Polytrichum juniperinum* and lichens, e.g. the pebbled pixie-cup (*Cladonia pyxidata*). The second type of habitat “island” is represented by pockets of moist soil developing in hollows. These are, in effect, miniature wetlands with many of the species characteristic of wetlands of greater extent: blue flag (*Iris versicolor*), arrow-leaved cutthumb (*Persicaria sagittata*), the rushes *Juncus effusus* and *J. pylaei*, marsh fern (*Thelypteris palustris*) and sensitive fern (*Onoclea sensibilis*).

It has been suggested (Gawler and Cutko 2010) that these shrubby communities developed on Maine’s “sheep islands” and it may be that with the departure of the sheep, the open grassy spaces



were rapidly colonized by native shrubs which had survived clearing and burning. The dense shrub growth, in turn, prevents a return to the the original, pre-sheep, maritime spruce-fir forest.

### **Freshwater Wetlands.**

Vinalhaven has numerous wetlands and freshwater aquatic habitats of diverse size and complexity. The boundary between wetland and upland is generally sharp if there is sufficient gradient between upland and wetland. In many wooded wetlands the transition from a bryophyte community dominated by *Sphagnum* spp. and one dominated by upland forest floor species like *Hypnum cupressiforme* and *Bazzania trilobata* can take place in less than a yard. In flat terrain, the boundary may be more blurred. The boundaries between wetland community types are usually indistinct with patches occupied by different combinations of species grading into each other. So to avoid engaging issues of wetland taxonomy, I will discuss the botany of our wetland types informally and in the following order, from simple to complex: streams, ponds, marshes, open shrubby wetlands, and wooded wetlands (peatlands).

### **Streams.**

Vinalhaven streams are not numerous but they present interesting botanical features. Our streams vary with respect to their sources (ponds, wetlands, the upland), mouths (ponds, wetlands, the sea) and gradients. A few streams have flow throughout the growing season but many are ephemeral. Some have mossy banks (*Sphagnum centrale* and *Mnium hornum* are typical), others have muddy banks where the liverworts *Pallavicinia lyellii*, *Pellia epiphylla* and *Scapania nemorea* can be seen. Alders are ubiquitous. Where the gradient is steep and the stream rushes over bare rock several truly aquatic liverworts occur in the current, e.g. *Marsupella emarginata*, *Gymnocolea inflata* as well as the moss *Fontinalis novi-angliae*. Low-gradient segments with sandy bottoms support the aquatic macrophytes American bur-reed (*Sparganium americanum*) and wild calla (*Calla palustris*). High-gradient segments have sharply defined banks but where the gradient is nil the stream spreads out and merges with (becomes) a surrounding wetland. This alternation between high and low gradient segments (with their different plant associations) is very common: outstanding examples include Murch's Brook in the Marcuse Preserve and the long stream which runs from Cedar Pond to Mack's Pond.

### **Ponds.**

Vinalhaven has two major ponds, Round Pond and Folly Pond. Some other ponds like Cedar Pond and Otter Pond are hidden away in the upland forest and less well known. Interesting botanical features of ponds include their shores, their surrounding wetlands, and their rooted and floating plants. Pond shores can be rocky with an abrupt transition between pond and upland vegetation or they can be more gradual, with a smooth transition between open water with floating and emergent macrophytes and a bordering wetland. Short shrubs like bog rosemary

(*Andromeda polifolia*) and leatherleaf (*Chamaedaphnia polifolia*) are frequent on pond margins as are the tall shrubs winterberry and speckled alder. The three most frequent emergent macrophytes (roots in the sediment but leaves held well above the water surface) are broad-leaved cattail, American calla and pickerelweed (*Pontederia cordata*). Floating on the surface are three species of water lilies: watershield (*Brasenia scheberi*) with its modest flowers and the spectacular yellow bullhead pond-lily (*Nuphar variegata*) and white water-lily (*Nymphaea odorata*). To these must be added the unrelated but superficially similar little floating-heart (*Nymphoides cordata*). Pondweeds (three species of *Potamogeton* recorded so far) have both submerged and floating leaves and although not as conspicuous from the shore as the water lilies, are important members of the aquatic plant community..

### **Cattail marshes.**

Cattails occur in a variety of habitats: the upper brackish to freshwater zone of coastal wetlands, the borders of ponds, roadside ditches and in upland marshes where they are the dominant species. They require standing water for much of the growing season. As cattails grow they exclude other species and cattail marshes on Vinalhaven are typically virtual monocultures of the broad-leaved cattail, *Typha latifolia*. These marshes are best developed on open sites with no forest canopy overhead. In such a marsh a few shrubs may poke up here and there: winterberry, Western poison ivy (*Toxicodendron rydbergii*), meadowsweet and hardhack (*Spiraea alba*, *S. tomentosa*) as well as a few herbaceous hydrophytes like swamp candles, but most of the cover is due to the cattails. Since broad-leaved cattails are such aggressive competitors and since cattail abundance and range has been expanding for several decades, they are considered invasive by some despite their native status (Shih and Finkelstein 2008). This can also be said of the narrow-leaved cattail (*T. angustifolia*) which is probably introduced in North America and may be even more successful in pre-empting wetland space (Ciotir et al. 2013). So far this species has only been noted on one site on Vinalhaven, the new coastal wetland at the head of Vinal Cove (the site of the drowned Trotting Park.) We may expect to see more of it, as well as the hybrid resulting from crosses between broad- and narrow-leaved cattails (*T. x glauca*). Cattails may be more common on Vinalhaven today than in the past and some present-day cattail marshes may have replaced more diverse sedge-shrub marshes. As cattail marshes experience a further wave of invasion from purple loosestrife (*Lythrum salicaria*), which has been noted in a few Vinalhaven marshes and common reed (*Phragmites communis*), not yet seen on the island, their character will be altered.

### **Open Sedge-Shrub Marshes.**

Freshwater marshes dominated by sedges and shrubs are found throughout the island. They range in size from a few square yards by a roadside to several acres. Many ponds (e.g. Folly Pond,

Mack's Pond) are partly bordered by these marshes. These are extremely variable with respect to the species occurring in them and the relative frequencies of the species. Typically they are in the open, with no forest canopy overhead. Among the most common sedges are three-way sedge (*Dulichium arundinaceum*), the tall and conspicuous common wooldsedge (*Scirpus cyperinus*), mosquito bullrush (*S. hattorianus*, especially in roadside marshes) and numerous *Carex* species, e.g. *Carex scoparia*, *C. crinita*, *C. gynandra*, *C. lasiocarpa*. Other common and conspicuous sedges include white beak-rush (*Rhynchospora alba*) and the fluffy white cottongsedge (*Eriophorum* spp.). Wet depressions and pools are colonized by cattails while exposed sediments are the habitats of two sundew species (*Drosera rotundifolia*, *D. intermedia*) and the creeping Northern bog clubmoss (*Lycopodiella inundata*). The shrub and herbaceous species occurring in cattail marshes also occur in sedgy marshes, and in some marshes the sedge-dominated zone grades into a shrubby zone (described next) dominated by sweet gale and *Spiraea* species.

#### **Open shrub-dominated wetlands.**

Open shrub-dominated wetlands are relatively infrequent on Vinalhaven. The wetland behind the berm on Lane's Island is shrub-dominated, consisting of a near monoculture of sweet gale. This grades into a sedge-shrub marsh toward the road/causeway. The northwestern margin of the Mack's Pond wetland is similarly a near sweet gale monoculture. In some wooded peaty wetlands, for example on the Swanson preserve a thin forest canopy promotes the development of a shrub-dominated wetland over a hummock-and-hollow topography under an open sky. The shrubs are Labrador tea (*Rhododendron groenlandicum*), bog rosemary (*Andromeda polifolia*) and sheep laurel (*Kalmia angustifolia*), all members of the heath family (Ericaceae). Alders are good indicators of wetland conditions and although some individuals of speckled alder (*Alnus incana*) can be seen in dry soil, the species is most common in wet to inundated conditions. It can occupy thickets in peatlands or borders of watercourses or, indeed, seasonally flooded roadside ditches. Green alder (*Alnus viridis*) is less common.

#### **Forested wetlands (Peatlands).**

The forested wetlands of Vinalhaven are structurally the most complex plant communities of the island. They are peatmoss-dominated. Of the 23 species of *Sphagnum* recorded so far on the island, 19 occur in forested wetlands. The biology of these mosses affects the community in two main ways: the cells of their leaves have tremendous capacity for holding water, and their metabolic activities lower the pH of their surroundings. A peatmoss habitat is consequently both waterlogged and acid. Although these wetlands are informally referred to as swamps or bogs they are technically fens. They are fens and not bogs because they occupy basins and receive their water primarily from the surrounding upland rather than from precipitation (as do bogs). And they are fens because they overlay peat, in some cases over 6 feet deep. Some forested

wetlands are local, occupying a few hundred square yards and others are major features of the landscape, extending over hundreds of acres. None of the wetlands on Vinalhaven have been investigated by paleobotanists, but we can guess something of their history from studies of other wetland sites (e.g. Doner 1995) in mid-coast Maine that were also below the limit of the post-glacial marine transgression. The deepest and oldest sediments in a major Vinalhaven fen must be marine — glacio-marine clays and silts of the Presumpscot formation.. Above them we expect a gradual transition to freshwater conditions, with lacustrine mineral sediments. *Sphagnum*-rich peat will overlay the marine sediments and up to the present-day surface. The major fens with deep glacio-marine, lake and peat deposits have been developing for about 13,000 years.

Although some fens have been logged (stumps are evident) the wettest ones with little merchantable timber may have escaped logging. If this is so, these very old ecosystems are among the closest things to undisturbed nature we have on Vinalhaven.

Major forested wetlands are typically bounded by an alder lagg, a sort of moat. This is a zone dominated by speckled and green alder. Other shrubs include mountain-holly, winterberry, and a tall and vigorous form of huckleberry. Below, it is very wet, with standing or slowly flowing water during most of the growing season. Skunk-cabbage (*Symplocarpus foetidus*) is present. *Sphagnum* hummocks are not well developed, but *Sphagnum cuspidatum* typically forms a partially submerged lawn. In most major wooded wetlands the alders mark the upland/wetland border, where surface flow runoff is received from the upland. In the spring the violets *Viola cucullata* and *V. pallens* add a dash of color. The lagg is dense and wet underfoot and discourages entry of the wetland. But once past this barrier, the going is easier.

There is typically a very sharp transition between the lagg and the forested fen. Most of the forested fen is dominated by a canopy of red spruce, black spruce, red spruce/black spruce hybrids, larch, red maple, balsam fir and yellow birch. There may be a shrub layer, especially of mountain-holly, alders and wild-raisin. In spots with sparser tree cover, these shrubs constitute the canopy species. The larger spruces often occupy what appear to be islands in the wetland, but probing reveals that these trees are not growing on bedrock, but on peat, generally more than 6 feet deep. Peat is a weak substrate for a large tree, and as trees grow and increase in mass, they sink down through the peat, their roots entering an anaerobic zone. Inhibition of root respiration results in death of the tree, hence the many standing dead spruces in the wetland. The “islands” support a community of plant species less tolerant of flooding, e.g. goldthread (*Coptis groenlandica*) and creeping snowberry (*Gaultheria hispidula*) along with the occasional upland colonist like dwarf dogwood and Canada mayflower. The understory is dominated by lush skunk cabbages and *Sphagnum* hummocks and hollows. These are highly structured, with different species occupying a moisture gradient from the very wet hummock base to the relatively dry summit which can be 2 feet above the base. Hummock summits are typically characterized by

*Sphagnum magellanicum*. Moving down the flanks, we encounter *S. affine*, *S. fallax*, and *S. papillosum*, in that order. Where there is standing water in the hollows, *S. recurvum* and *S. cuspidatum* occur. Many of these peatmosses are brilliantly colored in the Fall. In late summer/early fall when there is some drawdown of the water level, the thallose liverworts *Scapania nemorea* and *Pellia epiphylla* can be observed on the muddy hollow at the hummock base. Other mosses are also present on hummock summits and flanks and some of these are also those typical of uplands, e.g. *Orthodicranum montanum*, *Hypnum imponens*, *Thuidium deliculatum*, *Aulacomnium palustre*. Among the most common understory vascular plants of this zone are the marsh fern, swamp dewberry (*Rubus hispidus*), three-seeded sedge (*Carex trisperma*), and the sallow sedge (*Carex lurida*).

In drier phases of the wetland an understory of cinnamon fern (*Osmundastrum cinnamomeum*) replaces skunk cabbage. The peat surface is also *Sphagnum* covered, especially by *S. palustre*, *S. centrale*, and *S. magellanicum*. Goldthread is very common here. Sheep laurel (*Kalmia angustifolia*) is the principal shrub.

In some forested wetlands standing water pools occur commonly, frequently occupied by wild calla. The pool border is generally marked by sedges, especially *Carex lurida* and woolsedge. There may be an occasional cattail. Aquatic peatmosses, especially *Sphagnum cuspidatum* also occur, forming soggy mats or lawns. The thallose liverwort *Pallavicinia lyellii* may occur on mud at the pool's edge. Sedgy meadows may border some pools in relatively open areas. The meadows are dominated by the sedges *Carex canescens*, *C. lurida*, and *C. atlantica*, the rushes *Juncus effusus*, *J. brevicaudatus* and *J. pylaei*, and the grasses *Glyceria striata* and *Calamagrostis canadensis*.

Cedar swamps warrant special mention as a type of forested wetland. These are rare on Vinalhaven. One is in the Basin Preserve and another surrounds the southern margin of Cedar Pond and the upper reaches of the stream draining Cedar Pond to Mack's Pond to its south. The canopy is nearly 100% Northern white cedar. It is very wet underfoot, with evident flow, and well-developed *Sphagnum* hummocks and hollows. Trending south, the cedars are gradually replaced by red maples and red spruce.

### **Quarries and Motions.**

Granite quarrying has had an important impact on the landscape of the southern half of Vinalhaven. Botanically, the effect has been to increase habitat space for particular plant and lichen species. When motions are fully or partly flooded they can support an impressive array, almost a complete set, of wetland plants. Flooded motions can be very attractive — like artfully arranged rock gardens. In the early fall the graceful arching inflorescences of woolsedge signals the presence of a flooded motion with its mini-wetland. Deeper pools often contain populations

of the carnivorous aquatic bladderworts (*Utricularia geminiscapa* and *U. vulgaris*), more frequent in flooded quarries and motions than in “natural” pools and ponds. On Vinalhaven the peat moss *Sphagnum pylaesii* has only been recorded on former quarrying sites (it does not occur in hummock and hollow wetlands). Bare granite surfaces and cut vertical surfaces have been colonized by a rich lichen and bryophyte flora.

The abandoned quarrying sites which have been completely reclaimed by nature are remarkable features of the Vinalhaven landscape. It is striking that these spots — like the Granite Island Preserve and Armbrust Hill — have a complete set of understory species under the developing spruce-fir forest canopy. “Complete” in the sense that the vascular plant, bryophyte and lichen diversity of the quarrying sites is at least equal to sites that have not been subjected to quarrying operations. The community recovery has been rapid. Old photographs show that these sites were bare granite only about a century ago.

### **Roadsides and Other Disturbed Areas.**

Vinalhaven’s roadside flora is exceedingly diverse. For example the three-quarter acre crushed stone and cobble slope by the Town water treatment plant on Sands Road boasted 59 species of flowering plants when inventoried on a VLT nature walk in early September 2009. This is a very high level of species diversity on a species per unit area measure. Most of the species there (34, 58%) are not native to North America and it is typical of roadside spots that many or most of the species are “from away.” Roadsides present a haphazard mixture of native species (originally adapted to exploit forest openings) and non-native species (old garden escapes and weeds of agriculture). Until the Town of Vinalhaven began the practice of mercilessly mowing roadsides, one of the botanical delights on the island was watching the seasonal progression of roadside wildflowers. We can still enjoy this, but it takes a sharper eye. The year begins with bright yellow coltsfoot (*Tussilago farfara*). More modest but very attractive is bluets (*Houstonia caerulea*). Summer brings the hawkweeds: the yellow hawkweed (*Hieracium caespitosum*) and the less common orange hawkweed (*H. aurantiacum*), Queen Anne’s Lace (*Daucus carota*) and valerian (*Valeriana officinalis*). The approach of fall brings dramatic displays of tansy (*Tanacetum vulgare*) and the goldenrods — Canada goldenrod (*Solidago canadensis*), followed by rough-leaved goldenrod (*Solidago rugosa*) -- and the tall white aster (*Doellingeria umbellata*). These are all species of relatively dry roadside patches; some are native, others are introduced.

Occasionally an individual or two of a non-native species will appear by a roadside and represent the entire known population of the species on the island. Some of these waifs persist, others vanish. An example of the former is tansy ragwort (*Jacobaea vulgaris*) noted on Clamshell Alley

and an example of the latter is hawkweed oxtongue (*Picris hieracioides*) noted on the Calderwood Neck Road. Species like these may ultimately prove to be additions to our flora, or they may not.

Roadside ditches which are seasonally wet can support interesting linear wetlands of mostly native species. Most conspicuous are alders, cattails and the tall woolsedge. Two other frequent sedges are *Scirpus hattorianus* and *Carex lurida*. Sensitive fern (*Onoclea sensibilis*) is common. Two species of horsetails, *Equisetum arvense* and *E. sylvaticum* also occur in ditches. The non-native and potentially invasive spot-leaved crowfoot (a buttercup, *Ranunculus repens*) is increasingly common in ditches. The native yellow spotted touch-me-not (*Impatiens capensis*) is occasional in shaded ditches and is experiencing sharp competition from the introduced purple Himalaya touch-me-not (*I. glandulifera*). Alders (mostly speckled alders) are major components of the roadside ditch community.

Japanese knotweed (*Fallopia japonica*), a notorious invasive, is common on our roadsides. Shade-intolerant, it does not penetrate the forest.

#### 4. Macrolichens. Introduction.

The macrolichen checklist includes 95 species. I used Brodo et al. (2001) and Hinds and Hinds (2007) to identify lichens and nomenclature follows these references. The two largest genera are *Cladonia* (29 species) and *Usnea* (11 species) and together these constitute over 40% of the macrolichen diversity. I haven't ventured into crustose lichen species, but if these were to be included the lichen flora of Vinalhaven might increase several-fold. I have seen and collected 85 of the 95 species on the list. The remaining 10 species records were vouchered by participants of the 2009 Crum Workshop in the Huber and Starboard Rock preserves and by Jim and Patricia Hinds during a 2005 inventory of the Starboard Rock lichen flora. The "vouchered by others" species are enclosed in brackets in the checklist. My checklist does not include common names. I understand the argument that the use of common names on nature walks, etc. encourages appreciation and understanding of lichens, but on balance I have found common names to be a distraction<sup>4</sup>.

##### 1. Lichens of the forest floor.

The forest floor lichen flora is dominated by species of *Cladonia*. The most common one is *Cladonia squamosa* which occurs everywhere in the spruce-fir forest, especially on rotting stumps and logs, but also on litter-covered soil and in mats of *Dicranum scoparium* and other mosses. The second most frequently seen species is *Cladonia maxima*, usually in conifer leaf litter. Numerous other *Cladonia* species are common in the understory. A few examples: *C. ochrochlora* on wood, soil and tree bases; *C. rangiferina* and *C. stellaris*, forming extensive colonies on thin soil; *C. floerkeana* on rotting wood; *C. chlorophaea* on stumps, litter and ledge. These and most other understory *Cladonia* species have populations with numerous individuals and one doesn't walk far without seeing one. Some other forest-floor species are sparser on the ground. A good example is the uncommon and odd *Baeomyces rufus*, which I have occasionally seen on moss and liverwort cushions, overgrowing them. The superficially similar *Dibaeis baeomyces* is an occasional colonist of bare trailside soil<sup>5</sup>.

##### 2. Epiphytes.

More lichen genera are represented among the epiphytes. The most common conifer bole epiphyte is *Flavoparmelia caperata*. Other foliose lichens common on bark include *Parmelia squarrosa*, *Punctelia rudecta*, *Hypogymnia krogiae* and *H. physodes* (both of these also occur on branches and twigs). *Bryoria* species seem to be more common on boles than on twigs and are easy to miss, as their dark color provides some camouflage. The branch and twig flora is dominated by the 11 species of *Usnea* so far documented for Vinalhaven. The pendent species are the most dramatic, especially on dead balsam firs on a foggy

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<sup>4</sup> I especially recall a tedious discussion during a walk on whether all "*Cladina*" species were real reindeer lichens or only *Cladonia rangiferina*.

<sup>5</sup> I thank Jim Hinds for this record. Jim suggested that I be on the look-out for the species but it turned out I had in fact collected it but filed the specimens with crustose lichens to be identified.



day; the tufted species require more searching. It is not unusual to find half dozen *Usnea* species on a single dead balsam. Some other significant twig and branch species are *Hypogymnia krogiae* and *H. physodes*, *Platismatia glauca*, *P. tuckermanii*, and *Tuckermanopsis americana*. Three species of *Lobaria* are known from the island: *L. pulmonaria*, *L. quercizans* and *L. scrobiculata*. The first of these is the most common and all three are restricted to red maple bark. The oldest, most straggly trees are the best places to look for these species. *Parmotrema crinitum* and *P. perlatum* are regionally rare but occasional on the island and are discussed below.

### 3. Lichens on ledge.

In the granitic portion of the island flat or slightly convex ledge in full sunlight is dominated by several species of *Cladonia*. *C. strepsilis* is characteristic of these “lichen balds” and apparently restricted to these sunny, dry sites. *C. boryi*, *C. rangiferina*, *C. arbuscula* and *C. uncialis* are also common here as is the foliose lichen *Xanthoparmelia viriduloumbrina*. *Cladonia stellaris* is an exceptionally attractive member of the lichen bald community. *Cetraria aculeata* and *C. arenaria* are lichen bald species on Vinalhaven. In areas with little foot traffic the lichen cover on these sites is close to 100%. The rock-tripe lichens (*Umbilicaria americana*, *U. mammulata*, *U. muhlenbergii*, *Lasallia papulosa* and *L. pennsylvanica*) are typical of vertical, moister rock surfaces in the shade. Ledge by the sea can support lichens very close to the high-water line: *Xanthoparmelia viriduloumbrina* and *X. conspersa*, *Xanthoria parietina* and *X. elegans* are typical.

All of the ledge species mentioned so far are to be found on volcanic and meta-volcanic rocks in the northern part of Vinalhaven as well as in the southern, granitic terrain. However there are a few lichens that seem to be more common on the Vinalhaven Rhyolite, for example on the open, dry summits of Fox Rocks and Middle Mountain. These include *Stereocaulon dactylophyllum*, *Pycnothelia papillaria* and *Parmelia omphaloides*<sup>6</sup>. Although rhyolite and granite are chemically similar, the outcrops are quite different, with rhyolite presenting a rougher, more complex microtopography due to the greater number of joints and fractures.

### 4. Some lichen species occurring on Vinalhaven deserving special mention.

- *Cystocoleus ebeneus*. I collected this species on Crockett Point in 2010, was unable to identify it so I sent it to Jim Hinds who did. It turned out that my collection represented a new species record for the State of Maine. The species has a spotty but very broad geographic distribution in North America, Europe and as far north as Greenland and as far south as Antarctica. This is remarkable as this lichen is sterile — it never produces spores. It unclear how it is dispersed so widely. On Vinalhaven it occurs on Crockett Point (two stations so far, one in the Tiptoe Mountain Preserve) and at Indian Ladder in the

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<sup>6</sup> The moss *Hedwigia ciliata* also appears more common on rhyolite than granite.

Perry Creek Preserve. It favors moist and shaded vertical rhyolite surfaces. In 2012 Irwin Brodo discovered another Maine occurrence of the species down east on Roque Island.

- *Lobaria pulmonaria*, *L. scrobiculata*, *L. quercizans*. These lungwort lichens are considered indicators of old-growth forest in New England and Britain (Hinds and Hinds 2007). Of course, we have no genuine old-growth forests on Vinalhaven but the old, straggly red maples with no merchantable timber at all are the exclusive habitat of these species and may serve to remind us of the character of the original forest.
- *Parmotrema crinitum* and *P. perlatum* are rare in Maine, being essentially restricted to coastal sites. Both are very distinctive bark epiphytes and not hard to find on Vinalhaven. It should be noted that these species are regionally rare, not globally rare. Like many cryptogams they have absurdly broad geographical ranges, with sitings in the Azores (*P. crinitum*) and Korea (*P. perlatum*).
- In addition to the three lungworts, the following species are declining in New England: *Bryoria trichodes*, *B. fuscescens*, *Cladonia boryi*, *Usnea trichodea*, and *U. ceratina*. The regional decline may be due to air pollution (to which many lichen species are sensitive) or to the transformation of the original forest cover (Hinds and Hinds 2007). I argue elsewhere (p. 7.3) that the present day spruce-fir forest is similar to the pre-settlement forest. Although I have no data, I suspect that our air is cleaner than the mainland's. Vinalhaven's lichen flora may be more secure than that of much of New England.

