



Mi'kmaq Ecological Knowledge  
Distribution of  
Culturally Significant Plants

**Unama'ki Institute  
of Natural Resources**



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## Mi'kmaq Ecological Knowledge Distribution of Culturally Significant Plants

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Prepared by Membertou Geomatics Solutions

Mi'kmaq plant names translated by Tuma Young

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## Introduction

Parks Canada, Cape Breton Highlands National Park (CBHNP) has been a UINR partner since the late 1990s on Northern Cape Breton habitat management issues and has provided support for conservation of the cultural and ecological heritage of Northern Cape Breton.

As early as 2001, Unama'ki Institute of Natural Resources (UINR), and then StoraEnso and now NewPage Port Hawkesbury, have an agreement that has provisions for cooperating to identify and conserve rare or valuable plants of cultural significance to Mi'kmaq.

In 2008, UINR partnered with Membertou Geomatics Consultants (MGC), now known as Membertou Geomatics Solutions (MGS), to access Geographic Information System (GIS) capacity to create a GIS database for management and sharing of existing and new resource management data.

The project partners came together on this project for the purpose of understanding the distribution and abundance of plant species of cultural significance to the Mi'kmaq of Unama'ki. Earlier phase activities included interviews with knowledgeable Mi'kmaq Elders to determine priority plant species and where the significant species could be found. Botanical source literature was also reviewed for distribution, conservation status, and habitat requirements. The resulting data was mapped and included in the GIS database to be utilized for following phases of fieldwork, and ground-truthing the GIS database for further use as a resource management and conservation tool.

The GIS database and resultant mapping is intended to document known plant occurrences as well as predict potential occurrences by location and habitat requirements. Priority is given to potential occurrences on lands managed by Unama'ki Mi'kmaq, NewPage Port Hawkesbury, and Parks Canada. It was later determined that mapping all of Cape Breton for each identified plant's habitat requirements was just as efficient, if not more efficient, than mapping the project partners' management areas only.

## Methodology

The activities covered in this phase of the study of Mi'kmaq culturally significant plants are divided into three groups of Research, Mapping, and Ground Truths.

Research involved determining the habitat requirements of each plant and populating the columns and rows of habitat matrix tables. The habitat matrix tables were then referenced to produce mapping of all habitat-supporting areas for each of the research plants. The habitat-supporting mapping was then taken in the field to locate or ground truth selected plants species.

Earlier phases of this project identified 65 plant species that were of cultural importance to Mi'kmaq. The list of culturally important plant species was further classified by priority, based on susceptibility to potential impacts of forestry operations resulting in 10 High Priority plant species, 5 Medium Priority, and 50 of Lower Priority. For practical reasons of budget and time constraints, the concentration of effort was given to the High and Medium Priority plant species. The Lower Priority plants are sufficiently represented in the project research and resulting materials, regardless that the 50 plants were not priority in the fieldwork portion of the project.

The project research consisted of identifying habitat requirements for each plant with respect to soil drainage, sun light, topography, and species-favoured habitat type. Initial research was provided by project partner, Parks Canada, and was later supplemented by Membertou Geomatics Solutions' online research of each plant species. The research results were then compiled into an explicit list of species habitat requirements as well as matrix tables that matched each plant's habitat requirements with available mapping data.





Given the large list of Mi'kmaq culturally important plants, the large geographic area of NewPage leased parcels, and Mi'kmaq plant gathering areas identified in the earlier phase, it was determined that all Cape Breton Island would be mapped for all plant species identified by Mi'kmaq Elders and gatherers. It was determined that a method of mapping was required to represent each plant's favoured supporting habitat in a single map specific to each plant.

A plant species mapping and analysis-decision making tool for Mi'kmaq and project partners must be explicit for duplication of results and accessible to a wide range of technical skills, as to be understood by end-users consisting of Mi'kmaq community leaders, residents, as well as project partners. The proposed plant mapping and analysis method chosen is a revisit of the Grey Tone Method which was brought to prominence by Ian McHarg in the 1960s. It revolutionized land-use planning at that time and forms the foundation of modern GIS systems today.

A typical application of McHarg's method consists of mapping individual environmental factor maps relevant to the study, such as soil drainage, sun exposure, and habitat types. Each of these environmental factor maps is then assessed a value with respect to suitability for a particular land use or, in this case, suitable habitat for each plant species. In this project, values assigned to supporting environmental factors are typically either supporting or non-supporting, or characteristic to the environmental factor, such as Full Sun, Partial Shade, and Full Shade for the environmental factor of Sun Exposure. The values assigned to individual factors with respect to supporting habitat are typically arranged in the matrix tables of environmental factors, and derived from the accompanying explicit list of species habitat requirements and assigned value. All environmental factor matrix tables of plant species and assigned values can be found in the appendices.

The resulting plant species' potential supporting habitat factor maps can be viewed individually, but all relevant factor maps must be viewed collectively for analysis of the locations of High, Moderate, and Low supporting potential values. Overlaying shaded factor map transparencies based on assessed values are used to produce a composite graphic map of habitat potential for each species of plant.

Using the Grey Tone Method, each potential supporting habitat value is assigned a transparent grey or green value of dark green for High supporting potential, clear for Low supporting potential, and medium green for Moderate supporting potential. All the relevant factors maps and their assigned grey levels are overlain with each other to produce the composite map.

### Grey Tone Map Composition:



**Base Map with Soil Drainage Layer added**



**Add Surficial Geology Drainage Layer**



The cumulative effect of shading produces dark green areas within the map, indicating areas of High supporting potential, light grey areas indicating Moderate supporting potential, and clear areas of Low supporting potential for each plant species.

