1998 FLORISTIC SURVEY OF MINNESOTA POINT

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INTRODUCTION

ABSTRACT

A survey of the vascular flora of Minnesota Point in Duluth, St. Louis County, Minnesota was conducted during the spring, summer, and early fall of 1998. Floristically Minnesota Point is in the northern coniferous region of Minnesota. The dominant conifer species on Minnesota Point are white pine (*Pinus strobus*) and red pine (*P. resinosa*) which are largely found in a grove of old growth pine forest. Minnesota Point's sandy soil, dunes and location along the shore of Lake Superior provide habitat for some elements of the Atlantic coastal region which are best represented by beachgrass (*Ammophila breviligulata*), beach heather (*Hudsonia tomentosa*), and beach pea (*Lathyrus maritimus*). The catalogue of 393 vascular plants includes 13 rare plants (9 are ferns), 2 suspected hybrid fern species, and 20 species newly reported from St. Louis County. Among the rare species is a fern, *Botrychium pseudopinnatum* W. H. Wagner, Jr. (false northwestern moonwort), new to the United States and first reported from Minnesota Point in 1996. The presence of *B. pseudopinnatum* is extremely significant making Minnesota Point one of three known locations in the world for this rare fern. Eight other rare ferns, also in the genus *Botrychium*, occur on Minnesota Point: *Botrychium acuminatum*, *B. lanceolatum* var. *angustisegmentum*, *B. matricariifolium*, *B. michiganense*, *B. minganense*, *B. pallidum*, *B. simplex*, and *B. rugulosum*. Four species of Minnesota state-listed rare vascular flowering plants were also documented: *Ammophila breviligulata* (beach grass), *Deschampsia flexuosa* (crinkled hairgrass), *Hudsonia tomentosa* (beach heather), *Sparganium glomeratum* (clustered bur-reed). One hundred fourteen vascular plant species previously unreported from Minnesota Point are included in the current floristic inventory. These new reports include nearly all the rare and common *Botrychium* ferns as well as nine other species of flowering plants previously unreported from St. Louis County. Comparisons between this study and previous floristic works suggest by the high turnover of species that Minnesota Point's floristic composition may operate under a system similar to that seen on islands. Floristics, rare species, and biogeography are discussed, vegetation communities summarized, and an Index of Similarity presented.

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SCOPE OF SURVEY

The purpose and scope of the 1998 Floristic Survey of Minnesota Point was to record and document the native and non-native vascular plants found there. The area of Minnesota Point that was surveyed is located in T49N, R12W in Sections 12, 13, and T49N, R12W in Sections 18, 19, and 20 located in Duluth, St. Louis County, Minnesota. This survey included a search for historically reported occurrences and new populations of rare plants. In addition, there was an intensive effort to relocate populations of recently discovered species of rare *Botrychium* ferns and to find new populations.

MATERIALS AND METHODS

Surveys documenting the flora of Minnesota Point began as soon as the snow melted in late March and concluded in mid-October. Initial delineation of vegetation zones was made using aerial photographs. The delineation of vegetation zones was further refined by on site visits and typed on the basis of dominant vegetation. Floristic surveys were made periodically within each vegetation zone to document distinctive plant associations in each and the relative abundance of constituent species. Except for more difficult taxa, rare species, and some non-native plants herbarium quality vouchers were not collected. All specimens collected were identified using standard regional floristic texts. Nomenclature for ferns and ferns allies and for Hammamelidae is based on Volume 1 and Volume2 of the Flora of North America (1993 and 1997). All other vascular plant taxonomic nomenclature follows Gleason and Cronquist (1991).

Comparisons of survey results were made with records from Lakela's A Flora of Northeastern Minnesota (1965) and Johnson's (1963) A Taxonomic Study of the Flora of Minnesota Point. Other documents consulted pertinent to the flora of Minnesota Point include Davidson's & Bernard's (1968-1969) study of pine forests on Minnesota and Wisconsin Points, Bernard's & Davidson's (1969) floristic survey of Southworth Marsh, and Koch, et al.'s (1983) floristic survey of Wisconsin Point. In addition to these, several other taxonomic, ecological, and floristic journal articles and texts relevant to dune ecology and floristics were consulted.

GEOLOGICAL DESCRIPTION AND HISTORY

Minnesota Point is one of two sandbars forming the Duluth-Superior Harbor in conjunction with the drowned St. Louis River flowing into the harbor (Loy 1963). Sand accretion that would result in the formation of Minnesota Point began about 3200 years ago when Lake Superior's level dropped to 596 feet above sea level. At this time Conners Point and Rice's Point were abandoned as lake levels dropped establishing a new equilibrium in the sand of the south shore six miles east. Accreting at a rate of 15 to 20 feet per year a sand spit developed across the head of the lake parallel to the storm crest. By a few hundred years ago the sand spit reached the Minnesota shore (Loy 1963). Minnesota Point and Wisconsin Point are recent geologic features and have probably been colonized by plants for only a few centuries. The present outline of Minnesota Point shows the impact of human activity principally dredge spoil dumpings which was added south of the old lighthouse, to the airport property and city park, and to an area formerly known as the Oatka Beach Addition.

HUMAN IMPACTS

Minnesota Point has experienced severe human disturbance to its vegetation, soils, and wetlands since the last century. The south end of Minnesota Point is largely the result of dredge spoil dumping, as is Southworth Marsh. Soils at the runway are also dredge spoils. Each of these three areas has developed into unique plant communities since dredge spoil dumping has stopped. During this century, summer cabins were built in the pine forest. Remains of these buildings can still be found as not only piles of bricks and trash but also in the form of cultivated plants that have persisted after or spread from cultivation and naturalized. An old lighthouse and boathouse in Section 20 remain but apart from providing lichen habitat do not seem to have profoundly influenced the vegetation as much as recent human foot traffic around them. As an attempt to stabilize the dunes and dredge spoils in Section 20 trees

were planted. Two planted groves of jack pine and Scot's pine, coniferous tree species not native to the flora of Minnesota Point, are now established and spreading. It is very likely both could become components of the remaining old growth pine forest and, in fact, Scot's pine is already there.

Current human impacts to the environment of Minnesota Point are most noticeable from foot and bicycle traffic on the dunes and in the pine forest. Fragile plants are trampled and loose soils disturbed creating opportunities for wind erosion. In the dry, nearly sterile sand, vegetation cannot grow fast enough to repair the damage. Occasional uncontrolled fires in the forest and on the dunes are also harmful to native vegetation. Loss of shoreline and erosion of the beach into the stabilized dunes is another peril to Minnesota Point.

PREVIOUS FLORISIC WORK

Significant attention has been given to beach strand communities of the Great Lakes beginning in 1899 with Cowles account of the sand dunes of Lake Michigan. Curtis (1959) mentions the beach heather mats of Wisconsin Point, Beals & Cottam (1960) described the sand bar pine forests of the Apostle Islands, Davidson & Bernard (1969) studied the pine forests of Wisconsin and Minnesota Points, and Bernard & Davidson (1969) studied plant succession on Oatka Beach. Olga Lakela's study of the flora of Minnesota Point is represented in her paper on the Oatka Beach Addition (Lakela 1939b), several published papers in Rhodora (Lakela 1938, 1939a, 1939b, 1940, 1941), and her monumental work A Flora of Northeastern Minnesota (Lakela 1965). In 1963 Eugene Johnson conducted a floristic survey of Minnesota Point that included the Oatka Beach Addition (now known as Southworth Marsh), the sand dunes just past the present public beach, parts of the pine forest, and open areas by the airport and at the end of Minnesota Point. Using his collections in combination with floristic data collected by Lakela, he documented the presence of 399 vascular plant species (Johnson 1963).

RESULTS

A total of 393 vascular plant species were recorded during this survey from 73 families and 189 genera. Of the 73 families Asteraceae are largest with 56 species followed by Poaceae (38 species), Rosaceae (31 species), Cyperaceae (31 species), Salicaceae (14 species), Ophioglossaceae (13 species) and Fabaceae (12 species). The largest genera are *Carex* (23 species), *Botrychium* (13 species), and *Salix* (11 species). However *Botrychium*, represented by only several hundred individuals, constitute a minor component of the flora.

The only full list of the flora of Minnesota Point available for comparison with the present survey is Johnson's (1963). His list is largely a compilation of all species ever found on Minnesota Point since 1931 plus any he discovered when he surveyed a few selected parts of Minnesota Point. After adjusting Johnson's (1963) checklist of 404 species for nomenclature changes (and adding a few species Lakela includes but he left out) the list contains 399 species differing by 6 from the 1998 survey. The present floristic survey found a significant number of native species and non-native species that neither Lakela nor Johnson reported from Minnesota Point. Of the 393 species found 114 species (see Table 1) are reported as "new" to Minnesota Point. Among these are plantings (6 spp.), waifs (5 spp.), or stranded aquatics (3 spp.). Another 10 of the species are naturalized escapes from cultivation. The remainder are either native or non-native species that at present appear to be well established.

The number of species on Minnesota Point whether from Johnson's list or this floristic survey is considerably greater than Koch et al's 267 vascular plant species recorded from Wisconsin Point and the 220 species Davidson and Bernard (1968-1969, 1969) report for Minnesota Point. The differences in species counts are probably due to survey methods adopted. Rather than being exhaustive floristic surveys of Minnesota Point the work of Davidson and Bernard (1968-1969, 1969) were restricted to plots in Southworth Marsh and in the white pine forest. Likewise, Koch et al. (1983) used plots in their study of Wisconsin Point. It is interesting to note that in the years since Koch et al.'s (1983) work several rare species have been found on Wisconsin Point including *Deschampsia flexuosa* and a

few other Wisconsin state-listed species. In addition, *D. flexuosa* is not included on Davidson's and Bernard's (1968-1969) checklists for the Minnesota Point and Wisconsin Point pine forests even though it occurs in both (Walton 2702, 2615, 3241, and 3146, all deposited at DUL). The absence of these and other species is a limitation of the plot survey as a method for finding all especially rare species (see Goff et al. 1982) rather than a limitation of the botanists' ability.

Several different types of vegetation communities are found on Minnesota Point. These occur on both natural and artificial soil deposits. Distinctive vegetation communities occur on both kinds of soil deposits. On naturally deposited soils native vegetation communities can still be found. Native vegetation communities include beachgrass on the active sand dunes, the white and red pine forests, the pine savanna, certain wetlands, and a portion of bayside shoreline south of the runway. While all of these areas have sustained and still are sustaining human induced disturbance much of the natural vegetation cover is still present and dominant. Human altered habitat is largely any land created by dredge spoils including Southworth Marsh, the city park, the airport, and a large portion of land between the Superior Ship Canal and the old lighthouse. Native species may grow in, even dominate, these areas but the origins of the soils and land contours are from human activities and are not part of the original land mass of Minnesota Point.

Of the 393 species found on Minnesota Point 177 species (45.2% of the total) occur in natural habitat on native soils with 134 in natural (but disrupted) uplands and 43 species in the four remaining natural (but disrupted) wetlands. Excluding the Park only 31 species are found exclusively on artificial upland created by dredge soil deposits and 19 are found exclusively in Southworth Marsh which has developed on dredge spoils. Another 38 species are limited largely to altered shorelines on the bayside (not including Southworth Marsh). Other species are found in green ash stands, maintained lawns at the Park, and adventive plant communities between the shore and lakeside breakwaters where soils are highly anthropogenically disturbed or artificially deposited. Rare and common species of *Botrychium* ferns are found in on both native soils and non-native soils. The greatest numbers of individuals *Botrychium* ferns were found on artificial upland soils created from dredge spoils in Section 20 south of the old lighthouse. Only two of the rare vascular flowering plants, *Ammophila breviligulata* and *Hudsonia tomentosa* occur on both native and artificial soils. *A. breviligulata* is most prolific on the natural sand dunes while *H. tomentosa* is very abundant on dry dredge spoils as well as dune areas. *Deschampsia flexuosa* is found in the pine forest and dunes and *Sparganium glomeratum* grows in a natural marsh.

TABLE 1

Species Newly Reported from Minnesota Point

PTERIDOPHYES	**PTERIDOPHYES**
LYCOPODIACEAE *Diphasiastrum complantum* - northern ground cedar *D. digitatum* - fan-leaf ground cedar *Lycopodium annotinum* - bristly clubmoss *L. lagopus* - one-cone running clubmoss EQUISETACEAE *Equisetum palustre* - marsh horsetail OPHIOGLOSSACEAE *Botrychium acuminatum* - pointed moonwort *B. dissectum* var. *dissectum* - dissected-leaved grapefern *B. dissectum* var. *obliquum* - oblique-leaved grapefern *B. lanceolatum* var. *angustisegmentum* - narrow triangle moonwort	OPHIOGLOSSACEAE *B. matricariifolium* - daisy-leaved moonwort *B. michiganense* - Michigan moonwort *B. minganense* - Mingan moonwort *B. pallidum* - pale moonwort *B. pseudopinnatum* - false northwestern moonwort *B. rugulosum* - St. Lawrence grapefern *B. spathulatum* - spatulate moonwort *B. virginianum* - rattlesnake fern *B. matricariifolium* X *B. simplex* - hybrid moonwort *Botrychium* spp. - other suspected hybrid moonworts of uncertain derivation
CONIFERS	**CONIFERS**
PINACEAE *Larix laricina* - tamarack ‡ *Picea abies* - Norway spruce *P. glauca* - white spruce *Pinus sylvestris* - Scot's pine	CUPRESSACEAE *Thuja occidentalis* - white cedar ‡ *T. o.* cult. "Techny" - white cedar ‡
MONOCOTS	**MONOCOTS**
POACEAE *Aristida basiramea* var. *basiramea* - three-awned grass *Avena sativa* - cultivated oats *Sporobolus vaginiflorus* var. *vaginiflorus* - sheathed dropseed *Digitataria ischaemum* - crabgrass *Elymus virginicus* - wild rye *Eragrostis cilianensis* - stinkgrasss *E. pectinacea* - lovegrass *Oryzopsis asperfolia* - rough mountain ricegrass *Panicum lanuginosum* - panic grass *P. capillare* - witch grass *Triticum sativa* – wheat	CYPERACEAE *Carex aquatilis* - sedge *C. echinita* - star sedge *C. intumescens* - bladder sedge *C. leptalea* - sedge OTHER MONOCOT FAMILIES *Convallaria majus* - lily-of-the-valley *Elodea canadensis* - waterweed *Juncus articulatus* - rush *Lemna minor* - duckweed *Platanthera hyperborea* - northern bog-orchid *Potamogeton robbinsii* - pondweed *Vallisneria americana* - water celery

TABLE 1 - continued

Species Newly Reported from Minnesota Point

DICOTS	**DICOTS**
ASTERACEAE *Ambrosia artemisiifolia* - common ragweed *A. coronopilfoilia* - western ragweed *Anthemis arvensis* - corn chamomile *Artemisia serrata* - wormwood *Aster brachyactis* - western annual aster *Cirsium vulgare* - bull thistle *Erigeron glabellus* - daisy fleabane *Helianthus annuus* - common sunflower *Hieracium aurantiacum* - red king devil *H. piloselloides* - yellow king devil *Senecio viscosus* - sticky ragwort *S. vulgaris* - ragwort *Tragopogon pratense* - goat's beard	ROSACEAE *Amelanchier arborea* - downy serviceberry *A. spicata* - dwarf serviceberry *Filipendula ulmaria* - queen-of-the-meadow *Potentilla argentea* - silver cinquefoil *P. norvegica* - rough cinquefoil *Pyrus baccata* - crabapple *Pyrus* X *baccata* - hybrid crabapple ‡ *Rosa acicularis* - spiny rose *R. arkansana* - rose *R. rugosa* - Japanese rose *Rubus pubescens* - dewberry *Sorbaria sorbifolia*- false spirea *Sorbus aucuparia* - rowan tree SALICACEAE *Salix fragilis* - crack willow *S. myricoides* - blue willow *S. nigra* - black willow *S. planifolia* - tea-leaved willow
DICOTS	**DICOTS**
OTHER DICOT FAMILIES *Acer ginnala* - Amur maple *Apocynum sibiricum* - clasping-leaved dogbane *Betula alba* - white birch *Callitriche verna* - water starwort *Chenopodium album* - pigweed *Epilobium coloratum* - willow herb *Euphorbia glyptosperma* - spurge *E. maculata* - spotted spurge *Galium asprellum* - rough bedstraw *G. tinctorum* - bedstraw *Gypsophilla paniculata* - baby's breath *Halenia deflexa* - pale gentian *Heracleum lantanum* - Hercule's club *Leechia stricta* - pinweed *Lotus corniculatus* - trefoil clover *Polygonum hydropiperoides* - pepperwort *P. pensylvanicum* var. *laevigatum* - pepperwort *P. punctatum* - pepperwort *Rhamnus cathartica* - common buckthorn	OTHER DICOT FAMILIES *Rorippa palustris* - cress *Scutellaria lateriflora* - skullcap *Silene latifolia* - campion *Solanum dulcamara* - bittersweet nightshade *Sium suave* - cow parsnip *Stellaria media* - chickweed *Sueda calceoliformis* - sea-blite *Syringa vulgaris* - common lilac *Sueda calceoliformis* - sea-blite *Trifolium arvense* - rabbitfoot clover *T. campestre* - hop clover *Ulmus americana* - American elm *Veronica scutellata* - marsh speedwell *Viburnum lantana* - wayfaring tree *V. opulus* var. *americanum* - highbush cranberry *V. o.* var. *opulus* - Guelder rose *Viola cucullata* - blue marsh violet *V. incognita* - bigleaf white violet *V. renifolia* - kidney-leaf violet

‡ - indicates planting but not escaped from cultivation

FLORISTICS AND BIOGEOGRAPHY

Minnesota Point is on the southern edge of the boreal forest and the western edge of the northern hardwoods association (Barbour and Christiansen 1993). The dominant tree species, red pine and white pine, are typical species of the northern hardwoods association found on poor, sandy soils (Barbour and Christiansen 1993). Boreal species such as these woody and herbaceous species such as *Linnaea borealis*, *Coptis groenlandica*, *Aralia nudicaulis*, and *Triadenum fraseri* and others (Larsen 1982) are found here. Minnesota Point also contains beach community elements from the Atlantic coastal province including beachgrass and beach heather (Baptista and Shumway 1998).