**Checklist of Vinalhaven Macrolichens.**

*Arctoparmelia centrifuga* (L.) Hale  
*Baeomyces rufus* (Huds.) Rebent.  
*Bryoria furcellata* (Michx.) Brodo & D. Hawksw.  
*Bryoria fuscescens* (Michx.) Brodo & D. Hawksw,  
*Bryoria nadvornikiana* (Gyeln.) Brodo & D.Hawksw.  
*Bryoria trichodes* (Michx.) Brodo & D.Hawksw.  
*Cetraria aculeata* (Schreb.) Fr.  
*Cetraria arenaria* Kärnefelt  
 [Cetrelia chicitae (W. L. Culb.) W. L. Culb. & C. F. Culb.]  
 [Cetrelia olivetorum (Nyl.) W. L. Culb. & C. F. Culb.]  
*Cladonia arbuscula*(Wallr.) Flot.  
*Cladonia atlantica* A. Evans  
*Cladonia boryi* Tuck.  
 [Cladonia brevis (Sandst.) Sandst.]  
*Cladonia caespiticia* (Pers.) Flörke  
*Cladonia cariosa* (Ach.) Spreng.  
*Cladonia cenotea* (Ach.) Schaer.  
*Cladonia chlorophaea* group  
*Cladonia cristatella* Tuck.  
*Cladonia floerkeana* (Fr.) Flörke  
*Cladonia furcata* (Huds.) Schrad.  
*Cladonia gracilis* (L.) Willd.  
*Cladonia incrassata* Flörke  
*Cladonia maxima* (Asahina) Ahti  
*Cladonia ochrochlora* Flörke  
*Cladonia parasitica* (Hoffm) Hoffm.  
*Cladonia phyllophora* Hoffm.  
*Cladonia pyxidata* (L.) Hoffm.  
*Cladonia rangiferina* (L.) F. H. Wigg.  
*Cladonia rei* Schaer.  
*Cladonia scabriuscula* (Delise) Nyl.  
*Cladonia squamosa* Hoffm.  
*Cladonia stellaris* (Opiz) Pouzar & Vězda

*Cladonia strepsilis* (Ach.) Grognot  
*Cladonia stygia* (Fr.) Ruoss  
*Cladonia subtenuis* (Abbayes) Mattick  
*Cladonia terrae-novae* Ahti  
*Cladonia turgida* Hoffm.  
*Cladonia uncialis* (L.) F. H. Wigg.  
*Cystocoleus ebeneus* (Dillwyn) Thwaites  
*Dibaeis baeomyces* (L. f.) Rambold & Hertel  
*Evernia mesomorpha* Nyl.  
*Flavoparmelia caperata* (L.) Hale  
 [Hypogymnia incurvoides Rass.]  
*Hypogymnia krogiae* Ohlsson  
*Hypogymnia physodes* (L.) Nyl.  
*Imshaugia aleurites* (Ach.) S. L. F. Mey  
 [Imshaugia placorodia (Ach.) S. L. F. Mey.]  
*Lasallia papulosa* (Ach.) Llano  
*Lasallia pensylvanica* (Hoffm.) Llano  
*Leptogium cyanescens* (Rabenh.) Körb.  
*Lobaria pulmonaria* (L.) Hoffm.  
*Lobaria quercizans* Michx.  
*Lobaria scrobiculata* (Scop.) DC.  
 [Melanelia stygia (L.) Essl.]  
*Melanelia subaurifera* (Nyl.) Essl.  
*Parmelia omphaloides* (L.) Ach.  
*Parmelia saxatilis* (L.) Ach.  
*Parmelia squarrosa* Hale  
*Parmelia sulcata* Taylor  
*Parmotrema crinitum* (Ach.) M. Choisy  
*Parmotrema perlatum* (Huds.) M. Choisy  
 [Peltigera polydactylon (Neck.) Hoffm.]  
*Phaeophyscia rubropulchra* (Degel.) Essl.  
*Physcia millegrana* Degel.  
*Physcia subtilis* s. lat.,  
*Platismatia glauca* (L.) W.L. Culb. & C. F. Culb.

*Platismatia tuckermanii* (Oakes) W. L. Culb & C. F. Culb

[*Pseudevernia cladonia* (Tuck.) Hale & W. L. Culb.]

*Punctelia rudecta* (Ach.) Krog

*Pycnothelia papillaria* Dufour

*Ramalina farinacea* (L.) Ach.

*Stereocaulon dactylophyllum* Flörke

*Tuckermanopsis americana* (Spreng.) Hale

*Tuckermanopsis ciliaris* group

*Umbilicaria americana* Poelt & T. H. Nash

*Umbilicaria mammulata* (Ach.) Tuck.

*Umbilicaria muhlenbergii* (Ach.) Tuck.

*Usnea ceratina* Ach.

*Usnea cornuta* Körb.

*Usnea filipendula* Stirt.

*Usnea fulvovireagens* (Räsänen) Räsänen

*Usnea merrillii* Motyka

[*Usnea mutabilis* Stirt.]

*Usnea strigosa* (Ach.) Eaton

*Usnea subfloridana* Stirt.

[*Usnea subgracilis* Vainio

*Usnea subrubicunda* P. Clerc

*Usnea trichodea* Ach.

*Xanthoparmelia conspersa* (Ehr. ex Ach.) Hale

*Xanthoparmelia plittii* (Gyeln.) Hale

*Xanthoparmelia viriduloumbrina* (Gyeln.) Lendemer

*Xanthoria elegans* (Link) Th. Fr.

*Xanthoria parietina* (L.) Th. Fr.

*Xanthoria polycarpa* (Hoffm.) Rieber

## 5. Bryophytes. Introduction

The Bryophyte checklists include 28 liverworts and 107 mosses (I have yet to find a hornwort on Vinalhaven). Species which I have not collected but which have been vouchered by others are enclosed in brackets. The “vouchered by others” category includes 6 of the liverworts and 8 of the mosses. I believe the moss list is reasonably complete but suspect that liverworts are under-recorded, especially inconspicuous species of *Cephalozia* and *Cephaloziella*.

Liverwort nomenclature mostly follows Ley and Crowe (1999) and Lincoln (2008). Moss nomenclature follows Allen (2005, 2014).

### Liverworts.

These occupy diverse habitats on Vinalhaven. The most common species on the island is *Bazzania trilobata* which is ubiquitous on the forest floor and on wet and seepy ledge where it often forms very dense monocultures. It is also occasionally found entangled in dense *Sphagnum subtile* mats in the upland. Rotting wood on the forest floor is characteristically colonized by *Ptilidium ciliare*, *P. pulcherrimum*, and *Nowellia curvifolia*. *Frullana tamarisci* ssp. *asagrayana* and *F. eboracensis* are common bark epiphytes on conifers and hardwoods, also occasionally occurring on ledge and even on hummock bases in fens. *Radula complanata* is another a bark epiphyte, but uncommon, apparently restricted to red maple. *Lepidozia reptans* has a broad ecological range: rotting wood, as well as ledge (both dry and in seeps).

Several Vinalhaven liverworts are more or less aquatic. *Gymnocolea inflata* is the most common, occurring fully submerged in running water, in mats on seepy granite or in smaller colonies in wet cracks in the granite. In the pitch pine woodland it accompanies the moss *Andreaea rothii* in the ephemeral black runnels on the smooth granite surface. *Scapania nemorea* and *S. irrigua* are also common, in seeps, wet depressions and running water. *Marsupella emarginata* is more purely aquatic, being restricted to rocks under running water.

Only two thallose liverworts have been recorded so far on Vinalhaven: *Pellia epiphylla* and *Pallavicinia lyellii*. Both are frequent on bare mud, e.g. on stream banks and in the hollows between hummocks in fens.

None of our liverwort species are rare or endemic to New England. In fact, all have very broad geographical ranges in the eastern United States and Canada or even beyond (India, New Zealand, etc). For example, of the 28 liverwort species recorded on Vinalhaven, all but 6 also occur in Britain and

Ireland (Atherton et al. 2010).

### **Mosses.**

Vinalhaven is a mossy island. There are nearly one-fifth as many moss species here as species of vascular plants and in many parts of the island, the spruce-fir forest floor is dominated by mosses. The environment of our fens is largely controlled by the biology of *Sphagnum* species. What follows is a brief summary of the ecology of some of the more common or otherwise interesting moss species.

- **The forest floor:** the dominant forest floor species are *Dicranum scoparium* and *D. polysetum*, *Pleurozium schreberi*, *Polytrichum pallidisetum*, *Hylocomium splendens*, *Leucobryum albidum* and *L. glaucum*. Many others occur here and most of these species can be found in very different habitats as well, for example on the relatively dry tops of hummocks in fens. In some places the cover achieved by the forest floor mosses is virtually 100% and is it probable that they inhibit the recruitment of small-seeded understory wildflowers. Stumps and bits of rotting wood on the forest floor are almost invariably colonized by *Tetraphis pellucida*.
- **Tree bases:** *Hypnum imponens* and *Hypnum cupressiforme* are the characteristic tree-base species. The second of these has a broad ecological range and is also common on vertical faces of moist ledge.
- **Dry ledge in full sunlight:** there is little overlap between the moss flora of this habitat and that of the deeply shaded forest floor. The most common species here are *Polytrichum piliferum* and *P. juniperinum*, three species of *Andreaea*, *Grimmia muehlenbeckii*, and *Dicranum condensatum* and *D. spurium*. These can form extensive cushions over the rock or be restricted to cracks. *Hedwigia ciliata* is also a fairly common sunny ledge species, apparently favoring rhyolite over granite.
- **Bark:** due to the paucity of hardwood tree species the epiphyte moss flora on Vinalhaven is limited. *Ulota crispa* is the most common bark species, usually on red maple. On the mainland, for example in Baxter State Park, *Neckera pennata* is a common bole epiphyte, often forming luxuriant growths. I've only seen it once on Vinalhaven. I have one record of *Platygyrium repens* on an old apple tree and to this can be added a couple of sightings of *Sanionia uncinata* on bark of red maple and on northern white cedar.
- **Flowing water:** rocks in streams are often moss covered, with colonies of *Sematophyllum marylandicum*, *Philonotis fontana*, *Racomitrium aciculare*, and *Fontinalis novi-angliae* along with the aquatic liverworts listed above.
- **Freshwater Wetlands:** More moss species occur in wet habitats - from wet depressions in the forest, muddy banks of streams to extensive and complex fens - than anywhere else on the island and only a

few will be listed. *Mnium hornum* is extremely common in wet habitats, including *Sphagnum* hummocks, wet spots on rotting logs, muddy banks of streams and seeps at the forest edge by the shoreline. *Calliergon stramineum* and *C. cordifolium* are much more limited in their distribution, occurring in wet depressions in the forest and in hollows between hummocks along with *Leptodictyum riparium*. Additional moist habitat species are *Plagiomnium drummondii*, *Pseudobryum cinclidoides*, *Rhizomnium punctatum* and *Warnstorfia fluitans*. Of course the principal wetland moss genus is *Sphagnum*. With 22 species this is the second largest plant genus on Vinalhaven, surpassed only by *Carex* (38 species). *Sphagnum capillifolium*, *S. subtile*, *S. girgensohnii*, *S. compactum*, and *S. tenellum* are characteristic of moist soil in the upland and *S. pylaesii* is most common in pools on former quarry sites. All the other *Sphagnum* species on Vinalhaven are hummock-forming fen species. Maine has 42 species in this genus (Allen 2005) and it is noteworthy that Vinalhaven has more than half of these.

- **Disturbed habitats:** a few moss species are “weedy” in their biology. A common one on Vinalhaven is *Atrichum undulatum*, typically occurring on overturned soil at the base of blow downs. It also has the distinction of belonging to a very rare moss category: it is a non-native species, apparently introduced from Europe. *Bryum argenteum* is occasional in crushed stone on roadsides as is *Ceratodon purpureus*, which also occurs throughout the island in open terrain. Old burnt slash piles are the habitat of *Funaria hygrometrica*.



## Checklist of Vinalhaven Bryophytes 1. Liverworts

### Jungermanniales

- [*Anastrophyllum michauxii* (Web.) Buch & Evans]  
 [*Barbilophozia attenuata* (Mart.) Loeske]  
 [*Bazzania denudata* (Torrey ex Gott. et al.) Trev.]  
*Bazzania trilobata* (Wahl.) Trev.  
*Calypogeia muelleriana* (Schiffn.) K. Müll.  
*Cephalozia bicuspidata* (L.) Dum.  
*Cephalozia lunulifolia* (Dum.) Dum.  
 [*Cephaloziella divaricata* (Sm.) Schiffn.]  
 [*Chiloscyphus profundus* (Nees) J.J. Engel & R.M. Schust.]  
*Frullania eboracensis* Gott.  
*Frullania tamarisci* (L.) Dumort. ssp. *asagrayana* (Mont.) Hatt.  
*Gymnocolea inflata* (Huds.) Dum.  
 [*Jamesoniella autumnalis* (DC.) Steph.]  
*Lepidozia reptans* (L.) Dum.  
*Lophocolea heterophylla* (Schrad.) Dum.  
*Lophozia bicrenata* (Schimid. ex Hoffm.) Dum.  
*Lophozia ventricosa* (Dicks.) Dum.  
*Marsupella emarginata* (Ehrh.) Dum.  
*Nowellia curvifolia* (Dicks.) Mitt.  
*Odontoschisma denudatum* (Mart.) Dum.  
*Plagiochila porelloides* (Torrey ex Nees) Lindenb.  
*Ptilidium ciliare* (L.) Hampe  
*Ptilidium pulcherrimum* (G. Web.) Vaino  
*Radula complanata* (L.) Dum.  
*Scapania irrigua* (Nees) Nees  
*Scapania nemorea* (L.) Grolle

### Metzgeriales

- Pallavicinia lyellii* (Hook.) S. Gray  
*Pellia epiphylla* (L.) Corda

## Checklist of Vinalhaven Bryophytes 2. Mosses

### Amblystegiaceae

- Calliergon cordifolium* (Hedw.) Kindb.  
*Calliergon stramineum* (Schimp) Kindb.  
*Lepdotictyum riparium* (Hedw.) Warnst.  
*Sanionia uncinata* (Hedw.) Loeske  
*Warnstorfia fluitans*(Hedw) Loeske

### Andreaeaceae

- [*Andreaea crassinerva* Bruch]  
*Andreaea rothii* F.Weber & D.Mohr  
*Andreaea rupestris* Hedw.

### Aulacomniaceae

- Aulacomnium androgynum* (Hedw.) Schwägr.  
*Aulacomnium palustre* (Hedw.) Schwägr.

### Bartramiaceae

- Bartramia pomiformis* Hedw.  
*Philonotis fontana* (Hedw.) Brid.

### Brachytheciaceae

- Brachythecium campestre* (Müll. Hall.) Schimp. *in* Bruch, Schimp. & W. Gümbe  
 [*Brachythecium curtum* (Lindb.) Lange & Jensen *in* Lange]  
*Brachythecium laetum* (Hedw.) Schimp. *in* Bruch, Schimp. & W.Gümbe  
*Brachythecium rutabulum* (Hedw.) Schimp. *in* Bruch, Schimp. & W. Gümbe  
*Bryhnia novae-angliae* (Sull. & Lesq. *in* Sull.) Grout  
*Rhynchostegium serrulatum* (Hedw.) Jaeg. & Sauerb.

### Bryaceae

- Bryum amblyodon* Müll. Hal.  
*Bryum argenteum* Hedw.  
*Bryum caespiticium* Hedw.  
*Bryum capillare* Hedw.  
*Pohlia nutans* (Hedw.) Lindb.

**Dicranaceae**

*Dicranella heteromalla* (Hedw.) Schimp.

*Dicranum bonjeanii* De Not. in Lisa

*Dicranum condensatum* Hedw.

[*Dicranum fuscescens* Turn.]

[*Dicranum majus* Turn.]

*Dicranum ontariense* W. L. Peterson

*Dicranum polysetum* Sw.

*Dicranum scoparium* Hedw.

*Dicranum spurium* Hedw.

*Orthodicranum flagellare* (Hedw.) Loeske

*Orthodicranum fulvum* (Hook.) G. Roth in Casares-Gil

*Orthodicranum montanum* (Hedw.) Loeske

*Orthodicranum viride* (Sull. & Lesq.) G. Roth in Casares-Gil

**Diphysiaceae**

*Diphyscium foliosum* (Hedw.) D. Mohr

**Ditrichaceae**

*Ceratodon purpureus* (Hedw.) Brid.

**Fontinalaceae**

*Fontinalis novi-angliae* Sull.

**Funariaceae**

*Funaria hygrometrica* Hedw.

[*Physcomitrium pyriforme* (Hedw.) Lempe]

**Grimmiaceae**

*Grimmia muehlenbeckii* Schimp.

*Racomitrium aciculare* (Hedw.) Brid.

*Racomitrium fasciculare* (Hedw.) Brid.

*Schistidium liliputanum* (Müll. Hal.) Deguchi

*Schistidium maritimum* (Turn.) Bruch. & Schimp.

[*Schistidium papillosum* Culm. in J. J. Amman]

**Hedwigiaceae**

*Hedwigia ciliata* (Hedw.) P. Beauv.

**Hylocomiaceae**

*Hylocomium splendens* (Hedw.) Schimp. in Bruch, Schimp. & W. Gümberl

*Pleurozium schreberi* (Brid.) Mitt.

*Rhytiadelphus triquetrus* (Hedw.) Warnst.

**Hypnaceae**

*Callicladium haldanianum* (Grev.) H. A. Crum

*Hypnum cupressiforme* Hedw.

*Hypnum imponens* Hedw.

*Hypnum pallescens* (Hedw.) P. Beauv.

*Ptilium crista-castrensis* (Hedw.) DeNot.

**Lembophyllaceae**

*Isothecium myosuroides* Brid.

**Leskeaceae**

*Thuidium deliculatum* (Hedw.) Schimp. in Bruch, Schimp. & W. Gümberl

**Leucobryaceae**

*Leucobryum albidum* (Brid. ex P. Beauv.) Lindb.

*Leucobryum glaucum* (Hedw.) Ångstr.

**Mniaceae s. l.**

*Mnium hornum* Hedw.

*Mnium spinulosum* Bruch & Schimp.

*Pseudobryum cinclidioides* (Huebener) T.J. Kop.

*Rhizomnium punctatum* (Hedw.) T. J. Kop.

**Neckeraceae**

*Neckera pennata* Hedw.

**Orthotrichaceae**

*Ulota crispa* (Hedw.) Brid.

*Ulota hutchinsiae* (Sm.) Hammar

[*Zygodon conoideus* (Dicks.) Hook. & Taylor]

**Plagiotheciaceae**

*Herzogiella striatella* (Brid.) Z. Iwatsuki

*Herzogiella turfacea* (Lindb.) Z. Iwatsuki

*Plagiothecium laetum* Schimp. in Bruch, Schimp. & W. Gümberl

*Pseudotaxiphyllum elegans* (Brid.) Z. Iwats.

**Polytrichaceae**

*Atrichum undulatum* (Hedw.) P. Beauv.

*Atrichum crispum* (Sull.) in A. Gray

*Polytrichum commune* Hedw.

*Polytrichum juniperinum* Hedw.

[*Polytrichum ohioense* Renaud & Cardot]

*Polytrichum pallidisetum* Funck

*Polytrichum piliferum* Hedw.

*Polytrichum strictum* Brid.

**Pylaisiadelphaceae**

*Platygyrium repens* (Brid.) Schimp in Bruch, Schimp. & W. Gumbel

[*Pylaisiadelpha recurvans* (Michx.) W. R. Buck]

**Sematophyllaceae**

*Sematophyllum marylandicum* (Müll. Hal.) E. G. Britton

**Sphagnaceae**

*Sphagnum affine* Renaud & Cardot

*Sphagnum angermanicum* Melin

*Sphagnum angustifolium* (C.E.O. Jensen ex Russow) C.E.O. Jensen

*Sphagnum capillifolium* (Ehrh.) Hedw.

*Sphagnum centrale* C.E.O. Jensen

*Sphagnum compactum* DC. in Lam. & DC.

*Sphagnum cuspidatum* Hoffm.

*Sphagnum fallax* (H. Klinggr.) H. Klinggr.

*Sphagnum fimbriatum* Wilson ex Wilson & Hook.

*Sphagnum flavicomans* (Cardot) Warnst.

*Sphagnum girgensohnii* Russow

*Sphagnum lescurii* Sull. in A. Gray

*Sphagnum magellanicum* Brid.

*Sphagnum palustre* L.

*Sphagnum papillosum* Lindb.

*Sphagnum pulchrum* (Lindb. ex Braithw.) Warnst.

*Sphagnum pylaesii* Brid.

*Sphagnum recurvum* P. Beauv.

*Sphagnum squarrosum* Crome

*Sphagnum subsecundum* Nees in Sturm

*Sphagnum subtile* (Russ.) Warnst.

*Sphagnum tenellum* (Brid.) Bory

**Tetraphidaceae**

*Tetraphis pellucida* Hedw.

## 6. Vascular Plants. Introduction.

### Species included in the checklist.

The vascular plant checklist includes 596 taxa (species, subspecies and varieties) of native and naturalized plants. For 481 (81%) of these taxa I have collected voucher specimens except for cases where the identity of the species is so obvious (e.g., red spruce, skunk cabbage) that no voucher specimen is required. Also included are 53 species (about 9% of the total) which I have not seen on Vinalhaven but are documented by vouchers deposited in institutional herbaria<sup>7</sup>. These are marked by a pound sign (#) in the checklist. In addition to the species records supported by vouchers or otherwise obviously present on Vinalhaven I include an additional 62 species (about 10% of the total) compiled from floristic inventories conducted by others of Vinalhaven Land Trust and Maine Coast Heritage Trust preserves. These are marked in the checklist with an asterisk (\*). Although I suspect that the majority of the non-vouchered taxa are rare on the island and that I simply haven't chanced upon them it is also possible that some of the records represent misidentifications in the field and are therefore suspect. A third possible explanation is that some of the species may represent local extinctions since the original recording. I have not visited herbaria to verify the identification of species vouchered by others. Most of these specimens were collected decades ago and may represent local extinctions or may be of locally rare taxa that I haven't encountered. It is also possible that among these vouchers are some misidentifications.

The "divisions" in the vascular plant list will seem archaic to any professional botanist encountering this checklist: Pteridophytes, Monocots, Dicots, rather than Lycophytes, Monilophytes, Magnoliids, Monocots, Tricolpates. I chose this old-fashioned approach simply as a way of grouping species in a convenient and familiar fashion, not to make an obsolete phylogenetic argument. I have made every effort to have the species nomenclature follow Haines (2011). I also accept his common names with the exception of "asters" in the genus *Symphotrichum* where I prefer the traditional and genuinely vernacular names in that genus, like New England aster. The family common names, although not used by Haines (2011) are traditional and are mostly based on Gleason and Cronquist (1991). Where advances in fern taxonomy have resulted in realignment of genera, I had to invent a few family names.

The largest families are Asteraceae (67 taxa), Cyperaceae (61 taxa) and Poaceae (55 taxa).

### Species origin, habitat, relative frequency.

Following the common name of each species in the checklist are codes indicating whether the species is native or not, its typical habitat, and a measure of its relative frequency in the landscape. The classification of species as native ("N") or non-native ("E") is taken directly from Haines (2011) and includes all records, vouchered or not. On Vinalhaven about 25% of the vascular plant species are non

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<sup>7</sup> I searched the data base of the University of Maine herbaria (<http://herbaria.umaine.edu>) and the herbarium data bases accessible through the Consortium of Northeastern Herbaria (<http://portal.neherbaria.org/portal/>). I was able to locate records of Vinalhaven collections in the herbaria of the University of Maine, Harvard University, the University of Vermont, and Acadia University.

native<sup>8</sup>. This is a bit lower than the figure for all of New England — 31% (Mehrhof 2000). The habitat designations are based on my field observations. “U” indicates upland (as opposed to wetland) habitats. “WF” and “WS” are for freshwater and saline wetlands, respectively. Plants occurring on the shore, for example on ledge or beach but not in the salt marsh are indicated by “S”. Plants of roadsides and other highly disturbed habitats (mowed fields, sidewalks, etc. are indicated by “R”. Plants typical of roadside ditches like speckled alder (*Alnus incana*) and mosquito bulrush (*Scirpus hattorianus*) were given a “WF” designation since these disturbed habitats, despite their small scale, have the attributes of proper wetlands. In most cases, habitat designations were straightforward, but in a few species with broad ecological ranges, more than one habitat designation was required. For example, balsam fir (*Abies balsamea*) is an upland forest co-dominant, but also is frequent in wooded wetlands, so it gets both “U” and “WF”. Where a species occurred in more than one habitat type, but was much more common in one than the other, it received the habitat designation which best summarized its distribution on Vinalhaven, with the less frequent habitat in parentheses. A good example of this was cinnamon fern (*Osmundastrum cinnamomeun*), dominant in many peatlands on the island but occasionally observed in the upland forest, hence a habitat designation of “(U) WF”. The habitat codes are given for species which I have seen on the island and not for those recorded only by others.

The numerical scores measuring species frequency of occurrence are based on Palmer et al. 1995 and are explained in the table on the next page. These are based entirely on my field experience on Vinalhaven over several years and are therefore somewhat subjective. A score of 5 is assigned to species which are clearly dominant in their respective communities, e.g. skunk cabbage (*Symplocarpus foetidus*) in wetlands, red spruce (*Picea rubens*) in the upland forest, cordgrass (*Spartina alterniflora*) in salt marshes, but also tansy (*Tanacetum vulgare*) in roadside habitats. This is the category with the fewest species. Those species less abundant in their communities but which account for numerous individuals and much of the cover are assigned the score of 4. There are more of these. A few species were problematic. A good example is *Carex lasiocarpa*. This sedge is uncommon on Vinalhaven, but where it occurs (e.g. bordering Mack’s Pond), it is dominant, so I decided to give it a 4. The frequency class with the most members turns out to be 3, “widely scattered but not difficult to find”. This is a very very diverse category and includes some shrubs, e.g. green alder (*Alder viridis*), the parasitic one-flowered Indian-pipe (*Monotropa uniflora*), common mullein (*Verbascum thapsus*) and Jack-in-the-pulpit (*Arisaema triphylla*): species we see all over the island but which are not dominant in their communities. Infrequent and rare species get scores of 2 and 1, respectively. The distinction between the two categories is somewhat arbitrary and probably much affected by chance encounters by me. However, if we consider these two

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<sup>8</sup> The flora of Armbrust Hill is difficult to interpret as it is a mish-mash of the native and the exotic. In 1961-62 the Vinalhaven Garden Club planted numerous species there, native in the Northeast and non-native, and many of these persist to the present day without cultivation. Some of the natives, e.g. partridge berry (*Mitchella repens*), Canada burnet (*Sanguinaria canadensis*), I have not seen elsewhere on Vinalhaven, but could certainly occur in the wild here. Many of the non-natives are true exotics, e.g. Mugo pine (*Pinus mugo*), “red oriental poppies” (probably *Papaver somniferum*). In the end, I decided not to include a species (native or non-native) if the only known Vinalhaven occurrence was on Armbrust Hill.



categories together it is clear that most species on Vinalhaven are uncommon. (If we assume that the records of vascular plants made by others represent accurate identifications of species which I haven't seen due to their rarity, categories 2 and 1 would be greatly increased.)

Frequency	Score	Description	Taxa with score
Abundant	5	Dominant or codominant within the relevant community type.	27(5.6%)
Frequent	4	Easily found.	102 (21.2%)
Occasional	3	Widely scattered but not difficult to find.	144 (29.9%)
Infrequent	2	Difficult to find with few individuals but found in several locations.	125 (25.9%)
Rare	1	Very difficult to find and limited to one or very few occurrences.	84 (17.4%)

**Table 6.1. Frequency of occurrence of vascular plant taxa (species, subspecies, varieties) recorded on Vinalhaven. Data are restricted to species vouchered or otherwise verified by me. The numerical scale is based on Palmer et al. 1995.**

### Rare, introduced and invasive species.

Naturalists assembling species lists for natural resource inventories are always on the alert for rare species, since the occurrence of a rare species will have management implications. To decide if a species is rare we refer to the authority for rare species in our area - *Flora Conservanda: New England 2012* (Brumback and Gerke 2013) . This reference distinguishes between globally rare and regionally rare species. The second of these is by far the larger category and includes species with 20 or fewer occurrences in New England. By this criterion there are 89 rare vascular plant species occurring in Maine. Three of these have been recorded on Vinalhaven:

- American sea-blite (*Suaeda calceoliformis*) is found on gravelly beaches on Vinalhaven as well as on neighboring islands, for example Penobscot Island, Stoddard Island, Neck Island. It is nearly as common here as its congener, herbaceous sea-blite (*S. maritima*), a species of worldwide distribution<sup>9</sup>. *S. calceoliformis* is widely distributed and locally common in North America, especially in the Midwest and West of the continent, favoring inland and coastal saline habitats. The eastern North America populations (New Jersey to the Maritime Provinces) are coastal and disjunct. *S. calceoliformis* is in no danger of extinction as a species and it appears to be safe on Vinalhaven.