The Grey Tone Method is most suitable for First Nations in the context of accessibility to a wide range of technical skill capacity. The method is visual in representing and interpreting several layers of data and scalable from the community level to a regional level, thereby empowering First Nations to monitor relevant issues within and beyond their community boundaries. The method can be further enhanced with even more statistically robust analysis processes, with the use of weighted scores for priority rating as one example.



**Add Sun Exposure (Crown Closures) Layer**



**Add Habitat Layers for completed Grey Tone map**





## ENVIRONMENTAL FACTORS

### Soil Drainage:

Project partner, NewPage, provided the digital file CB\_FEC\_SOIL\_TYPES.shp and supporting files. The digital (electronic) file contains geo-referenced polygons of all soil types found within Cape Breton Island, as well as features such as slope, stoniness, and drainage characteristics similar to Agriculture Canada Soil Surveys of the 1960s. The Soil Drainage feature codes contained within the file range from R=Rapid to VP=Very Poor. This study required that the drainage feature codes be grouped into three assigned values of Good, Moderate, and Poor for Grey Tone mapping. The following are the groupings of feature codes that were extracted and exported into individual new shape (.shp) files for Grey Tone mapping.

Export\_CB\_FEC\_SOIL\_TYPES\_DRAINAGE\_GOOD.shp:

Good (Dry):        R= Rapid Drainage  
                      W= Well Drained

Export\_CB\_FEC\_SOIL\_TYPES\_DRAINAGE\_MODERATE.shp:

Moderate (Mesic-Moist):    M= Moderate  
                                      I= Imperfect

Export\_CB\_FEC\_SOIL\_TYPES\_DRAINAGE\_POOR.shp:

Poor (Damp-Wet):        P= Poor  
                              VP= Very Poor

### Sub-Soil Drainage:

The electronic file, CB\_FEC\_SOIL\_TYPES.shp, contains large polygons where the soil type was listed as "Not Surveyed" and had no entry for the drainage characteristics. The geographic area not surveyed was mostly the Cape Breton Highlands and the Highlands north of Mabou, as well as Kelly's Mountain, and Washabuck Centre.

To determine drainage characteristics within these areas, provincial surficial geology data was used to infer overlying surface drainage characteristics based on the underlying parent material characteristics. Parent materials are the tills and deposited materials left behind after the last ice sheets melted. Some of these deposits were derived from slumping of materials out of decaying ice. Some deposits were settled on the bottom of temporary glacial lakes and others were deposited by flowing glacier melt water. Over time, these surficial deposits developed thin layers of soil that shared the characteristics of the parent material. Coarse-textured parent material produced coarse-textured soils with good drainage, as fine-textured parent material produced fine-textured soils with generally poor drainage characteristics.

The original, downloadable NS Provincial electronic file, p92003gs.shp, has "Unit" features such as "stoney till plain", "Alluvial Deposit", and "Silty Drumlin" as a few examples, and is supported by unit descriptions detailing the structural characteristics of the parent material deposits. Units of the original surficial geology file were selected based on structure characteristics, and exported into new individual shape (.shp) files of the inferred drainage characteristics of "Good", "Moderate", and "Poor" drainage.

To avoid double counting with the Soil Drainage layer outside the areas "Not Surveyed", a mask was created to block out Sub-Surface Drainage Grey Tone mapping information overlaying the areas that already have Soil Drainage Grey Tone mapping.





The following are the “Units” and drainage characteristic values assigned to each unit type:

Export\_CB\_Surficial\_Geology\_SubSoil\_DRAINAGE\_GOOD\_2.shp:

- Colluvial
- Residuum
- Stony Till Plain
- Kames & Eskers (Glaciofluvial Deposits)
- Stony Drumlin

Export\_CB\_Surficial\_Geology\_SubSoil\_DRAINAGE\_MODERATE.shp:

- Alluvial Deposits
- Outwash Fans & Deltas

Export\_CB\_Surficial\_Geology\_SubSoil\_DRAINAGE\_POOR

- Bedrock
- Silty Till Plain
- Glaciolacustrine Deposits
- Organic Deposits
- Silty Drumlin

## Sun Exposure:

Project partner, NewPage, provided the electronic file, CB\_Forest.shp and supporting files which consist of geo-referenced polygons of forest types, and numerous features relevant to the forestry industry. The feature of Crown Closures (“CRNCL”) is given in percentages and was utilized to determine three classes of sun exposure being Full Sun, Partial Shade, and Full Shade. The following are the assigned values of crown closures and corresponding range of crown closure percentages:

CB\_Forest\_Export\_60Plus\_Closure.shp:

- Full Shade (Crown Closure of more than 60%)

CB\_Forest\_Export\_40to60\_Closure.shp:

- Partial Shade (Crown Closure of 40 to 60%)

CB\_Forest\_Export\_40Minus\_Closure.shp:

- Full Sun (Crown Closure of less than 40%)





## Habitat Type:

The research portion of the project often resulted in finding descriptions of typical Habitat Types where individual plant species could be found. Depending on the plant species, preferred or supporting habitat types were typically described as “Found on floodplains, edge of lake shores and stream banks, and slopes. Also found within hardwood forests and brush”.