It is of no small significance that the total number of species present on Minnesota Point reported by Johnson (1963) and this most recent survey are approximately the same (399 vs. 393 species) differing by six. The numbers reported by Johnson (1963) and the present paper are also close to the number of species, which is 356, Judziewicz and Koch (1993) reported from Long Island, a narrow 12 mile long by 50 meter wide peninsular sand spit in the Apostle Islands Lakeshore close to the mainland. For purposes of comparison the numbers of species, genera, and families reported by Johnson (1963), Davidson and Bernard (1968-1969, 1969), Koch et al. (1983), and the present survey are summarized in Table 2. Numbers of taxa in the table have been adjusted to reflect recent changes in nomenclature. Because Davidson and Bernard limited themselves to specific parts of the pine forest and Oatka Beach the species number from their floristic survey work is low. However, the number of families is close to that given by Johnson (1963), Koch (1983), and the present study. Koch et al's (1983) Wisconsin Point numbers are included for contrast and comparison of the two sandbars because the areas of the two study sites are about equal in size and share similar native vegetation covertypes, soils, and both have been disturbed by human activities. Two significantly different features of Wisconsin Point are the continued existence of a forested (but degraded) wetland in the harbor and less artificially created land.

TABLE 2- Comparison of Species Counts for Minnesota Point and Wisconsin Point

	Walton 1998	Davidson/ Bernard 1968-9	Johnson 1963	Koch 1983
Total species	393	182*	399**	267
Total genera	189	N/A	212	171
Total families	73	58	69	66
Ophioglossaceae	15 spp.	none	2 spp.**	none‡
Lycopodiaceae	6 spp.	none†	3 spp.**	4 ssp
Cyperaceae	31 spp.	13 spp.	39 spp.	22 spp.
Carex	23 spp.	11 spp.	25 spp.	N/A
Poaceae	38 spp.	25 spp.	46 spp.	14 spp.
Rosaceae	31 spp.	20 spp.	22 spp.	15 spp.
Asteraceae	56 spp.	32 spp.	58 spp.	29 spp.

* Combines results of their Minnesota Point pine study and study of Oatka Beach, excludes results of Wisconsin Point.
** Lakela collected *Botrychium simplex* and *B. multifidum* (Ophioglossaceae), *Huperzia lucidula* and *Lycopodiella inundata* (Lycopodiacea), and *Sparganium glomeratum* (Sparganiaceae) which are not included in Johnson's list are included here.
† Davidson and Bernard reported 3 Lycopodiacea from Wisconsin Point (*L. annotinum*, *L. dendroideum*, and *L. lucidulum*)
‡ *Botrychium simplex*, *B. pseudopinnatum* cf, *B. matricariifolium*, and *B. dissectum* were found by Walton (*unpub. data*) between 1996 and 1998 on Wisconsin Point.

To compare the results of the present survey with Johnson's list the following formula for the Index of Similarity (I.S.) was used (see Curtis 1959):

Index of Similarity = 200c/(a + b)
c = number of species in common to the two sets of data,
(a + b) = the combined total of species in both sets of data

I.S. = (200 * 262) / (399 + 393)
I.S. = 52,4 00 / 782
I.S. = 67.0%

The I.S. = 67.0% indicating two-thirds of the species on Johnson's list and the current survey list are the same, a very high degree of similarity. One hundred fourteen of the species recorded during this survey are new reports from Minnesota Point (see Table 1).

The Beachgrass zone and Juniper/Lichen zone share 19 species in common, with 31 species total. The Juniper/Lichen zone and mixed shrub thicket share 13 species in common, with 51 species total. The Beachgrass zone and mixed shrub thicket share 11 species in common, with 51 species total. The pine forest and pine savanna share 22 species in common, with 112 species total. There are 135 plant species present on the remaining native upland soils and 41 plant species within remaining native wetlands.

RARE SPECIES

With a total of 15 species from 9 population sites the discovery of rare and common species of *Botrychium* ferns (Family Ophioglossaceae) is the most significant contribution to the rare flora list. These discoveries are summarized in Table 3. Prior to 1994, only *B. multifidum* and *B. simplex* were known from Minnesota Point. Of the new species that have been reported from Minnesota Point since 1994 all are rare except *B. dissectum* var. *obliquum*, *B. dissectum* var. *dissectum* and *B. virginianum*. *B. multifidum*, which has been found in several places on Minnesota Point, is also a common, widespread species in the state. *B. matricariifolium, B. simplex, B. pseudopinnatum, B. dissectum* var. *dissectum* and several anomalous specimens of *Botrychium* were found on nearby Wisconsin Point between 1996 and 1998 (Walton, *unpub*. *data*).

Seven *Botrychium* species can be found on artificial upland soils created by dredge spoil dumping in Section 20 and at least 8 occur in brushy areas on the beach ridge and in the pine forest. The well-drained coarse sand and gravel deposit in Section 20 measures about 15 acres and is 10 feet above lake level. For comparison with the Section 20 site is Barker's Island, another landmass created by dredge spoils, on Superior side of the harbor measures about 1 mile long by 600 feet wide and about 12 feet above lake level (Dabydeen and Koch 1977). It has some floristic components and terrain features (Dabydeen and Koch 1977) like those found in Section 20 of Minnesota Point. However, the species checklist for Barker's Island has no species of Ophioglossaceae from any part of the island (Dabydeen and Koch 1977). The absence of Ophioglossaceae is also seen in another, later floristic survey of Wisconsin Point (Koch 1983). The Ophioglossaceae are present on Wisconsin Point with at least four species found between 1996 and 1998 including possibly *Botrychium pseudopinnatum* (Walton *unpubl. data*). On Minnesota Point Lakela only found *Botrychium multifidum* and *B. simplex* (Lakela 1965). This is confirmed by the samples that she collected since none contain any other species but these two. Bernard and Davidson (1968-69) did not report any Ophioglossaceae during their study of the pine forests on Minnesota Point and Wisconsin Point. Either the other species found during the present survey were not growing on these landmasses earlier than the 1990's or they were present in such small numbers that they were overlooked until very recently when their numbers became larger. Sample methods involving plot sampling techniques and time of sampling may also be responsible for the absence of Ophioglossaceae on the species checklists. Since 1977 Barker's Island has undergone a considerable amount of real estate development and if any Ophioglossaceae did grow there chances are populations have been destroyed.

Other rare species known historically from Minnesota Point were also located during the floristic survey. Among these are two species not seen on Minnesota Point in about 50 years. The first is crinkled hairgrass (*Deschampsia flexuosa*) last reported from Minnesota Point by Lakela in 1949 (Lakela 9149 DUL). In 1997, during a search for *Botrychium pseudopinnatum* with Pat Collins of the Mn-DNR, Lakela's original hairgrass population was rediscovered in a sandy clearing towards the south end of the pine forest. This year's floristic survey resulted in the discovery of four new populations of crinkled hairgrass, all in or associated with the old growth white pine forest and close to the Pine Knot cabin

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The second re-discovered species is clustered bur-reed (*Sparganium glomeratum*). *S. glomeratum* was originally found on Minnesota Point by Lakela (1941) from Section 19 with *Sphagnum*, water-calla, and sweetflag in what she described as a "shallow bog formerly connected to Superior Bay". Her site was the third known North American site at the time the others being in Quebec, Canada and near Lake Itasca, Minnesota (Walton 1995). There are three small wetlands in Section 19, two with *Sphagnum* and water-calla and another composed of lake-sedge (*Carex lacustris*). It seems certain, after five successive seasons of searching these wetlands (Walton *unpubl. data*, Walton 1995), *S. glomeratum* is no longer present in Section 19. In 1998 another wetland composed of bluejoint grass and sedges located at the northern line of Section 20 was found to contain a small group of *S. glomeratum*. The

rediscovery of *S. glomeratum* during this survey is the first time since 1949 (specimen Lakela 9148 at DUL) it was last seen on Minnesota Point.

Beachgrass (*Ammophila breviligulata*) and beach heather (*Hudsonia tomentosa*) are two other Minnesota Point rarities long known from there (Lakela 1940). Beachgrass was found in abundance on all dunes in Sections 18, 19, and 20 and on some disturbed sites as well. Beachgrass was also observed on dunes between residential areas and the lake in the north half of Minnesota Point. Beach heather was found in many open areas of the same sections on both naturally deposited and human deposited soils.

TABLE 3
***Botrychium* (Moonworts and Grapeferns) Species Found on Minnesota Point**

Species	**Minnesota Status**	**Known Populations on MN Point**
*Botrychium acuminatum**†	Very rare	2 (fewer than 30 plants)
B. dissectum var. *obliquum*†‡	Common, widespread	3 (fewer than 10 plants)
B. dissectum var. *dissectum*†‡	Common, widespread	1 (fewer than 10 plants)
B. lanceolatum var. *angustisegmentum*‡	Very rare	1 (only 1 plant)
B. matricariifolium†‡+	Uncommon but widespread	6 (about 250 plants)
B. michiganense†	Extremely rare	3 (fewer than 30 plants)
B. minganense†	Very rare	1 (fewer than 30 plants)
B. multifidum†‡	Common, widespread	5 (one site has about 200 plants)
B. pallidum‡	Very rare	3 (about 30 plants)
B. pseudopinnatum†	Extremely rare	2 (probably 100 plants)
B. rugulosum‡+	Very rare	2 (about 15 plants)
B. spathulatum‡	Very rare	1 (fewer than 10 plants)
*B. simplex**†	Uncommon but widespread	1 (about 20 plants)
B. virginianum+	Common, widespread	1 (several dozen plants)
B. matricariifolium X *B. minganense* (?)‡	Rare hybrid	1 (1 plant at least)
Botrychium spp. (hybrids?)‡	Unknown	2 (probably 5 plants)

* seen in 1997 but not 1998 † sandy dredge spoils ‡ native soils + moist dredge spoils with *Fraxinus* or *Populus*

NATURALIZED NON-NATIVE SPECIES

A number of non-native cultivated species are also recorded on the species checklist for Minnesota Point. A fair number are woody species, trees and shrubs, either escapes from cultivation or plantings for soil stabilization. Some are herbaceous plants probably cultivated as ornamentals or vegetable crops around the summer cabins that used to stand in Minnesota Point's pine forest. Naturalized woody species include European larch (*Larix decidua*), lilac (*Syringa vulgaris*), Tatarian honeysuckle (*Lonicera tatarica*), rose (*Rosa rugosa*), crabapple (*Pyrus baccata*), *Viburnum lantana* (wayfaring tree), *V. opulus* var. *opulus* (gelder rose), and rowan tree (*Sorbus aucuparia*). Two trees in particular, Scot's pine (*Pinus sylvestris*) and jack pine (*P. banksiana*), were deliberately planted and have since become naturalized near the old lighthouse. Jack pine is native to North America including Minnesota but is not historically native to Minnesota Point. Scattered saplings and small trees of Scot's pine are also growing on the beach dunes and even the old growth pine forest. Crack willow (*Salix fragilis*) and white willow (*S. alba*) have naturalized in wetlands. Cottonwood (*Populus deltoides*), white cedar (*Thuja occidentalis*), green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), and silver maple (*A. saccharinum*) although native to the region are probably not native to Minnesota Point.

Herbaceous garden plants now naturalized on Minnesota Point are baby's breath (*Gypsophilla paniculata*), soapwort (*Saponaria officinalis*), lily-of-the-valley (*Convallaria majalis*), yellow iris (*Iris pseudoacorus*), purple loosestrife (*Lythrum salicare*), and asparagus (*Asparagus officinalis*). *Artemisia absinthe* (wormwood) is another noteworthy non-native plant that was once cultivated for medicinal uses.

Several non-native species of grass are also naturalized including blue grass (*Poa annua*, *P. compressa*, *P. pratensis*), timothy (*Phleum pratense*), canary grass (*Phalaris arundinacea)*, brome (*Bromus inermis*), redtop (*Agrostis stolonifera* var. *major*), and quackgrass (*Elytrigia repens*). Sheep fescue (*Festuca ovina*) on Minnesota Point may be a mixture of native North American strains and non-native European strains.

DISCUSSION OF VEGETATION COMMUNITY TYPES

Major vegetation zones mapped and described are grass covertypes (beachgrass zone, disturbed areas), coniferous forests (old growth pine and planted conifers), deciduous forests, mixed forests, upland shrub, wetlands, and maintained lawns.

NATURALLY OCURRING GRASS COVERTYPES

Beachgrass Zone

Next to the pine forest the beachgrass zone is the most distinctive natural plant community on Minnesota Point. Dominated almost entirely by beachgrass (*Ammophila breviligulata*, Mn-DNR threatened species), the beachgrass zone is the first zone of vegetation in from the lakeshore and is composed of 4 distinct sub-zones: the beach, foredunes, stable dunes, and blowouts. Both structurally and floristically, this beach strand community is very similar to other strand communities such as Cape Cod where Baptista and Shumway (1998) studied seed banks in coastal dunes and their potential for natural revegetation. In their species checklists for dune communities they record *Ammophila breviligulata*, *Artemisia caudata*, *Lathyrus maritimus*, *Hudsonia tomentosa*, and *Arctostaphyllos uva-ursi* on the Cape Cod dunes. Minnesota Point is also similar to other Great Lakes beach strand communities (Baldwin and Maun 1983, Judziewicz and Koch 1993) and shares many of the same dune species in common with them.

On Minnesota Point the beachgrass zone is found on lake-facing sand dunes that extend north to south almost its entire length. On the east beachgrass zone is delimited by the strandline along the beach and to the west by a zone of more or less stable sand covered in shrubs and lichens (in less disturbed areas). Closest to the active beach and shoreline of the lake there is little or no beachgrass where constant foot traffic and winter ice movements prevent *A. breviligulata* from forming large long-lasting colonies. The dunes can be divided into sub-zones based on dominant vegetation and soil stability: foredunes, stable dunes, and beach ridge. In the foredunes species diversity is limited to *A. breviligulata* with some beach pea (*Lathyrus maritimus*) and occasionally annual species in Chenopodiaceae. Sand in the foredunes is unstable and constantly shifted by winds during the snow-free times of the year. During severe winter storms large sheets of ice may be pushed up onto the foredunes destroying vegetation. This natural disturbance creates new opportunities for beachgrass colonization and is important in maintaining the vigor of *A. breviligulata* colonies (Maun & Baye 1989).

Moving just a few yards further inland the sub-zone of stable dunes begins and species diversity increases showing a substantial presence of other grasses, sedges, and herbs and a decrease in beach grass. These include umbrella-sedge (*Cyperus schweinitzii*), wild rye (*Elymus canadense*), slender wheatgrass (*E. trachycaulus*), dropseed (*Sporobolus cryptandrus*), sedge (*Carex umbellatus*), beach pea, scouring rush (*Equisetum hyemale* var. *affine*), wormwood (*Artemisia campestris* subsp. *caudata)*, evening primrose (*Oenothera biennis*), beach plum (*Prunus pumila*), poison ivy (*Rhus toxicodendron*), and baby's breath (*Gypsophilla paniculata*). The stable dunes grade into pine forest through the juniper/lichen zone (discussed below) which grows on the beach ridge.