<sup>9</sup> All of the populations of *S. maritima* on Vinalhaven appear to be ssp. *maritima*, naturalized from Eurasia. The (rare) native subspecies, ssp. *richii* is to be sought.

Rising sea levels may threaten its habitat, but this will depend on the rate of sea level rise and the ability of shoreline plant communities to migrate landward.

- Swarthy sedge (*Carex adusta*) was collected on Vinalhaven by Arthur Haines in 1997. The plant was growing on mineral soil freshly exposed by a blowdown. In New England this species is near the southern limit of its geographical range which is extensive: north to the Canadian Maritimes and Newfoundland, west across the Great Lakes States and across Canada to British Columbia. Hence, it is globally secure but occurring sparsely in New England. Further occurrences of the species should be sought.
- Male fern (*Dryopteris filix-mas*) was ostensibly collected on Vinalhaven by C. C. Stockman in 1948. The specimen is deposited in the herbarium of the University of Maine, Orono and its identity was verified by A. V. Gilman. This record, unique for the species on the island, is problematic — the species is definitely rare in New England and there are no other coastal Maine occurrences known. The species is cultivated in gardens by fern-fanciers, so it is possible that this is the origin of the specimen. On the other hand, fern spores can be carried by winds long distances and if the gametophytes of this species are monoicous and self-compatible, it is conceivable that this record represents a genuine colonization event. However, the species hasn't been seen since.

Why are there not more rare species on Vinalhaven? The short answer is that we lack the habitats in which most rare New England species occur: of the 89 rare species recorded in Maine, 80 are limited to communities not present on the island: alpine and subalpine zones, river banks, northern hardwood forests and sand plains (New England Wildflower Society 2015). This leaves 9 species. One of these is *Suaeda calceoliformis*; the remaining 8 are other wetland plants which could definitely occur here, but which have not yet been spotted.

The flora of Vinalhaven includes 152 non-native (“introduced”, “naturalized”, “alien”) vascular plant species, representing about 25% of the total vascular plant species diversity. These plants are, with a very few exceptions shade-intolerant and most of them (about 70%) are restricted to or most common in open, sunny, disturbed habitats like roadsides and mowed fields. There is generally a very sharp and obvious demarcation in the flora as one passes from the sunny roadside into the shade of spruce-fir forest. Within a yard or so the introduced, shade-intolerant species are replaced by shade tolerant species of the forest floor.

Have introduced species displaced native species? Of course, without a checklist of the Vinalhaven flora before the arrival of Europeans, it is difficult to be sure. It seems more likely that the disturbed habitats favored by these species, which are in fact new habitats, have been colonized by a new group of species. On this interpretation, our non-native species represent an addition to our species diversity, and not a replacement.

All invasive species are non-native, but not all non-natives are invasive. An invasive plant species, by the most commonly used definition (but see below), is a non-native species which out-competes and displaces native species. We have lists of potentially invasive plant species: for the United States<sup>10</sup>, for New England<sup>11</sup> and for Maine<sup>12</sup>. The Maine list includes 19 actually or potentially invasive species occurring in Maine which have been recorded on Vinalhaven (table, next page). This is a very heterogeneous group of species. Most are shade-intolerant and are restricted to roadsides and other open, disturbed habitats, not penetrating closed canopy forest. A few deserve special mention. Japanese knotweed (*Fallopia japonica*) is the most familiar Vinalhaven invasive, a very aggressive roadside colonizer but very shade intolerant. Western lupine (*Lupinus polyphyllus*), introduced from the Western United States and Rugosa rose (*Rosa rugosa*), introduced from East Asia are “official” invasives, but are also much-loved Vinalhaven wildflowers. Although Rugosa rose does outcompete native shoreline shrubs, e.g. Virginia rose (*Rosa virginiana*), it is hard to detect any reduction in shoreline diversity attributable to Western lupine. Purple loosestrife (*Lythrum salicaria*) has taken over many freshwater wetlands in North America but (so far) is not seen too often on Vinalhaven. Common reed (*Phragmites communis*), another notorious wetland invasive does not yet (as of Summer 2018) occur on the island. Three species now on Vinalhaven have the greatest potential for invading forest habitats: the barberries (*Berberis thunbergii* and *B. vulgaris*) and glossy buckthorn (*Frangula alnus*). The barberries occur in a few spots in Vinalhaven Land Trust and Maine Coast Heritage Trust parcels and are periodically extirpated. Glossy buckthorn is rare so far, with only one known occurrence (on Calderwood Neck), since extirpated. The related European buckthorn (*Rhamnus cathartica*) is invasive on North Haven and I expect that eventually it will disperse to Vinalhaven, its seeds carried by birds. Coltsfoot (*Tussilago farfara*) is one of our earliest flowering species and brings a welcome springtime splash of color. Individuals line roadsides but there are very few in the shade of the forest and these are in poor condition. In short, it is not invasive on Vinalhaven, and in fact few species on the Maine list of *potential* invasives are *actually* currently invasive on Vinalhaven<sup>13</sup>.

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<sup>10</sup>[invasiveplantatlas.org](http://invasiveplantatlas.org) (1231 species, about 78 occurring on Vinalhaven)

<sup>11</sup>[eddmaps.org/ipane](http://eddmaps.org/ipane) (122 species, about 20 occurring on Vinalhaven)

<sup>12</sup>[maine.gov/dac/features/invasive\\_plants/invasivesheets.htm](http://maine.gov/dac/features/invasive_plants/invasivesheets.htm) (52 species, 19 occurring on Vinalhaven)

<sup>13</sup>Some investigators would expand the definition of “invasive” to include native species which have increased recently in disturbed habitats, displacing more “valued” vegetation (itself a contested category) On Vinalhaven this could include the native broad-leaved cattail (*Typha latifolia*) and the possibly non-native narrow-leaved cattail (*Typha angustifolia*). This point is discussed in more detail in the section “Vegetation of Vinalhaven”, p. 3.12). Considering *natives* to be invasive is a slippery slope: a case could be made for including the definitely native hay-scented fern (*Dennstaedtia punctilobula*) in this category as it spreads aggressively on clear-cut sites and inhibits regeneration of forest tree species.

Scientific Name	Common Name	Ecology
<i>Acer platanoides</i>	Norway maple	Occasional roadside tree
<i>Alliaria petiolata</i>	Garlic mustard	Shade tolerant, rarely seen.
<i>Artemisia vulgare</i>	Common mugwort	Common roadside plant.
<i>Berberis thunbergii</i>	Japanese barberry	Shade tolerant, a few occurrences.
<i>Berberis vulgaris</i>	Common barberry	Shade tolerant, a few occurrences
<i>Celastrus orbiculata</i>	Asiatic bittersweet	A few occurrences, roadsides.
<i>Cirsium arvense</i>	Canada thistle	Common roadside plant.
<i>Cirsium vulgare</i>	Bull thistle	Common roadside plant.
<i>Fallopia japonica</i>	Japanese knotweed	Aggressive roadside colonizer. Shade intolerant.
<i>Frangula alnus</i>	Glossy buckthorn	Shade tolerant. One occurrence (Calderwood Neck).
<i>Hesperis matronalis</i>	Dame's rocket	Uncommon roadside plant.
<i>Lonicera morrowii</i>	Morrow's honeysuckle	Occasional at the shore (Lanes Island, State Beach)
<i>Lupinus polyphyllus</i>	Western lupine	Common at the shore.
<i>Lythrum salicaria</i>	Purple loosestrife	Uncommon, in cattail marshes and roadside ditches.
<i>Poa nemoralis</i>	Wood blue grass	Recorded in inventories by others.
<i>Robinia pseudoacacia</i>	Black locust	A few occurrences at forest edge.
<i>Rosa multiflora</i>	Multiflora rose	Uncommon, roadsides.
<i>Rosa rugosa</i>	Rugosa rose	Common at the shore.
<i>Tussilago farfara</i>	Coltsfoot	Common roadside plant.

**Table 6.2 Species occurring on Vinalhaven listed (see Note 14) as actual or potential invasives in Maine.**

## Checklist of Vinalhaven Vascular Plants

### PTERIDOPHYTES (Lycophytes, Monilophytes)

#### Aspleniaceae Spleenwort Family

*Asplenium trichomanes* L.

Maidenhair spleenwort N U 1

#### Dennstaedtiaceae Bracken Family

*Dennstaedtia punctilobula* (Michx.) Moore

Hay-scented fern N U 5

*Pteridium aquilinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw.

Bracken N U 5

#### Dryopteridaceae Wood Fern Family

*Dryopteris campyloptera* (Kunze) Clarkson

Mountain wood fern N U 3

*Dryopteris carthusiana* (Villars) H. P. Fuchs

Spinulose wood fern N U 3

\**Dryopteris cristata* (L.) Gray

Crested wood fern N

#*Dryopteris filix-mas* (L.) Schott ssp. *brittonii* Fras.-Jenk & Widen

Male wood fern N

*Dryopteris marginalis* (L.) Gray

Marginal wood fern N U

#*Dryopteris intermedia* (Muhl. ex Willd.) Gray

Evergreen wood fern N

#### Equisetaceae Horsetail Family

*Equisetum arvense* L

Field horsetail N WF 3

*Equisetum sylvaticum* L.

Wood horsetail N WF 3

#### Huperziaceae

#*Huperzia lucidula* (Michx.) Trevisan

Shining firmoss N

#### Lycopodiaceae Clubmoss Family

*Dendrolycopodium dendroideum* (Michx.) A. Haines

Prickly tree clubmoss N U 2

*Dendrolycopodium hickeyi* (W. H. Wagner, Beitel & Moran) A. Haines

Hickey's tree clubmoss N U 2

\**Dendrolycopodium obscurum* (L.) A. Haines

Prickly tree-clubmoss N

\**Diphasiastrum complanatum* (L.) Holub

Northern ground-cedar N

*Lycopodiella inundata* (L.) Holub

Northern bog clubmoss N WF 3

\*= Not vouchered, #= Vouchered by others. N=Native, E=Non-native. U=Upland, WF=Freshwater Wetland, WS=Saline Wetland, S=The Shore, R=Roadsides. 5=abundant, 4=frequent, 3=occasional, 2=infrequent, 1=rare on Vinalhaven

*Lycopodium clavatum* L.  
Common clubmoss N U 2  
*Spinulum annotinum* (L.) A. Haines  
Common interrupted clubmoss N U 2

**Selaginellaceae.** Spikemoss family  
#*Selaginella rupestris* (L.) Spring.  
Ledge spikemoss N

**Onocleaceae** Sensitive Fern Family  
*Onoclea sensibilis* L.  
Sensitive fern N WF 4

**Osmundaceae** Royal Fern Family  
*Osmunda claytoniana* L.  
Interrupted fern N U 3  
*Osmunda regalis* L. var. *spectabilis* (Willd. Gray  
Royal fern N WF 1  
*Osmundastrum cinnamomeum* (L.) C. Presl.  
Cinnamon fern N (U) WF 5

**Polypodiaceae** Polypody Family  
*Polypodium appalachianum* Haufler & Windham  
Appalachian polypody N U 3  
*Polypodium virginianum* L.  
Rock polypody N U 3

**Thelypteridaceae** Beech Fern Family  
*Parathelypteris noveboracensis* (L.) Ching  
New York fern N U 3  
*Phegopteris connectilis* (Michx.) Watt  
Northern beech fern N U 2  
*Thelypteris palustris* Schott var. *pubescens* (Lawson) Fern.  
Marsh fern N WF 3

**Woodsiaceae** Cliff-fern Family  
*Athyrium angustum* (Willd.) C. Presl  
Narrow lady fern N U 3  
*Cystopteris fragilis* (L.) Bernh.  
Fragile fern N U 2  
#*Deparia acrostichoides* (Sw.) M. Kato  
Silvery false spleenwort N  
*Gymnocarpium dryopteris* (L.) Newman  
Northern oak fern N U 2

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Wetland, WS=Saline Wetland, S=The Shore, R=Roadsides. 5=abundant, 4=frequent,  
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**CONIFERS****Cupressaceae** Cypress Family*Juniperus communis* L. var. *depressa* Pursh

Common juniper N U 5

*Juniperus horizontalis* Moench

Creeping juniper N U 1

*Thuja occidentalis* L. N (U) WF 5

Northern white-cedar

**Pinaceae** Pine Family*Abies balsamea* (L.) P. Mill.

Balsam fir N U WF 5

*Larix laricina* (Du Roi) K. Koch

American larch N (U) WF 4

*Picea glauca* (Moench) Voss

White spruce N U 4

*Picea mariana* (P. Mill.) B.S.P.

Black spruce N WF 4

*Picea rubens* Sarg.

Red spruce N U 5

*Pinus resinosa* Ait.

Red pine N U 3

*Pinus rigida* P. Mill.

Pitch pine N U 5

*Pinus strobus* L.

White pine N U 3

*Tsuga canadensis* Marsh.

Eastern hemlock N U 1

**Taxaceae** Yew Family*Taxus canadensis* Marsh

American yew N U 1

**ANGIOSPERMS - MONOCOTS****Araceae** Arum Family*Arisaema triphyllum* (L.) Schott

Jack-in-the-pulpit N WF 3

*Calla palustris* L.

Wild calla N WF 3

\**Lemna minor* L.

Common duckweed N

\**Spirodela polyrrhiza* (L.) Schleid.

Common duck-meal N

*Symplocarpus foetidus* (L.) Salisb. ex Nutt.

Skunk-cabbage N WF 5

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**Cyperaceae** Sedge Family

*Bolboschoenus maritimus* (L.) Palla ssp. *paludosus* (A. Nels.) T. Koyama  
Saltmarsh tuber-bulrush N WS 3

*Bulbostylis capillaris* (L.) Kunth ex C.B. Clarke  
Tufted hair-sedge N R 1

#*Carex adusta* Boott  
Swarthy sedge N

*Carex albicans* Willd. ex Spreng.  
White-tinged sedge N U 3

*Carex atlantica* Bailey ssp. *capillacea* (Bailey) Reznicek  
Prickly bog sedge N WF 4

*Carex billingsii* (Knight) C.D. Kirschbaum  
Billings. sedge N WF 4

*Carex brunnescens* (Pers.) Poiret var. *sphaerostachya* (Tuckerman) Kückenthal  
Brownish sedge N U (WF) 3

*Carex canescens* L. ssp. *canescens*  
Hoary sedge U WF 4

*Carex canescens* L. ssp. *disjuncta* (Fern.) Tolvonon  
Hoary sedge U WF 4

\**Carex communis* Bailey  
Fibrous-rooted sedge N

*Carex conoidea* Schkuhr ex Willd.  
Open-field sedge N U 1

*Carex crawfordii* Fern.  
Crawford's sedge N U 1

*Carex crinita* Lam.  
Fringed sedge N WF 2

\**Carex cryptolepis* Mackenzie  
Northeastern sedge N

*Carex debilis* Michx. var. *rudgei* Bailey  
White-edged sedge N U 3

\**Carex disperma* Dewey  
Soft-leaved sedge N

*Carex echinata* Murr. var. *echinata*  
Star sedge N WF 3

\**Carex gracillima* Schwein.  
Graceful sedge N

*Carex gynandra* Schwein.  
Nodding sedge N WF 3

*Carex hormathodes* Fern.  
Marsh straw sedge N WS S 3

*Carex houghtoniana* Torr. ex Dewey  
Houghton.s sedge N U 1

\**Carex intumescens* Rudge  
Greater bladder sedge N

*Carex lasiocarpa* Ehrh. ssp. *americana* (Fern.) D. Löve & Bernard  
Woolly-fruited sedge N WF 4

\**Carex leptalea* Wahlenb.  
Bristle-stalk sedge N

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\**Carex lucorum* Willd. ex Link  
 Blue Ridge sedge N WF 4  
*Carex lurida* Wahlenb.  
 Sallow sedge N WF  
 #*Carex mackenziei* Krecz.  
 Mackenzie's sedge N  
*Carex merritt-fernaldii* Mackenzie  
 Merritt Fernald's sedge N U 1  
*Carex nigra* (L.) Reichard  
 Smooth black sedge N WF 4  
 \**Carex novae-angliae* Schwein.  
 New England sedge N  
*Carex paleacea* Schreb. ex Wahlenb.  
 Chaffy sedge N WS 4  
*Carex pallescens* L.  
 Pale sedge N U 3  
 #*Carex projecta* Mackenzie  
 Necklace sedge N  
*Carex pseudocyperus* L.  
 Cyperus-like sedge N WF 4  
*Carex scoparia* Schkurhr ex Willd.  
 Pointed broom sedge N U WF S 4  
*Carex silicia* Olney  
 Sea-beach sedge N S 1  
*Carex stipata* Muhl. ex Willd. var. *stipata*  
 Awl-fruited sedge N U WF 3  
 \**Carex stricta* Lam.  
 Tussock sedge N  
 \**Carex tosa* (Fern.) Bickn. var. *rugosperma* (Mackenzie) W. J. Crins.  
 Shaved sedge N  
*Carex tosa* (Fern.) Bickn. var. *tonsa*  
 Shaved sedge N U 1  
*Carex trisperma* Dewey  
 Three-seeded sedge N WF 4  
 \**Carex umbellata* Schkuhr. ex Willd.  
 Parasol sedge N  
*Carex viridula* Michx.  
 Little green sedge  
 \**Carex vulpinoidea* Michx.  
 Common fox sedge N U 2  
*Dulichium arundinaceum* (L.) Britton var. *arundinaceum*  
 Three-way sedge N WF 5  
*Eleocharis acicularis* (L.) Roemer & J. A. Schultes  
 Needle spikesedge N WF 3  
*Eleocharis elliptica* Kunth var. *elliptica*  
 Elliptic spikesedge N WF 3  
*Eleocharis obtusa* (Willd.) J. A. Schultes  
 Blunt spike-rush N WF 3

\*= Not vouchered, #= Vouchered by others. N=Native, E=Non-native. U=Upland, WF=Freshwater  
 Wetland, WS=Saline Wetland, S=The Shore, R=Roadsides. 5=abundant, 4=frequent,  
 3=occasional, 2=infrequent, 1=rare on Vinalhaven

\**Eleocharis palustris* L.  
Common spikesedge N  
*Eleocharis tenuis* (Willd.) J. A. Schultes  
Slender spikesedge N (U) WF 2  
*Eleocharis uniglumis* (Link) J. A. Schultes  
One-glumed spikesedge N WS 1  
\**Eriophorum angustifolium* Honckeny var. *angustifolium*  
Tall cottonsedge N  
*Eriophorum tenellum* Nutt.  
Few-nerved cottonsedge N WF 4  
*Eriophorum virginicum* L.  
Tawny cottonsedge N WF 4  
*Rhynchospora alba* (L.) Vahl  
White beak-rush N WF 4  
*Schoenoplectus pungens* (Vahl) Palla var. *pungens*  
Three-square bulrush N WS 4  
*Schoenoplectus tabernaemontani* (Gmel.) Palla  
Soft-stemmed bulrush N WF 1  
*Scirpus atrocinctus* Fern.  
Black-girdled woolsedge N WF 1  
*Scirpus cyperinus* (L.) Kunth  
Common woolsedge N WF 5  
*Scirpus hattorianus* Makino  
Mosquito bulrush N WF 4

#### **Hemerocallidaceae** Day-lily Family

*Hemerocallis fulva* (L.) L.  
Orange day-lily E R 3  
*Hemerocallis lilioasphodelus* L.  
Yellow day-lily E R 3

#### **Iridaceae** Iris Family

*Iris versicolor* L.  
Blue iris N WF 3  
\**Sisyrinchium angustifolium* P. Mill.  
Narrow-leaved blue-eyed-grass N  
*Sisyrinchium montanum* Greene var. *crebrum* Fern.  
Strict blue-eyed-grass N U 3

#### **Juncaceae** Rush Family

*Juncus balticus* Willd. ssp. *littoralis* (Engelm.) Snogerup  
Baltic rush N WS 4  
*Juncus brevicaudatus* (Engelm.) Fern.  
Short-tailed rush N WF 4  
*Juncus bufonius* L.  
Toad rush N R 2  
*Juncus canadensis* J. Gay ex Laharpe  
Canada rush N WF 4

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#*Juncus dudleyi* Wiegand  
 Dudley's rush N  
*Juncus effusus* L. ssp. *solutus* (Fern. & Wieg.) Hämet-Ahti  
 Common soft rush  
 \**Juncus filiformis* L.  
 Thread rush N  
*Juncus gerardii* Loisel  
 Saltmarsh rush N WS 5  
*Juncus pelocarpus* E. Meyer  
 Brown-fruited rush N WF 3  
*Juncus pylaei* Leharpe  
 Pylae's soft rush N WF 3  
*Juncus tenuis* Willd.  
 Path rush N R 3  
*Luzula multiflora* (Ehrh.) Lej.  
 Common woodrush N U 3

**Juncaginaceae** Arrow-grass Family

*Triglochin maritima* L.  
 Saltmarsh arrow-grass N WS 4

**Liliaceae** Lily Family

*Clintonia borealis* (Ait.) Raf.  
 Yellow bluebead-lily N U 2  
*Medeola virginiana* L.  
 Indian cucumber root N U 1

**Melanthiaceae** [Part of Liliaceae s. l.]

\**Trillium undulatum* Willd.  
 Painted wakerobin N

**Orchidaceae** Orchid Family

*Corallorhiza maculata* (Raf.) Raf.  
 Spotted coralroot N U 1  
*Cypripedium acaule* Ait.  
 Pink lady's slipper N U 3  
*Epipactis helleborine* (L.) Crantz  
 Broad-leaved helleborine E U 3  
*Goodyera repens* (L.) R. Br. ex Ait. f.  
 Dwarf rattlesnake-plantain N U 2  
 #*Liparis loeselii* (L.) L. C. Rich.  
 Loesel's wide-lipped orchid N  
 #*Platanthera blephariglottis* (Willd.) Lindl.  
 White-fringed bog-orchid N  
*Platanthera clavellata* (Michx.) Luer  
 Little club-spur bog-orchid N WF 3  
*Platanthera lacera* (Michx.) G. Don  
 Green fringed bog-orchid N U 1

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\**Platanthera orbiculata* (Pursh) Lindl.  
 Round-leaved bog-orchid N  
*Platanthera psycodes* (L.) Lindl.  
 Lesser purple-fringed bog-orchid N U 1  
*Pogonia ophioglossoides* (L.) Ker-Gawl.  
 Rose pogonia N WF 2  
*Spiranthes cernua* (L.) L. C. Rich  
 Nodding ladies'-tresses N U 2  
 \**Spiranthes romanzoffiana* Cham.  
 Hooded ladies'-tresses N

### **Poaceae** Grass Family

*Agrostis capillaris* L.  
 Rhode Island bentgrass E U 3  
*Agrostis gigantea* Roth  
 Redtop bentgrass E R 2  
*Agrostis perennans* (Walt.) Tuckerman.  
 Autumn bentgrass N R 2  
*Agrostis scabra* Willd.  
 Rough bentgrass N U WF S 3  
*Agrostis stolonifera* L.  
 Creeping bentgrass E U WS S 3  
 #*Alopecurus geniculatus* L.  
 Marsh meadow-foxtail N  
*Alopecurus pratensis* L.  
 Field meadow-foxtail E R 2  
*Anthoxanthum nitens* (Weber) Y. Schouten & Veldkamp ssp. *nitens*  
 Vanilla sweet grass N  
*Anthoxanthum odoratum* L.  
 Large sweet grass E U 3  
 #*Arrhenatherum elatius* (L.) J. & K. Presl  
 Tall oat grass E  
*Bromus inermis* Leysser ssp. *inermis*  
 Smooth brome N R 2  
*Calamagrostis canadensis* (Michx.) Beauv.  
 Canada reed grass N U WF 3  
*Dactylis glomerata* L.  
 Orchard grass E R 3  
*Danthonia compressa* Austin ex Peck  
 Flattened oatgrass N U 2  
*Danthonia spicata* (L.) Beauv. ex Roemer & J. A. Schultes  
 Poverty oatgrass N U 3  
*Deschampsia cespitosa* (L.) Beauv.  
 Tufted hair grass N U 3  
*Deschampsia flexuosa* (L.) Trin.  
 Common hair grass N U 3 R  
*Dichantherium acuminatum* (Sw.) Gould & C. A. Clark ssp. *implicatum* (Scribn.) Freckmann & Lelong  
 Hairy rosette-panicgrass N R 3

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*Dichanthelium acuminatum* (Sw.) Gould & C. A. Clark ssp. *fasciculatum* (Torr.) Freckmann & Lelong  
 Hairy rosette-panicgrass N R 3  
 #*Dichanthelium boreale* (Nash) Freckman  
 Northern rosette-panicgrass N  
*Digitaria sanguinalis* (L.) Scop.  
 Hairy crabgrass E R 2  
*Distichlis spicata* (L.) Greene  
 Saltgrass N WS 4  
*Echinochloa muricata* (Beauv.) Fern. var. *muricata*  
 American barnyard grass N R 1  
*Elymus repens* (L.) Gould  
 Creeping wild-rye N S R 3  
*Elymus trachycaulus* (Link) Gould ex Shinnery ssp. *glaucus* (Pease & Moore) Cody  
 Slender wild-rye N WS S 2  
*Elymus trachycaulus* (Link) Gould ex Shinnery ssp. *trachycaulus*  
 Slender wild-rye N WS S 2  
*Elymus virginicus* L. var. *virginicus*  
 Common eastern wild-rye N S 2  
*Elymus virginicus* L. var. *halophilus* (Bickn.) Wieg.  
 Common eastern wild-rye N S 1  
*Festuca filiformis* Pourret  
 Fine-leaved sheep fescue N U 3  
 \**Festuca ovina* L.  
 Sheep fescue N  
*Festuca rubra* L. ssp. *commutata* Gaudin  
 Red fescue E U 1  
*Festuca rubra* L. ssp. *pruinosa* (Hack.) Piper  
 Red fescue N S 1  
*Festuca rubra* L. ssp. *rubra*  
 Red fescue E U 3  
 \**Festuca trachyphylla* (Hack.) Krajina  
 Hard fescue E  
*Glyceria canadensis* (Michx.) Trin.  
 Rattlesnake manna grass N WF 3  
 #*Glyceria grandis* S. Wats  
 American manna grass N  
*Glyceria striata* (Lam.) A. S. Hitchc.  
 Fowl manna grass N WF 3  
*Hordeum jubatum* L. ssp. *jubatum*  
 Foxtail barley N S 2  
 \**Leersia oryzoides* (L.) Sw.  
 Rice cut grass N  
*Leymus mollis* (Trin.) Hara var. *mollis*  
 American lyme grass N S 4  
*Phalaris arundinacea* L.  
 Reed canary grass N WF 2  
*Phleum pratense* L.  
 Common Timothy E R 3