The electronic file, CB\_Forest.shp, provided by NewPage has feature codes for forest and non-forest (FORNON) habitat types. The following are the features codes selected that represent habitat types supporting a wide range of the Mi'kmaq culturally significant plants. For Grey tone mapping of individual plants, habitat types are either supporting or non-supporting for a plant. Supporting habitats are assigned a dark tone of semi-transparent green, and non-supporting habitats have no tone assigned and are clear or white space within the Grey-Tone maps. The FORNON feature codes are further supplemented with the selected feature codes for COVER\_TYPE which are Hardwood Cover, Softwood Cover, and Mixed Cover types that are frequently described in the research. The original CB\_Forest.shp file was copied and renamed in the map legend, “CB\_Forest\_Habitat\_Analysis”.

The following are the Habitat Type and Cover Type features and feature codes selected to represent supporting habitat for Mi'kmaq culturally significant plants:

CB_Forest_Habitat_Analysis.shp:			
Burn	2	Barren	85
Oldfield	5	Agriculture	86
Brush	33	Urban	87
Wetland	70	Landfill	93
Open Bog	72	Beach	94
Treed Bog	73	Road Corridor	98
Lake Wetland	75	Rail Corridor	99
Coastal Cliffs	76	*Softwood Cover	2
Inland Water	77	*Hardwood Cover	8
Rock Barren	84	*Mixed Wood Cover	5
*Cover Type Feature			





## Habitat Edges:

As with Habitat Types, the research into each plant species' supporting habitat found mention edge habitats such as "edge of forest", "edge of wetlands", and "edge of fields". Using the electronic file, CB\_Forest.shp, the geo-referenced polygons of selected Habitat Types were exported and edited to ensure only outside edges of the selected Habitat Types are used in the Grey-Tone mapping. The Habitat Edges were given line thicknesses of 15-30m, and a dark green tone to represent the eco-tone or area of transition from one habitat to an adjacent habitat.

The following Edge Habitats were selected and exported into individual shape (.shp) files:

Edge\_Meadow\_Field\_Export2.shp:

Meadow and Field edge habitat is derived from Oldfield and Agriculture Habitat Types.

Edge\_Forest\_Export2.shp:

Forest edge habitat is derived from a selection of Habitat Type edges of open areas that share an edge with a forest habitat such as Burn, Old Field, Agriculture, Open Bog, Barren, and Rock Barren.

Edge\_Swamp\_Export3.shp:

Edge of Swamp habitat is derived from Open Bog, Treed Bog, Lake, and Wetland Habitat Types.

The following two Edge Habitat shape (.shp) files are derived from NSTDB 1:10 000 map sheet downloadable electronic files from N. S. Provincial web sites. Each Polygon Outline is given a dark and semi-transparent green tone for supportive habitats, and the polygon interior is not assigned a fill or green tone, leaving the polygon interior clear.

Edge\_Lake\_Shoreline\_Export3.shp:

Edge Lake Shoreline utilizes the outlines of polygons provided for Lakes, Reservoirs, and Large River Systems. The polygon interiors show no colour fill, leaving only the polygon outline of dark green tone representing the shorelines of these bodies of freshwater.

Water\_Features\_Merge\_WaterCourses\_Export\_Buffer2:

Watercourse Riparian Zones are derived from Line features that represent watercourses. A 15m buffer watercourse Line features provide a 30m wide corridor of Riparian Zone with the Watercourse being the centerline. The 15m buffer zone is assigned a semi-transparent dark green tone representing supportive habitat in the Riparian Zone.

## Slopes

The research of supporting habitats for each of the Mi'kmaq culturally significant plants occasionally listed sloped topography as a habitat feature favoured by some plants. The NTDB (Digital Elevation Model) electronic files were utilized to produce raster mapping of 15% and greater slopes. The raster mapping was assigned the same semi-transparent dark green tone for supporting habitats and the clear, or white space, within the mapping are areas of low slopes of less than 15% to near-level topography.





## Miscellaneous Environmental Factors

As with the environmental factor of Slopes, occasionally Talus Slopes was a favoured habitat for some of the plant species researched. Talus slopes are steep slopes of naturally occurring fractured rock with a wide range of particle size, ranging from large boulders to smaller loose stone and gravel. To map Talus Slope habitat, the original downloadable N.S. Provincial electronic file p92003gs.shp, for surficial geology was utilized. The feature Unit of Colluvial deposits has an accompanying description of "weathered and frost fractured rock and soils which form a blanket of material on steep valley walls, talus cone or rotational slump formed by either downward creep or mass movement of material." The new layer, Export\_CB\_Surficial\_Geology\_Slope, was created from the Export\_CB\_Surficial\_Geology.shp file, and Colluvial deposit polygons were assigned semi-transparent dark green tone as supporting habitat of Talus Slopes.

Due to the steep sloping characteristics of Colluvial Deposits, Colluvial deposit polygons were also utilized in conjunction with raster mapping as representative of sloped topography, where there are gaps in the raster mapping used for the environmental factor of Slopes. Used in the context of sloped topography, Colluvial Deposit polygons were assigned a semi-transparent dark green tone as supporting habitat for some species of plants.

## Ground Truths

Using the environmental factors and the populated Habitat Tables, Grey Tone (Green Tone) mapping was produced for each individual plant species on the High and Medium and Lower Priority list. The cumulative effect of the overlain, semi-transparent, habitat layers produced darkened areas within the maps, indicating an accumulation of supportive habitat, and lighter areas of the maps indicate areas of less-supportive habitat, depending on the plant.

Target points were then selected for field visits to verify if the targeted plant species could be located based on the Grey-Tone mapping. These target points were uploaded to GPS (Global Positioning System) for fieldwork crews. During travel to the target points and upon arrival, a scan for other Mi'kmaq culturally significant plants was conducted, and all plants found were recorded with a newly-placed GPS point taken in the field.