Soil in the beachgrass zone is wind deposited sand, very dry, with little organic matter. What organic matter is present consists of dead grass leaves, roots of beachgrass and other plants, and woody debris washed in from Lake Superior. Baldwin and Maun (1983) found dune soils on Lake Huron to contain about 0.12% organic matter by weight. The fertility of the dune soil is extremely low. Analysis of beachgrass leaf litter from Atlantic Coast plants by Maun and Baye (1989) found it to have an extremely low C:N ratio of 330:1. The low cation exchange and great permeability of sand allow any nutrients it receives to be quickly leached. NPK levels of beach sand measured on oceanic coasts are extremely low with levels much less than 0.02% by weight for all 3 macronutrients (Maun &

Baye 1989). On ocean beaches algae washed up by storms contribute to the nutrient supply of the sand. Lake Superior has no algae beds which eliminates this source of nutrients on Minnesota Point. Logs, branches and other woody debris frequently wash up onto Minnesota Point. It is probably safe to assume that the woody debris washed in during Lake Superior's storms is even lower in nitrogen than beachgrass litter. Dead fish, dead shore birds, and guano may cause localized increases in available nutrients. Maun and Baye (1989) report *A. breviligulata* may receive as much as 76% of its nitrogen through a symbiotic relationship with the bacteria *Azotobacter* living in its roots. They also state nutrient absorption of potassium and phosphorus may be enhanced in *A. breviligulata* by vesicular-arbuscular mycorrhizae (VAM) species of *Glomus* and *Gigaspora*. *Glomus* and *Gigaspora* are unusual tuberous-fruited subterranean fungi (Harley & Smith 1983). Other vascular plant species living in these sandy soils also rely on bacteria and mycorrhizae for nutrient enhancement and absorption: bearberry, juniper, blueberry, white pine, and plum (Harley & Smith 1983). Earth star (*Geastrum*), a puffball fungus common on Minnesota Point, is reported to be involved in mycorrhizal associations (Harley & Smith 1983).

Species Checklist for Beachgrass Zone

PTERIDOPHYES	**PTERIDOPHYES**
Equisetum arvense - field horsetail	*E. hyemale* var. *affine* - scouring rush
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beachgrass *Carex umbellata* - sedge *Cyperus schweinitzii* - umbrella-sedge *Elymus canadense* - wild rye *E. trachycaulus* - wild rye	*Oryzopsis pungens* - mountain ricegrass *Panicum lanuginosum* - panic grass *Smilacina stellata* - Solomon's seal *Sporobolus cryptandrus* - dropseed
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Arctostaphyllos uva-ursi - bearberry *Artemisia campestris* subsp. *caudata* - wormwood *Coriospermum hyssopifolium* - bugseed *Cycloloma atriplicifolium* - winged pigweed *Gypsophilla paniculata* - baby's breath	*Hudsonia tomentosa* - beach heather *Lathyrus maritimus* - beach pea *Oenothera biennis* - evening primrose *Prunus pumila* - beach plum *Rhus toxicodendron* - poison ivy

GRASS COVERTYPES IN DISTURBED AREAS

Salix/*Equisetum* Zone

This is a large open mostly grassy area at the south end of Minnesota Point made from harbor dredge spoils mapped in part as meadow. Except for a small area near the old lighthouse there are no active or natural sand dunes. Vegetation from the old lighthouse to the Superior Ship Canal changes noticeably from a community dominated by sandbar willow (*Salix exigua*) and scouring rush (*Equisetum hyemalis* and *E. arvense*) to one dominated by short grasses such as *Panicum lanuginosum* and *Sporobolus cryptandrus* with scouring rush and beach heather. In the short grass area beach heather forms a significant part of the vegetation along with juniper, beach pea, scouring rush, strawberry, bearberry, sandbar willow, lichens, sedge (*Carex umbellata*), and some beachgrass and many weedy invasive species. This site is unique in that it supports hundreds of *Botrychium multifidum* and at least 400 hundred each of *B. matricariifolium* and *B. pseudopinnatum* with some *B. michiganense*. Balsam poplar and Scot's pine are slowly encroaching from the sides and from expanding patches in the middle of the dredge spoils. Lichens are a conspicuous group of organisms on the dredge spoil barrens. *Cladonia* and *Cladina* are prominent but certain crustose forms are also very common. These crustose species along with *Polytrichum* moss and other small moss species help to bind the soil surface together.

Species Checklist for *Salix*/*Equisetum* Zone (* signifies dominant species)

PTERIDOPHYTES	**PTERIDOPHYTES**
Botrychium acuminatum - moonwort	*B. dissectum* var. *obliquum* - oblique-leaved grapefern
B. matricariifolium - daisy-leaved moonwort	*B. dissectum* var. *dissectum* - dissected-leaved grapefern
B. michiganense - Michigan moonwort	*B. multifidum* - leathery-leaved grapefern
B. pallidum - pale moonwort	*Equisetum arvense* - field horsetail*
B. pseudopinnatum - false western moonwort	*E. hyemale* - scouring rush*
GYMNOSPERMS	**GYMNOSPERMS**
Juniperus communis var. *depressa* - juniper	*Pinus sylvestris* - Scot's pine*
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beachgrass	*Sporobolus cryptandrum* - dropseed grass*
Carex umbellata - sedge*	*Panicum lanuginosum* - panic grass*
Elymus canadense - Canada rye*	*Poa compressa* - blue grass species*
Festuca sp. - bentgrass*	
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Asclepias syriaca - milkweed	*Glycyrrhiza lepidota* - wild licorice
Astragalus canadensis - Canada milkvetch	*Lechea intermedia* - pinwheel
Artemisia campestris subsp. *caudata* - wormwood	*Linaria vulgaris* - butter and eggs
Fragaria virginiana - strawberry*	*Meliotus alba* - sweet clover*
Gnaphlium viscosum - sticky cudweed	*Salix exigua* - sandbar willow*
Hieracium aurantiacum - red hawkweed*	*Populus balsaminifera* - balsam poplar
H. piloselloides - yellow king devil*	*Rosa acicularis* - wild rose
Hudsonia tomentosa - beach heather*	*Rhus toxicodendron* - poison ivy*

Mowed Grass/Weed and Mixed Beach Grass/Weed Communities

Two weedy communities associated with the runway are described here. One, the mixed beach grass-weed community, is a degraded dune ridge with beachgrass and other species. The second, the mowed grass-weed community, like the dredge spoil barrens in Section 20 is a totally artificial creation. Soils in the mowed grass-weed community are composed of dredge spoils used to fill in part of the bay for the creation of land for the runway. Disturbed areas along runways and service road paralleling the runways are included under this designation. The soil is gravel and coarse sand, compacted, and, unlike the dunes, very stable. These habitats are more floristically diverse than the dunes with at least 47 different vascular plant species. Fifteen species (about one-third of the total) are grasses or sedges. Of the grasses and sedges about half are annuals but these are largely confined to road and runway shoulders where road grading disturbs vegetation. The only exception among the annual grasses is *Aristada basiramea* var. *basiramea* (three-awned grass) which also grows in thinly vegetated areas amongst the perennial grasses. *A. basiramea* var. *basiramea* is a native species found in southern Minnesota on dry soils. Its discovery here on Minnesota Point is the first reported occurrence of the species in St. Louis County a range extension of about 200 miles north (Ownbey & Morley 1991). *Sporobolus vaginiflorus* var. *vaginiflorus* (sheathed dropseed) is also an annual grass species and like *A. basiramea* var. *basiramea* is found in the southern part of the state. Another species of annual grass, *Eragrostis cilianensis* (stinkgrass), not previously reported from Minnesota Point is also new to St. Louis County and is largely found in areas south of here. Its presence in St. Louis (and also in Lake County) County is a recent northern advance.

Along the sides of the service road running parallel between the dunes and runway is a weedy community of annual and perennial grasses and forbes including several species in Chenopodiaceae (*Chenopodium album*, *Coriospermum hyssopifolium*, *Co. nitidum*, *Cycloloma atriplicifolium*, and *Sueda calceoliformis*) and species of *Euphorbia* (*E. glyptosperma*, *E. maculata*) and annual grasses (*A. b.*var. *basiramea*, with *Eragrostis cilianensis*, *E. pectinacea*, *Panicum capillare*, *Sporobolus vaginiflorus* var. *vaginiflorus*, and *Setaria viridis* var. *viridis*). The majority of

species reported from disturbed areas during the survey were also documented from there by Lakela (1965) and Johnson (1963).

The mowed grass-weed communities are very heterogeneous with separate areas dominated by perennial grasses (Hungarian brome and/or quackgrass and/or dropseed), and patches dominated by the same annual grasses found on the road margins. Some woody plants (white pine, pincherry, willow, balsam poplar, juniper, and bearberry) are invading the grassy area but with the exception of bearberry will probably not persist in this mowed meadow. The mixed beach grass-weed community is dominated by beachgrass with beach heather, juniper, dropseed and biennials and annuals in the Caryophyllaceae (pinks), Chenopodiaceae (goosefoot), and Asteraceae (sunflowers). Three-awned grass and sheathed dropseed are invading along some margins. The soil is a mixture of dredge spoils and dune sand. It is more prone to erosion from wind and trampling.

Rare and listed species found in this area include beachgrass and beach heather, both quite frequent. Several searches were made during the season for *Botrychium* species but none were found anywhere except at the end of the airport where the service road turns east. This is where the first US site for *Botrychium pseudopinnatum* and the first Minnesota site for *B. acuminatum* was discovered.

Species Checklist for Runway Associated Disturbed Areas

PTERIDOPHYES	**PTERIDOPHYES**
Botrychium acuminatum - moonwort fern *B. matricariifolium* - moonwort fern *B. michiganense* - moonwort fern	*B. pseudopinnatum* - moonwort fern *Equisetum hyemale* var. *affine* - scouring rush
GYMNOSPERMS	**GYMNOSPERMS**
Juniperus communis var. *depressa* - common juniper	*Pinus strobus* - white pine
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beach grass *Aristada basiramea* var. *basiramea* - three-awned grass *Bromus inermis* - Hungarian brome *Carex umbellata* - sedge *Cenchrus longispinus* - sandbur *Cyperus schweinitzii* - umbrella-sedge *Digitaria ischaemum* - crabgrass *Elymus canadensis* - Canada rye	*Elytrigia repens* - quackgrass *Eragrostis cilianensis* - stinkgrass *E. pectinacea* - lovegrass *Panicum capillare* - panic grass *Poa compressa* - bluegrass *Setaria viridis* var. *viridis* - green foxtail *Sporobolus cryptandrus* - dropseed *S. vaginiflorus* var. *vaginiflorus* - sheathed dropseed
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Achillea millefolium - yarrow *Amaranthus alba* - tumbleweed *Ambrosia artemisiifolia* - ragweed *A. coronopilfolia* - ragweed *Arabis divaricarpa* - cress *Arctostaphylos uva-ursi* - bearberry *Artemisia campestris* subsp. *caudata* - wormwood *Chenopodium album* - pigweed *Corispermum hyssopifolium* - bugseed *C. nitidum* - shining bugseed *Euphorbia glyptosperma* - spurge *E. maculata* - spotted milk purslane *Fragaria virginiana* - strawberry	*Helianthus petiolaris* - sunflower *Hudsonia tomentosa* - beach heather *Lathyrus maritimus* - beach pea *Mollugo verticillata* - carpetweed *Plantago purshii* - plantain *Polygonella articullata* - jointweed *Populus balsaminifera* - balsam poplar *Prunus pensylvanica* - pincherry *Rhus toxicodendron* - poison ivy *Salix bebbiana* - Bebb's willow *Salsola kali* var. *tenuiflora*- saltwort *Silene cserei* - catchfly *Solidago nemoralis* - goldenrod

Park Grounds

This area is largely planted to fescue, other grasses, and ornamental trees and shrubs but the turf, road shoulders, and shoreline are sufficiently disturbed to allow other species to grow and flourish. The greatest species diversity is found in the grassy areas along the bayshore.

Species Checklist for Maintained Lawn/ Park Grounds

GYMNOSPERMS	**GYMNOSPERMS (MONOCOTS)**
Larix decidua – European larch *L. laricina* - tamarack *Pinus banksiana* - jack pine	*P. muhgo* - muhgo pine *P. resinosa* - red pine *Thuja occidentalis* "Techny" - white cedar
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Agrostis hyemalis - ticklegrass *Carex scoparia* - sedge *Digitaria ischameum* - crabgrass *Festuca* sp. - bent grass *Hordeum jubatum* - foxtail barley *Iris pseudoacorus* - yellow iris	*Juncus baliticus* - shore rush *J. brevicaudatus* - soft rush *J. tenuis* - soft rush *Poa annua* - grass *Sparganium eurycarpum* - bur-reed
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**

Acer ginnela - amur maple	*Medigo sativa* - alfalfa
Achillea millefolium - yarrow	*Mentha arvensis* - field mint
Ambrosia artemisiifolia - ragweed	*Mollugo verticillata* - carpetweed
Anthemis arvensis - wild chamomile	*Myrica gale* - sweet gale
Asclepias speciosa - milkweed	*Plantago major* - plantain
Aster brachyactus - western aster	*Polygonum lapathifolium* - smartweed
A. simplex - aster	*Potentilla argentea* - silvery cinquefoil
Bidens cernua - nodding burmarigold	*P. norvegica* - rough cinquefoil
B. frondosa - beggar's ticks	*Pyrus* X *baccata* - ornamental crabapple
Caragana sp - Siberian peabush	*Rosa rugosa* - Japanese rose
Chenopodium sp. - pigweed	*Salix alba* - white willow
Cirsium arvense - field thistle	*S. discolor* - pussy willow
C. vulgare - bull thistle	*S. exigua* - sandbar willow
Epilobium coloratum - willowherb	*Senecio viscosus* - sticky ragwort
Eupatorium maculatum - spotted joe-pye-weed	*S. vulgaris* - ragwort
Euthamia graminifolia - grass-leaved goldenrod	*Silene latifolia* - white campion
Fraxinus pennsylvanica - green ash	*Sium suave* - cow parsnip
Galeopsis tetrahit - horsemint	*Solanum dulcamara* - nightshade
Helianthus annuus - common sunflower	*Sonchus asper* - sowthistle
Impatiens capensis - touch-me-not	*S. uliginosum* - sowthistle
Lotus corniculata - bird's foot trefoil	*Stellaria media* - chickweed
Lycopus asper - water horehound	*Taraxacum officinalis* - dandelion
Lythrum salicaria - purple loosestrife	*Ulmus americana* - American elm

SHRUB AND SAPLING COVERTYPES

Juniper/Lichen Zone

The juniper/lichen zone located on the sand dunes is a thin strip of vegetated land between the beachgrass zone and the pine forest and shrub thickets. It seems very likely the juniper/lichen zone once extended for the entire length of Minnesota Point. The lichens, mostly *Cladina* and *Cladonia*, appear to be very susceptible to trampling and the junipers probably grow too slowly to re-colonize places where they have died out.

The soil of the juniper/lichen zone is still sand but more stable and in places darkened by the presence of some organic matter. This is a zone of low growing and mat forming evergreen vegetation and includes juniper (*Juniperus communis* var. *depressa*), bearberry (*Arctostaphyllos uva-ursi*), beach heather (*Hudsonia tomentosa*), scouring rush (*Equisetum hyemale* and *E. arvense*), and three-toothed cinquefoil (*Potentilla tridentata*). Low growing and mat forming woody deciduous species such as blueberry (*Vaccinium angustifolium*, *V. myrtilloides*), beach plum (*Prunus pumila*), and poison ivy are also very common. Various grasses and other herbaceous species grow here, too- beachgrass (*Ammophila breviligulata)*, umbrella-sedge, wild rye, dropseed, sedge, beach pea, and commandra (*Commandra umbellatus*). The rare crinkled hair grass (*Deschampsia flexuosa*) is occasionally present at the margins of the pine zone and juniper/lichen zone. Other plants sometimes found here are baby's breath and jointweed (*Polygonella articullata*). Seventeen species of lichens, most from the genera *Cladonia* and *Cladina*, have been tentatively identified (list at end of report) from the juniper/lichen zone.

Three listed species of plants are known to grow in the juniper/lichen zone: *Ammophila breviligulata*, *Hudsonia tomentosa*, and *Deschampsia flexuosa*. The margins of the juniper/lichen zone and pine forest might be suitable habitat for several rare *Botrychium* ferns. Some *Botrychium* species were found in brushy areas with similar floristic components to the juniper/lichen zone towards the south end of Minnesota Point.