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*Poa compressa* L.  
Flat-stemmed blue grass E U 3  
\**Poa nemoralis* L.  
Wood blue grass E  
*Poa palustris* L.  
Fowl blue grass N WF 1  
*Poa pratensis* L. ssp. *pratensis*  
Kentucky bluegrass  
*Puccinellia nuttalliana* (J. A. Schultes) A. S. Hitchc.  
Nuttall's alkali grass E WS 2  
*Puccinellia pumila* (Vasey) A. S. Hitchc.  
Tundra alkali grass N WS 2  
*Schedonorus arundinaceus* (Schreb.) Dumort.  
Tall rye grass E R 1  
*Schedonorus pratensis* (Huds.) Beauv.  
Meadow rye grass E U 1  
*Setaria faberi* Herrm.  
Chinese foxtail E R 2  
*Setaria pumila* (Poir.) Roemer & J. A. Schultes  
Yellow foxtail E R 2  
*Spartina alterniflora* Loisel.  
Smooth cordgrass N WS 5  
*Spartina patens* (Aiton) Muhl.  
Saltmeadow cordgrass N WS 5  
*Spartina pectinata* Link  
Prairie cordgrass N WS 3

**Pontederiaceae** Water-hyacinth Family

*Pontederia cordata* L.  
Pickerelweed N WF 4

**Potamogetonaceae** Pondweed Family

*Potamogeton confervoides* Reichenb.  
Alga-like pondweed N WF 3  
*Potamogeton epihydrus* Raf.  
Ribbon-leaved pondweed N WF 3  
*Potamogeton oakesianus* J. W. Robbins  
Oakes' pondweed N WF 2

**Ruppiaceae** Ditch-grass Family

*Ruppia maritima* L.  
Beaked ditch-grass N WS 2

**Ruscaceae** [Part of Liliaceae, s.l.]

*Maianthemum canadense* Desf.  
Canada mayflower N U 4  
\**Maianthemum racemosum* (L.) Link. ssp. *racemosum*  
Feathery false Solomon's-seal N

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*Maianthemum stellatum* (L.) Link  
 Star-like false Solomon's seal N U 2  
 \**Maianthemum trifolium* (L.) Sloboda  
 Three-leaved false Solomon's seal N

**Typhaceae** Cattail Family

*Sparganium americanum* Nutt.  
 American bur-reed N WF 4  
*Sparganium eurycarpum* Engelm. ex Gray  
 Great bur-reed N WF 1  
*Typha angustifolia* L.  
 Narrow-leaved cat-tail N WF 1  
*Typha latifolia* L.  
 Broad-leaved cat-tail N WF 5

**Zosteraceae** Eel-grass Family

*Zostera marina* L.  
 Eel-grass N WS 5

**ANGIOSPERMS - DICOTS (Magnoliids, Tricolpates)**

**Adoxaceae** Moschatel Family

*Sambucus nigra* L. ssp. *canadensis* (L.) Bolli  
 Black elderberry N U 4  
*Sambucus racemosa* L.  
 Red elderberry N U 4  
*Viburnum nudum* L. var. *cassinoides* (L.) T. & G.  
 Withe-rod N U 4  
*Viburnum opulus* L. ssp. *opulus*  
 Highbush-cranberry E U 1

**Amaranthaceae** Amaranth Family

*Atriplex acadiensis* Tascher.  
 Maritime orache N S 4  
*Atriplex glabriuscula* Edmonston  
 Bracted orache N S 1  
*Atriplex prostrata* Boucher ex DC.  
 Hastate-leaved orache N S 3  
 \**Chenopodium album* L.  
 White goosefoot E  
*Chenopodium pratericola* Rydb.  
 Desert goosefoot N S 5  
*Salicornia depressa* Standl.  
 Common glasswort N WS 5  
*Suaeda calceoliformis* (Hook.) Moq.  
 American sea-blite N WS 3  
*Suaeda maritima* (L.) Dumort ssp. *maritima*  
 Herbaceous sea-blite E WS 4

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**Anacardiaceae** Cashew Family*Rhus hirta* (L.) Sudworth

Staghorn sumac N U 4

*Toxicodendron radicans* (L.) Kuntze

Poison-ivy N U 4

*Toxicodendron rydbergii* (Small ex Rydberg) Greene

Western poison-ivy N WF 2

**Apiaceae** Carrot Family*Angelica lucida* L.

Sea coast Angelica N S 3

*Aralia hispida* Vent.

Bristly sarsaparilla N U 3

*Aralia nudicaulis* L.

Wild sarsaparilla N U 4

*Carum carvi* L.

Caraway N S 1

*Cicuta maculata* L. var. *maculata*

Spotted water-hemlock N WF 1

*Daucus carota* L.

Queen Anne's lace E R 4

*Heracleum maximum* Bartr.

American cow-parsnip N WF 1

*Hydrocotyle americana* L.

American marsh-pennywort N WF 2

*Ligusticum scoticum* L. ssp. *scoticum*

Scotch wild lovage N S 4

#*Osmorhiza claytonii* (Michx.) C. B. Clarke

Bland sweet-cicely N

**Apocynaceae** Dogbane Family*Apocynum androsaemifolium* L.

Spreading dogbane N R 3

*Asclepias syriaca* L.

Common milkweed N R 3

**Aquifoliaceae** Holly Family*Ilex mucronata* (L.) M. Powell, Savol. & S. Andrews

Mountain holly N WF 3

*Ilex verticillata* (L.) Gray

Common winterberry N WF 4

**Asteraceae** Sunflower Family*Achillea millefolium* L. ssp. *lanulosa* (Nutt.) Piper

Common yarrow N U S R 4

*Ambrosia artemisiifolia* L.

Common ragweed N R 3

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*Anaphalis margaritacea* (L.) Benth. & Hook. f.  
 Pearly everlasting N R 3  
 #*Antennaria howellii* Greene ssp. *neodioica* (Greene) Bayer  
 Small pussytoes N  
*Anthemis cotula* L.  
 Stinking chamomile N R 2  
*Arctium minus* Bernh.  
 Common burdock E R 1  
*Artemisia vulgaris* L. var. *vulgaris*  
 Common wormwood N R 4  
 #*Artemisa stelleriana* Bess.  
 Beach wormwood E  
 \**Bidens frondosa* L.  
 Devil's beggar-ticks N  
 #*Calendula officinalis* L.  
 Pot marigold E  
*Centaurea jacea* L.  
 Brown knapweed E R 1  
 #*Centaurea nigra* L.  
 Black knapweed E  
*Cirsium arvense* (L.) Scop.  
 Creeping thistle E R 4  
 #*Cirsium muticum* Michx.  
 Swamp thistle N  
*Cirsium vulgare* (Savi) Ten.  
 Common thistle E R 4  
*Doellingeria umbellata* (P. Mill.) Nees var. *umbellata*  
 Tall white aster N U R 4  
*Erechtites hieraciifolius* (L.) Raf. ex DC.  
 American burnweed N U 3  
*Erigeron canadensis* L.  
 Canada fleabane N U R 3  
*Erigeron strigosus* Muhl. ex Willd. var. *strigosus*  
 Rough fleabane N U R 3  
*Eupatorium perfoliatum* L.  
 Boneset thoroughwort N WF 1  
*Eurybia macrophylla* (L.) Cass.  
 Large-leaved wood aster N U 2  
*Euthamia graminifolia* (L.) Nutt.  
 Common grass-leaved goldenrod N U R 4  
*Galinsoga quadriradiata* Ruiz & Pavón  
 Common quickweed E R 3  
*Hieracium aurantiacum* L.  
 Orange hawkweed E R 3  
*Hieracium caespitosum* Dumort.  
 Yellow hawkweed E R 4  
*Hieracium kalmii* L.  
 Canada hawkweed N U 3

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*Hieracium paniculatum* L.  
 Panicked hawkweed N U 2  
*Hieracium pilosella* L.  
 Mouse-ear hawkweed E R 2  
*Hieracium scabrum* Michx.  
 Rough hawkweed N U WF 2  
*Jacobaea vulgaris* Gaertn.  
 Tansy ragwort E R 1  
*Leucanthemum vulgare* Lam.  
 Ox-eye daisy E R 3  
*Matricaria discoidea* DC.  
 Rayless discoidea E R 1  
*Nabalus trifolius* Cass.  
 Three-leaved rattlesnake-root N U 4  
*Oclemena acuminata* (Michx.) Nesom  
 Whorled aster N U 4  
*Oclemena nemoralis* (Ait.) Greene  
 Bog aster N WF 4  
*Oclemena x blakei* (Porter) Nesom  
 Blake's aster N WF 2  
*Packera schweinitziana* (Nutt.) W.A. Weber & A. Löve  
 New England groundsel N R 2  
*Picris hieracioides* L.  
 Hawkweed oxtongue E R 1  
*Rudbeckia hirta* L. var. *pulcherrima* Farw.  
 Black-eyed coneflower E R 2  
*Scorzoneroidea autumnalis* (L.) Moench ssp. *pratensis* (Link) Holub  
 Fall-dandelion E R  
*Scorzoneroidea autumnalis* (L.) Moench ssp. *autumnalis*  
 Fall-dandelion E R  
*Senecio sylvaticus* L.  
 Woodland ragwort E WF 1  
*Senecio vulgaris* L.  
 Common ragwort E R 2  
 #*Solidago altissima* L.  
 Tall goldenrod N  
*Solidago bicolor* L.  
 White goldenrod N U 2  
*Solidago canadensis* L. var. *canadensis*  
 Canada goldenrod N U R 4  
*Solidago gigantea* Ait.  
 Smooth goldenrod N U R 3  
*Solidago juncea* Ait.  
 Early goldenrod N R 2  
*Solidago nemoralis* Ait. ssp. *nemoralis*  
 Gray goldenrod N R 2  
*Solidago puberula* Nutt. var. *puberula*  
 Downy goldenrod N U 3

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*Solidago rugosa* P. Mill. ssp. *rugosa*  
 Common wrinkle-leaved goldenrod N U R 4  
*Solidago sempervirens* L. var. *sempervirens*  
 Seaside goldenrod N WS R 4  
 \**Solidago uliginosa* Nutt.  
 Bog goldenrod N  
*Sonchus arvensis* L. var. *arvensis*  
 Field sow-thistle E S 4  
*Sonchus asper* (L.) Hill  
 Spiny-leaved sow-thistle E R 2  
*Symphyotrichum ericoides* (L.) Nesom  
 Heath aster N U 1  
*Symphyotrichum lanceolatum* (Willd.) Nesom ssp. *lanceolatum* var. *lanceolatum*  
 Lance-leaved aster N R 2  
*Symphyotrichum lateriflorum* (L.) A. & D. Love  
 Calico aster N U R 4  
*Symphyotrichum novae-angliae* (L.) Nesom  
 New England aster N R 2  
*Symphyotrichum novi-belgii* (L.) Nesom  
 New York aster N U WF WS R 4  
 \**Symphyotrichum puniceum* (L.) A. & D. Löve var. *puniceum*  
 Purple-stemmed aster N  
 #*Tanacetum parthenium* (L.) Schultz-Bip.  
 Feverfew tansy E  
*Tanacetum vulgare* L.  
 Common tansy E R 4  
*Taraxacum laevigatum* (Willd.) DC.  
 Red-seeded dandelion E R 3  
*Taraxacum officinale* Wiggers  
 Common dandelion E R 4  
*Tragopogon pratensis* L.  
 Meadow goat's beard E R 2  
*Tussilago farfara* L.  
 Coltsfoot E R 4

#### **Balsaminaceae** Touch-me-not Family

*Impatiens capensis* Meerb.  
 Spotted touch-me-not N WF 3  
*Impatiens glandulifera* Royle  
 Himalaya touch-me-not E WF R 3

#### **Berberidaceae** Barberry Family

*Berberis thunbergii* DC.  
 Japanese barberry E U R 2  
*Berberis vulgaris* L.  
 Common barberry E U 2

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**Betulaceae** Birch Family

*Alnus incana* (L.) Moench ssp. *rugosa* (DuRoi) Clausen  
Speckled alder N WF 5

*Alnus viridis* (Villars) Lam. ssp. *crispa* (Ait.) Turill  
Green alder N WF 3

*Betula alleghaniensis* Britt.  
Yellow birch N U 2

*Betula cordifolia* Regel  
Heart-leaved paper birch N U 1

*Betula papyrifera* Marsh.  
Paper birch N U 5

*Betula populifolia* Marsh.  
Gray birch N U 3

\**Betula x caerulea* Blanch.  
Blue birch N

\**Corylus cornuta* Marsh. ssp. *cornuta*  
Beaked hazelnut N

**Boraginaceae** Borage Family

*Mertensia maritima* (L.) S. F. Gray var. *maritima*  
Seaside bluebells N S 1

*Myosotis arvensis* (L.) Hill  
Field forget-me-not E R 3

**Brassicaceae** Mustard Family

*Alliaria petiolata* (Bieb.) Cavara & Grande  
Garlic-mustard E U R 2

*Barbarea vulgaris* Ait. f.  
Garden yellow-rocket E S R 3

*Brassica juncea* (L.) Czern.  
Chinese mustard E R 1

*Brassica rapa* L.  
Rape E R 1

*Cakile edentula* (Bigelow) Hook.  
American sea-rocket N S 4

#*Capsella bursa-pastoris* (L.) Medik.  
Shepherds's purse E

\**Cardamine parviflora* L. ssp. *arenicola* (Britt.) O. E. Schulz  
Small-flowered bitter-cress N

*Draba verna* L.  
Spring Whitlow-mustard E U 1

*Hesperis matronalis* L.  
Dame's-rocket E R 2

*Raphanus raphanistrum* L. ssp. *raphanistrum*  
Wild radish E S 4

#*Rorippa palustris* (L.) Bess.  
Common yellow-cress N

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**Campanulaceae** Bellflower Family

*Campanula aparinoides* Pursh  
Marsh bellflower N

*Campanula rapunculoides* L.  
Creeping bellflower E R 2

*Campanula rotundifolia* L.  
Scotch bellflower N R 2

*Lobelia inflata* L. N U R 3  
Bladder-pod lobelia

**Caprifoliaceae** Honeysuckle Family

*Diervilla lonicera* P. Mill.  
Bush-honeysuckle N U 2

*Linnaea borealis* L. ssp. *americana* (Torr.) Hultén ex Clausen  
American twinflower N U 4

*Lonicera canadensis* Bartr. ex Marsh.  
American honeysuckle N U 2

*Lonicera morrowii* Gray  
Morrow's honeysuckle E S 2

*Valeriana officinalis* L.  
Common valerian E R 4

**Caryophyllaceae** Pink Family

*Arenaria serpyllifolia* L.  
Thyme leaved sandwort E U 2

*Cerastium arvense* L.  
Field chickweed E R 1

*Cerastium fontanum* Baumg. ssp. *vulgare* (Hartman) Greuter & Burdet  
Mouse-ear chickweed E R 3

*Dianthus armeria* L.  
Deptford pink E R 2

\**Honckenya peploides* (L.) Ehrh. ssp. *robusta* (Fern.) Hultén  
Seaside-sandwort N

#*Moehringia lateriflora* (L.) Fenzl.  
Blunt-leaved grove-sandwort N

*Sagina nodosa* (L.) Fenzl. ssp. *nodosa*  
Knotted pearlwort E S 1

*Sagina procumbens* L.  
Bird's-eye pearlwort N U 1

#*Silene dioica* (L.) Clairville  
Red campion E

*Silene latifolia* Poir. ssp. *alba* (P. Mill.) Greuter & Burdet  
White campion N R 1

*Spergularia canadensis* (Pers.) G. Don ssp. *canadensis*  
Canada sand-spurry N WS 2

*Spergularia marina* (L.) Griseb.  
Saltmarsh sand-spurry N WS

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*Spergularia rubra* (L.) J. & K. Presl

Red sand-spurry N S 2

*Stellaria alsine* Grimm

Bog stichwort N U 1

*Stellaria graminea* L.

Grass-leaved stichwort E R 3

*Stellaria media* (L.) Vill.

Common stichwort E R 3

#*Stellaria longifolia* Muhl. ex Willd.

Long-leaved stichwort N

#### **Celastraceae** Staff-tree Family

*Celastrus orbiculatus* Thunb.

Asian bittersweet E U R 3

#### **Cistaceae** Rock-rose Family

*Hudsonia ericoides* L.

Golden false-heather N U 2

*Lechea intermedia* Leggett ex Britt. var. *juniperina* (Bickn.) B. L. Robins.

Round-fruited pinweed N U R 3

#### **Convolvulaceae** Morning glory Family

*Calystegia sepium* (L.) R. Br. ssp. *angulata* Brummitt

Hedge false bindweed N S 3

*Cuscuta gronovii* Willd. ex J. A. Schultes

Common dodder N WS 3

#### **Cornaceae** Dogwood Family

*Chamaepericlymenium canadense* (L.) Aschers. & Graebn.

Canada dwarf-dogwood N U 4

*Swida alternifolia* (L. f.) Small

Alternate-leaved dogwood N U 1

*Swida rugosa* (Lam.) Rydb.

Round-leaved dogwood N U 2

#### **Crassulaceae** Stonecrop Family

\**Hylotelephium telephium* (L.) H. Ohba

Purple orpine E

*Sedum acre* L.

Moss stonecrop E R 1

*Sedum hispanicum* L.

Spanish stonecrop E R 1

#### **Cucurbitaceae** Gourd Family

\**Cucurbita pepo* L.

Pumpkin E

*Echinocystis lobata* (Michx.) Torr. & Gray

Wild cucumber N R 2

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**Droseraceae** Sundew Family

*Drosera intermedia* Hayne  
Spatulate-leaved sundew N WF 3  
*Drosera rotundifolia* L.  
Round-leaved sundew N WF 4

**Eleagnaceae** Oleaster Family

*Eleagnus angustifolia* L.  
Russian-olive E S 1

**Ericaceae** Heather Family

*Andromeda polifolia* L. var. *glaucophylla* (Link) DC.  
Bog-rosemary N WF 3  
#*Arctostaphylos uva-ursi* (L.) Spreng.  
Red bearberry N  
*Chamaedaphne calyculata* (L.) Moench.  
Leatherleaf N WF 3  
\**Chimaphila umbellata* (L.) W. Bart. ssp. *cisatlantica* (Blake) Hultén  
Spotted prince-pine N  
*Corema conradii* (Torr.) Torr. ex Loud.  
Broom crowberry N U S 4  
*Empetrum nigrum* L.  
Black crowberry N U S 3  
\**Epigaea repens* L.  
Trailing-arbutus N  
*Gaultheria hispidula* (L.) Muhl. ex Bigelow  
Creeping spicy-wintergreen N U 3  
*Gaultheria procumbens* L.  
Eastern spicy-wintergreen N U 2  
*Gaylussacia baccata* (Wangenh.) K. Koch  
Black huckleberry N U 5  
*Hypopitys monotropa* Crantz  
Yellow pine-sap N U 1  
*Kalmia angustifolia* L. ssp. *angustifolia*  
Sheep-laurel N U WF 4  
*Moneses uniflora* (L.) Gray  
One-flowered shinleaf N U 1  
*Monotropa uniflora* L.  
One-flowered Indian-pipe N U 3  
*Pyrola americana* Sweet.  
American shinleaf NU 2  
*Pyrola elliptica* Nutt.  
Elliptic-leaved shinleaf N U 1  
*Rhododendron canadense* (L.) Torr.  
Rhodora N U WF 2  
*Rhododendron groenlandicum* (Oeder) Kron & Judd.  
Labrador-tea N U WF 3

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*Vaccinium angustifolium* Ait.  
Common lowbush blueberry N U 4  
\**Vaccinium corymbosum* L.  
Highbush blueberry N  
*Vaccinium macrocarpon* Ait.  
Large cranberry N WF S 3  
\**Vaccinium myrtilloides* Michx.  
Velvet-leaved blueberry N  
*Vaccinium oxycoccos* L.  
Small cranberry N WF 1  
*Vaccinium vitis-idaea* L. ssp. *minus* (Lodd) Hultén  
Mountain cranberry N U 2

### **Euphorbiaceae** Spurge Family

*Euphorbia esula* L.  
Leafy spurge E R 3

### **Fabaceae** Pea Family

*Genista tinctoria* L.  
Dyer's greenwood E R 1  
*Lathyrus japonicus* Willd. var. *maritimus* (L.) Kartesz & Gandhi  
Beach pea, beach vetchling, N S 4  
*Lupinus polyphyllus* Lindl. var. *polyphyllus*  
Blue lupine E S 2  
*Medicago lupulina* L.  
Black medick E R 2  
*Melilotus officinalis* L.  
Yellow sweet-clover ER 3  
*Robinia pseudoacacia* L.  
Black locust N U 1  
*Securigera varia* (L.) Lassen  
Crown-vetch E R 2  
*Trifolium arvense* L.  
Rabbit-foot clover E R 4  
*Trifolium aureum* Pollich  
Palmate hop clover E R 4  
*Trifolium campestre* Schreb.  
Pinnate hop clover E R 4  
\**Trifolium dubium* Sibthorp  
Lesser hop clover E  
*Trifolium hybridum* L.  
Alsike clover E R 1  
*Trifolium pratense* L.  
Red clover E R 4  
*Trifolium repens* L.  
White clover E R 4  
*Vicia sativa* L.  
Common vetch E R 1

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*Vicia villosa* Roth var. *varia* (Host) Carb.  
Hairy vetch E R 3

**Fagaceae** Beech Family

*Fagus grandifolia* Ehrh.

American beech N U 2

*Quercus rubra* L.

Northern red oak N U 3

**Geraniaceae** Geranium Family

#*Geranium bicknellii* Britt.

Northern crane's-bill N

**Grossulariaceae** Gooseberry Family

*Ribes glandulosum* Grauer

Skunk currant N U 3

*Ribes hirtellum* Michx.

Hairy-stemmed gooseberry N U 4

**Hypericaceae** St. John's-wort Family

\**Hypericum boreale* (Britt.) Bickn.

Northern St. John's-wort N

*Hypericum canadense* L.

Lesser Canada St. John's-wort N U 3

*Hypericum gentianoides* (L.) B. S. P.

Orange-grass St. John's-wort N U 3

*Hypericum punctatum* Lam.

Spotted St. John's-wort E R 3

*Triadenum fraseri* (Spach) Gleason

Fraser's marsh-St. John's-wort N WF 3

**Lamiaceae** Mint Family

*Galeopsis bifida* Boenn.

Split-lipped hemp-nettle E WF 2

\**Galeopsis tetrahit* L.

Brittle-stemmed hemp-nettle E

*Lycopus americanus* Muhl. ex W. Bart

American water-horehound N U WF 2

*Lycopus uniflorus* Michx.

Northern water-horehound N WF 4

*Lycopus virginicus* L.

Virginia water-horehound N WF 3

*Mentha arvensis* L. ssp. *parietariaefolia* (Becker) Briq.

Field mint E R 2

#*Mentha Xgracilis* Sole

Ginger spear mint N

*Origanum vulgare* L.

Wild marjoram E R 1

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*Prunella vulgaris* L. ssp. *vulgaris*

Common selfheal E R 3

*Scutellaria galericulata* L.

Hooded skullcap N S 3

*Teucrium canadense* L.

American germander N S 2

#### **Lentibulariaceae** Bladderwort Family

*Utricularia geminiscapa* Benj.

Mixed bladderwort N WF 2

*Utricularia vulgaris* L. ssp. *macrorhiza* (Le Conte) Clausen

Greater bladderwort N WF 2

#### **Linaceae** Flax Family

#*Linum catharticum* L.

White flax E

#### **Lythraceae** Loosestrife Family

*Lythrum salicaria* L.

Purple loosestrife N WF 2

#### **Malvaceae** Mallow Family

*Malva moschata* L.

Musk mallow E R 3

#### **Menyanthaceae** Buckbean Family

*Nymphoides cordata* (Ell.) Fern.

Little floating-heart N WF 3

#### **Myricaceae** Bayberry Family

*Comptonia peregrina* (L.) Coult.

Sweet-fern N U 4

*Morella caroliniensis* (P. Mill.) Small

Small bayberry N U 5

*Myrica gale* L.

Sweetgale N WF 5

#### **Myrsinaceae** Myrsine Family

*Lysimachia arvensis* (L.) U. Manns & A. Anderb.

Scarlet pimpernel E R 2

*Lysimachia borealis* (Raf.) U. Manns & A. Anderb.

Starflower N U 4

*Lysimachia maritima* (L.) Galasso, Banfi & Soldano

Sea-milkwort N S 3

*Lysimachia quadrifolia* L.

Whorled yellow-loosestrife N U 3

*Lysimachia terrestris* (L.) B.S.P.

Swamp yellow-loosestrife N WF 4

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*Lysimachia vulgaris* L.  
Garden yellow-loosestrife E R 1

**Nymphaeaceae** Water-lily Family

*Brasenia schreberi* J. F. Gmel.  
Water shield N WF 3  
*Nuphar variegata* Dur.  
Bullhead pond-lily N WF 5  
*Nymphaea odorata* Ait.  
White water-lily N WF 5

**Oleaceae** Olive Family

*Fraxinus americana* L.  
White ash N U 2

**Onagraceae** Evening-primrose Family

*Chamerion angustifolium* (L.) Holub ssp. *circumvagum* (Mosq.) Kartesz  
Narrow-leaved fireweed N U R 4  
*Circaea alpina* L. ssp. *alpina*  
Small enchanter.s nightshade N U 3  
*Epilobium ciliatum* Raf. var. *ciliatum*  
Fringed willow-herb N U R 2  
\**Epilobium coloratum* Biehler  
Eastern willow-herb N  
*Epilobium leptophyllum* Raf.  
Bog willow-herb N WF 3  
*Oenothera biennis* L.  
Common evening-primrose E R 3  
#*Oenothera parviflora* L.  
Small-flowered evening-primrose N  
*Oenothera perennis* L.  
Little evening-primrose N U 2

**Orobanchaceae** Broom-rape Family

*Agalinis paupercula* (Gray) Britt. ssp. *borealis* Pennell  
Small-flowered agalinis N U 3  
*Euphrasia nemorosa* (Pers.) Wallr.  
Common eyebright N R 3  
*Melampyrum lineare* Desr.  
American cow-wheat N U 3  
*Odontites vernus* (Bellard) Dumort. ssp. *serotinus* (Dumort.) Corb.  
Red false bartsia N S 2  
*Orobanche uniflora* L.  
One-flowered broom-rape N U 1  
*Rhinanthus minor* L. ssp. *minor*  
Little yellow-rattle N R 3

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**Oxalidaceae** Wood sorrel Family*Oxalis florida* Saslisb.

Flowering yellow wood sorrel N S 1

*Oxalis montana* Raf.

Northern wood sorrel N U 3

*Oxalis stricta* L.