Fieldwork was done in three stages. Initial fieldwork involved visiting areas indicated by Elders as gathering places for various plants. The next stage formed the bulk of the fieldwork and involved visiting individual target points to locate specific plant species. The later stage was an attempt to locate specific plant species that proved to be elusive in earlier fieldwork stages. Both the Elder first stage and second stage field visits were attended by a botanist to verify plant species.

Although the field crews attempted to visit NewPage parcels, due to time constraints and a large geographic area, field crews in the second stage of fieldwork chose target point locations in close proximity to public roads.

Field-recorded, ground truth points are supplemented by previously recorded locations of plant species derived from Cape Breton University (CBU) archives. The CBU locations were given in Latitude and Longitude coordinates that were rounded off to degrees and minutes. These points are shown in the mapping for each plant where CBU data was available, along with a 60-second window box representing an area where the plant could have been located, assuming the coordinates were rounded down to the nearest minute.

All ground truth points recorded in the field are shown with the Grey Tone mapping for each plant and include points recorded during Elder site visits, and the CBU archive location points. All Grey Tone maps for each plant species can be found in the appendices.





The initial research into habitat requirements for plants considered culturally significant to the Mi'kmaq, was conducted by project partner, Parks Canada. Additional web-based research was conducted by Membertou Geomatics Solutions to fill in some of the gaps in the environmental factors and to better populate the Habitat Tables. The additional research was necessary for geomatics staff to gain an insight into plant habitat to better select ground truth target points. The field visits were successful for some plant species but the Grey Tone mapping is much better interpreted with additional insight to favourable-supporting habitat for the plant species. An example of this insight would be the knowledge that, regardless of an accumulation of supporting environmental factors, some plants will not be found on the top of a mountain if they are known only to be found at the bottom of a river valley.

The following are Mi'kmaq significant plant species accompanied by the environmental factors and supporting habitat conditions for each plant:

### HIGH PRIORITY PLANTS

### Research Results



Dave Powell, USDA Forest Service, Bugwood.org

#### A’MAQANSUTI Balsam Poplar *Populus balsamifera* L.

Balsam Poplar Favourable Conditions:	
Soils Drainage:	Moderately drained
Sub-Surface Drainage:	Moderately drained
Sun Exposure:	Full sun
Habitat:	Alluvial floodplains, river banks, field edges, brush
Slopes:	N/A



Dave Powell, USDA Forest Service, Bugwood.org







John R. Seiler, Virginia Polytechnic Institute and State University, Bugwood.org

### **MALIPQWANJ Beaked Hazelnut *Corylus cornuta***

Beaked Hazelnut Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Partial shade to full shade
Habitat:	Found within forested wetlands, streams and riverbanks riparian corridors, rocky slopes, deciduous and mixed forest, thickets as well as meadows and grassy areas. Also found in edges of woods, brush, fields, and roadsides, disturbed areas and slopes
Slopes:	Yes



Rob Routledge, Sault College, Bugwood.org



Manfred Mielke, USDA Forest Service, Bugwood.org

### **MALTEWEKNEJKL Bloodroot *Sanguinaria canadensis***

Bloodroot Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Partial shade to full shade
Habitat:	Found on floodplains, edge of lake shores and stream banks and slopes. Also found within hardwood forests and brush
Slopes:	Yes



Joseph O'Brien, USDA Forest Service, Bugwood.org







Paul Wray, Iowa State University, Bugwood.org

### Large Toothed Aspen *Populus grandidentata*

#### Large Toothed Aspen Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Full sun
Habitat:	Found on floodplains and lowland slopes, disturbed and burned sites. Associated with Trembling Aspen or mixed wood forests
Slopes:	Yes



Paul Wray, Iowa State University, Bugwood.org



### MA'SUSI'L Ostrich Fern *Matteuccia struthiopteris*

#### Ostrich Fern Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poor drainage
Sun Exposure:	Partial to full shade
Habitat Type:	Hardwood and mixed forests, floodplains, swamps and swamp edges, river bottoms and alluvial soils
Slopes:	N/A







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**KNA'J'JK Snow Berry (Wax Berry) *Gaultheria hispidula***

Snow Berry Favourable Conditions:

Soils Drainage:	Moderate
Sub-Surface Drainage:	Moderate
Sun Exposure:	Partial shade
Habitat Type:	Mossy woodlands, barrens, treed bogs, edge of meadows, softwood forests
Slopes:	N/A



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**KETAQNIMUSI Staghorn Sumac *Rhus typhina***

Staghorn Sumac Favourable Conditions:

Soil Drainage:	Well drained
Sub-Surface Drainage:	Well drained
Sun Exposure:	Full sun to partial shade
Habitat Type:	Oldfields, rock barrens, meadow and forest edges, roadsides, waste sites, dry river banks and disturbed areas. Also brush, rocky bluffs and riparian zones
Slopes:	Yes







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**KI'KWESU'SK Sweet Flag (Flagroot) *Acorus americanus***

Sweet Flag Favourable Conditions:

Soils Drainage:	Poorly drained
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun
Habitat Type:	Habitat includes edges of ponds and moist soils, marshes, shallow waters
Slopes:	N/A



**KAJU Toothwort *Cardamine diphylla***

Toothwort Favourable Conditions:

Soils Drainage:	Moderately drained
Sub-Surface Drainage:	Moderately drained
Sun Exposure:	Partial shade to shade
Habitat:	Moist, humus rich woodland edge habitats within hardwood or mixed wood forests
Slopes:	N/A







**ESKITMUKEWEY Wild Cucumber *Medeola virginiana***

Wild Cucumber Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Partial shade
Habitat:	Semi-open woods, hardwood forests on slopes
Slopes:	Yes