Species Checklist for Juniper/Lichen Zone

PTERIDOPHYES	**PTERIDOPHYES**
Equisetum arvense - field horestail	*E. hyemale* var. *affine* - scouring rush
GYMNOSPERMS	**GYMNOSPERMS**
Juniperus communis var. *depressa* - juniper *Pinus sylvestris* - Scot's pine	*P. resinosa* - red pine *P. strobus* - white pine
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beachgrass *Carex umbellata* - sedge *Cyperus schweinitzii* - umbrella-sedge *Deschampsia flexuosa* - crinkled hairgrass *Elymus canadense* - wild rye	*E. trachycaulus* - wild rye *Elytrigia repens* - quackgrass *Panicum lanuginosum* - panic grass *Sporobolus cryptandrus* - dropseed
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Arctostaphyllos uva-ursi - bearberry *Artemisia campestris* subsp. *caudata* - wormwood *Coriospermum hyssopifolium* - bugseed *Cycloloma atriplicifolium* - winged pigweed *Gypsophilla paniculata* - baby's breath *Hudsonia tomentosa* - beach heather *Lathyrus maritimus* - beach pea	*Oenothera biennis* - evening primrose *Polygonella articullata* - jointweed *Potentilla tridentata* - three-toothed cinquefoil *Prunus pumila* - beach plum *Rhus toxicodendron* - poison ivy *Vaccinium angustifolium* - blueberry *V. myrtilloides* - blueberry

Deciduous and Coniferous Shrub Thicket

Situated in a low spot in Section 19 in the dune ridge this is a human disturbance created community in what used to be part of the white pine and red pine forest. Some white pines (*Pinus strobus*) remain but these are scattered small trees. Most of the woody plants present are deciduous hardwoods and shrubs. There is a sparse cover of paper birch (*Betula papyrifera*) and red maple (*Acer rubrum*) but shrub species are common and form a dense layer. The most abundant shrub species is beaked hazel (*Corylus cornuta*) followed by pin cherry (*Prunus pensylvanica*), serviceberry (*Amelanchier* spp.) and juniper. Poison ivy, raspberry (*Rubus strigosus*), wild rose (*Rosa acicularis* and *R. blanda*), hawthorne-leaved gooseberry (*Ribes oxyacanthoides*), and bearberry are frequent. Some white cedar (*Thuja occidentalis*), probably planted, grows at one end. Daisy-leaved moonwort (*Botrychium matricariifolium*), a Mn-DNR tracked species, is the only rare *Botrychium* species known to be present here.

Species Checklist for Deciduous and Coniferous Shrub Thicket

PTERIDOPHYES	**PTERIDOPHYES**
Botrychium matricariifolium - daisy-leaved moonwort	*B. multifidum* - leather-leaved grapefern
GYMNOSPERMS	**GYMNOSPERMS**
Pinus resinosa - red pine	*Juniperus communis* var. *depressa* - juniper
P. strobus - white pine	*Thuja occidentalis* - white cedar
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beachgrass	*Elytrigia repens* - quackgrass
Asparagus officinalis - asparagus	*Festuca ovina* - sheep fescue
Carex umbellata - sedge	*Maianthemum canadenses* - May flower
Clintonia borealis - bluebead lily	*Panicum lanuginosum* - panic grass
Cyperus schweinitzii - umbrella-sedge	*Smilacina stellata* - Solomon's seal
Elymus canadense - wild rye	*Sporobolus cryptandrus* - dropseed
E. trachycaulus - wild rye	
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Acer rubrum - red maple	*Rhamnus cathartica* – common buckthorn
Asclepias syriaca - common milkweed	*Rhus toxicodendron* - poison ivy
Arctostaphyllos uva-ursi - bearberry	*Ribes cynosbati* - dogberry
Amelanchier spicata - serviceberry	*R. oxyacanthoides* - hawthorn leaved gooseberry
Amelanchier spp - serviceberry	*Rosa acicularis* - wild rose
Betula papyrifera - paper birch	*R. blanda* - smooth rose
Cornus sericea - red osier dogwood	*Rubus strigosus* - red raspberry
Corylus cornuta - beaked hazelnut	*Sorbus aucuparia* - rowan tree
Fragaria virginiana - strawberry	*Tanacetum vulgare* - tansy
Lonicera tatarica - honeysuckle	*Vaccinium angustifolium* - blueberry
Potentilla tridentata - three-toothed cinquefoil	*V. myrtilloides* - blueberry
Prunus pensylvanica - pin cherry	

FORESTED COVERTYPES

Old Growth White Pine-Red Pine Forest

With the sand dune plant communities and some wetlands, white pine-red pine forest is one of the native plant communities on Minnesota Point. With 87 vascular plant species the old growth pine forest is not floristically diverse. The white pine-red pine forest is composed of a nearly pure stand of old growth white pines (*Pinus strobus*) and red pines (*P. resinosa*) growing on stabilized beach ridges. Most of the original pine forest on Minnesota Point is gone, making what remains extremely valuable as a natural feature and biological resource.

Davidson and Bernard (1968-1969) found the soils to be acidic (pH 5.1), low in nutrients (Ca 150 ppm, P 9 ppm, K 20 ppm) and organic matter (2.0%). Based on cores taken from red and white pines Davidson and Bernard (1968-1969) estimated the age of this forest to be at least 200 years. The dominant trees are white and red pine which are self perpetuating on the site. Davidson and Bernard (1968-1969) noted that on the lake side of the forest reproduction of red pine is dominant while white pine reproduction is dominant in the interior.

Nearly all mature trees seen were either red or white pine but a few non-native conifer specimens, European larch (*Larix decidua*), Norway spruce (*Picea abies*), and Scot's pine (*P. sylvestris*), were also seen. Most specimens of these non-native conifers appear to be deliberate introductions but some younger specimens of larch and Scot's pine may be self-sown trees. Beaked hazel and bush honeysuckle (*Diervilla lonicera*) are major species in the shrub layer. There are occasional patches of paper birch with quaking aspen (*Populus tremuloides*), balsam poplar (*Populus balsaminifera*), choke cherry (*Prunus virginiana*), pincherry, juneberry, and beaked hazel. These appear where there are in gaps in the pine canopy. Some red maple is present as small individual trees in the understory. Under the pines the ground layer is largely made up of low growing woody evergreen plants such as twinflower (*Linnaea borealis*), shinleaf (*Pyrola* spp.), bearberry, and blueberry, with some three-toothed cinquefoil, clubmosses, and juniper. Grass species include crinkled hairgrass, sheep fescue (*Festuca ovina*), bluegrass (*Poa annua*, *P. compressa*, *P. pratensis*). Among the forbes and ferns are sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), wood fern (*Dryopteris carthusiana*), fireweed (*Epilobium angustifolium*), goldenrod (*Solidago nemoralis*), butter-and eggs (*Linnaria vulgaris*), violet (*Viola* spp.), tansy (*Tanacetum vulgare*), cow-wheat (*Melampyrum lineare*), harebell (*Campanula rotundifolia*), and commandra.

One low area where the pines have fallen is a tangle of mountain maple (*Acer spicatum*), boxelder (*A. negundo*), and some green ash (*Fraxinus pennsylvanica*). Two non-native viburnums, *Viburnum lantana* and *V. opulus* var. *opulus*, were found here. These species are probably escapes from cultivation but they may also have been introduced as part of a conservation planting as both produce edible berries that may be eaten by birds. Another low area between the runway service road and pine forest supports a thick growth of tag alder (*Alnus incana* ssp. *rugosa*) with sensitive fern (*Onoclea sensibilis*) and ostrich fern (*Matteuccia struthiopteris*).

One of the most interesting finds made in the white pine-red pine forest are the clubmosses (Lycopodiaceae). The near absence of any species of clubmoss from previous floristic checklists suggests these species are recent arrivals to Minnesota Point rather than simply overlooked in the past. Lakela's collections on Minnesota Point and Johnson's later floristic survey only recorded three species: *Lycopodiella inundata* (*Lycopodium inundatum*, bog clubmoss) *Huperzia lucidula* (*Lycopodium lucidulum*, shining clubmoss) and *Lycopodium dendroideum* (*Lycopodium obscurum* var. *dendroideum*, princess pine). *Lycopodium dendroideum* was found in several places during the survey. *Lycopodiella inundata*, a species confined to wet usually peaty soils, was not relocated during this survey. Lakela collected *Lycopodiella inundata* from a small bog on the bayside of Minnesota Point in 1936 and 1938 (Lakela 1871 DUL). *H. lucidula* was found by Lakela in 1937 in Section 19 under juniper near a cabin (Lakela 1905 DUL).

Five clubmoss species native to and common in St. Louis County were collected from the old growth white pine-red pine forest: *Diphasiastrum complantum* (*Lycopodium complantum*) - northern ground cedar, *Huperzia lucidula* - shining clubmoss, *Lycopodium annotinum* - bristly clubmoss, *L. dendroideum* - princess pine, and *L. lagopus* (*Lycopodium clavatum* var. *monostachyon*) - one-cone running clubmoss. With exception of *L. dendroideum* and *H. lucidula*, this is the first report of these native clubmoss species from Minnesota Point. Colonies of all clubmoss species were generally large, expanding vegetatively, and all bore fertile sporangia. Also, *Huperzia lucidula* plants bore numerous gemmae (asexual diaspores) on their stems.

Rare vascular plants from the pine forest are *Deschampsia flexuosa* and some *Botrychium* species (*B. matricariifolium*, *B. minganense*, and *B. pallidum*, and possibly *B. rugulosum*). Also found were two common species of *Botrychium*, ferns *B. dissectum* and *B. multifidum*. All *Botrychium* species found occur largely in a disturbed part of the pine forest near an old cabin site under a mixed aged stand of pines, aspen, hazel, and red osier.

In 1997 a small fire burned through part of the forest near the Pine Knot cabin. No large living trees were killed but many seedlings and some saplings did burn, as did some snags. Much of the underbrush was also cleared. The long-lasting effect of this fire is unknown but crinkled hairgrass appears to have benefited from the reduced competition with brush. A fire in late 1998 may have caused more damage but this waits to be seen during the growing season of 1999. Occasional fires may have been part of the natural regimen in the pine forest prior to European settlement. It would be useful know how often fires occurred and how severe they were. An analysis of soils in the forest and remaining wetlands could provide information.

Old Growth White Pine-Red Pine Forest Species Checklist

PTERIDOPHYES	**PTERIDOPHYES**
Botrychium dissectum - dissected-leaved grapefern	*E. hyemale* var. *affine* - scouring rush
B. matricariifolium – daisy-leaved moonwort	*E. sylvaticum* - woodland horsetail
B. minganense- Mingan moonwort	*Diphasiastrum complanatum* - northern ground cedar
B. multifidum - leather grapefern	*Huperzia lucidulum* - shining clubmoss
B. pallidum - pale moonwort	*Lycopodium annotinum* - bristly clubmoss
B. rugulosum - St. Lawrence grapefern	*L. dendroideum* - princess pine
Dryopteris carthusiana - toothed wood fern	*L. lagopus* - one-cone running clubmoss
Equisetum arvense - field horsetail	
GYMNOSPERMS	**GYMNOSPERMS**
Juniperus communis var. *depressa* - juniper	*Pinus resinosa* - red pine
Larix decidua - European larch	*P. strobus* - white pine
Picea abies - Norway spruce	*P. sylvestris* - Scot's pine
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Calamagrostis canadensis - bluejoint grass	*Festuca ovina* - sheep fescue
Carex peckii - sedge	*Maianthemum canadense* - May flower
C. gracillima - sedge	*Poa annua* - bluegrass
Clintonia borealis - bluebead lily	*Schizachne purpurascens* - false melic grass
Deschampsia flexuosa - crinkled hairgrass	
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Acer negundo - boxelder maple	*Polygonum cilinoides* - bindweed
A. rubra - red maple	*Populus balsaminifera* - balsam poplar
A. spicatum - mountain maple	*P. tremuloides* - quaking aspen
Amelanchier laevis - smooth serviceberry	*Potentilla tridentata* - three-toothed cinquefoil
A. spicata - serviceberry	*Prunus pensylvanicus* - pincherry
Aralia nudicaulis - wild spikenard	*P. virginica* - chokecherry
Arctostaphyllos uva-ursi – bearberry	*Pyrola asirifolia* - pink pyrola
Aster macrophyllus – big-leaf aster	*P. elliptica* - shinleaf
Betula alleghiensis - yellow birch	*Pyrus baccata* - crabapple
B. papyrifera - paper birch	*Rhus toxicodendron* - poison ivy
Campanula rotundifolia - harebell	*Rosa acicularis* - rose
Coptis groenlandica - goldthread	*R. blanda* - rose
Cornus canadensis - bunchberry	*Rubus strigosus* - raspberry
C. rugosa - round-leaved dogwood	*Sambucus pubens* - red elderberry
C. sericea - red osier dogwood	*Scrophularia lanceolata* - figwort
Corylus cornuta - beaked hazel	*Sorbus aucuparia* - rowan tree
Crataegus chrysocarpa - fireberry hawthorne	*Syringia vulgaris* - lilac
Diervilla lonicera - bush honeysuckle	*Tanacetum vulgare* - tansy
Fragaria virginiana - strawberry	*Thalictrum revolutum* - meadow rue
Fraxinus pennsylvanicus - green ash	*Trientailis borealis* - star flower
Galium borealis - bedstraw	*Urtica dioica* - stinging nettle
Gaultheria procumbens - wintergreen	*Vaccinium angustifolium* - blueberry
Hieracium kalmii - native species of hawkweed	*V. myrtilloides* - blueberry
Humulus lupulus - hops	*Viburnum lantana* - wayfaring tree
Linaria vulgaris - butter and eggs	*V. opulus* var. *americanum* - highbush cranberry
Linnaea borealis - twinflower	*V. o.* var. *opulus* - Guelder rose
Lonicera canadense - honeysuckle	*Viola adunca* - violet
L. dioica - honeysuckle vine	*V. incognita* - violet
Melampyrum lineare - cow-wheat	*V. pallens* - violet

Open Pine Stand (Savanna)

The open pine stand, a savanna-like forest, is located between the old growth pine forest and the barren area in Section 20 is characterized by a sparse open canopy of stunted red and white pines as well as a few large, and blowouts. Some jack pine is encroaching. One old blowout is revegetating with lichens, strawberry, beach heather, wild rye, *Carex umbellata*, panic grass, *Smilacina stellata*, poison ivy, goat's beard, beach plum, and juniper. The other is more recent but re-growth of vegetation is hindered along this favored path for hikers.

Botrychium lanceolatum, *B. matricariifolium*, *B. michiganense*, *B. spathulatum*, and possible hybrid forms occur in brushy areas between the dunes and interior portion of the stabilized dune ridge. *B. acuminatum*, *B. michiganense*, *B. pseudopinnatum*, and *B. pallidum* grow in a patch of poison ivy. *Deschampsia flexuosa* is thriving in a clearing at the edge of the pines on the bayside of the dunes. Beach heather and beachgrass occur in old blowouts and other areas of loose sand. Populations of *Artemisia absinthe*, C*onvallaria majus*, *Saponaria officianalis* are established.