Common yellow wood sorrel N U 3

**Papaveraceae** Poppy Family#*Capnoides sempervirens* (L.) Borkh.

Pink-corydalis N

*Chelidonium majus* L.

Greater celandine E R 1

**Plantaginaceae** Plantain Family#*Callitriche palustris* L.

Vernal water-starwort N

*Linaria vulgaris* L.

Butter-and-eggs toadflax E R 3

*Nuttallanthus canadensis* (L.) D. A. Sutton

Oldfield-toadflax N R 2

*Plantago lanceolata* L.

English plantain E R 2

*Plantago major* L.

Common plantain E R 4

*Plantago maritima* L. ssp. *juncooides* (Lam) Hultén

Seaside plantain N S 4

*Veronica arvensis* L.

Corn speedwell E R 2

*Veronica officinalis* L.

Common speedwell E R 3

*Veronica peregrina* L. ssp. *xalapensis* (Kunth) Pennell

Purslane speedwell U 1

*Veronica serpyllifolia* L. ssp. *serpyllifolia*

Thyme-leaved speedwell E U WF 2

**Plumbaginaceae** Leadwort Family*Limonium carolinianum* (Walter) Britton

Carolina sea-lavender N WS S 4

**Polygonaceae** Buckwheat Family\**Fallopia cilinodis* (Michx.) Holub

Fringed bindweed E

#*Fallopia convolvulus* (L.) A. Löve

Black bindweed E

*Fallopia cristata* (Engelm. & Gray) Holub

Crested bindweed N S 2

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*Fallopia japonica* (Houtt.) Decraene var. *japonica*  
Japanese knotweed E R 5

*Persicaria hydropiperoides* (Michx.) Small  
False water-pepper smartweed N R 1

*Persicaria maculosa* S. F. Gray  
Lady's-thumb smartweed E WF 2

*Persicaria punctata* (Ell.) Small.  
Dotted smartweed N WF 2

*Persicaria sagittata* (L.) H. Gross  
Arrow-leaved tearthumb N WF 3

\**Polygonum buxiforme* Small  
Prairie knotweed N

*Polygonum fowleri* B. L. Robins. ssp. *fowleri*  
Fowler's knotweed N

*Rumex acetosella* L. ssp. *pyrenaicus* (Pourret ex Lapeyr.) Akeroyd  
Sheep dock E U R 4

*Rumex brittanica* L.  
Greater water dock N WF 1

*Rumex crispus* L. ssp. *crispus*  
Curly dock E R 4

#*Rumex pallidus* Bigelow  
Seabeach dock N

### **Ranunculaceae** Buttercup Family

*Actaea rubra* (Ait.) Willd.  
Red baneberry N U 2

*Aquilegia canadensis* L.  
Red columbine N R 1

*Coptis trifolia* (L.) Salisb.  
Three-leaved goldthread N U WF 3

*Delphinium exaltatum* Ait.  
Tall larkspur E R 2

#*Ranunculus abortivus* L.  
Kidney-leaved crowfoot N

*Ranunculus acris* L.  
Tall crowfoot E U 2

*Ranunculus cymbalaria* Pursh  
Seaside crowfoot

*Ranunculus repens* L.  
Spot-leaved crowfoot E WF 3

*Thalictrum pubescens* Pursh  
Tall meadow-rue N U 2

### **Rhamnaceae**

*Frangula alnus* P. Mill  
Glossy false buckthorn E U 1

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**Rosaceae** Rose Family*Amelanchier arborea* (Michx. f.) Fern.

Downy shadbush N U 3

\**Amelanchier bartramiana* (Tausch) M Roemer

Mountain shadbush N

#*Amelanchier intermedia* Spach

Intermediate shadbush N

*Amelanchier laevis* Wieg.

Smooth shadbush N U 3

#*Amelanchier spicata* (Lam.) K. Koch

Dwarf shadbush N

*Argentina egedii* (Wormsk.) Rydb. ssp. *groenlandica* (Tratt.) A. Löve

Pacific silverweed N S 2

*Aronia floribunda* (Lindl.) Spach

Purple chokeberry N U 2

*Aronia melanocarpa* (Michx.) Ell.

Black chokeberry N U 2

#*Crataegus jonesiae* Sarg.

Miss Jones's hawthorn N

*Fragaria virginiana* Duchesne

Common strawberry N U 4

*Potentilla argentea* L.

Silver-leaved cinquefoil N S R 3

#*Potentilla litoralis* Rydb.

Coast cinquefoil N

*Potentilla norvegica* L.

Norwegian cinquefoil N R 1

\**Potentilla recta* L.

Sulphur cinquefoil

*Potentilla simplex* Michx.

Old-field cinquefoil N U R 3

*Prunus nigra* Ait.

Canada plum N R 1

*Prunus pensylvanica* L. f. var. *pensylvanica*

Pin cherry N U 4

*Prunus virginiana* L. var. *virginiana*

Choke cherry N U 3

#*Rosa cinnamomea* L.

Cinnamon rose E

*Rosa multiflora* Thunb. ex Murr.

Rambler rose E R 2

*Rosa nitida* Willd.

Shining rose N WF 1

\**Rosa palustris* Marsh.

Swamp rose N

#*Rosa rubiginosa* L.

Sweet-briar rose E

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*Rosa rugosa* Thunb.  
 Beach rose E S 4  
*Rosa virginiana* P. Mill.  
 Virginia rose N U S 4  
*Rubus allegheniensis* Porter  
 Common blackberry N U 4  
 #*Rubus canadensis* L.  
 Smooth blackberry N  
 #*Rubus elegantulus* Blanch.  
 Showy blackberry N  
 \**Rubus flagellaris* Willd.  
 Northern blackberry N  
*Rubus hispidus* L.  
 Bristly blackberry N U WF 4  
*Rubus idaeus* L. ssp. *strigosus* (Michx.) Focke  
 Red raspberry N U 4  
*Rubus pubescens* Raf.  
 Dwarf raspberry N WF 2  
*Rubus recurvicaulis* Blanch.  
 Arching blackberry N U S 3  
*Rubus vermontanus* Blanch.  
 Vermont blackberry N U 2  
*Sibbaldiopsis tridentata* (Ait.) Rydb.  
 Three-leaved cinquefoil N U S 4  
*Sorbaria sorbifolia* (L.) A. Braun  
 False spiraea E R 2  
*Sorbus americana* Marsh  
 American mountain-ash N U 2  
*Sorbus aucuparia* L.  
 European mountain-ash E U 2  
 #*Sorbus decora* (Sarg.) Schneid.  
 Showy mountain-ash N  
*Spiraea alba* DuRoi var. *latifolia* (Ait.) Dippel  
 White meadowsweet N U WF 4  
*Spiraea tomentosa* L.  
 Rosy meadowsweet N U WF 4

### **Rubiaceae** Madder Family

*Galium aparine* L.  
 Scratch bedstraw E WF 1  
*Galium mollugo* L.  
 Whorled bedstraw E R 3  
*Galium palustre* L.  
 Marsh bedstraw N WF 4  
*Galium tinctorium* (L.) Scopoli var. *tinctorium*  
 Stiff three-pleated bedstraw N WF 3  
*Galium trifidum* L.  
 Three-petaled bedstraw N U 2

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\**Galium triflorum* Michx.  
Fragrant bedstraw N  
*Houstonia caerulea* L.  
Little bluet N U R 3

**Salicaceae** Willow Family

*Populus balsamifera* L. ssp. *balsamifera*  
Balsam poplar N U 1  
*Populus grandidentata* Michx.  
Big-toothed aspen N U 3  
*Populus tremuloides* Michx.  
Quaking aspen N U 2  
*Salix discolor* Muhl.  
Pussy willow N U 3  
#*Salix humilis* Marsh.  
Prairie willow N  
#*Salix lucida* Michx.  
Shining willow N  
*Salix petiolaris* Sm.  
Meadow willow N U 2  
#*Salix pyrifolia* Anderss.  
Balsam willow N

**Sapindaceae** Soapberry Family

*Acer pensylvanicum* L.  
Striped maple N U 2  
*Acer platanoides* L.  
Norway maple N R 2  
*Acer rubrum* L.  
Red maple N U 5  
*Acer saccharum* Marsh.  
Sugar maple N U 1  
*Acer spicatum* Lam.  
Mountain maple N U 2

**Sarraceniaceae** Pitcherplant Family

*Sarracenia purpurea* L. ssp. *purpurea*  
Purple pitcherplant N WF 3

**Saxifragaceae** Saxifrage Family

#*Tiarella cordifolia* L. var. *cordifolia*  
Foam-flower N

**Scrophulariaceae** Figwort Family

*Verbascum thapsus* L.  
Common mullein E R 3

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**Solanaceae** Nightshade Family*Solanum dulcamara* L. var. *vilosissimum* Desv.

Climbing nightshade E S 1

*Solanum nigrum* L. ssp. *nigrum*

European black nightshade E S 2

**Thymeleaceae** Mezereum Family*Daphne mezereum* L.

February daphne E U 1

**Urticaceae** Nettle Family*Boehmeria cylindrica* (L.) Swartz.

Small-spiked false nettle N S 1

*Urtica dioica* L. ssp. *gracilis* (Ait.) Seland.

Stinging nettle N S 2

**Violaceae** Violet Family\**Viola adunca* Sm. var. *adunca*

Hook-spurred violet N

*Viola blanda* Willd.

Sweet white violet N U 1

*Viola cucullata* Ait.

Blue marsh violet N WF 3

*Viola lanceolata* L.

Lance-leaved violet N U 2

*Viola pallens* (Banks ex DC) Brainerd

Smooth white violet N WF 2

*Viola sororia* Willd.

Woolly blue violet N U 4

**Viscaceae** Mistletoe Family*Arceuthobium pusillum* Peck

Dwarf mistletoe N U 1

**Vitaceae** Grape Family*Parthenocissus quinquefolia* (L.) Planch.

Virginia creeper N U 3

\*= Not vouchered, #= Vouchered by others. N=Native, E=Non-native. U=Upland, WF=Freshwater Wetland, WS=Saline Wetland, S=The Shore, R=Roadsides. 5=abundant, 4=frequent, 3=occasional, 2=infrequent, 1=rare on Vinalhaven

## 7. Development and Diversity of the Vinalhaven Flora.

Why are there so many species on Vinalhaven? Alternatively, Why are there so few species? Why are these species present and not others? These are interesting questions which are worth considering even if answers may not be easily forthcoming. They should be explored with three big facts about Vinalhaven in mind. The first of these is that the flora of Vinalhaven, like that of all New England, is a geologically young, post-glacial flora. This is expected to affect the frequency of rare and endemic species in the region and on the island. Second, since Vinalhaven is an island, the problem of the origin of its native flora becomes interesting. How did the island acquire its flora? Which species migrated to the island when it was connected to the mainland during the postglacial period? Those species that did not must have dispersed to the island over the water. Third, we recognize that the landscape and flora of Vinalhaven has been greatly transformed by human activity beginning with English colonization in the 18th century, and perhaps even earlier, by indigenous people. What was the vegetation and flora like before English settlement? How are we to view the numerous non-native species (some of them potentially invasive) on the island?

### **Glaciation and Deglaciation. How did Vinalhaven Acquire its Flora?**

Sometime during the last interglacial period (about 75,000 to 125,000 years ago) our area was occupied by a flora similar to but not identical to the present one (e.g. Mott 1990, Clett and Occhietti 1995). As the climate cooled and the glaciers advanced those species which were able to disperse escaped to refugia many hundreds or thousands of miles to the south and west where they were to remain for thousands of years. The ice sheet reached its maximum extent at the edge of the continental shelf about 21,500 years ago (Dyke 2004, Borns et al. 2004, Shaw et al. 2006)<sup>14</sup>. The landscape of what was to become New England, its soil and its vegetation, had been scraped clean by the glaciers and Vinalhaven was under nearly a mile of ice. As the climate warmed and the glaciers retreated the open terrain was colonized by species dispersing from the interglacial refugia. Our present-day native flora is largely composed of survivors from the previous interglacial period and includes those species which were able to disperse to the refugia, survive in the refugia and disperse back to our area.

Considerable research has been directed toward reconstructing the history of the recolonization of deglaciated land by plants. The evidence comes from an examination of pollen grains, spores and fragments of leaves and wood recovered from cores extracted from lake and peatland sediments. The flora did not advance as a bloc: different species migrated at different rates and arrived in our area at different times,

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<sup>14</sup>All dates in this section are calendar years before present, not radiocarbon years. Many of them were presented as calendar years in the literature I reviewed. When a primary source reported radiocarbon years I used the on-line calibration tool CalPal (<http://www.calpal-online.de>) to convert the radiocarbon dates to calendar years before present. Calibration of radiocarbon dates to calendar years is one of the dark arts and since different procedures often yield different results, some of the dates in this section may differ from others in the literature. However I believe that the order of events - the relative dates - are reliable although the absolute dates - calendar years - may differ from those in other references.

as influenced by their dispersal abilities and the increasing suitability of the de-glaciated terrain. The pattern of revegetation along the Maine coast was complex. The coast became ice-free around 15,000 years ago but by about 14,000 years ago the sea had penetrated many miles inland over land which had been depressed by the weight of the ice. Vinalhaven was under water. Above the limit of this marine transgression poplars - balsam poplar and quaking aspen - were among the first tree species to become established (around 14,800 years ago), followed by spruces, jack and red pine (around 12,500 years ago). Fir, birch and ash came later while oak and hemlock were late arrivals (10,200 and 9,300 years ago, respectively). These arrival dates are based on Davis and Jacobson (1985) and are the best we have for low-elevation sites in Maine above the limit of the post-glacial marine transgression. But as will be seen, the situation for Vinalhaven island is more complicated.

With the glaciers in retreat, the land, relieved of the weight of ice, rose and the relative sea level fell sharply. Between 14,000 and 13,000 years ago Vinalhaven emerged above the sea as an island, with the Fox Rocks and Middle Mountain appearing as the first dry land. The present day sea level was reached about 13,000 years ago. As the land continued to rise, the relative sea level continued to fall, reaching a minimum of about 60m (about 200ft) below the present level around 12,000 years ago. For as long as the sea level was less than about 50m (160ft) deep Vinalhaven was part of a peninsula of the mainland along with present-day Deer Isle, Isle au Haut and the Penobscot Bay islands to the north. This period lasted about 500 years: 12,500 to 12,000 years before the present. After about 12,000 years ago global post-glacial sea level rise began to flood the connection to the mainland. As the sea level continued to rise the valleys on “greater” Vinalhaven flooded, the sea penetrating far inland in Long and Crockett’s Coves, Seal Bay, Winter Harbor and the Mill River. More islands formed. For example, Hurricane Island became separated from Green’s Island about 11,500 years ago, but Green’s was connected to the mainland until about 4,000 years ago. Leadbetter Island was isolated about 7,000 years ago, as was North Haven. Calderwood Neck and Penobscot Island were connected by dry land to the mainland of Vinalhaven until a few thousand years ago<sup>15</sup>.

Based on this history of sea level changes we recognize that Vinalhaven must have acquired its flora in three stages:

- Long distance dispersal from the mainland to Vinalhaven as the island rose above the sea.
- Conventional dispersal over land while Vinalhaven was connected to the mainland. This would have been augmented by long distance dispersal over land.

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<sup>15</sup> This account is based on the graph of post-glacial relative sea level (calendar years) in Kelley (2010). The critical depth (ca. 50m or 160ft) for a land bridge connection is based on the NOAA chart 13302 *Penobscot Bay and Approaches*. To look for potential land bridges I study the soundings on the chart, seeking a path over what today is the most shallow water. Then I find that depth on the relative sea level graph to determine the number of years before present when flooding would sever the land bridge. I first learned that Vinalhaven had been connected to the mainland during a period of low sea level from the Maine Geological Survey paper “Penobscot Bay 10,000 years ago” (Dickson 1999). Note that the relative sea level graph in that paper is based on radiocarbon years, not calendar years.

- Long distance dispersal over the sea from the mainland after Vinalhaven had become separated from the mainland. This is continuing to the present day.

Some of this process is easy to visualize, some is not. To begin: how was Vinalhaven colonized as it was rising above the sea? Long distance dispersal over the sea is not as easy to imagine as conventional dispersal by land a few yards per generation. Since it is less frequent it is not as easily observed as conventional dispersal. But good evidence for its efficacy comes from real-time monitoring of the colonization of new islands formed by volcanic activity in the present day. A good example is the North Atlantic island of Surtsey off Iceland (Magnússon et al. 2014). Surtsey emerged in 1963 and by 2013 a total of 69 plant species had arrived with about half of these becoming well established. Transport was by floating propagules, by birds and by wind. A famous example of the power of long distance dispersal to re-vegetate bare land surfaces has been the rapid colonization of sterile surfaces created by the eruptions of the Indonesian volcano Krakatau (Whittaker 1998). Rakata Island was sterilized by the eruption of Krakatau in 1863 and had achieved continuous forest cover by 1930, all due to long distance dispersal of plants over the sea to the island.<sup>16</sup> We can surmise that the young Vinalhaven island would have been a more welcoming target for propagules dispersed by wind and birds than new volcanic terrain. Fine glacio-marine sediments, relatively rich in marine organic matter, could develop into soils quicker than volcanic ash. Low points on the islands, initially saline ponds, would soon develop into freshwater wetlands attractive to waterfowl.

We have good evidence that the mainland would have been a good source of propagules for this initial stage of colonization. By about 13,500 years ago, while Vinalhaven was emerging, a forest with many present-day species was established in the area near present-day Portland (Thompson et al. 2011). This can be concluded from a remarkable fossil assemblage including seeds of white spruce and balsam poplar, wetland sedges, raspberry or blackberry nutlets and fragments of 20 moss species, many of them common members of the present-day Vinalhaven bryoflora, e.g. *Dicranella heteromalla*, *Dicranum scoparium*, *Polytrichum juniperinum*, *Philonotis fontana*, and *Calliergon giganteum*.

Vinalhaven is a “land bridge island”, so-called by biogeographers since it was connected to the mainland during a period of low sea level, but became isolated by rising sea levels. For land bridge islands the mainland connection provides a pathway for migration, but after it is severed, further migration to the island must be over the water. Since conventional dispersal over land (a few yards per generation) is more reliable than long distance dispersal over the sea (many miles per generation), it is a reasonable hypothesis that Vinalhaven acquired most of its flora while it was connected to the mainland. When I began thinking about the history of our flora this was my assumption. But there is a problem with this scenario: a period of climatic cooling temporarily reversed the post-glacial warming trend, and it was during this period that Vinalhaven was part of the mainland. The cooling resulted in a decline in the

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<sup>16</sup> Of course this is in the tropics where everything happens faster. Among the agents transporting seeds to the Krakatau islands are large-fruit eating bats (“flying foxes”) which, alas, are not common in Midcoast Maine.

frequency of forest species and this may have reduced the available pool of species migrating over land to Vinalhaven.

The cooling event is known as the Younger Dryas<sup>17</sup>. This period, which was worldwide in extent lasted, from about 13,000 to 11,500 years before present (Borns et al. 2004). The cooling resulted in glacial re-advance in northern Maine (Dieffenbacher-Krall et al. 2016) and in our area was associated with a decline in forest cover. Locally this has been well documented by Doner (1995) in her analysis of the fossil pollen record in cores taken from Ross Pond (about 35 miles southwest of Vinalhaven) and Mud Pond (about 55 miles to the northeast). In the absence of pollen data from Vinalhaven these two studies can serve as surrogates for the vegetation history of the island during this period. Both sites show a well-established forest before the Younger Dryas period, a return to more open vegetation during the Younger Dryas, and then a return to forest conditions. The decline in tree species began as early as 13,300 years ago and lasted to about 11,400 years ago, bracketing the life span of our land bridge. Many tree and shrub species now present on Vinalhaven appear to have declined or disappeared entirely during this period, including red oak, the ashes, maples, hemlock, poplars, junipers, and bayberry. For several hundred years, perhaps as long as 1000 years, the vegetation of midcoast Maine had no modern analogue. Birches, willows and members of the Ericaceae increased in cover as did sedges, grasses and other herbaceous plants. Some tree species appeared on the scene too late to take advantage of the land bridge: red oak and hemlock arrived less than 11,000 years ago, well after the connection to the mainland was lost. Beech, ash and maple were also late arrivals, unlikely to have been transported by mammals over land. The Younger Dryas ended with a resumption of post-glacial warming and (on the mainland) forest communities must have recovered as species resumed their northward migration bit by bit. But Vinalhaven was cut off from this process and it is likely that recovery of forest vegetation here must have been due to dispersal over the water.<sup>18</sup>

So, to understand how Vinalhaven acquired its flora we need to consider the range of dispersal mechanisms employed by species during the period of post-glacial revegetation of New England up to the present day. Migration of plant species occurs when dispersal events result in more survival and reproduction in one direction than in another. It is often helpful to distinguish between conventional dispersal which moves populations a few yards per generation and long distance dispersal which can move propagules hundreds of yards or many miles at a time, for example by ocean currents, by birds carrying seeds, or by storm updraft winds transporting seeds. It is now widely recognized that long

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<sup>17</sup> Regarding the mysterious name: the episode is called the Younger Dryas because pollen of the Arctic-Alpine wildflower *Dryas octopetala* reappears in the pollen record in some areas, signaling a return to colder conditions. An “Older Dryas” period occurred earlier.

<sup>18</sup> An alternative hypothesis for the recovery of forest vegetation of Vinalhaven after the Younger Dryas is that during that period, populations of forest species persisted in “mini-refugia” on favorable sites on Vinalhaven (south-facing slopes?) after the mainland connection was lost and then expanded to revegetate the island upon the resumption of a warming climate. However, these refugial populations would have had to persist for many generations for this scenario to be plausible.

distance dispersal is “rare but disproportionately important” (Nathan 2006) and must have occurred during post glacial migration from refugia to account for the rates (miles per century) at which plant populations advanced. A sketch of dispersal mechanisms:

- Dispersal of shoreline plants. Many shoreline species can disperse readily by means of seeds which survive saltwater immersion. *Cakile maritima*, a close relative of the American sea-rocket (*Cakile edentula*) common on our beaches, was one of the first species to colonize Surtsey after it emerged. Fragments of saltmarsh grass rhizomes can float considerable distances to establish new shoreline wetlands. Many of the shoreline plants of Vinalhaven also occur in western Europe, for example the seaside plantain (*Plantago maritima*) and bracted orache (*Atriplex glabriuscula*), attesting to their capacity for dispersal by sea. The shoreline community of Vinalhaven was probably one of the first to become established. We expect that propagules of shoreline plants are still washing up on the shore currently, possibly bringing new species.
- Dispersal by wind. This is the most common dispersal syndrome of all. Bryophyte and lichen spores can be transported great distances and these organisms were surely among the first colonizers of Vinalhaven. Fern spores can also disperse by wind over long distances. Among the flowering plants members of the Aster family with pappus parachutes on their fruits - like dandelions - are champion wind dispersers. Conifer propagules can be dispersed by squirrels and birds and also by wind, since the seeds have wings. Although most pine, spruce, balsam and larch seeds land close to the parent tree occasional episodes of long-distance dispersal by wind have been well documented. The winged fruits of maples and ashes can also be dispersed long distances. Dispersal by wind must be occurring even now, bringing new species to the island and adding genes to the populations of existing species. So, for example, native species of hawkweeds (*Hieracium* spp.) may have dispersed to the island before European colonization of New England, but non-native hawkweeds of European origin dispersed to Vinalhaven only in the last few centuries.
- Animal dispersal. Dispersal by animals can occur when propagules attach to fur or feathers, when fruits are consumed with the seeds passing unharmed through the digestive tract and when small mammals (especially squirrels) cache nuts and seeds in germination-friendly sites but forget about them. While dispersal by mammals must have been limited to the period when Vinalhaven was part of the mainland during the Younger Dryas dispersal by birds will have been on-going since Vinalhaven was exposed. Birds can transport seeds of pin cherry, huckleberry and other members of the heather family, elderberries, poison ivy, mountain holly and so forth since these species produce fruits attractive to birds. Ducks and other waterfowl can transport propagules of wetland plants in their guts or by attachment to feathers. Dispersal of nuts - acorns, beech nuts, hazel nuts - to the island over the water is not so straightforward. Blue jays gather, transport and cache acorns and beech nuts over considerable distances, several kilometers in some studies (e.g. Johnson and Webb 1989). Since the pollen record indicates that red oak and beech migrated to midcoast Maine only after rising sea levels had flooded the

land connection between Vinalhaven and the mainland, it is likely that that the propagules of these species were transported to Vinalhaven by blue jays.

### **The Pre-settlement Forest.**

What was the species composition of the Vinalhaven forest when European colonists arrived on the island? Visitors to Vinalhaven are frequently struck by the contrast between the rich northern hardwoods forest of the Camden Hills and the reduced tree and understory diversity of our island spruce-fir forest. So, one often hears, e.g. on local nature walks, the idea that the original forest was much richer in hardwoods than today and that the present-day spruce-fir forest is therefore unnatural. What is the basis of this belief that hardwoods were once much more frequent on Vinalhaven? One source may be Philip Conkling's *Islands in Time* (1981), an excellent guide to the history and ecology of Maine's islands. Conkling argues that the original forests of the islands were richer in species, especially hardwoods, than they are today. He makes a strong claim: that many species (oaks, sugar maple, chestnuts, hickory, ash, yellow birch, hemlock, and white pine) were once much more common on Maine islands than they are today, that they were harvested to extinction or near-extinction on the islands, and that these species cannot re-establish on the islands due to the difficulty of dispersing over water. His evidence for a pre-settlement abundance of hardwoods comes from the descriptions of island vegetation by early settlers and others. However, the descriptions Conkling cites are mixed and include islands from Casco Bay east to New Brunswick. Some are more convincing than others. A more recent and better attempt to determine the nature of the pre-settlement forest can be found in *The Changing Nature of the Maine Woods* (Barton et al. 2012). This book describes the account of Martin Pring, who in 1603 named four species on the Fox Islands: cedar, spruce, pine and fir. Several other early accounts in Barton et al. (2012) make it clear that the coastal forest was dominated by conifers in Penobscot Bay and to the east, and by mixed hardwoods to the west.

The hypothesis that the absence of a particular hardwood species on Vinalhaven is due to its inability to disperse from the mainland (the island habitat being otherwise suitable for it) is impossible to test without planting seeds of that species. However, the relative infrequency of beech, hemlock and sugar maple on Vinalhaven cannot be due to lack of dispersal to the island, because these species are in fact present on the island. They occur as scattered individuals with very poor recruitment. An obvious explanation for this is that the environment is unsuitable for them.

R. B. Davis (1966) in a classic paper gave a very complete account of the ecology and extent of maritime spruce-fir forests in New England. Our Vinalhaven forests are near the southwestern limit of this forest type but are entirely typical of the forest cover extending along the coast and outer islands east to New Brunswick. Davis's description of this forest reads exactly like a description of Vinalhaven: spruce (red mostly, some white), red maple, paper birch, lowbush blueberry and black huckleberry in the understory, with a set of common forest floor herbaceous plants, bryophytes and lichens identical to those in the

Vinalhaven forest, along with a set of relatively uncommon tree species (beech, hemlock, sugar maple, etc.).