Charles T. Bryson, USDA Agricultural Research Service,  
Bugwood.org





## Medium Priority Plants



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### **E'PSEMUSI American Mountain Ash *Sorbus americana***

American Mountain Ash Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Full sun and partial shade
Habitat:	Edge of swamps, forest, roadsides to rocky hillsides. More abundant in early succession communities, but present at low densities in old growth spruce-fir communities and shorelines
Slopes:	Yes



Richard Webb, Self-employed horticulturist, Bugwood.org

### **PUKULU'SKWIMANAQSI'L Common Elder *Sambucus canadensis***

Common Elder Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Full sun to partial shade
Habitat:	Oldfields, pastures, disturbed sites, pastures, bogs. Edge of field/meadow, roadsides, swamps and riparian and flood zone of rivers and lakes
Slopes:	N/A



UINR







**KAPAQTEJMUSI'L Gooseberry *Ribes hirtellum***

Gooseberry Favourable Conditions:

Soils Drainage:	Moderately drained
Sub-Surface Drainage:	Moderately drained
Sun Exposure:	Full sun and partial shade
Habitat:	Edge of forest, meadows and river banks to rocky bluffs and bogs. Also found in pastures, wetlands and bogs
Slopes:	Yes



The Dow Gardens Archive, Dow Gardens, Bugwood.org

**NIPANMAQSI'L Highbush Cranberry *Viburnum opulus***

Highbush Cranberry Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Partial shade
Habitat:	Wet field/meadow, swamps intervals and riparian zone of rivers and lakes
Slopes:	N/A



The Dow Gardens Archive, Dow Gardens,  
Bugwood.org







Paul Wray, Iowa State University, Bugwood.org



Dave Powell, USDA Forest Service, Bugwood.org

### WJKULJE'MANAQSI Red Osier Dogwood *Cornus sericea*

Red Osier Dogwood Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Full sun to partial shade
Habitat:	Edge of forest, field/meadow and riparian zone of rivers and lakes
Slopes:	N/A

## Lower Priority Plants



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### STOQN Balsam Fir *Abies balsamea*

Balsam Fir Favourable Conditions:

Soils Drainage:	Found on textures from heavy clay to rocky soils but most common on cool, medium to wet sites
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Shade tolerant
Habitat Type:	Late successional or climax species found on a wide variety of upland and lowland sites, including alluvial flats, peatlands, and swamps, in pure, mixed coniferous and coniferous/deciduous stands
Slopes:	N/A



Keith Kanoti, Maine Forest Service, Bugwood.org







Derek Ramsey

**KLJIMANAQSI Bay Berry *Myrica pensylvanica***

Bay Berry Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Full to partial sun
Habitat Type:	Coastal headlands, beaches and open swamp and boggy forest, dry rocky forest and semi-open rocky ridges
Slopes:	Yes



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**ALAWAY Beach (Sea) Pea *Lathyrus maritimus***

Beach Pea Favourable conditions:

Soils Drainage:	Dry sandy soil, well drained
Sub-Surface Drainage:	Sandy, well drained
Sun Exposure:	Full sun
Habitat Type:	Shores, beaches, inland sands; in sandy soil
Slopes:	N/A







Dave Powell, USDA Forest Service, Bugwood.org

### **KINNICKICK Bearberry *Arctostaphylos uva-ursi***

Bearberry Favourable Conditions:

Soils Drainage:	Commonly found on well-drained soils with relatively low amounts of clay and silt. Frequently occurs on sandy soils
Sub-Surface Drainage:	Well drained, fine grained parent material
Sun Exposure:	Shade-intolerant. Grows best in high light situations and becomes very rare when shade becomes intense
Habitat Type:	Sand and well-drained sites in woodlands, open areas and fields
Slopes:	N/A



UINR

### **WISKOQ Black Ash *Fraxinus nigra***

Black Ash Favourable Conditions:

Soils Drainage:	Moderate to poor drainage
Sub-Surface Drainage:	Moderate drainage to poor drainage
Sun Exposure:	Full sun to partial shade
Habitat Type:	Damp woods, low areas and swamps. Typically grows in bogs, along streams, or in poorly drained areas that often are seasonally flooded. Black ash is typical of swampy woodlands that have moving water and stream banks
Slopes:	N/A



UINR







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### **KAWATKW Black Spruce (Bog Spruce) *Picea mariana***

#### Black Spruce Favourable Conditions:

Soils Drainage:	Commonly found on poorly drained acidic peatlands but productive stands are found on a variety of soil types from deep humus through clays, loams, sands, coarse till, boulder pavements and shallow soil mantles over bedrock
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun
Habitat Type:	It is frequently found in cold, poorly drained areas, such as swamps and bogs, along with sphagnum mosses and horsetails. Also found on transitional sites between peatlands and uplands. Pioneer that invades the sedge mat in filled-lake bogs, Black Spruce typically seeds in promptly after fire, and with the continued absence of fire, will eventually dominate the hardwoods
Slopes:	N/A







### **PKUMANAQSI Low Bush Blueberry *Vaccinium angustifolium***

Low Bush Blueberry Favourable Conditions:

Soils Drainage:	Well drained acidic soils. Loam, sandy loam, gravelly loam, and silt or clay loam developed from sandstone, shale, or glacial drift
Sub-Surface Drainage:	Well drained till
Sun Exposure:	Shade is detrimental to the growth
Habitat Type:	Mixed conifer and hardwood forests, in headlands, upland bogs, peaty barrens, along sandy riverbanks, and on exposed rocky outcrops. It is also common in abandoned pastures, clear-cuts and along roadsides
Slopes:	N/A