Species Checklist for Open Pine Stand (Savanna)

PTERIDOPHYES	**PTERIDOPHYES**
Botrychium acuminatum - pointed moonwort	*B. pallidum* - pale moonwort
B. lanceolatum - lanceolate moonwort	*B. pseudopinnatum* - false northwestern moonwort
B. matricariifolium - daisy-leaved moonwort	*B. spathulatum* - spatulate moonwort
B. michiganense - Michigan moonwort	*Equisetum arvense* - field horsetail
B. multifidum - leather grapefern	*E. hyemale* var. *affine* - scouring rush
GYMNOPSERMS	**GYMNOPSERMS**
Pinus banksiana - jack pine	*P. strobus* - white pine
P. resinosa - red pine	*Juniperus communis* var. *depressa* - juniper
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Ammophila breviligulata - beach grass	*Elytrigia repens* - quackgrass
Calamagrostis canadensis - bluejoint grass	*Festuca ovina* - sheep fescue
Carex umbellata - sedge	*Maianthemum canadense* - Mayflower
C*onvallaria majus* - lily-of-the-valley	*Panicum lanuginosum* - panic grass
Deschampsia flexuosa - crinkled hairgrass	*Smilacina stellata* - false Solomon's seal
Elymus canadensis - wild rye	
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Amelanchier arborea - downy serviceberry	*Lonicera tatarica* - honeysuckle
Amelanchier bartramiana - mountain serviceberry	*Mirabilis hirsuta* - four o'clock
Amelanchier sangunea - New England serviceberry	*Prunus pensylvanica* - pincherry
Amelanchier wiegandii - serviceberry	*P. pumila* - beach plum
Arctostaphyllos uva-ursi - bearberry	*P. virginiana* - chokecherry
Artemisia absinthe - bitter wormwood	*Rosa acicularis* - spiny rose
A. campestris subsp. *caudata* - wormwood	*Rhus toxicodendron* - poison ivy
Asclepias syriaca - common milkweed	*R. typhina* - smooth sumac
Betula papyrifera - paper birch	*R. oxyacanthoides* - hawthorn-leaved gooseberry
Commandra umbellata - bastard toadflax	*Rubus strigosus* - red raspberry
Corylus cornuta - beaked hazel	*Salix exigua* - sandbar willow
Cratageus chrysocarpa - fireberry hawthorn	*Saponaria officianalis* - soapwort
Fragaria virginiana - strawberry	*Solidago nemoralis* - goldenrod
Helianthus petiolaris - sunflower	*Syringa vulgaris* - common lilac
Hudsonia tomentosa - beach heather	*Tragopogon pratense* - goat's beard
Lathyrus maritimus - beach pea	*Vaccinium angustifolium* - lowbush blueberry
Linnaria vulgaris - butter and eggs	*V. myrtilloides* – velvet-leaf blueberry

Poplar Stands in Sec. 20 (Deciduous Forest)

These stands are on moist soils developed after dredge spoils were dumped to extend the length of Minnesota Point. The dominant tree species is balsam poplar (*Populus balsaminifera*) with Canada bluejoint grass, raspberry, and poison ivy common in the lower vegetation layers. Other species include scouring rush, wild rose, sandbar willow, green ash (*Fraxinus pennsylvanicus*), and a few young white pines.

Species Checklist for Poplar Stands

PTERIDOPHYES	**PTERIDOPHYES**
Botrychium matricariifolium- moonwort	*B. pallidum* - pale moonwort
B. multifidum - leather-leaved grapefern	*Equisetum hyemale* - scouring rush
GYMNOSPERMS	**GYMNOSPERMS**
Pinus resinosa - red pine	*P. strobus* - white pine
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Calamagrostis canadensis - bluejoint grass	*Carex* sp. - sedge (sterile plants only)
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Achillea millefolium - yarrow	*Populus balsaminifera* - balsam poplar
Alnus incana ssp. *rugosa* - tag alder	*P. tremuloides* - quaking aspen
Amelanchier spp - serviceberry	*Prunus virginiana* - chokecherry
Amelanchier intermedia - serviceberry	*Pyrola asarifolia* - pink-flowered pyrola
Anaphalis margaritacea - pearly everlasting	*P. elliptica* - shinleaf
Cirsium arvense - field thistle	*Rhus toxicodendron* - poison ivy
Convovulus arvensis - morning glory	*Rosa acicularis* - spiny rose
Cornus sericea - red osier dogwood	*R. blanda* - smooth rose
Epilobium angustifolium - fireweed	*Rubus strigosus* - raspberry
Fragaria virginiana - strawberry	*Sambucus pubens* - red elderberry
Lactuca puchella - blue lettuce	*Solidago gigantea* - goldenrod
Lonicera tatarica - honeysuckle	

Jack Pine/Scot Pine Groves (Pine and Mixed Pine/Deciduous Forest)

Both the jack pine (*Pinus banksiana*) and Scot's pine (*P. sylvestrus*) groves represent plantings made in an attempt to vegetate the dredge spoils. Scot's pine is not a tree native to North America and according to Davidson and Bernard (1969) jack pine is not native to Minnesota Point. Both have become naturalized on Minnesota Point on the dredge spoils where trees ranging from seedlings to more than 40 feet high can be found. The most significant plant finds in these stands are least moonwort (*Botrychium simplex*), a rare species, and two species of clubmoss - fanleaf groundcedar (*Lycopodium digitatum*) and one-cone running clubmoss (*Lycopodium lagopus*) both new to Minnesota Point. *B. simplex* was seen here in 1997 but could not be found again in 1998. Also present are bearberry, blueberry, *Pyrola* spp., beaked hazel, cow-wheat, bush honeysuckle and many other species found in other forested cover types.

WETLANDS

Virtually none of the original wetlands on Minnesota Point's remain and those that do show human impact. Five general wetland types are found on Minnesota Point: shrub carr, alder thicket, sedge marsh, deciduous forested, and ericaceous shrub. Southworth Marsh, born of a dredge spoil fill project in the 1930's is the best documented and the largest wetland on Minnesota Point. It contains shrub carr, alder thicket, an incipient deciduous forested wetland, and sedge marsh. Parts of the Southworth Marsh shrub carr and alder thicket are succeeding to forested wetland dominated by balsam poplar (*Populus balsaminifera*). Other forested wetlands found in Section 20 are dominated by green ash (*Fraxinus pensylvanicus*) with balsam poplar. There are a few small, isolated shrub and sedge marshes found on Minnesota Point. There are two sparsely ericaceous type wetlands on Minnesota Point, both in Section 19

in the pine forest, with a heavy ground layer of *Sphagnum* moss. These bog-like wetlands are extremely small but share several species often found in northern bogs (Larsen 1982): *Sphagnum* moss, leatherleaf (*Chamaedaphne calyculata*), water calla (*Calla palustris*), willowherb (*Epilobium leptophyllum*), St. John's wort (*Triadenum fraseri*), and swamp cinquefoil (*Potentilla palustris*). A small graminoid marsh found in a dune depression on the Section 19-20 line is dominated by bluejoint grass (*Calamagrostis canadensis*) and sedges (*Carex* spp.)

Green Ash Stand in Sec. 20 (Deciduous Forest)

This small stand of green ash (*Fraxinus pennsylvanicus*) in a low area on the bayside contains a population of the rare St. Lawrence grapefern (*Botrychium rugulosum*, Mn-DNR threatened species) along with dissected-leaved grapefern (*B. dissectum* var. *dissectum* and *B. dissectum* var. *obliquum*) and rattlesnake fern (*B. virginianum*). Soils are dark colored, moist, and richer in organic matter and probably on old dredge spoils. Shallow depressions that remain moist throughout the summer provide good habitat for ostrich fern (*Matteuccia struthiopteris*) and nettle (*Urtica dioica*). The *Botrychium* ferns were found on the edges of these moist depressions. Other rare *Botrychium* ferns (*B. pallidum*, *B. matricariifolium*, *B. michiganense*) were found in the transition zone between the green ash stand and the drier *Salix*/*Equisetum* zone (dredge spoil barrens).

Species Checklist for Green Ash Stand

PTERIDOPHYES	**PTERIDOPHYES**
Athyrium felix-femina var. *angustum* - northern lady fern *Botrychium dissectum* var. *dissectum* - dissected leaved grapefern *B. rugulosum* - St. Lawrence grapefern *B. virginianum* - rattlesnake fern	*Dryopteris carthusiana* - toothed wood fern *Equisetum arvense* - field horsetail *E. sylvaticum* - woodland horsetail *Mattuecia struthiopteris* var. *pensylvanica* - ostrich fern
GYMNOPSERMS	**GYMNOPSERMS**
(None present)	(None present)
ANGIOSPERMS (MONOCOTS)	**ANGIOSPERMS (MONOCOTS)**
Calamagrostis canadensis - bluejoint grass	*Maianthemum canadense* - May flower
ANGIOSPERMS (DICOTS)	**ANGIOSPERMS (DICOTS)**
Arctium minus - burdock *Cirsium arvense* - field thistle *Cornus sericea* - red osier dogwood *Hieracium lantanum* - Hercules club *Pyrola asarifolia* - pink-flowered pyrola	*Ribes americanum* - eastern black currant *R. glandulosum* - skunk currant *R. triste* - swamp red currant *Rubus strigosus* - red raspberry *Salix fragilis* - crack willow

Southworth Marsh

The Southworth Marsh, formerly known as the Oatka Beach Addition is wetland plant community that has developed on a dredge spoils dumpsite. Unlike soils found on the dunes and in the pine forests of Minnesota Point, the soils of the Southworth Marsh are fine grained and rich in organic matter. These highly saturated soils have developed true wetland soil characteristics. Lakela (1939) studied the vegetation succession on the fresh spoils from 1935 to 1938. Vegetation succession began with annual species belonging to *Bidens*, *Polygonum* and perennials species of *Carex*, *Juncus*, *Scirpus*, grasses, and others. In the second year, Lakela noted numerous *Salix* seedlings, many of which grew rapidly during the summer that year. In 1936, she also noted zonal development of a vegetation pattern. On the bayside *Typha* and *Scirpus* predominated towards the center was a thicket of willows. In patches of *Bidens* and *Polygonum* Lakela noted *Populus balsaminifera*. For the first two years plant species migration into the new habitat was at a maximum and composed of many wind-dispersed species. At the end of the second year 92 species were recorded. Species migration tapered after that with only 19 new additions by 1938.

The total number of species listed by Lakela was 117. Lakela predicted two of the new species, both trees, cottonwood (*Populus deltoides*) and red maple (*Acer rubrum*), would form the dominant plant cover over time. Almost 30 years later Bernard and Davidson (1969) followed up on Lakela's study of Oatka Beach. They found cottonwood and red maple no longer present. They described Oatka Beach as a meadow being invaded by alder thicket or shrub carr but without a continuous canopy cover and gave the total number of species as 161. The similarity index Bernard and Davidson (1969) calculated between theirs and Lakela's species checklists was 28.0% indicating little relationship between the two species lists. During the present survey a total of 59 species were identified, a great drop from the 161 species found in 1969.

Many of the species Lakela listed for the Oatka Beach Addition are gone now. These include annuals and biennials dependent on disturbed soil but also many perennials. Sedges and rushes listed by Lakela are much fewer in species, as are many grasses. Johnson's (1963) list for Oatka Beach is rather sparse and thus not very useful. He does note, however, *Myrica gale*, still present to some extent. His sedge list only contains *Carex hystericina* which, if this indicates dominance of the vegetation, is probably based on a misidentification. Both Lakela and Johnson collected *Petasites sagittatus* from the Oatka Beach Addition in 1948 and 1963 respectively and this perennial member of the sunflower family continues to the present.

When Bernard and Davidson studied Oatka Beach they saw a graminoid-dominated community with thin willow and poplar cover. Today, three major vegetation covertypes – willow/alder thickets, stands of balsam poplar, and open areas of sedges - make up Southworth Marsh. Balsam poplar with tag alder and some quaking aspen now form a near continuous canopy from the north side to the south side bordered on the east by Minnesota Avenue. The shade created by these species may account for the disappearance of certain sedges and grasses that are shade intolerant. Erosion of the shoreline may have led to the loss of other species. Soil in the balsam poplar groves is wet but not so saturated as to be swampy and this may account for a reduction in species adapted to wetter soils. The thick leaves of balsam poplar and quaking aspen may also be inhibiting some species. Changes in soil moisture caused by changes in lake level or by other factors have reduced habitat for many wetland species. When Lakela first described this site the soil was just a few centimeters above the waterline with pools about 30-60 centimeters deep. Bernard and Davidson (1969) described slight sandy rises about 0.5 meters above the waterline and also marshy areas. Only a few patches of true marsh remain, the rest is shrub carr and young poplar forest. Changes in species diversity are probably related to loss of habitat by erosion, changes in water levels, and heavy shading from *Populus balsaminifera* and *Salix* spp. Table 4 lists major species present by covertype.

TABLE 4
Checklist of Major Species by Covertype in the Southworth Marsh

POPLAR STAND	WILLOW THICKETS	SEDGE MARSH
Alnus incana ssp. *rugosa* - tag alder	*Alnus incana* ssp. *rugosa* - tag alder	*Agrostis stolonifera* var. *major* - redtop grass
Calamagrostis canadensis - bluejoint grass	*Calamagrostis canadensis* - bluejoint grass	*Calamagrostis canadensis* - bluejoint grass
Carex canescens - sedge	*Carex lacustris* - lake sedge	*Carex aquatilis* - sedge
C. lacustris - lake sedge	*Equisetum arvense* - field horsetail	*C. buxbaumii* - sedge
C. leptalea- sedge	*E. fluviatile* - waterpipes	*C. lacustris* - lake sedge
Cornus sericea - red osier dogwood	*E. palustre* - marsh horsetail	*C. lanuginosa* - wooly sedge
Dryopteris cristata - crested wood fern	*Myrica gale* - sweet gale	*C. rostrata* - beaked sedge
D. carthusiana - toothed wood fern	*Salix bebbiana* - Bebb's willow	*C. scoparia* - sedge
Equisetum arvense - field horsetail	*S. discolor* - pussy willow	*Myrica gale* - sweet gale
E. fluviatile - waterpipes	*S. exigua* - sandbar willow	*Scirpus cyperinus* - wool rush
E. palustre - marsh horsetail	*S. petiolaris* - narrow-leaved willow	*Typha latifolia* - cattail
Petasites sagittatus - arrowhead coltsfoot	*S. lucida* - shining willow	
Populus balsaminifera - balsam poplar	*S. pyrifolia* - balsam willow	
S. alba - white willow		

Other species observed in Southworth Marsh are *Acorus calamus*, *Carex diandra*, *C. echinita*, C. *intumescens*, *C. scoparia*, C. *stipata*, *C. tenera*, *Corallorhiza trifida*, *Epilobium angustifolium*, *E. ciliatum*, *Juncus balticus*, *Impatiens capensis*, *Iris pseudoacorus*, *I. versicolor*, *Lysimachia ciliata*, *Lythrum salicare*, *Mentha arvense*, *Parthenocissus inserta*, *Phalaris arundinacea*, *Phragmites australis*, *Picea glauca*, *Platanthera hyperborea*, *Poa pratense*, *Polygonum hydropiperoides*, *P. sagittatum*, *Potentilla norvegica*, *P. palustris*, *Pyrola asarifolia*, *Ribes americana*, *Rorippa islandica*, *Rubus strigosus*, *Rumex orbiculatus*, *Salix fragilis*, *Sorbaria sorbifolia*, *Tanacetum vulgare*, *Taraxacum officinale*.

NATURAL WETLAND REMNANTS in SECTIONS 19 and 20

Wetland #1 east of runway

Wetland #1 is primarily lake sedge (*Carex lacustris*) with some cattail (*Typha latifolia*) and pepperwort (*Polygonum punctatum*) in a shallow depression between the service road and the pine forest. Wetland #1 may be a remnant of a once larger and more complex wetland associated with the bay. It seems likely that some part of this wetland was where Lakela first found the rare plant *Sparganium glomeratum* on Minnesota Point in 1931. Portions of this wetland extend into the pine forest where it becomes a shrub thicket of red osier, tag alder, and mountain maple. Under the shade of tag alder are ostrich fern (*Matteuccia struthiopteris*) and sensitive fern (*Onoclea sensibilis*).

Wetlands #2 and #3 south of runway

These two wetlands, both on the bayside of Minnesota Point bear some resemblance to the one described by Lakela (1941) where she found *Sparganium glomeratum*. Both appear to have had some recent connection to the harbor but are blocked by a sand ridge. These wetlands are dominated by *Sphagnum* with leatherleaf (*Chamaedaphne calyculata*), water-calla (*Calla palustris*), and sweetflag (*Acorus calamus*).

Wetland #1 shows a definite zonation of vegetation. Starting from the center is an area of *Sphagnum* mosses with a thicket of balsam (*Salix pyrifolia*) and tea-leaved (*S. planifolia*) willows, tag alder (*Alnus incana* ssp. *rugosa*), and water-calla (*Calla palustris*). *Sphagnum* continues to the edges where manna grasses (*Glyceria grandis*, *G. canadense*), bluejoint grass (*Calamagrostis canadensis*), sweet flag (*Acorus calamus*), and water-calla grow with pepperweed (*Polygonum* spp.), willowherb (*Epilobium ciliatum*, and *E. coloratum*). A shallow depression in the

mossy part of this wetland is apparently water-filled during years of normal rainfall. A narrow shallow depression connects Wetland #1 with Wetland#2.