Perhaps the most convincing body of evidence against the idea of an ancient hardwood forest on Vinalhaven is the detailed analysis of “witness tree” data. Today on the island we find lengths of re-bar driven into the ground at surveyed property corners, but early surveyors generally just noted the type of tree at each corner. These “witness trees” are recorded in archival land survey records and collectively provide a relatively unbiased sample of forest composition at the time of the survey (Thompson et al. 2013). Table 7.1 (below) with data courtesy of Charles Cogbill, one of the co-authors in the reference just cited, shows the witness tree data from the Fox Islands, ca. 1800. It includes 231 trees from Vinalhaven and North Haven. It should be noted that surveyors often failed to distinguish species within genera, but if most of the “maples” were red maple and most of the “birches” were paper birch, it seems that the around 1800 the forest was pretty much like it is today. The hardwoods beech and oak were present but rare, and if the hardwoods hornbeam, chestnut, hickory, and so forth were here, they were evidently not frequent enough to register as witness trees<sup>19</sup>. There is little reason to believe in a pre-settlement Vinalhaven forest dominated by hardwoods.

<b>Tree Type</b>	<b>Percent of Trees</b>
Spruce	40
Fir	18
Birch	16
Maple	10
Hemlock	6
Pine	5
Beech	2
Oak	1

**Table 7.1. Fox Islands witness trees, ca. 1800**

<sup>19</sup> Hemlock is a problem. Some of the hemlocks in the table may have been recorded on North Haven (where hemlock bark was used in tanning) and/or hemlocks may have been more common on Vinalhaven in years past. Splitting the Vinalhaven and North Haven data would have resulted in sample sizes too small to be reliable.



### Human Transformation of the Vegetation and Flora.

With the arrival of the first English colonists, the landscape and flora of Vinalhaven began a major transformation. Forests were cleared, crops were planted, ponds and their surrounding wetlands were created and numerous plant species were introduced, deliberately or not. One-quarter of the vascular plant species of Vinalhaven are “from away.”<sup>20</sup> With a very few exceptions, these plants are restricted to open disturbed habitats created by human activity — they are new species in new habitats — and since it is therefore very unlikely that they have displaced species of the native flora, they should be viewed as additions to our flora. In fact, non-native species have increased the Vinalhaven vascular plant species diversity by about one-third<sup>21</sup>. Some non-native species were introduced to Vinalhaven directly (e.g. as seed contaminants) and others may have dispersed from nearby mainland sites. The first alien species to become established on the island were probably weeds of European agriculture, especially grasses, the clovers, etc. Ship’s ballast is also thought to have been an important source of introductions. These early inadvertent introductions account for the majority of our non-native species and are now well-established, completely naturalized species. Later introductions included ornamental plants escaping from cultivation on the mainland and dispersing by natural means to the island. Some of these are of European origin, e.g. orange hawkweed (*Hieracium aurantiacum*), common barberry (*Berberis vulgaris*), and glossy false buckthorn (*Frangula alnus*) and some can be traced to East Asia, e.g. multiflora rose (*Rosa multiflora*), rugosa rose (*Rosa rugosa*), Japanese barberry (*Berberis thunbergii*), Japanese knotweed (*Fallopia japonica*), and Asian bittersweet (*Celastrus orbiculatus*). At least two species considered non-native in New England by Haines (2011) are in fact North American natives. Blue lupine (*Lupinus polyphyllus*) is native to the west coast. It has been cultivated world-wide and frequently escapes, achieving invasive status in a number of countries. Black-eyed cornflower (*Rudbeckia hirta*) is native to the American west and mid-west, and may have spread east along railroad lines.

The relative frequency of some native species must also have been altered with widespread forest clearing. Today open areas on the island are colonized by a mixture of native and introduced species. Native species adapted to exploit naturally occurring forest openings will have increased in frequency. These include goldenrods (*Solidago* spp.), asters (*Symphyotrichum* spp.), bracken and hay-scented fern (*Pteridium aquilinum* and *Dennstaedtia punctlobula*), and of course paper birch and red maple.

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<sup>20</sup> Estimates of the proportion of the non-native flora in the Northeast range from 24% (Rhode Island) to 45% (Massachusetts). The latest estimate for Maine (which is out of date) is 30% (Mehrhoff 2000).

<sup>21</sup> Here’s the math: There are 444 vascular plant native taxa and 152 non-native taxa recorded so far for a total of 596 taxa. Considering the 152 non-native species to be additions to the native flora,  $152/403 = 0.34$ .

### Floristic Diversity of Vinalhaven.

The checklists in this flora include 596 species of vascular plants, 135 species of bryophytes and 95 species of macrolichens. How is this level of biodiversity to be explained? A classic problem in biogeography has been to account for geographical patterns in species diversity. This question can be addressed on the global scale (Why are there more species in the tropics than in temperate regions?) or on the very local scale (Why are there more species on Penobscot Island than on Stoddard Island?) The literature in this area is enormous and while some patterns of species diversity are answered readily, others have been more resistant to investigation. It is easier to answer questions about rare and endemic species than about the overall level of species diversity, so that will be addressed first.

The flora of Vinalhaven consists of a sub-set (about 15%) of the flora of New England, so any consideration of the floristic diversity of Vinalhaven must be considered in the context of the flora of New England. A total of about 3500 vascular plant species, subspecies and varieties has been recorded from New England, and this level of diversity is comparable to other regions of the United States with similar land area and at similar latitudes (New England Wildflower Society 2015). However, the flora has a very low level of endemism with about 10 species restricted in their distribution to New England. This is not very many: by way of comparison, Alabama has 27 endemics and the San Francisco Bay Area has about 40. In fact, regions like ours, with the land scraped clean during repeated glaciations, generally have very low levels of endemism. This can be accounted for in two ways. First, we recognize that no plant population has existed in its present location in New England and subject to current environmental conditions for more than a few thousand years. This is insufficient time for local populations to evolve into new species<sup>22</sup>. And, second, since any present-day New England species has spent only a fraction of its existence here under present conditions we need to take into account factors which would favor or disfavor speciation during its evolutionary lifetime. Our species are those that survived numerous migrations away from advancing glaciers toward refugia, survival in the refugia, and re-migration following deglaciation. The species that were able to do this were probably environmental generalists with good dispersal abilities and these are not the attributes of populations prone to rapid speciation and the production of endemics (Dynesius and Jansson 2000).

The lack of genuinely rare species on Vinalhaven is addressed in the introduction to the vascular plant checklist (p. 6.3). Briefly, we lack the habitats that (in New England) support globally or regionally rare species.

So, is a total of 766 recorded macrolichen, bryophyte, and vascular plant species on Vinalhaven a little, a lot, or what we should expect for an island the size of Vinalhaven with its level of habitat diversity and post-glacial history? Some comparisons may prove helpful in exploring this question. McMaster (2005)

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<sup>22</sup> But here is a counterexample to that generalization: Maine's single endemic species, the Orono sedge (*Carex oronensis*) is probably a genuine neoendemic, having arisen since deglaciation (Dibble and Campbell 2001). We can assume that some isolated populations on islands like ours are in the early stages of speciation.

analyzed the vascular plant species diversity of 22 islands along the Atlantic coast from Connecticut to New Brunswick (Vinalhaven, with no completed floristic inventory at the time of his study was not included). His goal was to determine the effect of several variables on island diversity, including island size, habitat diversity, latitude, years since deglaciation and years since isolation from the mainland (all were once connected). The two factors with the greatest influence (much greater than any of the others) were island size and habitat diversity (McMaster used number of soil types as a surrogate for habitat diversity)<sup>23</sup>. Of course these two factors are correlated, since large islands are generally more diverse in their habitats than smaller ones, so the independent effects of island size and diversity are difficult to disentangle. Island size *per se* is expected to influence species diversity as the larger populations of larger islands are less likely to go extinct due to haphazard environmental events and larger islands represent better targets for new species dispersing from the mainland. So, in McMaster's data set, the largest islands (e.g. Mount Desert, Nantucket) have many more species than the smallest (e.g. Matinicus Rock, Bear Island), with islands of intermediate size scattered in between with intermediate levels of species diversity.

The most relevant comparisons to Vinalhaven are Isle au Haut, with an area of 6325 acres and 708 vascular plant taxa<sup>24</sup>; and Mount Desert, with an area of 69000 acres and 1079 vascular plant taxa. Vinalhaven has an area of 16,000 acres and 596 vascular plant taxa. Mount Desert, with its greater area, higher elevations and greater variety of habitats certainly "deserves" to have more species than Vinalhaven, but why does Isle au Haut have more species than Vinalhaven even though it is a smaller island? Here some possible explanations:

- Isle au Haut has more relief and a more varied topography than Vinalhaven. The highest point on Isle au Haut (Mt. Champlain summit) is over 540 ft. above sea level, while Vinalhaven's high point (Fox Rocks) is only about 210 ft. above sea level. A greater variety of habitats is expected to result in a higher level of species diversity. This is admittedly vague and the hypothesis could be tested by vegetation inventories of the two islands following the same protocols. The two islands have a similar geology, granitic and volcanic rocks.
- The difference could be partly an artifact of the different botanical histories of the islands. Isle au Haut has a much longer history of botanical exploration than Vinalhaven, with records as far back as the 1880's and continuous exploration to date (Greene et al. 2005). More botanists on the ground means more species recorded. This, of course suggests that if we just looked harder on Vinalhaven, we would find more species, and in fact since I began maintaining species checklists on the island, new species

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<sup>23</sup> The  $r^2$  values for the individual regressions of native species numbers on island area and habitat diversity are 0.83 and 0.87, respectively (the analysis used logarithmic values).

<sup>24</sup> "Taxa" here means all species, subspecies and varieties. The number of *taxa* in a floristic inventory is always slightly higher than the number of *species* because some species have more than one subspecies or variety. The Mount Desert Island and Isle au Haut counts are taken from Greene et al. 2005.

turn up every year, either found by me or by my friends. On this hypothesis, my checklists underestimate the true species diversity of Vinalhaven.

- The extended period of botanizing on Isle au Haut has shown that some species recorded in the past have gone missing. For the Acadia National Park region, fully 20% of historically recorded taxa are apparently no longer extant. Although Greene et al. (2005) do not provide data on the number of missing Isle au Haut species, the list of 708 taxa for that island probably includes species only known historically. There is not as much historical data for Vinalhaven; about 10% of our taxa are known only historically.
- Isle au Haut was probably more accessible to migrating plant populations following deglaciation. It is separated from Deer Isle by shallow water and so the land bridge connection would have flooded later than ours. An archipelago of small islands lies between Isle au Haut and Deer Isle, and these could have served as stepping stones during post-glacial revegetation. On this hypothesis, Isle au Haut simply “filled up” with more species after the glaciers retreated.

When pondering patterns of species diversity, we are on firmer ground when evaluating factors favoring species diversity on Vinalhaven Island. Most of the VLT and MCHT preserves on the island have floristic inventories and the effect of preserve size on diversity is very evident and not all surprising (table and figure, Appendix 1). The largest preserves, The Basin and Perry Creek, have many more species than the smallest (the water treatment plant and Heller Meadow), as we would expect. Preserves of intermediate area have intermediate levels of diversity. It is fruitless to try to separate the effect of area *per se* from the association between area and habitat diversity. As area increases, it is more likely that individuals of uncommon species will be encountered and tallied. As area increases, more habitat types occur. While bearing in mind that the data in the figure are from inventories conducted by many different consultants it is tempting to pick out particular data points and wonder about differences. For example the Neck Island (NI) data point lies below the regression line, suggesting that it has fewer species than expected for its size. A plausible explanation is that Neck Island lacks the freshwater wetlands (with their component species) of other reserves of comparable size. Other differences are more difficult to explain. Why, for example, does the Huber Reserve (HU) lie above the line while Penobscot Island (PI) lie below? Again, this may be due to the better developed wetlands in the Huber Preserve. Penobscot Island has a longer coastline but shoreline communities do not add that many species. Some of this is “armchair ecology”, but it is clear that habitat diversity is the key to understanding species diversity on Vinalhaven. For example, throughout this flora I’ve mentioned how miniature wetlands, e.g. behind the root plates of blowdowns, support a surprising number of wetland species. Walking in the woods with notebook in hand, assembling an inventory, encountering one of these little communities, we immediately add a dozen species to the running total. A patch of bare ledge will automatically add several lichen and moss species. An old red maple snag is sure to contain the moss *Ulota crispa* and (if we are lucky) one of the lungwort lichens (*Lobaria* spp.). Any senescent balsam fir will provide several beard lichen (*Usnea*) species. By

the shore, even the smallest pocket salt-marsh will add several species. A productive way of thinking about the species diversity of a parcel of land on Vinalhaven is to view it as being assembled from the individual diversities of various types of habitats.

Of course, to be fair, we need to consider how the *lack* of certain elements of habitat diversity constrains the level of species diversity on Vinalhaven. First of all, we have to admit that Vinalhaven has a limited range of bedrock geology. It is true that the bedrock of the southern part of the island is granitic while the bedrock of the northern part is mostly of volcanic origin. But from the point of view of plants, these rock types are chemically similar and weather to produce soils low in pH and exchangeable calcium. The volcanics and meta-volcanics, with more cracks and fissures than granite encourage groundwater seepage and often support spectacular bryophyte and lichen growth, e.g in “The Gorge” on the VLT Tiptoe Mountain Reserve. However, there are no species in The Gorge that are not found elsewhere on the island, so there is no increase in species diversity associated with that rock type. What is missing on Vinalhaven is calcareous bedrock and this means that we cannot expect to find those plant and lichen species which favor the high pH and high calcium soils associated with calcareous rocks. This would include the rare wildflowers occupying one of the the hot spots for rare plant species in New England — the marble valleys of western New England (New England Wildflower Society 2015).

A second factor limiting plant and lichen species diversity on Vinalhaven is the relative infrequency of deciduous hardwood trees. The understory of a deciduous woodland is typically richer in species than the forest floor under coniferous cover — many forest floor species of deciduous woodlands have adapted to exploit the few weeks in spring when the canopy is open and the forest floor is well illuminated and warm. By and large, Vinalhaven lacks this element of the flora. Where we might expect to find it, under birches and red maples, that niche is filled by a dense cover of hay-scented fern (*Dennstaedtia punctilobula*) and bracken (*Pteridium aquilinum*). An additional effect of the lack of hardwoods is with respect to the bryophyte and lichen epiphyte flora. As a rule, hardwood bark supports more species of epiphytes than conifer bark, so the fewer hardwood trees, the fewer epiphyte species.

As I stated in the introduction, I have not botanized all of the Vinalhaven islands and it is reasonable to wonder if that means that my checklists are missing some significant species, those that occur on the islands but not the “mainland” of Vinalhaven. I argue that floristic diversity on Vinalhaven increases by the addition of habitat types. Since it is unlikely that there are habitat types on the islands absent on the Vinalhaven “mainland”, I doubt that exploring these islands would yield many new species.

### **Biogeography of the Vinalhaven Flora (with some stories about a few species).<sup>25</sup>**

There are very few plant and lichen species limited to New England (or, for that matter to Vinalhaven). Our flora consists includes species with geographical distributions — many of them very broad — that overlap in our area. The richness of our flora is attributable in part to the overlap between the ranges of southern species reaching their northern limits in Maine, and the ranges of northern species reaching their southern limits here (Barton et al. 2012). Vinalhaven’s plant and lichen diversity represents a slice of the diversity of New England, of North America, and in some cases of the boreal regions of the Northern Hemisphere. In this section I discuss a few species to show that they have lives well beyond Vinalhaven.

- New England Aster (*Symphyotrichum novae-angliae*). What could be more “New England” than this lovely wildflower? The species was first described in 1753 by Linnaeus as *Aster novae-angliae* (which remained its name until recently). Linnaeus, of course, never saw the plant in the wild — he was attaching a name to a specimen which had been collected in North America by an early plant collector (perhaps Peter Kalm) and sent to George Clifford in Haarlem, The Netherlands whose collections Linnaeus studied. His 1753 Latin description includes the phrase “*habitat in Nova Anglia*” since a label on the specimen does say “*nova anglia.*” So, Linnaeus thought it came from New England and named it accordingly. But there is nothing particularly “New England” about this species. It ranges across the United States west to the Pacific coast (Oregon and Washington, but not California) and as far south as Georgia. To the north it dips into southern Ontario and Quebec and the Maritime Provinces. Its common name is an historical accident, a translation of the Latin.
- The spruces: on Vinalhaven red spruce and white spruce can occur in the same patch of woods. This represents overlap between two very different geographical ranges. Red spruce is a northern Appalachian species with the center of its distribution in Maine and New Brunswick. It extends further south a bit, but only at high elevations. White spruce, by contrast, is essentially a boreal species with a very large geographical range, extending north to Newfoundland and then across boreal Canada to Alaska. It meets the tundra at the tree line. In Eastern North America, the southern limit of its range is in Maine. Balsam fir and black spruce have similar boreal distributions.
- Red oak and beech occur throughout the eastern half of the United States, extending west to the prairie border and south to Alabama. We are near the northern limit of the geographical ranges of these tree species. They were among the last species to reach our latitude after the retreat of the glaciers and it

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<sup>25</sup> Information on tree geographical tree distributions in this discussion can be found in the Forest Service “Silvics” volumes, available on-line at [http://na.fs.fed.us/spfo/pubs/silvics\\_manual/Volume\\_1](http://na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1) and [http://na.fs.fed.us/spfo/pubs/silvics\\_manual/Volume\\_2](http://na.fs.fed.us/spfo/pubs/silvics_manual/Volume_2). Vascular plant distributions are from the on-line version of the *Flora of North America*, available at [www.efloras.org](http://www.efloras.org). The original (Latin) descriptions of *Aster novae-angliae* and *Sphagnum magellanicum* are from Linnaeus’s *Species Plantarum* and Bridel’s *Muscologia Recentiorum*. Both can be viewed on the [botanicus.org](http://botanicus.org) website. A map of the distribution of *Cladonia rangiferina* is available through the GBIF data portal, reachable from the website of [discoverlife.org](http://discoverlife.org).

are predicted to resume their northern migration as a consequence of the future warming climate. (Barton et al. 2012).

- Red maple has a range overlapping that of red oak, but broader, extending up into Newfoundland and south to Florida and the Gulf Coast. This is one of the largest ranges of any hardwood in North America.
- Black crowberry (*Empetrum nigrum*) is essentially an arctic-alpine species of high elevation and boreal tundra, descending to the coast in New England. It is characteristic of peatlands across boreal North America and Eurasia. The related broom crowberry (*Corema conradii*) has a much more limited distribution, occurring in small, disjunct populations along the Atlantic coastal plain and in the interior uplands of northeastern North America. Fowler's knotweed (*Polygonum fowleri*), an occasional Vinalhaven shore line plant, is another species with northern affinities. Maine is near its southern limit and its range extends northward into the Canadian Maritimes, Quebec and the shores of Hudson's Bay.
- Round-leaved sundew (*Drosera rotundifolia*) has, like many wetland species, an immense geographical range. It is a circumboreal species, occurring at high latitudes all around the Northern Hemisphere. It extends south to wetlands in Mississippi and Georgia and has a *very* disjunct population in New Guinea.
- Bracken, common on Vinalhaven, is probably the most widespread species of vascular plant on the planet. It occurs on all continents (except Antarctica) and in all but the driest and coldest climatic zones. A reproductive fern can produce millions of spores which can be easily carried by wind to establish new individuals and bracken is simply an extreme example of the vagility of ferns. On Vinalhaven it is mostly limited to forest openings but in many parts of the world (e.g. Britain, Australia, South Africa, Yucatán Peninsula) it is a serious invasive species.
- Two of Vinalhaven's most common ferns, sensitive fern (*Onoclea sensibilis*) and cinnamon fern (*Osmundastrum cinnamomeum*) could be considered "living fossils" (Rothwell and Stockey 1991, Serbet and Rothwell 1999). The first of these has persisted, unchanged, since the Paleocene epoch (60-66 million years ago) as has the second, for at least 70 million years, since the Cretaceous period (I like to think that dinosaurs fed on it). The fossils of these ferns look exactly like their present day descendants, and it is no easy task to explain how these species have avoided extinction while failing to evolve over such an expanse of time.
- Mosses: about 60% of the moss species that occur in North America also occur in Europe (Frahm and Vitt 1993). The similarities between the moss floras of the two continents is much greater than between the vascular plant floras. An American botanist in Europe will see many familiar *genera* of vascular plants (e.g. the tree genera *Pinus*, *Quercus*, *Betula*, *Picea*, etc.), but the *species* will be different (e.g. red pine, *Pinus resinosa* in North American; Scots pine, *P. sylvatica* in Europe). Consequently, it is very striking to botanize a Scottish woodland and come across many of

Vinalhaven's most common forest floor mosses: *Pleurozium schreberi*, *Hypnum cupressiforme*, *Hylocomium splendens*, etc. There have been several efforts to account for the similarities between the floras. One explanation is that the species in common are representatives of the ancient moss flora that occupied both continents before they began to separate about 50 million years ago. Another is that long distance dispersal from one continent to another accounts for the similarities. Moss spores can, in fact, be carried vast distances in the wind and this probably accounts for the similarities between the peat-moss floras of Vinalhaven and the southern tip of South America. My favorite example is *Sphagnum magellanicum*, one of our most common fen peat-mosses. This species was first named by Samuel Elisée von Bridel in 1798, who wrote "*in Freto Magellanico habitat*" ("it lives in the Straits of Magellan"). This is a very widespread peatland species occurring throughout much of North and South America and Eurasia.<sup>26</sup> It does not occur in Antarctica, but two Vinalhaven mosses of dry roadsides, *Ceratodon purpureus* and *Bryum argenteum* do so.

- Lichens: many of these organisms, like mosses, have very broad geographic distributions. The largest lichen genus on Vinalhaven is *Cladonia* (27 species). Of these, more than one-half (15) also occur in Britain (Dobson 2005). One of our reindeer lichens (*C. rangiferina*) has an extensive distribution in cool forests, and arctic and alpine tundra all around the Northern Hemisphere, with strangely disjunct populations in Hawaii, Thailand and South Georgia Island (a sub-Antarctic island).

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<sup>26</sup> A recent paper (Hassel et al. 2018) argues that *S. magellanicum* is actually restricted to South America and that the Northern Hemisphere populations previously assigned to that species are either *S. medium* or *S. divinum*. In the moss world this counts as "breaking news" and is not yet reflected in standard floras.



## 8. Appendix 1. Species and Community Type Diversity of Protected Areas on Vinalhaven.

Most of the preserves of the Vinalhaven Land Trust (VLT) and Maine Coast Heritage Trust (MCHT) have been the subject of natural history inventories or other forms of diversity assessment. This has resulted in a rich body of natural history information documented in reports filed with the respective organizations. In this Appendix I summarize some of the findings from several preserves: Penobscot Island and Huber Preserve (Alex Jones); The Basin, Perry Creek, Fishhook, Polly Cove, Bathing Pool (Sally Rooney and Jill Weber); Starboard Rock (Spencer-Famous Associates); Water treatment plant<sup>27</sup>, Heller Meadow, Whitmore Falls, Stoddard Island, Neck Island, Marcuse Wetland Preserve (Javier Peñalosa).

Table 8.1 (next page) shows that vascular plant species diversity increases with preserve size. This is partly an effect of preserve size *per se* and partly due to the accumulation of habitats types, each with its own characteristic suite of species, as preserve size increases. A log-log vascular plant species/area curve is shown in Figure 8.1 (next page).

The pattern of bryophyte and macrolichen diversity is not as clear. My species inventories have included these groups, but not all consultants have provided cryptogam lists. The Starboard Rock and Huber Preserve cryptogam counts are from surveys conducted after the original natural resource inventories by Jim and Patricia Hinds (lichens, Starboard Rock) and the 2009 Crum Workshop (bryophytes and lichens, Starboard Rock and Huber Preserve.) Note that Starboard Rock holds the record for lichen numbers, but that Neck Island (with modest vascular plant diversity) is a close second. It seems that the diversity/area relationships for vascular plants is reliable, but that much of the variability among preserves with respect to cryptogam records is due to the vagaries of collection and documentation practices.

A list of the Maine Natural Areas Program (MNAP) community (vegetation) types documented for Vinalhaven appears after the table and figure. I compiled this from reports by consultants who described vegetation diversity using the MNAP taxonomy (Gawler and Cutko 2010)

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<sup>27</sup> Admittedly not a real preserve but remarkable for its rich (mostly non-native) flora.

Table 8.1. Species diversity of protected lands on Vinalhaven compiled from reports on file with VLT and MCHT

Preserve	Water Treatment Plant	Heller Meadow	Whitmore Falls	Stoddard Island	Bathing Pool	Neck Island	Fish Hook	Starboard Rock	Polly's Cove	Marcuse	Huber	Penobscot Island	Perry Creek	The Basin
Area (Acres)	0.75	2	6	11	12	13	16	18	21	55	69	111	329	900+
Vascular plants	59	70	96	91	118	68	186	186	177	150	217	156	242	313
Mosses	--	12	--	18	16	28	24	38	22	52	33	--	23	34
Liverworts	--	0	--	2	2	5	3	14	2	13	15	--	3	5
Macrolichens	--	8	--	17	3	41	5	53	5	27	30	--	11	14
Total	59	90	96	128	139	142	218	291	206	242	295	156	279	366

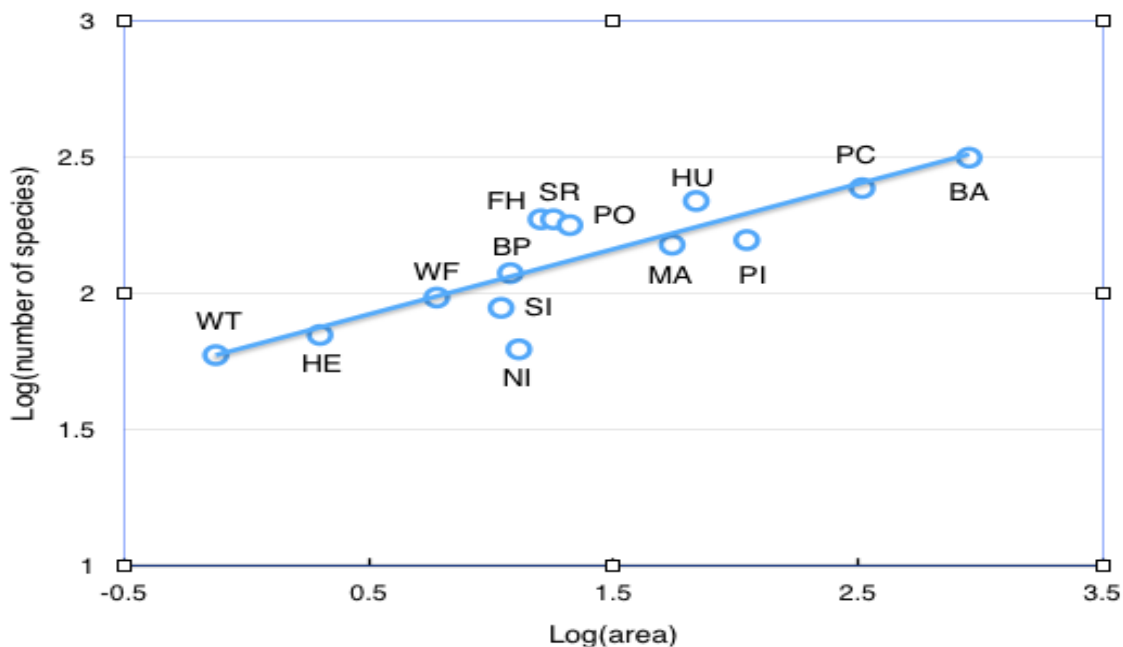


Figure 8.1. Vascular plant species/area relationship of VLT and MCHT preserves on Vinalhaven. The logarithm of total vascular plant species is plotted against the logarithm of reserve area in hectares.  $R^2 = .73$  for the linear relationship. Reserve symbols and names (left to right): WT = water treatment plant, HE = Heller meadow, WF = Whitmore Falls, SI = Stoddard Island, BP= Bathing Pool, NI = Neck Island, FH = Fishhook, SR = Starboard Rock, PO = Polly Cove, MA = Marcuse Wetland, PI = Penobscot Island, PC = Perry Creek, BA = The Basin.

**MNAP Community (Vegetation) Types Documented on Vinalhaven.  
These Units are Described in Gawler and Cutko (2010)**

**The shore**

- Beach strand
- Spartina saltmarsh
- Mixed graminoid-forb saltmarsh
- Rose-bayberry maritime shrubland
- Crowberry-bayberry headland
- Seaside goldenrod-goosetongue open headland

**Freshwater wetlands**

- Northern white cedar swamp
- Bog-moss lawn
- Mountain holly-alder woodland fen
- Water lily macrophyte aquatic bed
- Mixed graminoid shrub marsh
- Spruce-larch wooded “bog” (fen)
- Red maple wooded fen
- Spruce-fir cinnamon fern forest
- Cattail marsh
- Alder-shrub thicket

**The Upland**

- Maritime spruce-fir forest
- Spruce northern hardwoods forest
- Red spruce mixed conifer woodland
- Northern white cedar woodland
- Pitch pine woodland
- Acidic cliff gorge
- Three-toothed cinquefoil- blueberry low summit

## Appendix 2. Vascular Plant Common Name/Scientific Name Concordance

For users more familiar with common names than scientific names I've prepared this concordance which will facilitate finding the species entry in the vascular plant species checklist in this flora. In the checklist species are arranged first by "division": Pteridophytes, Conifers, Monocots, Dicots - in that order - and then by family name, with the families in alphabetical order.

The common names here are nearly all taken from Haines (2011, *Flora Novae-Angliae*), with a few exceptions, e.g. "Aster" rather than "American-aster." I've added a few common names which seem to be in general use here but do not occur in Haines, e.g., "Blackeyed Susan", "Swamp candles".

Consequently, a few species appear more than once. Many common names consist of a noun and a descriptive adjective, e.g. white spruce, white goldenrod, and Haines groups these by the adjectives in his index, so all the species with "white" in their names are grouped together. I prefer to sort the common names by their nouns, so in this concordance "Goldenrod, white" will be found near "Goldenrod, Canada" and "Spruce, white" is near "Spruce, red." I've followed Haines' convention of hyphenating common names, when the noun part is misleading. So, it is "Hemp-nettle", not "Nettle, hemp" for *Galeopsis*, because *Galeopsis* is a mint and not a nettle. It is surprisingly difficult to alphabetize common names: should *Maianthemum trifolium* appear under: "False Solomon's seal, three leaved" or "Solomon's seal, false three-leaved"? For finding some common plant names it may be necessary to try different combinations of the parts of the common name.

Although most vascular plant common names are genuine vernacular names in actual use by wildflower enthusiasts, many of the common names in Haines (2011) and consequently in this concordance are bogus, concocted by translating Latin scientific names, e.g. "Sallow sedge" for *Carex lurida*, on the dubious theory that every plant needs a common name.

Agalinis, small-flowered	<i>Agalinis paupercula</i>	D	Orobanchaceae
Alder, green	<i>Alnus viridis</i>	D	Betulaceae
Alder, speckled	<i>Alnus incana</i>	D	Betulaceae
Alkali grass, Nuttall's	<i>Puccinellia nuttalliana</i>	M	Poaceae
Alkali grass, tundra	<i>Puccinellia pumila</i>	M	Poaceae
Angelica, sea coast	<i>Angelica lucida</i>	D	Apiaceae
Arrow-grass, saltmarsh	<i>Triglochin maritima</i>	M	Juncaginaceae
Ash, white	<i>Fraxinus americana</i>	D	Oleaceae
Aspen, big-toothed	<i>Populus grandidentata</i>	D	Salicaceae
Aspen, quaking	<i>Populus tremuloides</i>	D	Salicaceae
Aster, bog	<i>Oclemena nemoralis</i>	D	Asteraceae
Aster, calico	<i>Symphotrichum lateriflorum</i>	D	Asteraceae
Aster, heath	<i>Symphotrichum ericoides</i>	D	Asteraceae
Aster, lance-leaved	<i>Symphotrichum lanceolatum</i>	D	Asteraceae
Aster, large-leaved wood	<i>Eurybia macrophylla</i>	D	Asteraceae
Aster, New England	<i>Symphotrichum novae-angliae</i>	D	Asteraceae
Aster, New York	<i>Symphotrichum novi-belgii</i>	D	Asteraceae
Aster, purple-stemmed	<i>Symphotrichum puniceum</i>	D	Asteraceae
Aster, tall white	<i>Doellingeria umbellata</i>	D	Asteraceae
Aster, whorled	<i>Oclemena acuminata</i>	D	Asteraceae
Baneberry, red	<i>Actaea rubra</i>	D	Ranunculaceae
Barberry, common	<i>Berberis vulgaris</i>	D	Berberidaceae
Barberry, Japanese	<i>Berberis thunbergii</i>	D	Berberidaceae
Barley, foxtail	<i>Hordeum jubatum</i>	M	Poaceae
Barnyard grass, American	<i>Echinochloa muricata</i>	M	Poaceae
Bartsia, red false	<i>Odontites vernus</i>	D	Orobanchaceae
Bayberry, small	<i>Morella caroliniensis</i>	D	Myricaceae
Beak-rush, white	<i>Rhynchospora alba</i>	M	Cyperaceae
Bearberry, red	<i>Arctostaphylos uva-ursi</i>	D	Ericaceae
Bedstraw, fragrant	<i>Galium triflorum</i>	D	Rubiaceae
Bedstraw, marsh	<i>Galium palustre</i>	D	Rubiaceae
Bedstraw, scratch	<i>Galium aparine</i>	D	Rubiaceae
Bedstraw, stiff three-pleated	<i>Galium tinctorium</i>	D	Rubiaceae
Bedstraw, three-petaled	<i>Galium trifidum</i>	D	Rubiaceae
Bedstraw, whorled	<i>Galium mollugo</i>	D	Rubiaceae

Beech, American	<i>Fagus grandifolia</i>	D Fagaceae
Beggar-ticks, devil's	<i>Bidens frondosa</i>	D Asteraceae
Bellflower, creeping	<i>Campanula rapunculoides</i>	D Campanulaceae
Bellflower, marsh	<i>Campanula aparinoides</i>	D Campanulaceae
Bellflower, Scotch	<i>Campanula rotundifolia</i>	D Campanulaceae
Bentgrass, Autumn	<i>Agrostis perennans</i>	M Poaceae
Bentgrass, creeping	<i>Agrostis stolonifera</i>	M Poaceae
Bentgrass, redtop	<i>Agrostis gigantea</i>	M Poaceae
Bentgrass, Rhode Island	<i>Agrostis capillaris</i>	M Poaceae
Bentgrass, rough	<i>Agrostis scabra</i>	M Poaceae
Bindweed, black	<i>Fallopia convolvulus</i>	D Polygonaceae
Bindweed, crested	<i>Fallopia cristata</i>	D Polygonaceae
Bindweed, fringed	<i>Fallopia cilinodis</i>	D Polygonaceae
Bindweed, hedge false	<i>Calystegia sepium</i>	D Convolvulaceae
Birch, blue	<i>Betula X caerulea</i>	D Betulaceae
Birch, gray	<i>Betula populifolia</i>	D Betulaceae
Birch, heart-leaved paper	<i>Betula cordifolia</i>	D Betulaceae
Birch, paper	<i>Betula papyrifera</i>	D Betulaceae
Birch, yellow	<i>Betula alleghaniensis</i>	D Betulaceae
Bitter-cress, small-flowered	<i>Cardamine parviflora</i>	D Brassicaceae
Bittersweet, Asian	<i>Celastrus orbiculatus</i>	D Celastraceae
Blackberry, arching	<i>Rubus recurvicaulis</i>	D Rosaceae
Blackberry, bristly	<i>Rubus hispidus</i>	D Rosaceae
Blackberry, common	<i>Rubus allegheniensis</i>	D Rosaceae
Blackberry, Northern	<i>Rubus flagellaris</i>	D Rosaceae
Blackberry, showy	<i>Rubus elegantulus</i>	D Rosaceae
Blackberry, smooth	<i>Rubus canadensis</i>	D Rosaceae
Blackberry, Vermont	<i>Rubus vermontanus</i>	D Rosaceae
Bladderwort, greater	<i>Utricularia vulgaris</i>	D Lentibulariaceae
Bladderwort, mixed	<i>Utricularia geminiscapa</i>	D Lentibulariaceae
Blake's aster	<i>Oclemena X blakei</i>	D Ast
Blue grass, flat-stemmed	<i>Poa compressa</i>	M Poaceae
Blue grass, fowl	<i>Poa palustris</i>	M Poaceae
Blue grass, wood	<i>Poa nemoralis</i>	M Poaceae
Blue-eyed-grass, narrow-leaved	<i>Sisyrinchium angustifolium</i>	M Iridaceae
Blue-eyed-grass, strict	<i>Sisyrinchium montanum</i>	M Iridaceae

Bluebead-lily, yellow	<i>Clintonia borealis</i>	M	Liliaceae
Bluebells, seaside	<i>Mertensia maritima</i>	D	Boraginaceae
Blueberry, common lowbush	<i>Vaccinium angustifolium</i>	D	Ericaceae
Blueberry, highbush	<i>Vaccinium corymbosum</i>	D	Ericaceae
Blueberry, velvet-leaved	<i>Vaccinium myrtilloides</i>	D	Ericaceae
Bluegrass, Kentucky	<i>Poa pratensis</i>	M	Poaceae
Bluet, little	<i>Houstonia caerulea</i>	D	Rubiaceae
Bog-orchid, green-fringed	<i>Platanthera lacera</i>	M	Orchidaceae
Bog-orchid, little club-spur	<i>Platanthera clavellata</i>	M	Orchidaceae
Bog-orchid, purple-fringed	<i>Platanthera psycodes</i>	M	Orchidaceae
Bog-orchid, round-leaved	<i>Platanthera orbiculata</i>	M	Orchidaceae
Bog-orchid, white-fringed	<i>Platanthera blephariglottis</i>	M	Orchidaceae
Bog-rosemary	<i>Andromeda polifolia</i>	D	Ericaceae
Bracken	<i>Pteridium aquilinum</i>	P	Dennstaedtiaceae
Brome, smooth	<i>Bromus inermis</i>	M	Poaceae
Broom-rape, one-flowered	<i>Orobanche uniflora</i>	D	Orobanchaceae
Buckthorn, glossy false	<i>Frangula alnus</i>	D	Rhamnaceae
Bulrush, mosquito	<i>Scirpus hattorianus</i>	M	Cyperaceae
Bulrush, soft-stemmed	<i>Schoenoplectus tabernaemontani</i>	M	Cyperaceae
Bulrush, three-square	<i>Schoenoplectus pungens</i>	M	Cyperaceae
Bur-reed, American	<i>Sparganium americanum</i>	M	Typhaceae
Bur-reed, great	<i>Sparganium eurycarpum</i>	M	Typhaceae
Burdock, common	<i>Arctium minus</i>	D	Asteraceae
Burnweed, American	<i>Erechtites hieraciifolius</i>	D	Asteraceae
Buttercup see Crowfoot			
Calla, wild	<i>Calla palustris</i>	M	Araceae
Campion, red	<i>Silene dioica</i>	D	Caryophyllaceae
Campion, white	<i>Silene latifolia</i>	D	Caryophyllaceae
Canary grass, reed	<i>Phalaris arundinacea</i>	M	Poaceae
Caraway	<i>Carum carvi</i>	D	Apiaceae
Cat-tail, broad-leaved	<i>Typha latifolia</i>	M	Typhaceae
Cat-tail, narrow-leaved	<i>Typha angustifolia</i>	M	Typhaceae
Cedar, northern white-	<i>Thuja occidentalis</i>	C	Cupressaceae
Celandine, greater	<i>Chelidonium majus</i>	D	Papaveraceae
Centaury, branched	<i>Gentiana tinctoria</i>	D	Gentianaceae
Chamomile, rayless	<i>Matricaria discoidea</i>	D	Asteraceae

Chamomile, stinking	<i>Anthemis cotula</i>	D Asteraceae
Cherry, choke	<i>Prunus virginiana</i>	D Rosaceae
Cherry, pin	<i>Prunus pensylvanica</i>	D Rosaceae
Chickweed, field	<i>Cerastium arvense</i>	D Caryophyllaceae
Chickweed, mouse-ear	<i>Cerastium fontanum</i>	D Caryophyllaceae
Chokeberry black	<i>Aronia melanocarpa</i>	D Rosaceae
Chokeberry, purple	<i>Aronia floribunda</i>	D Rosaceae
Cinquefoil, coast	<i>Potentilla litoralis</i>	D Rosaceae
Cinquefoil, Norwegian	<i>Potentilla norvegica</i>	D Rosaceae
Cinquefoil, old-field	<i>Potentilla simplex</i>	D Rosaceae
Cinquefoil, silver-leaved	<i>Potentilla argentea</i>	D Rosaceae
Cinquefoil, sulphur	<i>Potentilla recta</i>	D Rosaceae
Cinquefoil, three-leaved	<i>Sibbaldiopsis tridentata</i>	D Rosaceae
Clover, alsike	<i>Trifolium hybridum</i>	D Fabaceae
Clover, lesser hop	<i>Trifolium dubium</i>	D Fabaceae
Clover, palmate hop	<i>Trifolium aureum</i>	D Fabaceae
Clover, pinnate hop	<i>Trifolium campestre</i>	D Fabaceae
Clover, rabbit-foot	<i>Trifolium arvense</i>	D Fabaceae
Clover, red	<i>Trifolium pratense</i>	D Fabaceae
Clover, white	<i>Trifolium repens</i>	D Fabaceae
Clubmoss, common	<i>Lycopodium clavatum</i>	P Lycopodiaceae
Clubmoss, Hickey's tree	<i>Dendrolycopodium hickeyi</i>	P Lycopodiaceae
Clubmoss, interrupted	<i>Spinulum annotinum</i>	P Lycopodiaceae
Clubmoss, Northern bog	<i>Lycopodiella inundata</i>	P Lycopodiaceae
Clubmoss, prickly tree	<i>Dendrolycopodium dendroideum</i>	P Lycopodiaceae
Coltsfoot	<i>Tussilago farfara</i>	D Asteraceae
Columbine, red	<i>Aquilegia canadensis</i>	D Ranunculaceae
Coneflower, black-eyed,	<i>Rudbeckia hirta</i>	D Asteraceae
Coralroot, spotted	<i>Corallorhiza maculata</i>	M Orchidaceae
Cordgrass, prairie	<i>Spartina pectinata</i>	M Poaceae
Cordgrass, saltmeadow	<i>Spartina patens</i>	M Poaceae
Cordgrass, smooth	<i>Spartina alterniflora</i>	M Poaceae
Corydalis, pink	<i>Capnoides sempervirens</i>	D Papaveraceae
Cottonsedge, narrow leaved	<i>Eriophorum angustifolium</i>	M Cyperaceae
Cottonsedge, tawny	<i>Eriophorum virginicum</i>	M Cyperaceae
Cottonsedge, few-nerved	<i>Eriophorum tenellum</i>	M Cyperaceae



Cow-parsnip	<i>Heracleum maximum</i>	D Apiaceae
Cow-wheat, American	<i>Melampyrum lineare</i>	D Orobanchaceae
Crabgrass, hairy	<i>Digitaria sanguinalis</i>	M Poaceae
Cranberry, large	<i>Vaccinium macrocarpon</i>	D Ericaceae
Cranberry, mountain	<i>Vaccinium vitis-idaea</i>	D Ericaceae
Cranberry, small	<i>Vaccinium oxycoccos</i>	D Ericaceae
Crane's bill, northern	<i>Geranium bicknellii</i>	D Geraniaceae
Crowberry, black	<i>Empetrum nigrum</i>	D Ericaceae
Crowberry, broom	<i>Corema conradii</i>	D Ericaceae
Crowfoot, kidney-leaved	<i>Ranunculus abortivus</i>	D Ranunculaceae
Crowfoot, seaside	<i>Ranunculus cymbalaria</i>	D Ranunculaceae
Crowfoot, spot-leaved	<i>Ranunculus repens</i>	D Ranunculaceae
Crowfoot, tall	<i>Ranunculus acris</i>	D Ranunculaceae
Cucumber-root, Indian	<i>Medeola virginiana</i>	M Liliaceae
Cucumber, wild	<i>Echinocystis lobata</i>	D Cucurbitaceae
Currant, skunk	<i>Ribes glandulosum</i>	D Grossulariaceae
Cut grass, rice	<i>Leersia oryzoides</i>	M Poaceae
Daisy, ox-eye	<i>Leucanthemum vulgare</i>	D Asteraceae
Dame's-rocket	<i>Hesperis matronalis</i>	D Brassicaceae
Dandelion, common	<i>Taraxacum officinale</i>	D Asteraceae
Dandelion, fall	<i>Scorzoneroides autumnalis</i>	D Asteraceae
Dandelion, red-seeded	<i>Taraxacum laevigatum</i>	D Asteraceae
Daphne, February	<i>Daphne mezereum</i>	D Thymeleaceae
Day-lilly, orange	<i>Hemerocallis fulva</i>	M Hemerocallidaceae
Day-lilly, yellow	<i>Hemerocallis lilioasphodelus</i>	M Hemerocallidaceae
Ditch-grass, beaked	<i>Ruppia maritima</i>	M Ruppiaceae
Dock, curly	<i>Rumex crispus</i>	D Polygonaceae
Dock, greater water	<i>Rumex brittanica</i>	D Polygonaceae
Dock, seabeach	<i>Rumex pallidus</i>	D Polygonaceae
Dock, sheep	<i>Rumex acetosella</i>	D Polygonaceae
Dodder, common	<i>Cuscuta gronovii</i>	D Convolvulaceae
Dogbane, spreading	<i>Apocynum androsaemifolium</i>	D Apocynaceae
Dogwood, alternate-leaved	<i>Swida alternifolia</i>	D Cornaceae
Dogwood, Canada dwarf	<i>Chamaepericlymenium canadense</i>	D Cornaceae
Dogwood, round-leaved	<i>Swida rugosa</i>	D Cornaceae
Duck-meal, common	<i>Spirodela polyrrhiza</i>	M Araceae

Duckweed, common	<i>Lemna minor</i>	M Araceae
Eel-grass	<i>Zostera marina</i>	M Zosteraceae
Elderberry, black	<i>Sambucus nigra</i>	D Adoxaceae
Elderberry, red	<i>Sambucus racemosa</i>	D Adoxaceae
Enchanter's nightshade, small	<i>Circaea alpina</i>	D Onagraceae
Evening-primrose, common	<i>Oenothera biennis</i>	D Onagraceae
Evening-primrose, little	<i>Oenothera perennis</i>	D Onagraceae
Evening-primrose, small-flowered	<i>Oenothera parviflora</i>	D Onagraceae
Everlasting, pearly	<i>Anaphalis margaritacea</i>	D Asteraceae
Eyebright, common	<i>Euphrasia nemorosa</i>	D Orobanchaceae
False Solomon's seal, feathery	<i>Maianthemum racemosum</i>	M Ruscaceae
False Solomon's seal, star-like	<i>Maianthemum stellatum</i>	M Ruscaceae
False Solomon's seal, three-leaved	<i>Maianthemum trifolium</i>	M Ruscaceae
False-heather, golden	<i>Hudsonia ericoides</i>	D Cistaceae
Fern, cinnamon	<i>Osmundastrum cinnamomeum</i>	P Osmundaceae
Fern, crested wood	<i>Dryopteris cristata</i>	P Dryopteridaceae
Fern, evergreen wood	<i>Dryopteris intermedia</i>	P Dryopteridaceae
Fern, fragile	<i>Cystopteris fragilis</i>	P Woodsiaceae
Fern, hay-scented	<i>Dennstaedtia punctilobula</i>	P Dennstaedtiaceae
Fern, interrupted	<i>Osmunda claytoniana</i>	P Osmundaceae
Fern, marginal wood	<i>Dryopteris marginalis</i>	P Dryopteridaceae
Fern, marsh	<i>Thelypteris palustris</i>	P Thelypteridaceae
Fern, mountain wood	<i>Dryopteris campyloptera</i>	P Dryopteridaceae
Fern, narrow lady	<i>Athyrium angustum</i>	P Woodsiaceae
Fern, New York	<i>Parathelypteris noveboracensis</i>	P Thelypteridaceae
Fern, northern beech	<i>Phegopteris connectilis</i>	P Thelypteridaceae
Fern, northern oak	<i>Gymnocarpium dryopteris</i>	P Woodsiaceae
Fern, royal	<i>Osmunda regalis</i>	P Osmundaceae
Fern, sensitive	<i>Onoclea sensibilis</i>	p Onocleaceae
Fern, spinulose wood	<i>Dryopteris carthusiana</i>	P Dryopteridaceae
Fescue, hard	<i>Festuca trachyphylla</i>	M Poaceae
Fescue, meadow	<i>Schedonorus pratensis</i>	M Poaceae
Fescue, red	<i>Festuca rubra</i>	M Poaceae
Fescue, sheep	<i>Festuca ovina</i>	M Poaceae
Fir, balsam	<i>Abies balsamea</i>	C Pinaceae
Fireweed, narrow-leaved	<i>Chamerion angustifolium</i>	D Onagraceae

Firmoss, shining	<i>Huperzia lucidula</i>	P	Huperziaciae
Flax, white	<i>Linum catharticum</i>	D	Linaceae
Fleabane, Canada	<i>Erigeron canadensis</i>	D	Asteraceae
Fleabane, rough	<i>Erigeron strigosus</i>	D	Asteraceae
Floating-heart	<i>Nymphoides cordata</i>	D	Menyanthaceae
Foam-flower	<i>Tiarella cordifolia</i>	D	Saxifragaceae
Forget-me-not, field	<i>Myosotis arvensis</i>	D	Boraginaceae
Foxtail, Chinese	<i>Setaria faberi</i>	M	Poaceae
Foxtail, yellow	<i>Setaria pumila</i>	M	Poaceae
Garlic-mustard	<i>Alliaria petiolata</i>	D	Brassicaceae
Germander, American	<i>Teucrium canadense</i>	D	Lamiaceae
Glasswort, common	<i>Salicornia depressa</i>	D	Amaranthaceae
Goat's beard, meadow	<i>Tragopogon pratensis</i>	D	Asteraceae
Goldenrod, bog	<i>Solidago uliginosa</i>	D	Asteraceae
Goldenrod, Canada	<i>Solidago canadensis</i>	D	Asteraceae
Goldenrod, common grass-leaved	<i>Euthamia graminifolia</i>	D	Asteraceae
Goldenrod, downy	<i>Solidago puberula</i>	D	Asteraceae
Goldenrod, early	<i>Solidago juncea</i>	D	Asteraceae
Goldenrod, gray	<i>Solidago nemoralis</i>	D	Asteraceae
Goldenrod, seaside	<i>Solidago sempervirens</i>	D	Asteraceae
Goldenrod, smooth	<i>Solidago gigantea</i>	D	Asteraceae
Goldenrod, tall	<i>Solidago altissima</i>	D	Asteraceae
Goldenrod, white	<i>Solidago bicolor</i>	D	Asteraceae
Goldenrod, wrinkle-leaved	<i>Solidago rugosa</i>	D	Asteraceae
Goldthread, three-leaved	<i>Coptis trifolia</i>	D	Ranunculaceae
Gooseberry, hairy-stemmed	<i>Ribes hirtellum</i>	D	Grossulariaceae
Goosefoot, desert	<i>Chenopodium pratericola</i>	D	Amaranthaceae
Goosefoot, white	<i>Chenopodium album</i>	D	Amaranthaceae
Grass, orchard	<i>Dactylis glomerata</i>	M	Poaceae
Grass, tall oat	<i>Arrhenatherum elatius</i>	M	Poaceae
Grass, vanilla sweet	<i>Anthoxanthum nitens</i>	M	Poaceae
Greenwood, dyer's	<i>Genista tinctoria</i>	D	Fabaceae
Ground-cedar, northern	<i>Diphasiastrum complanatum</i>	P	Lycopodiaceae
Groundsel, New England	<i>Packera schweinitziana</i>	D	Asteraceae
Grove-sandwort, blunt-leaved	<i>Moehringia lateriflora</i>	D	Caryophyllaceae
Hair grass, common	<i>Deschampsia flexuosa</i>	M	Poaceae