Wetland #3 is more complex than Wetland #2. Like Wetland #1 it is composed of a *Sphagnum* mat but with a willow/leatherleaf component rather than alder and willow. Wetland #2 grades into a thicket of meadowsweet and a circular depression with bluejoint grass. The *Sphagnum* mat supports leatherleaf (*Chamaedaphne calyculata*), lake sedge (*Carex lacustris*), tussock sedge (*Carex stricta*), bluejoint grass, marsh cinquefoil (*Potentilla palustris*), swamp candles (*Lysimachia terrestris*), white violet (*Viola incognita*), St. John's wort (*Triadenum fraserii*), water-calla, and pepperweed (*Polygonum* spp.). The willow/leatherleaf component: *Sphagnum* mosses, tag alder, balsam willow, leatherleaf, lake sedge, marsh cinquefoil, sweet woodruff (*Galium tinctorum*), skullcap (*Scutellaria lateriflora*), willowherb (*Epilobium leptophyllum* and *E. strictum*), wild blue iris (*Iris versicolor*), crested wood fern (*Dryopteris cristata*), toothed wood fern (*D. carthusiana*), and pale touch-me-not (*Impatiens capensis*). The meadowsweet thicket is largely *Spirea alba*. The bluejoint grass opening is in a shallow depression with no *Sphagnum* mosses or other bog species. Thin spots in the bluejoint grass support an abundance of pepperworts (*Polygonum hydropiperoides*, *P. pensylvanicum* var. *laevigatum*) and pale touch-me-not.

Wetland #4

The green ash stand discussed above is one of the wetlands in Section 20. Another wetland in Section 20 (Wetland #4) isolated now but possibly once connected to the bay in the past is dominated by grasses and sedges. It is situated in a shallow, circular, almost crater-like depression surrounded by a thicket of tag alder with *Aster umbellatus* and *Vaccinium angustifolium*. The central portion is very saturated and composed of bluejoint grass with a coarse-leaved sedge (*Carex rostrata*) and *Sphagnum* mosses. In parts with less sedge and grass are clumps of rushes and small sedges (*Scirpus atrocinctus*, *Juncus brevicaudatus*, *J. alpinoarticulatis*, *Carex projecta*, *C. scoparia*, *C. tenera*) with *Eleocharis erythropoda*, *Polygonum punctatum*, *Epilobium leptophyllum*, and *Utricullaria minor*. In one thin spot of the sedge and grass an 8 FT^2 patch of *Sparganium glomeratum* was found thus marking the first time in 49 years since it was last reported from Minnesota Point.

TABLE 5
A Comparison of Vegetation in the Three Remaining Natural Wetlands

WETLAND #2	WETLAND #3	WETLAND #4
Acorus calamus - sweetflag	*Acorus calamus* - sweetflag	*Aster umbellatus* - aster
Alnus incana ssp. *rugosa* - tag alder	*Alnus incana* ssp. *rugosa* - tag alder	*Alnus incana* ssp. *rugosa* - tag alder
Calamagrostis canadensis - bluejoint grass	*Calamagrostis canadensis* - bluejoint grass	*Calamagrostis canadensis* - bluejoint grass
Calla palustris - water calla	*Calla palustris* - water calla	*Eleocharis erythropoda* - red-stemmed spikerush
Chamaedaphne calyculata - leatherleaf	*Carex lacustris* - lake sedge	*Epilobium leptophyllum* - willowherb
Epilobium ciliatum - willowherb	*C. stricta* - tussock sedge	*Juncus brevicaudatus* - tailed-rush
E. coloratum - willowherb	*Chamaedaphne calyculata* - leatherleaf	*J. alpinoarticulatis* - soft rush
Glyceria canadense - manna grass	*Dryopteris carthusiana* - toothed wood fern	*Carex projecta* - sedge
G. grandis - manna grass	*D. cristata* - crested wood fern	*C. rostrata* - sedge
Polygonum hydropiperoides - pepperwort	*Epilobium leptophyllum* - willowherb	*C. scoparia* - sedge
P. pensylvanicum var. *laevigatum* - pepperwort	*E. strictum* - willowherb	*C. tenera* - sedge
Salix planifolia - tea-leaved willow	*Galium tinctorum* - bedstraw	*Polygonum punctatum* - pepperwort
S. pyrifolia - balsam willow	*Impatiens capensis*	*Salix pyrifolia* - balsam willow
	Iris versicolor - blueflag	*Salix* spp. - willow
	Lysimachia terrestris - yellow loosestrife	*Scirpus atrocinctus* - woolrush
	Polygonum hydropiperoides - pepperwort	*Sparganium glomeratum* - clustered bur-reed
	P. pensylvanicum var. *laevigatum* - pepperwort	*Utricullaria minor* - fan-leaved bladderwort
	Potentilla palustris - swamp cinquefoil	*Vaccinium angustifolium* – lowbush blueberry
	Salix pyrifolia - balsam willow	
	Scutellaria lateriflora - skullcap	
	Spiraea alba - meadowsweet	
	Triadenum fraserii - St. John's wort	
	Viola incognita - bigleaf white violet	

OTHER VEGETATION ALONG BAYSIDE

Along the bayside of Minnesota Point waves are usually calm enough to allow some vegetation to grow nearly to the water's edge. This area has experienced much human manipulation and no attempt is made here to distinguish natural from native plant communities. It is doubtful that any of the pant communities on the bayside are truly natural even though some are dominated by native plants. Although there is no continuous zone or band of wetland vegetation, many wetland species grow close to or at the water's edge. Among the most common are: water-plantain (*Alisma subcordatum*), tag alder (*Alnus incana* ssp. *rugosa*), begger's ticks (*Bidens cernua*, *B. discoidea*), red osier (*Cornus sericea*), green ash (*Fraxinus pennsylvanica*), shore-rush (*Juncus balticus* var. *littoralis*), bugleweed (*Lycopus asper*), purple loosestrife (*Lythrum salicare*), field mint (*Mentha arvense*), sweet gale (*Myrica gale*), canary grass (*Phalaris arundinacea*), duck-potato (*Sagittaria latifolia*), willows (*Salix eriocephala*, *S. exigua*, *S. lucida*, *S. nigra*), giant burreed (*Sparganium eurycarpum*), and cord-grass (*Spartina pectinata*). Occasionally, aquatics are washed up on the shore. These species were found near the end of Minnesota Point by the old pier: waterweed (*Elodea canadensis*), pondweed (*Potamogeton robbinsii*), and water celery (*Vallisneria americana*). The strandline is often suitable habitat for several annual species: corn chamomile (*Anthemis arvensis*), aster (*Aster brachyactis*), oats (*Avena sativa*), sunflower (*Helianthus annuus*), campion (*Lychnis alba*), soapwort (*Saponaria officinalis*), carpetweed (*Mollugo verticillata*), knotweed (*Polygonum aviculare*), pigweed (*Chenopodium album*), field bindweed (*P. convovulus*), pepperwort (*P. hydropiperoides*), ragwort (*Senecio viscosus*, *S. vulgaris*), chickweed (*Stellaria media*), and sea-blite (*Sueda calceoliformis*).

VEGETATION IN BREAKWATER AREAS ON LAKESIDE

This area is somewhat protected from the lake by a breakwater and is mostly on artificially deposited soils. The majority of species present are rushes and sedges but some Asteraceae are occurring above the waterline. The species checklist includes: horsetails (*Equisetum arvense*, *E. hyemale* var. *affine*), wormwood (*Artemisia serrulata*), aster (*Aster lanceolatus*, *A. lateriflorus*), sedges (*Carex rostrata*, *C. stipata*), wild rye (*Elymus virginicus*), meadowsweet (*Filipendula ulmaria*), manna grass (*Glyceria grandis*), rushes (*Scirpus microcarpus*, *S. validus*, *Juncus balticus* var. *littoralis*, *J. canadensis*), dock (*Rumex mexicanus*), and goldenrods (*Solidago gigantea*, *Euthamia graminifolia*).

CONSERVATION CONCERNS AND RECOMMENDATIONS

Severe disturbance and alteration to Minnesota Point since the last century has all but eliminated the native vegetation communities of old growth white and red pine forests, beachgrass dune communities, and wetlands. The implementation of protection and restoration of all remnant native plant communities is urgently needed if they are to continue into succeeding generations.

Sand Dunes

Wind, waves and ice are constantly rearranging the sand of the dunes. Low moisture, poor fertility, scouring wind blown sand, high sunlight, and changing contours make the dunes particularly inhospitable to most native and nonnative plant species. *A. breviligulata* or beach grass, the most abundant species on the dunes, is able to survive these conditions with a deep and extensive system of rhizomes and roots, leathery leaves, and mycorrhizal fungi. The fragility of the dunes is evident almost everywhere on Minnesota Point. Damage from footpaths is very evident on the dunes and has created opportunities for wind to erode clear through the dunes to the bayside of Minnesota Point. Some of these blowouts are decades old and may be growing larger. Re-vegetation of blowouts is slower than would be expected under natural conditions because of constant traffic through them. New trails are also being forged and as the popularity of Minnesota Point increases so will damage to beach strand plant communities. Public education to increase awareness of the area's sensitivity is a preferable effort.

Old Growth Pine Forest

It is estimated that the pine forest first appeared on Minnesota Point about 800 years ago (Bernard and Davidson 1968-1969). The extent of the original pine forest on Minnesota Point has been greatly diminished by human encroachment into the forest and by elimination of the habitat. Protection of what remains is critical to the continued existence of old growth red pines and white pines on the Point. Threats to the pines include uncontrolled fires, vandalism to trees, mutilation and/or removal of trees, damage to soil by increased traffic, and invasion by exotic species. Non-native trees and shrubs should be eliminated soon before they become major species components in the forest. The least desirable non-native tree species are Scot's pine (*P. sylvestris*) and jack pine (*P. banksiana*) two conifers escaping from plantings at the south end of Minnesota Point. Jack pine is native to Minnesota but it is not native to Minnesota Point. Jack pine's adaptation to poor soils, propensity to burn easily, ability to rapidly colonize burned areas, and its quick life cycle could disrupt the red pine and white pine forest ecology.

Wetlands

All wetlands, whether adventive, created, or apparently natural are in need of protection. These wetlands provide habitat for permanent resident small mammals and possibly amphibians. Larger wetlands such as Southworth Marsh and the green ash stands have values to wildlife especially songbirds. Inappropriate use of Southworth Marsh as a yard waste dumpsite and for raising caged animals should not continue. Non-native plants, specifically purple loosestrife, yellow iris, and several species of garden escapes, should be removed from Minnesota Point's wetlands while their numbers are still low.

Rare species

Protection and sound management of the dunes and pine forest will ensure the continued existence of beach grass, beach heather, and hairgrass. Fire control, traffic control, and the elimination of non-native species are important to the integrity of these species, habitats. The survival of clustered bur-reed is dependent upon the survival of the single small wetland in which it grows. Presently, the wetland is secure but drifting sand from eroding trails could fill it. Changes in water levels might drown it out or leave it stranded.

All but a few of the rare species of *Botrychium* ferns are on highly disturbed or artificially created soils. Little is known why these small ferns prefer such meager sites as habitat. They are relatively abundant on Minnesota Point but no one particular site is safe from exploitation or destruction at this time. Population numbers for all species of *Botrychium* on Minnesota Point are low with one species, *B. rugulosum*, known from only a few plants at two colonies.

The *Botrychium* ferns are in need of special protection especially from persons wishing to collect specimens that pose as serious a threat as do off road vehicles and hikers. During the field trip with Dr. Wagner in June of 1998 a person from the group collected the only known plant of *Botrychium lanceolatum* var. *angustifolium* from Minnesota Point and has since kept it in their personal possession. This was in spite of my request that no specimens be taken. Furthermore, they have shared no information about the specimen. This sort of collecting is nothing more than trophy hunting. This reprehensible and completely irresponsible behavior was an intrusion into the proper functioning of this floristic survey. The interest people express in these ferns is potentially deleterious to the species' survival on Minnesota Point. I recommend that no locations of the *Botrychium* fern species be made available. Additionally, I suggest that the Mn-DNR agree that no collections will be permitted except as part of scientific study of the taxonomy, ecology and life history of the *Botrychium* species. Collection of *Botrychium* specimens for any reason should be severely restricted and should be limited to thoughtful scientific projects. Collecting for the frivolous purpose of adding another unusual plant to some herbarium's collection or to a collector's "life list" should be strongly discouraged.

If collecting continues on these dry, poor soils the populations could decline. Specimen collection, if unchecked, will affect the plants' ability to photosynthesize, produce spores, and recycle nutrients from senescing leaves. It is no different than caterpillars defoliating a tree year after year. The suggestion that *Botrychium* are using mycorrhizal fungi to acquire nutrients is an insufficient, and in my opinion, a self-serving justification for repeated collection of fronds from the same sites year after year. The evidence for a mycorrhizal association consists only of finding fungal stands with *Botrychium* fern roots. To my knowledge no one has shown that *Botrychium* ferns actually do use mycorrhizal fungi to acquire nutrients and no one has ventured to say which nutrients the plants may be getting. I know of no experiments into this, either. There is an implied assumption that the fungi are supplying carbon and this is then used to justify removing the photosynthetic organs of the fern. This implied assumption is based on an incomplete understanding of what occurs in most mycorrhizal associations. Typically, in most mycorrhizal associations the fungus exchanges nitrogen compounds and minerals it has acquired for sugar, a carbon compound, made by the plant's photosynthetic activity. Only secondarily non-photosynthetic plants acquire all of their carbon from fungal associations. It is possible that *Botrychium* gains some carbon from fungi if those fungi are decomposing woody material in the soil or are transferring it from other photosynthetic plants but this seems unlikely or is at most only a minor source. Leaves of *Botrychium* are large relative to the rhizome and dotted with many stomata. It seems more likely that normal photosynthesis rather than a fungus is the main source of carbon for *Botrychium*.

Non-native species

Several of the species discovered during this survey are non-natives either to Minnesota Point or North America. Species of particular concern are jack pine and Scot's pine. Jack pine is a short-lived plant often invading recently disturbed ground. Even though it is a short-lived plant (average life span is about 100 years) jack pine often is able to occupy and dominate poor soils for long periods of time. It does this by being able to survive devastating fires not as a living tree but through its remarkable fecundity and seed dispersal methods. Jack pine produces two types of cones on the same tree. One type of cone opens soon after the seeds mature while the other type, called serotinous, will open only after exposure to heat of a fire. Jack pine also begins producing cones at around 7 years of age while most other conifers are nearly 30 years of age by the time of first cone set. As long as fires are at

intervals longer than seven years jack pine can be successful in occupying a site. More frequent fires will kill any young jack pine trees before they can produce cones. Frequent fires will also eliminate other pines except for a few very old thick barked specimens. If jack pine becomes established on Minnesota Point this fire tolerant and fire dependent species will change the ecosystem of red and white pine.

Scot's pine is similar in appearance to jack pine but can actually live very well among native red and white pines. It could change the pine forest through replacement following death by old age or windthrow of native pines rather than death by fire followed by replacement. Scot's pine is a species that can live for hundreds of years like red and white pine and thus could become permanent part of the pine forest canopy. The effects of this species on the ecology of the pine forest are unknown. It would seem though that its needles which are similar to jack pine's could change the soil's fertility and moisture retention ability from that now in place under the red and white pines. In any case, if Scot's pine does naturalize the old growth red pine/white pine forest will no longer exist. What will exist is a pine forest only. The potential negative effects of Scot's pine and jack pine on the remaining old growth red and white pine forest warrant their complete removal from Minnesota Point. Two other conifers, European larch and Norway spruce, should also be removed before they become naturalized.

Other non-natives discovered include shrubs and herbaceous species. Any non-native species that could potentially takeover large areas and exclude common and rare native species should not be allowed to persist. Among these are lilac, honeysuckle, spurge, the two species of viburnum, purple loosestrife, lily-of-the-valley, and buckthorn. Currently these species are present as a few plants or patches and could be easily removed. Buckthorn and lily-of-the-valley pose the greatest threat to the forest and shrub covertypes as both reproduce well under shade. Lily-of-the-valley is found in at least two places: one population is in the pine forest and the other near a patch of hairgrass. So far there is only one buckthorn bush but it is large and the number of seedlings, if any, is not known.

FUTURE STUDIES

Paleo-ecology of Minnesota Point

Minnesota Point probably had an exposed surface suitable for permanent plant colonization about 500 years ago but it is uncertain when pines first appeared (Davidson and Bernard 1968-1969). One possible way to resolve this question would be to analyze peat samples from the four remaining natural wetlands on Minnesota Point. Cores of peat could be collected and examined for pine pollen and pine sub-fossil materials such as cones, needles, and wood. These cores could be dated using C-14 and analyzed for charcoal and wood ash to determine the historical fire regimen on Minnesota Point. Soil cores from the pine forest and elsewhere on Minnesota Point could also be collected and analyzed similarly.