Hair grass, tufted	<i>Deschampsia cespitosa</i>	M Poaceae
Hair sedge, tufted	<i>Bulbostylis capillaris</i>	M Cyperaceae
Hawkweed, Canada	<i>Hieracium kalmii</i>	D Asteraceae
Hawkweed, mouse-ear	<i>Hieracium pilosella</i>	D Asteraceae
Hawkweed, orange	<i>Hieracium aurantiacum</i>	D Asteraceae
Hawkweed, panicled	<i>Hieracium paniculatum</i>	D Asteraceae
Hawkweed, rough	<i>Hieracium scabrum</i>	D Asteraceae
Hawkweed, yellow	<i>Hieracium caespitosum</i>	D Asteraceae
Hawthorn, Miss Jones'	<i>Crataegus jonesiae</i>	D Rosaceae
Hazelnut, beaked	<i>Corylus cornuta</i>	D Betulaceae
Helleborine, broad-leaved	<i>Epipactis helleborine</i>	M Orchidaceae
Hemlock, eastern	<i>Tsuga canadensis</i>	C Pinaceae
Hemp-nettle, brittle-stemmed	<i>Galeopsis tetrahit</i>	D Lamiaceae
Hemp-nettle, split-lipped	<i>Galeopsis bifida</i>	D Lamiaceae
Highbush-cranberry	<i>Viburnum opulus</i>	D Adoxaceae
Holly, mountain	<i>Ilex mucronata</i>	D Aquifoliaceae
Honeysuckle, American	<i>Lonicera canadensis</i>	D Caprifoliaceae
Honeysuckle, bush	<i>Diervilla lonicera</i>	D Caprifoliaceae
Honeysuckle, Morrow's	<i>Lonicera morrowii</i>	D Caprifoliaceae
Horsetail, field	<i>Equisetum arvense</i>	P Equisetaceae
Horsetail, wood	<i>Equisetum sylvaticum</i>	P Equisetaceae
Huckleberry, black	<i>Gaylussacia baccata</i>	D Ericaceae
Indian-pipe, one-flowered	<i>Monotropa uniflora</i>	D Ericaceae
Iris, blue	<i>Iris versicolor</i>	M Iridaceae
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>	M Araceae
Juniper, common	<i>Juniperus communis</i>	C Cupressaceae
Juniper, creeping	<i>Juniperus horizontalis</i>	C Cupressaceae
Knapweed, black	<i>Centaurea nigra</i>	D Asteraceae
Knapweed, brown	<i>Centaurea jacea</i>	D Asteraceae
Knotweed, dooryard	<i>Polygonum aviculare</i>	D Polygonaceae
Knotweed, Fowler's	<i>Polygonum fowleri</i>	D Polygonaceae
Knotweed, Japanese	<i>Fallopia japonica</i>	D Polygonaceae
Knotweed, prairie	<i>Polygonum buxiforme</i>	D Polygonaceae
Labrador-tea	<i>Rhododendron groenlandicum</i>	D Ericaceae
Ladies'-tresses, hooded	<i>Spiranthes romanzoffiana</i>	M Orchidaceae
Ladies'-tresses, nodding	<i>Spiranthes cernua</i>	M Orchidaceae

Lady's slipper, pink	<i>Cypripedium acaule</i>	M	Orchidaceae
Larch, American	<i>Larix laricina</i>	C	Pinaceae
Larkspur, tall	<i>Delphinium exaltatum</i>	D	Ranunculaceae
Leatherleaf	<i>Chamaedaphne calyculata</i>	D	Ericaceae
Lobelia, bladder-pod	<i>Lobelia inflata</i>	D	Campanulaceae
Locust, black	<i>Robinia pseudoacacia</i>	D	Fabaceae
Loosestrife, garden yellow	<i>Lysimachia vulgaris</i>	D	Myrsinaceae
Loosestrife, purple	<i>Lythrum salicaria</i>	D	Lythraceae
Loosestrife, swamp yellow	<i>Lysimachia terrestris</i>	D	Myrsinaceae
Loosestrife, whorled yellow	<i>Lysimachia quadrifolia</i>	D	Myrsinaceae
Lupine, blue	<i>Lupinus polyphyllus</i>	D	Fabaceae
Lyme grass, American	<i>Leymus mollis</i>	M	Poaceae
Mallow, musk	<i>Malva moschata</i>	D	Malvaceae
Manna grass, American	<i>Glyceria grandis</i>	M	Poaceae
Manna grass, fowl	<i>Glyceria striata</i>	M	Poaceae
Manna grass, rattlesnake	<i>Glyceria canadensis</i>	M	Poaceae
Maple, mountain	<i>Acer spicatum</i>	D	Sapindaceae
Maple, Norway	<i>Acer platanoides</i>	D	Sapindaceae
Maple, red	<i>Acer rubrum</i>	D	Sapindaceae
Maple, striped	<i>Acer pensylvanicum</i>	D	Sapindaceae
Maple, sugar	<i>Acer saccharum</i>	D	Sapindaceae
Marigold, pot	<i>Calendula officinalis</i>	D	Asteraceae
Marjorum, wild	<i>Origanum vulgare</i>	D	Lamiaceae
Marsh-pennywort	<i>Hydrocotyle americana</i>	D	Apiaceae
Mayflower, Canada	<i>Maianthemum canadense</i>	M	Ruscaceae
Meadow-foxtail, field	<i>Alopecurus pratensis</i>	M	Poaceae
Meadow-foxtail, marsh	<i>Alopecurus geniculatus</i>	M	Poaceae
Meadow-rue, tall	<i>Thalictrum pubescens</i>	D	Ranunculaceae
Meadowsweet, rosy	<i>Spiraea tomentosa</i>	D	Rosaceae
Meadowsweet, white	<i>Spiraea alba</i>	D	Rosaceae
Medick, black	<i>Medicago lupulina</i>	D	Fabaceae
Milkweed, common	<i>Asclepias syriaca</i>	D	Apocynaceae
Mint, field	<i>Mentha arvensis</i>	D	Lamiaceae
Mint, ginger spear	<i>Mentha X gracilis</i>	D	Lamiaceae
Mistletoe, dwarf	<i>Arceuthobium pusillum</i>	D	Viscaceae
Mountain-ash, American	<i>Sorbus americana</i>	D	Rosaceae

Mountain-ash, European	<i>Sorbus aucuparia</i>	D Rosaceae
Mountain-ash, showy	<i>Sorbus decora</i>	D Rosaceae
Mullein, common	<i>Verbascum thapsus</i>	D Scrophulariaceae
Mustard, Chinese	<i>Brassica juncea</i>	D Brassicaceae
Nettle, small-spiked false	<i>Boehmeria cylindrica</i>	D Urticaceae
Nettle, stinging	<i>Urtica dioica ssp. gracilis</i>	D Urticaceae
Nightshade, climbing	<i>Solanum dulcamara</i>	D Solanaceae
Nightshade, European black	<i>Solanum nigrum</i>	D Solanaceae
Oak, northern red	<i>Quercus rubra</i>	D Fagaceae
Oatgrass, flattened	<i>Danthonia compressa</i>	M Poaceae
Oatgrass, poverty	<i>Danthonia spicata</i>	M Poaceae
Orache, bracted	<i>Atriplex glabriuscula</i>	D Amaranthaceae
Orache, hastate-leaved	<i>Atriplex prostrata</i>	D Amaranthaceae
Orache, maritime	<i>Atriplex acadiensis</i>	D Amaranthaceae
Orchid, Loesel's wide-lipped	<i>Liparis loeselii</i>	M Orchidaceae
Orpine, purple	<i>Hylotelephium telephium</i>	D Crassulaceae
Oxtongue, hawkweed	<i>Picris hieracioides</i>	D Asteraceae
Panicgrass, hairy rosette-	<i>Dichanthelium acuminatum</i>	M Poaceae
Panicgrass, Northern rosette-	<i>Dichanthelium boreale</i>	M Poaceae
Pearlwort, birds-eye	<i>Sagina procumbens</i>	D Caryophyllaceae
Pearlwort, knotted	<i>Sagina nodosa</i>	D Caryophyllaceae
Pickeralweed	<i>Pontederia cordata</i>	M Pontederiaceae
Pimpernel, scarlet	<i>Lysimachia arvensis</i>	D Myrsinaceae
Pine-sap, yellow	<i>Hypopitys monotropa</i>	D Ericaceae
Pine, pitch	<i>Pinus rigida</i>	C Pinaceae
Pine, red	<i>Pinus resinosa</i>	C Pinaceae
Pine, white	<i>Pinus strobus</i>	C Pinaceae
Pink, Deptford	<i>Dianthus armeria</i>	D Caryophyllaceae
Pink, maiden	<i>Dianthus deltoides</i>	D Caryophyllaceae
Pinweed, round-fruited	<i>Lechea intermedia</i>	D Cistaceae
Pitcherplant, purple	<i>Sarracenia purpurea</i>	D Sarraceniaceae
Plantain, common	<i>Plantago major</i>	D Plantaginaceae
Plantain, English	<i>Plantago lanceolata</i>	D Plantaginaceae
Plantain, seaside	<i>Plantago maritima</i>	D Plantaginaceae
Plum, Canada	<i>Prunus nigra</i>	D Rosaceae
Pogonia, rose	<i>Pogonia ophioglossoides</i>	M Orchidaceae

Poison-ivy	<i>Toxicodendron radicans</i>	D Anacardiaceae
Poison-ivy, Western	<i>Toxicodendron rydbergii</i>	D Anacardiaceae
Polypody, Appalachian	<i>Polypodium appalachianum</i>	P Polypodiaceae
Polypody, rock	<i>Polypodium virginianum</i>	P Polypodiaceae
Pond-lily, bullhead	<i>Nuphar variegata</i>	D Nymphaeaceae
Pondweed, alga-like	<i>Potamogeton confervoides</i>	M Potamogetonaceae
Pondweed, Oakes'	<i>Potamogeton oakesianus</i>	M Potamogetonaceae
Pondweed, ribbon-leaved	<i>Potamogeton epihydrus</i>	M Potamogetonaceae
Poplar, balsam	<i>Populus balsamifera</i>	D Salicaceae
Princes-pine, spotted	<i>Chimaphila umbellata</i>	D Ericaceae
Pumpkin	<i>Cucurbita pepo</i>	D Cucurbitaceae
Pussytoes, small	<i>Antennaria howellii</i>	D Asteraceae
Queen Anne's lace	<i>Daucus carota</i>	D Apiaceae
Quickweed	<i>Galinsoga quadriradiata</i>	D Asteraceae
Radish, wild	<i>Raphanus raphanistrum</i>	D Brassicaceae
Ragweed, common	<i>Ambrosia artemisiifolia</i>	D Asteraceae
Ragwort, common	<i>Senecio vulgaris</i>	D Asteraceae
Ragwort, tansy	<i>Jacobaea vulgaris</i>	D Asteraceae
Ragwort, woodland	<i>Senecio sylvaticus</i>	D Asteraceae
Raspberry, dwarf	<i>Rubus pubescens</i>	D Rosaceae
Raspberry, red	<i>Rubus idaeus</i>	D Rosaceae
Rattlesnake-root, three-leaved	<i>Nabalus trifoliatius</i>	D Asteraceae
Rattlesnake-plantain, dwarf	<i>Goodyera repens</i>	M Orchidaceae
Reed grass, Canada	<i>Calamagrostis canadensis</i>	M Poaceae
Rhodora	<i>Rhododendron canadense</i>	D Ericaceae
Rose, beach	<i>Rosa rugosa</i>	D Rosaceae
Rose, cinnamon	<i>Rosa cinnamomea</i>	D Rosaceae
Rose, rambler	<i>Rosa multiflora</i>	D Rosaceae
Rose, shining	<i>Rosa nitida</i>	D Rosaceae
Rose, swamp	<i>Rosa palustris</i>	D Rosaceae
Rose, sweet-briar	<i>Rosa rubiginosa</i>	D Rosaceae
Rose, Virginia	<i>Rosa virginiana</i>	D Rosaceae
Rush, baltic	<i>Juncus balticus</i>	M Juncaceae
Rush, brown-fruited	<i>Juncus pelocarpus</i>	M Juncaceae
Rush, Canada	<i>Juncus canadensis</i>	M Juncaceae
Rush, common soft	<i>Juncus effusus</i>	M Juncaceae

Rush, Dudley's	<i>Juncis dudleyi</i>	M	Juncaceae
Rush, path	<i>Juncus tenuis</i>	M	Juncaceae
Rush, Pylae's soft	<i>Juncus pylaei</i>	M	Juncaceae
Rush, saltmarsh	<i>Juncus gerardii</i>	M	Juncaceae
Rush, short-tailed	<i>Juncus brevicaudatus</i>	M	Juncaceae
Rush, thread	<i>Juncus filiformis</i>	M	Juncaceae
Rush, toad	<i>Juncus bufonius</i>	M	Juncaceae
Russian-olive	<i>Eleagnus angustifolia</i>	D	Eleagnaceae
Saltgrass	<i>Distichlis spicata</i>	M	Poaceae
Sand-spurry, Canada	<i>Spergularia canadensis</i>	D	Caryophyllaceae
Sand-spurry, red	<i>Spergularia rubra</i>	D	Caryophyllaceae
Sand-spurry, saltmarsh	<i>Spergularia marina</i>	D	Caryophyllaceae
Sandwort, seaside	<i>Honckenya peploides</i>	D	Caryophyllaceae
Sandwort, thyme-leaved	<i>Arenaria serpyllifolia</i>	D	Caryophyllaceae
Sarsaparilla, bristly	<i>Aralia hispida</i>	D	Apiaceae
Sarsaparilla, wild	<i>Aralia nudicaulis</i>	D	Apiaceae
Sea-blite, American	<i>Suaeda calceoliformis</i>	D	Amaranthaceae
Sea-blite, herbaceous	<i>Suaeda maritima</i>	D	Amaranthaceae
Sea-lavender, Carolina	<i>Limonium carolinianum</i>	D	Plumbaginaceae
Sea-milkwort	<i>Lysimachia maritima</i>	D	Myrsinaceae
Sea-rocket, American	<i>Cakile edentula</i>	D	Brassicaceae
Sedge, awl-fruited	<i>Carex stipata</i>	M	Cyperaceae
Sedge, Billings'	<i>Carex billingsii</i>	M	Cyperaceae
Sedge, Blue Ridge	<i>Carex lucorum</i>	M	Cyperaceae
Sedge, bristle-stalk	<i>Carex leptalea</i>	M	Cyperaceae
Sedge, brownish	<i>Carex brunnescens</i>	M	Cyperaceae
Sedge, chaffy	<i>Carex paleacea</i>	M	Cyperaceae
Sedge, common fox	<i>Carex vulpinoidea</i>	M	Cyperaceae
Sedge, Crawford's	<i>Carex crawfordii</i>	M	Cyperaceae
Sedge, Cyperus-like	<i>Carex pseudocyperus</i>	M	Cyperaceae
Sedge, fibrous-rooted	<i>Carex communis</i>	M	Cyperaceae
Sedge, fringed	<i>Carex crinita</i>	M	Cyperaceae
Sedge, graceful	<i>Carex gracillima</i>	M	Cyperaceae
Sedge, greater bladder	<i>Carex intumescens</i>	M	Cyperaceae
Sedge, hoary	<i>Carex canescens</i>	M	Cyperaceae
Sedge, Houghton's	<i>Carex houghtoniana</i>	M	Cyperaceae



Sedge, little green	<i>Carex viridula</i>	M Cyperaceae
Sedge, Mackenzie's	<i>Carex mackenzii</i>	M Cyperaceae
Sedge, marsh straw	<i>Carex hormathodes</i>	M Cyperaceae
Sedge, Merritt Fernald's	<i>Carex merritt-fernaldii</i>	M Cyperaceae
Sedge, necklace	<i>Carex projecta</i>	M Cyperaceae
Sedge, New England	<i>Carex novae-angliae</i>	M Cyperaceae
Sedge, nodding	<i>Carex gynandra</i>	M Cyperaceae
Sedge, northeastern	<i>Carex cryptolepis</i>	M Cyperaceae
Sedge, open field	<i>Carex conoidea</i>	M Cyperaceae
Sedge, pale	<i>Carex pallescens</i>	M Cyperaceae
Sedge, parasol	<i>Carex umbellata</i>	M Cyperaceae
Sedge, pointed broom	<i>Carex scoparia</i>	M Cyperaceae
Sedge, prickly bog	<i>Carex atlantica</i>	M Cyperaceae
Sedge, sallow	<i>Carex lurida</i>	M Cyperaceae
Sedge, sea-beach	<i>Carex silicia</i>	M Cyperaceae
Sedge, shaved	<i>Carex tonsa</i>	M Cyperaceae
Sedge, smooth black	<i>Carex nigra</i>	M Cyperaceae
Sedge, soft-leaved	<i>Carex disperma</i>	M Cyperaceae
Sedge, star	<i>Carex echinata</i>	M Cyperaceae
Sedge, swarthy	<i>Carex adusta</i>	M Cyperaceae
Sedge, three-seeded	<i>Carex trisperma</i>	M Cyperaceae
Sedge, three-way	<i>Dulichium arundinaceum</i>	M Cyperaceae
Sedge, tussock	<i>Carex stricta</i>	M Cyperaceae
Sedge, white-edged	<i>Carex debilis</i>	M Cyperaceae
Sedge, white-tinged	<i>Carex albicans</i>	M Cyperaceae
Sedge, wooly-fruited	<i>Carex lasiocarpa</i>	M Cyperaceae
Selfheal, common	<i>Prunella vulgaris</i>	D Lamiaceae
Shadbush, downy	<i>Amelanchier arborea</i>	D Rosaceae
Shadbush, dwarf	<i>Amelanchier spicata</i>	D Rosaceae
Shadbush, mountain	<i>Amelanchier bartramiana</i>	D Rosaceae
Shadbush, smooth	<i>Amelanchier laevis</i>	D Rosaceae
Sheep fescue, fine-leaved	<i>Festuca filiformis</i>	M Poaceae
Sheep-laurel	<i>Kalmia angustifolia</i>	D Ericaceae
Shepherd's purse	<i>Capsella bursa-pastoris</i>	D Brassicaceae
Shinleaf, American	<i>Pyrola americana</i>	D Ericaceae
Shinleaf, elliptic-leaved	<i>Pyrola elliptica</i>	D Ericaceae

Shinleaf, one-flowered	<i>Moneses uniflora</i>	D Ericaceae
Silverweed, Pacific	<i>Argentina egedii</i>	D Rosaceae
Skullcap, hooded	<i>Scutellaria galericulata</i>	D Lamiaceae
Skunk-cabbage	<i>Symplocarpus foetidus</i>	M Araceae
Smartweed, dotted	<i>Persicaria punctata</i>	D Polygonaceae
Smartweed, false water-pepper	<i>Persicaria hydropiperoides</i>	D Polygonaceae
Smartweed, Lady's-thumb	<i>Persicaria maculosa</i>	D Polygonaceae
Solomon's seal, feathery false	<i>Maianthemum racemosum</i>	M Ruscaceae
Solomon's seal, star-like false	<i>Maianthemum stellatum</i>	M Ruscaceae
Solomon's seal, three-leaved false	<i>Maianthemum trifolium</i>	M Ruscaceae
Sow-thistle, field	<i>Sonchus arvensis</i>	D Asteraceae
Sow-thistle, spiny-leaved	<i>Sonchus asper</i>	D Asteraceae
Speedwell, common	<i>Veronica officinalis</i>	D Plantaginaceae
Speedwell, corn	<i>Veronica arvensis</i>	D Plantaginaceae
Speedwell, purslane	<i>Veronica peregrina</i>	D Plantaginaceae
Speedwell, thyme-leaved	<i>Veronica serpyllifolia</i>	D Plantaginaceae
Spikemoss, ledge	<i>Selaginella rupestris</i>	P Selaginellaceae
Spikesedge uniglumis	<i>Eleocharis uniglumis</i>	M Cyperaceae
Spikesedge, blunt	<i>Eleocharis obtusa</i>	M Cyperaceae
Spikesedge, common	<i>Eleocharis palustris</i>	M Cyperaceae
Spikesedge, elliptic	<i>Eleocharis elliptica</i>	M Cyperaceae
Spikesedge, needle	<i>Eleocharis acicularis</i>	M Cyperaceae
Spikesedge, slender	<i>Eleocharis tenuis</i>	M Cyperaceae
Spiraea, false	<i>Sorbaria sorbifolia</i>	D Rosaceae
Spleenwort, maidenhair	<i>Asplenium trichomanes</i>	P Aspleniaceae
Spleenwort, silvery false	<i>Deparia acrostichoides</i>	P Woodsiaceae
Spruce, black	<i>Picea mariana</i>	C Pinaceae
Spruce, red	<i>Picea rubens</i>	C Pinaceae
Spruce, white	<i>Picea glauca</i>	C Pinaceae
Spurge, leafy	<i>Euphorbia esula</i>	D Euphorbiaceae
St. John's-wort, Fraser's marsh	<i>Triadenum fraseri</i>	D Hypericaceae
St. John's-wort, lesser Canada	<i>Hypericum canadense</i>	D Hypericaceae
St. John's-wort, northern	<i>Hypericum boreale</i>	D Hypericaceae
St. John's-wort, orange-grass	<i>Hypericum gentianoides</i>	D Hypericaceae
St. John's-wort, spotted	<i>Hypericum punctatum</i>	D Hypericaceae
Starflower	<i>Lysimachia borealis</i>	D Myrsinaceae

Stichwort, bog	<i>Stellaria alsine</i>	D Caryophyllaceae
Stichwort, common	<i>Stellaria media</i>	D Caryophyllaceae
Stichwort, grass-leaved	<i>Stellaria graminea</i>	D Caryophyllaceae
Stichwort, long-leaved	<i>Stellaria longifolia</i>	D Caryophyllaceae
Stonecrop, moss	<i>Sedum acre</i>	D Crassulaceae
Stonecrop, Spanish	<i>Sedum hispanicum</i>	D Crassulaceae
Strawberry, common	<i>Fragaria virginiana</i>	D Rosaceae
Sumac, staghorn	<i>Rhus hirta</i>	D Anacardiaceae
Sundew, round-leaved	<i>Drosera rotundifolia</i>	D Droseraceae
Sundew, spatulate-leaved	<i>Drosera intermedia</i>	D Droseraceae
Sweet grass, large	<i>Anthoxanthum odoratum</i>	M Poaceae
Sweet-cicely, bland	<i>Osmorhiza claytonii</i>	D Apiaceae
Sweet-clover, yellow	<i>Melilotus officinalis</i>	D Fabaceae
Sweet-fern	<i>Comptonia peregrina</i>	D Myricaceae
Sweetgale	<i>Myrica gale</i>	D Myricaceae
Tansy, common	<i>Tanacetum vulgare</i>	D Asteraceae
Tansy, feverfew	<i>Tanacetum parthenium</i>	D Asteraceae
Tearthumb, arrow-leaved	<i>Persicaria sagittata</i>	D Polygonaceae
Thistle, common	<i>Cirsium vulgare</i>	D Asteraceae
Thistle, creeping	<i>Cirsium arvense</i>	D Asteraceae
Thistle, swamp	<i>Cirsium muticum</i>	D Asteraceae
Thoroughwort	<i>Eupatorium perfoliatum</i>	D Asteraceae
Timothy, common	<i>Phleum pratense</i>	M Poaceae
Toadflax, butter-and-eggs	<i>Linaria vulgaris</i>	D Plantaginaceae
Toadflax, oldfield	<i>Nuttallanthus canadensis</i>	D Plantaginaceae
Touch-me-not, Himalaya	<i>Impatiens glandulifera</i>	D Balsaminaceae
Touch-me-not, spotted	<i>Impatiens capensis</i>	D Balsaminaceae
Trailing-arbutus	<i>Epigaea repens</i>	D Ericaceae
Tuber-bulrush, saltmarsh	<i>Bolboschoenus maritimus</i>	M Cyperaceae
Twinflower, American	<i>Linnaea borealis</i>	D Caprifoliaceae
Valerian, common	<i>Valeriana officinalis</i>	D Caprifoliaceae
Vetch, crown	<i>Coronilla varia</i>	D Fabaceae
Vetch, hairy	<i>Vicia villosa var. varia</i>	D Fabaceae
Vetchling, beach	<i>Lathyrus japonicus</i>	D Fabaceae
Violet, blue marsh	<i>Viola cucullata</i>	D Violaceae
Violet, hook-spurred	<i>Viola adunca</i>	D Violaceae

Violet, lance-leaved	<i>Viola lanceolata</i>	D	Violaceae
Violet, smooth white	<i>Viola pallens</i>	D	Violaceae
Violet, sweet white	<i>Viola blanda</i>	D	Violaceae
Violet, woolly blue	<i>Viola sororia</i>	D	Violaceae
Virginia creeper	<i>Parthenocissus quinquefolia</i>	D	Vitaceae
Wakerobin, painted	<i>Trillium undulatum</i>	M	Melanthiaceae
Water shield	<i>Brasenia schreberi</i>	D	Nymphaeaceae
Water-hemlock, spotted	<i>Cicuta maculata</i>	D	Apiaceae
Water-horehound, American	<i>Lycopus americanus</i>	D	Lamiaceae
Water-horehound, Northern	<i>Lycopus uniflorus</i>	D	Lamiaceae
Water-horehound, Virginia	<i>Lycopus virginicus</i>	D	Lamiaceae
Water-lily, white	<i>Nymphaea odorata</i>	D	Nymphaeaceae
Water-starwort, vernal	<i>Callitriche palustris</i>	D	Plantaginaceae
Whitlow-mustard, Spring	<i>Draba verna</i>	D	Brassicaceae
Wild lovage, Scotch	<i>Ligusticum scoticum</i>	D	Apiaceae
Wild-rye, common eastern	<i>Elymus virginicus</i>	M	Poaceae
Wild-rye, creeping	<i>Elymus repens</i>	M	Poaceae
Wild-rye, slender	<i>Elymus trachycaulus</i>	M	Poaceae
Willow-herb, bog	<i>Epilobium leptophyllum</i>	D	Onagraceae
Willow-herb, eastern	<i>Epilobium coloratum</i>	D	Onagraceae
Willow-herb, fringed	<i>Epilobium ciliatum</i>	D	Onagraceae
Willow, balsam	<i>Salix pyrifolia</i>	D	Salicaceae
Willow, meadow	<i>Salix petiolaris</i>	D	Salicaceae
Willow, prairie	<i>Salix humilis</i>	D	Salicaceae
Willow, pussy	<i>Salix discolor</i>	D	Salicaceae
Willow, shining	<i>Salix lucida</i>	D	Salicaceae
Winterberry, common	<i>Ilex verticillata</i>	D	Aquifoliaceae
Wintergreen, creeping spicy	<i>Gaultheria hispidula</i>	D	Ericaceae
Wintergreen, eastern spicy	<i>Gaultheria procumbens</i>	D	Ericaceae
Withe-rod, wild-raisin	<i>Viburnum nudum</i>	D	Adoxaceae
Wood sorrel, common yellow	<i>Oxalis stricta</i>	D	Oxalidaceae
Wood sorrel, flowering yellow	<i>Oxalis florida</i>	D	Oxalidaceae
Wood sorrel, northern	<i>Oxalis montana</i>	D	Oxalidaceae
Woodrush, common	<i>Luzula multiflora</i>	M	Juncaceae
Woolsedge, black-girdled	<i>Scirpus atrocinctus</i>	M	Cyperaceae
Woolsedge, common	<i>Scirpus cyperinus</i>	M	Cyperaceae

Wormwood, beach	<i>Artemisia stelleriana</i>	D	Asteraceae
Wormwood, commonm	<i>Artemisia vulgaris</i>	D	Asteraceae
Yarrow, common	<i>Achillea millefolium</i>	D	Asteraceae
Yellow-cress	<i>Rorippa palustris</i>	D	Brassicaceae
Yellow-rattle, little	<i>Rhinanthus minor</i>	D	Orobanchaceae
Yellow-rocket, garden	<i>Barbarea vulgaris</i>	D	Brassicaceae
Yew, American	<i>Taxus canadensis</i>	C	Taxaceae

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