Rare *Botrychium* ferns

As stated above the ecology and life history of these peculiar ferns is in need of further study. Other studies should focus on the taxonomy of the species. There is a chance that some hybrids are allopolyploids and thus new species possibly endemic to Minnesota Point. Other species reported are of uncertain classification. These include specimens identified as *B. pseudopinnatum*, *B. matricariifolium*, *B. michiganense*, *B. spathulatum*, and *B. minganense*. A serious taxonomic study of the species found here is recommended.

A CHECKLIST OF THE VASCULAR FLORA OF MINNESOTA POINT

Taxonomic nomenclature generally follows Gleason & Cronquist (1991). Plants are broken into three major groups: ferns and fern allies, gymnosperms, and angiosperms. The angiosperms are divided into the subclasses monocots and dicots. Arrangement of families, genera, and species is in alphabetical order, rather than taxonomic, for convenience. Synonyms for some species are given if the names have been recently changed. For ferns and fern allies these synonomies follow Vol. 2 of the flora of North America (1993). For all others synonomy is after that given in Gleason & Cronquist (1991). Common names are given if these exist. A checklist of all known rare plant species found on Minnesota Point with descriptions of habitat, associated species, population size, phenology will be presented separately.

Codes for habitats are:

BG- beachgrass zone	OP- open pine/shrub thicket	PS- poplar stands	OW- other wetlands
JL- juniper/lichen zone	JS- jack/Scot pine	GS- green ash stand	SB- spoil barrens
WR- white-red pine forest	DA- disturbed area	PG- park grounds	BS- bayshore
		SM- Southworth Marsh	

FERNS and FERN ALLIES

TAXON	HABITAT CODE
Dryopteridaceae – Wood Fern Family	
Athyrium felix-femina (L.) Mertens	
var. *angustum* (Willd.) Lawson - northern lady fern	GS
Dryopteris carthusiana (Villars) H. P. Fuchs - toothed wood fern	WR, GS, OW
D. cristata (L.) A. Gray - crested wood fern	OW
Matteuccia struthiopteris (L.) Todaro	
var. *pensylvanica* (willd.) Morton - ostrich fern	GS, WR (in low areas)
Onoclea sensibilis L. - sensitive fern	WR (in low areas)
Equisetaceae - Horsetail Family	
Equisetum arvense L. - field horsetail	BG, JL, WR, OP, DA, GS, SM, SB, BS
E. fluviatile L. - waterpipes	SM
E. hyemale L. var. *affine* (Engelm.)	
Calder & Roy - scouring rush	BG, JL, WR, OP, DA, PS, BS
E. palustre L. - marsh horsetail	SM
E. sylvaticum L. - woodland horsetail	WR, GS, SM
Lycopodiaceae - Clubmoss Family	
Diphasiastrum complanatum (L.) Holub	
(syn. *Lycopodium complanatum* L.) - northern groundcedar	WR
Diphasiastrum digitatum (Dillenius ex A. Br.) Holub	
(syn. *Lycopodium digitatum* Dillenius ex A. Br.) - fan-leaf groundcedar	JS
Huperzia lucidula (Michx.) Trev.	
(syn. *Lycopodium lucidulum* Michx.) - shining clubmoss	WR,
Lycopodium annotinum L. - bristly clubmoss	WR
L. dendroideum Michx. - princess pine	WR

TAXON	HABITAT CODE
L. lagopus (Laest. ex C. Hart.) G. Zinserling ex Kuzeneva-Prochovora (syn. *Lycopodium clavatum* L. var. *monostachyon* Fernald & Bissel) - one-cone clubmoss	WR
Ophioglossaceae - Adder's Tongue Fern and Grapefern Family	
Botrychium acuminatum W. H. Wagner, Jr. - pointed moonwort	OP, DA, SB
B. dissectum Sprengel forma *dissectum* - dissected-leaved grapefern	WR, SB, GS
B. dissectum Sprengel forma *obliquum* (Muhl. ex Willd.) Fern. - oblique-leaved grapefern	WR, SB
B. lanceolatum (Gmelin) Angström subsp. *angustisegmentum* (Pease & Moore) Clausen - narrow triangle moonwort	OP
B. matricariifolium (Döll) A. Braun ex WDJ Koch - daisy-leaf moonwort	WR, OP, DA, SB
B. michiganense W. H. Wagner, Jr. - Michigan moonwort	DA, SB
B. minganense Victorin - Mingan moonwort	WR
B. multifidum (Gmelin) Ruprecht - leather grapefern	WR, OP, JS, SB
B. pallidum W. H. Wagner, Jr. - pale moonwort	WR, OP, PS
B. pseudopinnatum W. H. Wagner, Jr. - false northwestern moonwort	OP, DA, SB
B. rugulosum W. H. Wagner, Jr. - St. Lawrence grapefern	WR, GS
B. simplex E. Hitchcock - least moonwort	SB
B. spathulatum W. H. Wagner, Jr. - spatulate moonwort	OP
B. virginianum (L.) Swartz - rattlesnake fern	GS
Botrychium Swartz subgenus *Botrychium* - unidentified moonworts (hybrids?)	WR, OP, SB

GYMNOSPERMS (CONIFERS)

TAXON	HABITAT CODE
Pinaceae - Pine Family	
Abies balsamea (L.) Miller - balsam fir	SM
Larix decidua Miller - European larch*	BG, WR
L. laricina (Duroi) K. Koch - tamarack	PG
Picea abies L. - Norway spruce*	WR
P. glauca (Moench) Voss - white spruce	SM
Pinus banksiana Lambert - jack pine	OP, JS, SB
P. mugo Turra - Mugho pine	PG
P. resinosa Aiton - red pine	JL, WR, OP, PS, PG
P. strobus L. - white pine	JL, WR, OP, DA, PS, PG
P. sylvestris L. - Scot's pine*	JL, WR, OP, PG, SB
Cupressaceae - Cedar Family	
Juniperus communis L. var. *depressa* Pursh - common juniper	JL, WR, OP, DA, SB
Thuja occidentalis L. - northern white cedar	OP
T. occidentalis L. "Techny" - cultivar of northern white cedar*	PG

ANGIOSPERMS (MONOCOTS)

TAXON	HABITAT CODE
Acoraceae (formerly in Araceae) - Sweetflag Family	
Acorus calamus L. - sweetflag	SM, OW
Alismaceae - Water-plantain Family	
Alisma subcordatum Raf. - water-plantain	BS
Sagittaria latifolia Willd. - duck potato	BS
Araceae - Arum Family	
Calla palustris L. - water-calla	OW
Cyperaceae - Sedge Family	
Carex aquatilis Wahlenb. - sedge	SM
C. bebbii (L. Bailey) Fern.- sedge	OW
C. brunnescens (Pers.) Poir. - sedge	SM
C. buxbaumii Wahlenb.- sedge	SM
C. crawfordii Fern. - sedge	OW
C. cristatella Britton - sedge	OW
C. diandra Schrank - sedge	SM
C. echinita Murray (syn. *C. cephalantha* (L. Bailey) Bickn.) - star sedge	SM
C. gracillima Schwein. - sedge	WR
C. hystericina Muhl. ex Willd. - sedge	SM

TAXON	HABITAT CODE
C. intumescens Rudge. - bladder sedge	SW
C. lacustris Willd. - sedge	SM
C. lasiocarpa Ehrh. var. *americana* Fern. (syn. *C. lanuginosa*-) - wirey sedge	SM
C. leptalea Wahlenb. - sedge	SM
C. pensylvanica Lam. - sedge	OP
C. projecta Mackenzie - sedge	OW
C. retrorsa Schwein. - sedge	OW
C. rostrata Stokes - sedge	SM, BS
C. scoparia Schk. ex Willd. - sedge	SM
C. stipata Muhl. ex Willd. - sedge	SM
C. stricta Lam. - sedge	OW, BS
C. tenera Dewey - sedge	SM
C. umbellata Schk. ex Willd. (syn. *C. tonsa* (Fern.) Bickn. in part) - sedge	BG, JL, OP, DA, SB
Cyperus schweinitzii Torr. - umbrella sedge	BG, JL, OP, DA, SB
Eleocharis erythropoda Steud. (syn. *E. calva* Torr.) - red-stemmed spikerush	OW
E. palustris (L.) R & S (syn. *E. smallii* Britt.) - spikerush	OW
Scirpus atrocinctus Fern. - blackrush	OW
S. atrovirens Willd. - greenrush	OW
S. cyperinus (L.) Kunth - woolrush	SM
S. microcarpus Presl (syn. *S. rubrotinctus* Fern.) - redrush	OW, BS
S. validus Vahl. - soft-stemmed bullrush	BS
Hydrocharitaceae - Frogbit Family	
Elodea canadensis Michx. - waterweed	BS
Vallisneria americana Michx. - water celery	BS
Iridaceae - Iris Family	
Iris pseudoacorus L. - yellow iris or yellow flag*	SM, BS
I. versicolor L. - blue flag or wild iris	SM, OW, BS
Juncaceae - Soft-rush Family	
Juncus alpinoarticulatus Chaix in Villars (syn. *J. alpinus* Villars) - soft-rush	OW
J. articulatus L. - soft-rush	OW
J. balticus Willd. var. *littoralis* Engelm. - shore-rush	SM, BS
J. brevicaudatus (Engelm.) Fern. - tailed-rush	OW
J. canadensis J. Gray - soft-rush	BS
J. tenuis Willd. - path-rush	WR

TAXON	HABITAT CODE
Lemanceae - Duckweed Family	
Lemna minor L. - common duckweed	BS
Liliaceae - Lily Family	
Asparagus officinalis L. - asparagus*	JL, DA
Clintonia borealis (Ait.) Raf. - bluebead lily	WR,
Convallaria majalis L. - lily-of-the-valley*	WR, OP
Maianthemum canadensis Desf. - Canada Mayflower	WR, OP, GS
Smilacina stellata (L.) Desf. - false Solomon's seal	BG, JL, OP, DA
Orchidaceae - Orchid Family	
Corallorhiza trifida Chat. - early coral root	SM
Platanthera hyperborea (L.) Lindl. - northern rein orchid	SM
Poaceae (syn. Graminae) - Grass Family	
Agrostis stolonifera L. var. *major* (Gaud.) Farw. - redtop*	SM
A. hyemalis (Walt.) BSP - ticklegrass	PG
A. scabra Willd. - ticklegrass	PG
Ammophila breviligulata Fern. - beachgrass	BG, JL, OP, DA, SB
Aristida basiramea Engelm. var. *basiramea* - three-awned grass*	DA
Avena sativa L. - cultivated oats*	BS
Bromus ciliatus L. - fringed brome	WR
B. inermis Leyss. - Hungarian brome*	DA
Calamagrostis canadensis (Michx.) Nutt. - Canada bluejoint grass	WR, OP, PS, GS, SM, OW
Cenchrus longispinus (Hackel) Fern. - sandbur	DA
Danthonia spicata (L.) Beauv. - poverty oats	OP, SB
Deschampsia flexuosa (L.) Trin. - crinkled hairgrass	JL, WR, OP
Digitaria ischaemum (Schreb.) Mulh. - crabgrass*	DA
Elymus canadensis L. - wild rye	BG, JL, OP, DA, SB
E. trachycaulon (syn. *Agropyron trachycaulum* (Link) Malte) - slender wheatgrass	BG, JL, DA, SB
E. virginicus - wild rye	BS
Elytrigia repens (L.) Nevski (syn. *Agropyron repens* (L.) Beauv.) - quack grass*	BG, JL, OP, DA, SB
Eragrostis cilianensis (All.) Lutati ex Hubbard - stinkgrass*	DA
E. pectinacea (Michx.) - lovegrass*	DA
Festuca ovina L. - sheep fescue*	WR, OP,
Glyceria canadensis (Michx.) Trin. - rattlesnake manna grass	OW
G. grandis S. Wats. - tall manna grass	OW, BS
Hordeum jubatum L. - foxtail barely	BS
Oryzopsis asperfolia Michx. - rough leaved rice grass	WR
O. pungens (Spreng.) Hitchc. - mountain rice grass	JL
Panicum capillare L. - witch grass	DA
P. lanuginosum Ell. var. *fasciculatum* (Torr.) Fern. - panic grass	JL, OP, DA, SB
Phalaris arundinacea L. - reed canary grass*	SW, BS
Phleum pratense L. - timothy grass*	DA

TAXON	HABITAT CODE
Phragmites australis (Cav.) Steud. (syn. *Phragmites communis* Trin.) - common reed grass	BS
Poa annua - bluegrass	WR
P. compressa L. - Canada bluegrass	WR, OP, DA, SB
P. palustris L. - fowl meadow-grass	OW
P. pratensis L. - Kentucky bluegrass	DA
Schizachne purpurascens (Torr.) Swallen - false melic grass	WR
Spartina pectinata Link - cord-grass	BS
Setaria viridis (L.) Beauv. var. *viridis* - green foxtail	DA
Sporobolus cryptandrus (Torr.) Gray - dropseed	BG, JL, DA, SB
S. vaginiflorus (Torr.) Wood var. *vaginiflorus* - sheathed dropseed	DA
Potamogetonaceae - Pondweed Family	
Potamogeton robbinsii Oakes - pondweed	BS
Sparganiaceae - Bur-reed Family	
Sparganium eurycarpum Engelm. - giant bur-reed	BS
S. glomeratum Laest. - clustered bur-reed	OW
Typhaceae - Cattail Family	
Typha latifolia L. - cattail	SM, OW, BS

ANGIOSPERMS (DICOTS)

TAXON	HABITAT CODE
Aceraceae - Maple Family	
Acer ginnala Maxim. - Amur maple	PG
A. negundo L. - boxelder maple	WR, PG
A. rubrum L. - red maple	WR
A. saccharinum L. - silver maple	BS
A. spicatum Lam. - mountain maple	WR
Amaranthaceae - Amaranth Family	
Amaranthus alba - tumbleweed	DA
Anacardiaceae - Cashew Family	
Toxicodendron rydbergii (Small) Greene - poison ivy	BG, WR, OP, PS, DA, SB
Rhus typhina L. - staghorn sumac	OP
Apiaceae - Carrot Family	
Heracleum lantanum Michx. - Hercule's club	GS
Sium suave Walt. - water parsnip	BS
Apocynaceae - Dogbane Family	
Apocynum androsaemifolium L. - dogbane	SB
A. sibiricum Jacq. - clasping-leaved dogbane	SB

TAXON	HABITAT CODE
Araliaceae - Aralia Family	
Aralia nudicaulis L. - wild sarsaparilla	WR
Asclepiadaceae - Milkweed Family	
Asclepias speciosa Torr. - milkweed	BS
A. syriaca L. - common milkweed	OP, DA
Asteraceae (syn. Compositae) - Sunflower Family	
Achillea millifolium L. - common yarrow	PS, DA
Ambrosia artemisiifolia L. - common ragweed	DA
A. coronopilfolia T & G - western ragweed	DA
Anaphalis margaritacea (L.) Clarke - pearly everlasting	PS
Antennaria neglecta Greene var. *neglecta* - pussytoes	SB
A. neglecta Greene var. *neodioica* (Greene) Cronquist - pussytoes	SB
Anthemis arvensis L. - corn chamomile	BS
Arctium minus Schk. - burdock	GS
Artemisia absinthe L. - bitter wormwood	OP
A. campestris L. subsp. c*audata* (Michx.) Hall & Clem. (syn. *A. caudata* Michx.) - wormwood	BG, JL, OP, DA, SB
A. serrata Nutt. - wormwood	BS
Aster brachyactis Blake - western annual aster	BS
A. ciliolatus Lindley - fringed aster	DA
A. lanceolatus Willd. (syn. *A. simplex* Willd. var. *interior* (Wieg.) Jones - panicled aster	BS
A. lateriflorus (L.) Britton - calico aster	BS
A. macrophyllus L. - big-leaf aster	WR
A. umbellatus Miller - flat-topped aster	OW
Bidens cernua L. - nodding bur marigold	BS
B. discoidea (T & G) Britt. - few-bracted beggar's ticks	BS
B. frondosa L. - Devil's beggar's ticks	BS
Chrysanthemum leucanthemum L. - ox-eye daisy	DA
Cirsium arvense (L.) Scop. - Canada thistle	PS, GS
C. vulgare (Savi) Tenore - bull thistle	BS
Conyza canadensis (L.) Cronq. - horseweed	SB
Crepis tectorum L. - hawk's beard	DA, SB
Erigeron glabellus Nutt. - fleabane	SB
E. strigosus Muhl. - daisy fleabane	BS
Eupatorium purpureum L. - Joe-Pye Weed	
Euthamia graminifolia (L.) Nutt. (syn. *Solidago graminifolia* (L.) Salisb.) - grass-leaved goldenrod	BS
Gnaphalium obtusifolium L. - fragrant cudweed	SB
Helianthus annuus L. - common sunflower	BS
H. petiolaris Nutt. - sunflower	OP, DA
Hieracium aurantiacum L. - red king-devil	OP, DA
H. kalmii L. (syn. *H. canadense*) - Canada hawkweed	WR
H. piloselloides Villars - yellow king-devil	DA

TAXON	HABITAT CODE
Lactuca puchella (Pursh) DC - blue lettuce	PS
Matricaria matricarioides (Less.) Porter - pineapple-weed	PG
Petasites sagittatus (Banks ex Pursh) Gray - arrowhead sweet coltsfoot	SM
Prenanthes alba L. - white lettuce	WR, PS, GA
Senecio viscosus L. - sticky groundsel	BS
S. vulgaris L. - common groundsel	BS
Solidago canadense L. - goldenrod	DA
S. gigantea Ait - goldenrod	PS, BS
S. nemoralis Ait. - goldenrod	JL, WR, OP
Sonchus asper (L.) Hill - spiny sowthistle	PG
S. uliginosus Bieb. - smooth sowthistle	PG
Tanacetum vulgare L - common tansy	DA, SM
Taraxicum officianale Wiggers - dandelion	SM, DA
Tragopogon pratense L. - goat's beard	OP, DA, SB
Xanthium strumarium L. var. *canadense* (Mill.) T & G - cocklebur	DA
Balsamaceae - Balsam Family	
Impatiens capensis Nutt. - pale touch-me-not	WR (in low area), SM, OW
Betulaceae - Birch Family	
Alnus incana (L.) Moench ssp. *rugosa* (Du Roi) Clausen - tag alder	PS, SM, OW, BS
Betula alba L. - European white birch	PG
B. alleghaniensis Britt. - yellow birch	WR
B. papyrifera Marsh. - paper birch	WR, OP
Corylus cornuta Marsh. - beaked hazelnut	WR, OP
Brassicaceae (Cruciferae) - Mustard Family	
Arabis drummondii A. Gray - rock-cress	DA
Berteroa incana (L.) DC - hoary alyssum	DA
Capsella bursa-pastoris (L.) Medic. - shepherd's purse	DA
Rorippa palustris (L.) Besser. - cress	BS
Thlaspi arvense L. - penny cress	DA
Callitrichaceae - Starwort Family	
Callitriche verna L. - starwort	BS
Campanulaceae - Bluebell Family	
Campanula aparinoides Pursh (syn. *Campanula uliginosa* Rydb.) - eastern marsh bellflower	SM
C. rotundifolia L.- harebell	WR
Canabinaceae (syn. Moraceae) - Hemp Family	
Humulus lupulus L. - hops	WR
Caprifoliaceae - Honeysuckle Family	
Diervilla lonicera Mill. - yellow honeysuckle	WR

TAXON	HABITAT CODE
Linnaea borealis L. - twinflower	WR
Lonicera canadensis Marsh. - mountain honeysuckle	WR
L. dioica L. - wild honeysuckle vine	WR
L. tatarica L. - Tatarian honeysuckle	WR, OP, PS
Sambucus pubens Mixhx. - red elderberry	WR, PS
Viburnum lantana L. - wayfaring tree	WR
V. opulus L. var. *americanum* Ait. (syn. *Viburnum trilobum* Marsh.) - highbush cranberry	WR
V. opulus L. var. *opulus* - Geulder rose	WR
Caryophylaceae - Pink Family	
Gypsophila paniculata L. - baby's breath	BG, JL
Saponaria officinalis L. - soapwort, bouncing bette	OP, BS
Silene cserei Baumg. - catchfly	DA
S. latifolia Poire (syn. *Lychnis alba* Miller) - white campion	DA, BS
Stellaria longifolia Muhl. ex Willd. - chickweed	SM
S. media (L.) Vill. - chickweed	BS
Chenopodiaceae - Goosefoot Family	
Chenopodium album L. - pigweed	DA, BS
Coriospermum hyssopifolium L. - bugseed	DA
C. nitidum Kit. ex Schultes - shining bugseed	DA
Cycloloma atriplicifolium (Spreng.) Coult. - winged pigweed	DA
Salsola iberica Sennen & Pau (syn. *Salsola kali* L. var. *tenufolia* Meyer) - saltwort	DA
Sueda calceoliformis (Hook.) Moq. (syn. misapplied *Sueda depressa* (Pursh) S. Wats.) - sea-blite	DA, BS
Cistaceae - Rock-rose Family	
Hudsonia tomentosa Nutt. - beach heather	JL, OP, DA, SB
Leechia stricta Leggett - pinweed	SB
Clusiaceae (syn. Hypericaceae) - St. John's-wort Family	
Triadenum fraserii (Spach) Gleason - marsh St. John's-wort	OW
Convovulaceae - Morning Glory Family	
Convovulus arvensis L. - field morning glory	PS
Cornaceae - Dogwood Family	
Cornus canadensis L. - bunchberry	WR
C. rugosa Lam. - round-leaved dogwood	WR
C. sericea Michx. - red osier dogwood	WR, PS, BS
Ericaceae - Heath Family	
Arctostaphylos uva-ursi L. - bearberry	JL, WR, OP, DA, SB
Chamaedaphne calyculata (L.) Moench - leatherleaf	OW

TAXON	HABITAT CODE
Gaultheria procumbens L. - wintergreen	WR
Vaccinium angustifolium Ait. - lowbush blueberry	JL, WR, OP, SB
V. myrtilloides Michx. - velvet-leaf blueberry	JL, WR, OP, SB
Euphorbiaceae - Spurge Family	
Euphorbia glyptosperma Engelm. - spurge	DA
E. maculata L. - spotted spurge	DA
Fabaceae (syn. Leguminosae) – Pulse or Bean Family	
Astragalus canadensis L. - Canada milkvetch	SB
Caragana arborescens Lam. - Siberian peabush	PG
Glycyrrhiza lepidota Pursh - wild licorice	SB
Lathyrus maritimus (L.) Bigelow - beach pea	BG, JL, OP, DA, SB
Lotus corniculatus L. - trefoil clover	PG
Medigo sativa L. - alfalfa	PG
Meliotus alba Medic. - white sweet clover	DA, SB
M. officianalis (L.) Pallas - yellow sweet clover	DA, SB
Trifolium arvense L. - rabbitfoot clover	DA
T. campestre Schreber in Sturm - hop clover	
T. hybridum L. - pink alsike	DA
T. pratense L. - red clover	DA
T. repens L. - white clover	DA, PG
Gentianaceae - Gentian Family	
Gentiana andrewsii Griseb. - bottle-gentian	BS
Halenia deflexa Smith (Griseb.) - spurred-gentian	WR
Grossulariaceae - Gooseberry Family	
Ribes americanum Miller - eastern black currant	SM
R. cynosbati L. - dogberry	OP
R. glandulosum Grauer. - skunk currant	GS
R. hirtellum Michx. - northern gooseberry	GS
R. oxycanthoides L. - northern gooseberry	OP
R. triste Pallas - swamp red currant	GS
Lamiaceaea (syn. Labitae) - Mint Family	
Galeopsis tetrahit L. - hemp-nettle	PG
Lycopus americanus Muhl. - water horehound	BS
L. asper Greene - water horehound	PG, BS
L. uniflorus Michx. - water horehound	BS
Mentha arvense L. - field mint	SM, PG, BS
Scutellaria galericulata L. - common skullcap	OW
S. lateriflora L. - mad-dogskullcap	OW
Stachys palustris L - woundwort	BS

TAXON	HABITAT CODE
Lentibulariaceae - Bladderwort Family	
Utricularia minor L. - small bladderwort	OW
Lythraceae - Loosestrife Family	
Lythrum salicaria L. - purple loosestrife	SM, BS
Mollugonaceae (syn. Aizoaceae) - Carpetweed Family	
Mollugo verticillata L. - carpetweed	DA, BS
Myricaceae - Sweet Gale Family	
Myrica gale L. - sweet gale	SM, BS
Nyctaginaceae - 4 o'clocks Family	
Mirabilis hirsuta (Pursh) MacM. - umbrella-wort	OP
Oleaceae - Olive Family	
Fraxinus pennsylvanica Marsh. - green ash	WR, PS, GS, BS
Syringa vulgaris L. - common lilac	WR, OP, DA
Onagraceae - Evening Primrose Family	
Epilobium angustifolium L. - fireweed	WR, PS, SM
E. ciliatum Raf. - willowherb	SM
E. coloratum Biehler - willowherb	OW, PG
E. leptophyllum Raf. - willowherb	OW
E. strictum Muhl. - willowherb	OW
Oenothera biennis L. - evening primrose	BG, JL, DA
Plantaginaceae - Plantain Family	
Plantago major L. - common plantain	PG
P. patagonica Jacq. - wooly plantain	DA
Polygonaceae - Buckwheat Family	
Polygonella articullata (L.) Meissner - jointweed	JL, OP, DA
Polygonum aviculare L. - knotweed	DA, BS
P. cilinoide Michx. - bindweed	WR
P. convovulus L. - black bindweed	BS
P. hydropiperoides Michx. - water pepper	SM, OW, BS
P. pensylvanicum L. var. *laevigatum* Fern. – pinkweed	OW
P. punctaum Ell. - water smartweed	OW
P. sagittatum L. - arrowleaved tear-thumb	SM
Rumex acetosella L. - sheep sorrel	WR, DA
R. crispus L. - yellow dock	PG
R. mexicanus Meisn. - willow-leaved dock	BS
R. orbiculatus Gray - water-dock	SM

TAXON	HABITAT CODE
Primulaceae - Primrose Family	
Lysimachia ciliata L. - fringed loosestrife	SM
L. terrestris (L.) BSP. - yellow loosestrife	OW
L. thyrsiflora L. - swamp candles	OW
Trientalis borealis Raf. - starflower	WR
Pyrolaceae - Wintergreen Family	
Monotropa uniflora L. - ghost pipes	WR
Pyrola asarifolia Michx. - pink-flowered pyrola	WR, JS, PS
P. elliptica Nutt. - shinleaf	WR, PS, GS, SM
Orthila secunda (L.) House (syn. *Pyrola secunda* L.) - one-sided shinleaf	WR
Ranunculaceae - Buttercup Family	
Actaea rubra (Ait.) Willd. - red baneberry	WR
Anemone cylindrica A. Gray - thimbleflower	SB
A. quinquefolia L. - wood anemone	WR, OP
Caltha palustris L. - marsh marigold	SM
Coptis groenlandica (Oeder) Fern. - goldthread	WR
Ranunculus acris L. - buttercup	PG
R. pensylvanicus L. - swamp buttercup	SM
Thalictrum dasycarpum Fisch. & Lall. - tall meadowrue	BS
T. venulosum Trel. - veiny meadowrue	WR
Rhamnaceae - Buckthorn Family	
Rhamnus cathartica L. - common buckthorn	OP
Rosaceae - Rose Family	
Amelanchier arborea (Michx. f.) Fern. - downy serviceberry	OP
A. bartramiana (Tausch) Roemer. - mountain serviceberry	OP
A. intermedia Spach. - serviceberry	PS
A. laevis Wieg. - smooth serviceberry	WR
A. sanguinea (Pursh) DC - New England serviceberry	OP
A. spicata (Lam.) K. Koch - dwarf serviceberry	WR
A. wiegandii Nielssen - serviceberry	OP
Crataegus chrysocarpa Ashe - fireberry hawthorne	WR, BS
Fragaria virginiana Duchesne - strawberry	WR, OP, PS, SB
Filipendula ulmaria (L.) Maxim. - queen-of-the-meadow	BS
Geum aleppicum Jacq. - yellow avens	WR
G. macrophyllum Murr. - geum	WR
Potentilla argentea L. - silver cinquefoil	PG
P. norvegica L. - rough cinquefoil	SM, OW
P. palustris (L.) Scop. - swamp cinquefoil	OW
P. tridentata L. - three-leaved cinquefoil	JL, WR, SB
Prunus pensylvanica L. f. - pincherry	JL, WR, OP, DA
P. pumila L. - sand cherry	JL, WR, OP, DA, SB

TAXON	HABITAT CODE
P. virginiana L. - chokecherry	WR, OP, DA
Pyrus baccata L. (syn. *Malus baccata*) - Siberian crabapple	WR, DA
Pyrus L. (syn. *Malus* L.) hybrid - crabapple hybrid cultivar	PG
Rosa acicularis Lindl. - spiny rose	WR, OP, PS
R. arkansana Porter - rose	DA
R. blanda Ait. - smooth rose	WR, PS
R. rugosa Thunb. - Japanese rose	BS
Rubus pubescens Raf. - dewberry	WR
R. strigosus Michx. - red raspberry	WR, OP, PS, SM
Sorbaria sorbifolia (L.) A. Br. - false spiraea	SM
Sorbus aucuparia L. - rowan tree	WR
S. decora (Sarg.) Schneider - showy mountain ash	OP
Spiraea alba Du Roi - meadowsweet	OW
Rubiaceae - Madder Family	
Galium asprellum Michx. - rough bedstraw	WR
G. boreale L.- northern bedstraw	JS
G. tinctorum L. - bedstraw	OW
G. trifidum L. - bedstraw	WR
G. triflorum Michx. - sweet-scented bedstraw	WR, SM
Salicaceae - Willow Family	
Populus balsamifera L. - balsam poplar	WR, DA, PS, SM, SB
P. deltoides Marsh. - cottonwood	DA
P. tremuloides Michx. - quaking aspen	WR, PS, SM
Salix alba L. - white willow	SM
S. bebbiana Sarg. - Bebb's willow	SM
S. discolor Muhl. - pussy willow	SM, OW
S. eriocephala Michx. - heart-leaf willow	BS
S. exigua Nutt. (syn. *S. interior* Rowlee) - sandbar willow	PS, OP, SM, BS
S. fragilis L. - crack willow	GS, SM
S. lucida Muhl. - shining willow	SM, BS
S. myricoides (Muhl.) J. Carey - blue willow	BS
S. nigra Marsh. - black willow	BS
S. petiolaris Smith (syn. *S. gracilis* Anderss.) - narrow-leaved willow	SM
S. planifolia Pursh - tea-leaved willow	SM
S. pyrifolia Anderss. - balsam willow	SM
Salix L. hybrid - hybrid willow cultivar	PG
Santalaceae - Sandalwood Family	
Commandra umbellata (L.) Nutt. - bastard-toadflax	WR, OP
Saxifragaceae - Saxifrage Family	
Saxifraga pensylvanica L. - swamp-saxifrage	SM

TAXON	HABITAT CODE
Scrophulariaceae - Figwort Family	
Linnaria vulgaris Hill - butter-and-eggs	WR, DA
Melampyrum lineare Desr. - cow-wheat	WR, JS
Scrophularia lanceolata Pursh - figwort	WR, DA
Veronica scutellata L. - marsh-veronica	OW
Solanaceae - Potato Family	
Solanum dulcamara L. - bittersweet nightshade	BS
Ulmaceae - Elm Family	
Ulmus americana L. - American elm	PG
Urticaceae - Nettle Family	
Urtica dioica L. - stinging nettle	WR
Violaceae - Violet Family	
Viola adunca Smith - dog violet	WR
V. cucullata Ait. - blue marsh violet	GS
V. incognita Brainerd - bigleaf white violet	WR, OW
V. pallens (Banks) Brainerd (syn. *V. macloskeyi* Lloyd subsp. *pallens* (Banks) Baker) - pale violet	WR
V. renifolia Gray - kidney-leaf violet	WR
Vitaceae - Grape Family	
Parthenocissus vitacea (Knerr) Hitchc. (syn. *Parthenocissus inserta* (Kerner) Fretsch) - Virginia creeper	SM, OW

Lichen List

Cladonia (subgenus *Cladina*)
C. alpestris(L.) Rabenh.
*C.*m*arbuscula* (Wallr.) Rabenh.
C. mitis Sandst.
C. rangifera (L.) Wigg.

Cladonia (subgenus *Cladonia*)
C. botrytes (Hag.) Willd.
C. cariosa (Ach.) Spreng.
C. cristatella Tuck.
C. decorticata (Flk.) Spreng.
C. gracilis (L.) Willd.
C. multiformis Merr.
C. nemoxyna (Ach.) Nyl.
C. phyllopora (Ehrh.) Hoffm.
C. pyxidata (L.) Hoffm.
C. uncialis(L.) Wigg.
C. verticillata (Hoffm.) Schaer.

Other lichens
Peltigera canina (L.) Willd.
Peltigera spuria (Ach.) DC.
Stereocaulon tomentosum Fr.

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