### **Blueberry (Velvet-Leaved) *Vaccinium myrtilloides***

Blueberry (Velvet-Leaved) Favourable Conditions:

Soils Drainage:	Found on gravelly or sandy soils including well-drained coarse, or light-textured soils; fine sandy soils, loam, clay loam. Moderate to well drained
Sub-Surface Drainage:	Well drained till, and lacustrine deposits. Moderate to well drained.
Sun Exposure:	Generally tolerant of shade; grows well in open woods, though berry production is enhanced in sunny locations. Full to partial sun
Habitat Type:	Drier, relatively infertile conifer stands; also forested portions of bogs, in muskegs, peatlands, treeless mountain slopes, mountain meadows, barrens, headlands, boreal forests, and on rock outcrops. greatest abundance on disturbed sites such as clear-cuts or recent burns
Slopes:	Yes







UINR

**WSO'QMANAQSI'L Bunchberry *Cornus canadensis***

Bunchberry Favourable Conditions:

Soils Drainage:	Normal, moist, clay, sand, loam, humus enriched (forest floor). Moderately to poorly drained
Sub-Surface Drainage:	Moderately to poorly drained
Sun Exposure:	Partial shade and full shade, growth most vigorous in partial shade
Habitat Type:	Forest, woodland, swamp/marsh (mature bogs), barrens
Slopes:	N/A



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UINR

**KAWATKW White Spruce (Cat Spruce) *Picea glauca***

White Spruce Favourable Conditions:

Soils Drainage:	Grows well on loams, silt loams, and clays, but rather poorly on sandy soils
Sub-Surface Drainage:	Silt and clays (poorly drained)
Sun Exposure:	White Spruce seedlings establish under hardwoods, develop and grow slowly, and eventually replace them
Habitat Types:	Coniferous and mixed coniferous-hardwood forests. Abandoned farms and coastal headlands, burned areas
Slopes:	N/A





Paul Wray, Iowa State University, Bugwood.org

### **LUIMANAQSI Choke Cherry *Prunus virginiana***

#### Choke Cherry Favourable Conditions:

Soils Drainage:	Most sites are characterized by silty or sandy soils with good depth, fertility, and drainage (moderate to well drained)
Sub-Surface Drainage:	Silty and sandy soil parent material, well to moderate drained
Sun Exposure:	Full sun, partial shade
Habitat Type:	Woods, clearings, hillsides and river terraces; often on dry and exposed sites. Growing preferentially along streams, springs, and seeps, where plants typically form dense thickets, chokecherry is generally intolerant of poor drainage. Edges of road/rail corridors, intervals and woods
Slopes:	N/A



Rob Routledge, Sault College, Bugwood.org



Mary Ellen (Mel) Harte, Bugwood.org

### **MKUO'QMINAQSI'K Cloudberry (Bakeapple) *Rubus chamaemorus***

#### Cloudberry Favourable Conditions:

Soils Drainage:	Poor to moderate drained
Sub-Surface Drainage:	Poor to moderate drained till
Sun Exposure:	Full sun
Habitat Type:	Coastal bogs and headlands, wet and dry meadows, around the margins of ponds, marshes, along streams, slopes, ridges
Slopes:	Yes



Joy Viola, Northeastern University, Bugwood.org







UINR

### **AJIOQJOMINAQSI Common Blackberry *Rubus allegheniensis***

Common Blackberry Favourable Conditions:

Soils Drainage:	Sandy, well drained to moderate
Sub-Surface Drainage:	Sandy, well drained to moderate
Sun Exposure:	Full
Habitat Type:	Sandy ground, oldfields, open woods and clearings
Slopes:	N/A



UINR

### **KINI'SKWEJ'JIK Low Bush (Common) Juniper *Juniperus communis***

Low Bush Juniper Favourable Conditions:

Soils Drainage:	A variety of soil types including acidic and calcareous sands, loams, or marls. Well drained
Sub-Surface Drainage:	Well drained
Sun Exposure:	Intolerant of shade, found in open environments and tolerates full sun
Habitat Type:	Found on dry open woods, gravelly ridges, outcrops, and open rocky slopes. Also found on wooded hillsides, sand terraces, maritime escarpments, and on exposed slopes and plateaus and may spread into fields and pastures. May also be found in bogs
Slopes:	Yes





UINR

### **WO'JEKUNMUSI Common Mullein *Verbascum thapsus***

Common Mullein Favourable Conditions:

Soils Drainage:	Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Full sun
Habitat Type:	Agricultural areas, ruderal/disturbed areas, oldfield habitat, meadows and pasture lands, along fence rows, roadsides and in industrial areas
Slopes:	N/A



John Cardina, The Ohio State University, Bugwood.org



UINR

### **WIJIKANIPKL Common Plantain *Plantago major***

Common Plantain Favourable Conditions:

Soils Drainage:	Moderate drainage
Sub-Surface Drainage:	Moderate drainage
Sun Exposure:	Full sun
Habitat Type:	Urban, waste areas, roadsides and pastures
Slopes:	Yes







UINR

### **JIJAWIKNEJEWIMUSI'L Common Wild Rose *Rosa virginiana***

Common Wild Rose Favourable Conditions:

Soils Drainage:	Moist heavy clay soils. Poorly drained
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun
Habitat Type:	Grows along the edges of salt marshes, roadsides and in pastures. Also found damp to dry thickets, clearings, swamps and shores
Slopes:	N/A



Simon Pierre Barrette

### **MUJILA'PIJ Cow (Yellow Pond) Lily *Nuphar variegata***

Cow Lily Favourable Conditions:

Soils Drainage:	With sediment soil. Moderate to well drained soil base
Sub-Surface Drainage:	Tills with high sediment content. Moderate to well drained
Sun Exposure:	Can grow in sun or shade but flowers more readily in good light
Habitat Type:	Pond margins, slow streams, pools, and marshes and where water is less than 7' deep with soft sediment bottom
Slopes:	N/A





UINR

### PAKO'SI Cow Parsnip (Masterwort) *Heracleum lanatum*

#### Cow Parsnip Favourable Conditions:

Soils Drainage:	Grows best on moist to semi-wet soils with good drainage. Clay, clay loam, and gravelly substrates and sandy loam. Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained. Sand, gravelly and clay parent materials
Sun Exposure:	Full sun to partial shade
Habitat Type:	Moist forests, disturbed areas and riparian areas, stream terraces, alluvial benches, floodplains, and stream and lake margins, sea bluffs and coastal areas
Slopes:	Yes



UINR

### E'PSEMUSI Dogberry (Mountain Ash) *Sorbus decora*

#### Dogberry Favourable Conditions:

Soils Drainage:	Found on well-drained to imperfectly drained and grows in a stunted form in drier soils
Sub-Surface Drainage:	Well drained to moderate
Sun Exposure:	Shade intolerant
Habitat Type:	Prefers moist habitats from borders of swamps to rocky hillsides. Common in openings or in woods, scattered on uplands along edges of woods, roadsides and under semi-open stands. Densities highest on sites with scattered mature or semi-mature coniferous and deciduous species and lowest on conifer sites
Slopes:	N/A



UINR







### **TUPSI Downy Alder *Alnus viridis***

Downy Alder Favourable Conditions:

Soils Drainage:	Moderate to poorly drained
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Full sun to partial shade
Habitat Type:	Coastal bluffs and headlands, heaths and oldfield habitat. Found along streams, lakeshores, coasts, bogs, or muskeg margins and within conifer forests
Slopes:	Yes



UINR

### **APU'TAM'KIE'JIT Eastern Larch (Tamarack) *Larix laricina***

Eastern Larch Favourable Conditions:

Soils Drainage:	Most commonly wet/moist organic soils, such as sphagnum or woody peat, especially nutrient-poor, acid peatlands
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun, shade intolerant: tends to cast light shade and have a dense undergrowth of shrubs
Habitat Type:	Wet/moist, poorly drained sites such as swamps, bogs, muskeg, stream, lake, and swamp edges and occasionally uplands. Pioneer species, often first tree to invade open bogs and burned peatlands, first tree to pioneer floating sphagnum mats
Slopes:	N/A





Michael Wolf

### **KAWIKSA'QOAQSI Fineberry Hawthorn *Crataegus chrysocarpa***

Fineberry Hawthorn Favourable Conditions:

Soils Drainage:	Grows best on well-drained loamy soils and some moderate
Sub-Surface Drainage:	Well drained to moderate
Sun Exposure:	Grows best in full sunlight, partial shade
Habitat Type:	Open brush, field edges and urban
Slopes:	N/A



Dan Aamlid, Forest and Landscape, Bugwood.org

### **POQOMANNAQSI Foxberry (Mountain Cranberry) *Vaccinium vitis-idaea***

Foxberry Favourable Conditions:

Soils Drainage:	Commonly grows on acidic sandy loams or loamy clays with poorest growth on sandy soils. Moderate to poor
Sub-Surface Drainage:	Glacial outwash sands and gravel. Moderate to poor
Sun Exposure:	Full sun
Habitat Type:	Coastal headlands, bogs, moist forests, rocky barrens, open slopes and dry woods
Slopes:	Yes







UINR

### **WISAWTAQJI'JKL Gold Thread *Coptis trifolia***

Gold Thread Favourable Conditions:

Soils Drainage:	Moist habitats on poor to moderately well drained
Sub-Surface Drainage:	Poor to moderate
Sun Exposure:	Intolerant of closed canopies but does require some shade, possibly because of its preference for moist sites
Habitat Type:	Coniferous forests, swamps, bogs and road banks. Also occurs in thickets and mossy places.
Slopes:	N/A



### **APUISTEKIE'JI'JIT Labrador Tea *Ledum groenlandicum***

Labrador Tea Favourable Conditions:

Soils Drainage:	Dry and acidic soils. Also in moist, sterile soils. Poorly drained
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun
Habitat Type:	Grows in bogs and wet shores, and sometimes on rocky alpine slopes, such as peat bogs, muskegs and heathlands. Shares habitat with black spruce, blueberry. Also, wet barrens and poorly drained clearings and pastures
Slopes:	Yes



Paul Bolstad, University of Minnesota, Bugwood.org





Michael Becker

**PLAMWIPKL Mint (Field Mint) *Mentha arvensis***

Field Mint Favourable Conditions:

Soils Drainage:	Moderate
Sub-Surface Drainage:	Moderate
Sun Exposure:	Full sun
Habitat Type:	Cultivated fields, oldfield habitat, along streams and shores
Slopes:	N/A



Magnus Manske

**PLAMWIPKL Mint (Lemon Mint) *Mentha x citrata***

Lemon Mint Favourable Conditions:

Soils Drainage:	Moderate
Sub-Surface Drainage:	Moderate
Sun Exposure:	Full sun
Habitat Type:	Damp and open areas
Slopes:	N/A







Sten Porse

**PLAMWIPKL Mint (Peppermint) *Mentha x piperita***

Peppermint Favourable Conditions:

Soils Drainage:	Poor
Sub-Surface Drainage:	Poor
Sun Exposure:	Full sun
Habitat Type:	Wet and open areas, stream edges and drainage ditches
Slopes:	N/A



Simon Eugster

**PLAMWIPKL Mint (Spearmint) *Mentha spicata***

Spearmint Favourable Conditions:

Soils Drainage:	Poor
Sub-Surface Drainage:	Poor
Sun Exposure:	Full sun
Habitat Type:	Wet areas near urban settlement
Slopes:	N/A





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### **MASKWE'SMANAQSI Pin Cherry *Prunus pensylvanica***

Pin Cherry Favourable Conditions:

Soils Drainage:	Sand, loam, well drained ranging from very stony to extremely stony, sandy loams to loams
Sub-Surface Drainage:	Non-stratified glacial till, moderate to well drained
Sun Exposure:	Sun
Habitat Type:	Found at forest clearings, hillsides and riverbanks; usually on well-drained sites, commonly after fire or other disturbances. Oldfields, edges of fields
Slopes:	Yes



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### **MKOQEWIK Pitcher Plant *Sarracenia purpurea***

Pitcher Plant Favourable Conditions:

Soils Drainage:	Poorly drained
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full sun
Habitat Type:	Bogs, open bogs, swamp edges, lake edges
Slopes:	N/A







Vern Wilkins, Self employed, Bugwood.org

### LMU'JI'MNAQSI Pussy Willow *Salix discolor*

Pussy Willow Favourable Conditions:

Soils Drainage:	Moist, wet clay, sand, loam, damp to wet
Sub-Surface Drainage:	Moderate to poorly drained
Sun Exposure:	Pussy willow is shade intolerant, requires full sun
Habitat Type:	Found at swamps, fens, stream banks, floodplains, marsh borders, ditches and other wet habitats such as wet pastures and swamp edges. Prefers moist site conditions and rarely persists beyond the water's edge in climax forest vegetation
Slopes:	N/A



Mary Ellen (Mel) Harte, Bugwood.org

### KLITAWMANAQSI'K Red Raspberry *Rubus idaeus*

Red Raspberry Favourable Conditions:

Soils Drainage:	Moist to well drained clay, sand, loam
Sub-Surface Drainage:	Clay, sand, loam parent material, moderate to well drained
Sun Exposure:	Full sun, partial shade
Habitat Type:	Forest edge, frequently grows in old-field communities and sites which have been subject to wind-throw, fire, or timber harvest. Also, talus slopes and rocky ground
Slopes:	Yes



Mary Ellen (Mel) Harte, Bugwood.org





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**WOPAPA'KJUKAL Sarsaparilla (Wild) *Aralia nudicaulis***

Wild Sarsaparilla Favourable Conditions:

Soils Drainage:	Soils range from fine loamy clay to coarse loam, moderate to rich in nutrients, poorly to well drained, but prefers sandy, acid soil
Sub-Surface Drainage:	Fine loamy clay to coarse loam soil parent material. Poor to well drained
Sun Exposure:	Shade tolerant
Habitat Type:	Common in moist or dry woodlands, thickets, riparian areas, and prairie or bog edges. Also found in dry to moist hardwoods and mixed-woods
Slopes:	N/A



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**NUTKE'JMANAQSI Small Cranberry *Vaccinium oxycoccus***

Small Cranberry Favourable Conditions:

Soils Drainage:	An indicator of moist to very wet, nitrogen-poor soils and high surface groundwater. Sand, loam, moderate to poorly drained
Sub-Surface Drainage:	Sand, loam parent material. Moderate to poorly drained.
Sun Exposure:	Shade intolerant, full sun
Habitat Type:	Open bogs, mounds of sphagnum moss, well drained swamps
Slopes:	N/A







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### **KLMUEJMNAQSI Smooth Serviceberry *Amelanchier laevis***

Smooth Serviceberry Favourable Conditions:

Soils Drainage:	Clay, sand, loam, humus enriched (forest floor)
Sub-Surface Drainage:	Well drained to moderate
Sun Exposure:	Full sunlight to partial shade
Habitat Type:	Found on forested slopes, open rocky woods, cliff edges; also bogs, wet sites and forest edges
Slopes:	Yes



Vanessa Richins, About.com, Bugwood.org



Rob Routledge, Sault College, Bugwood.org

### **TUPSI Speckled Alder *Alnus incana***

Speckled Alder Favourable Conditions:

Soils Drainage:	Moist and nutrient-rich soils. Also grows in sandy loams, peatlands, alluvial soils, and ericaceous bogs. Sand, loam, humus enriched (forest floor), moderately to poorly drained
Sub-Surface Drainage:	Grows in mucky soils, which are relatively shallow over glacial till or deep over lacustrine peat. Moderate to poorly drained
Sun Exposure:	Described as shade intolerant to intermediately shade intolerant (full sun to partial shade)
Habitat Type:	Moist lowlands, frequently bordering streams and lakes, common in swamps and the older zones of bogs. Frequently found in riparian, bog, and nutrient-rich swamp communities
Slopes:	N/A



Bill Cook, Michigan State University, Bugwood.org





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### ATUOMKMINAQSI Strawberry *Fragaria virginiana*

Strawberry Favourable Conditions:

Soils Drainage:	Moist (moderately drained)
Sub-Surface Drainage:	Moderately drained
Sun Exposure:	Full sun
Habitat Type:	Grows in patches in open fields, oldfield habitats, roadsides and edges of woods, often in disturbed areas
Slopes:	N/A



Dave Powell, USDA Forest Service, Bugwood.org



John Ruter, University of Georgia, Bugwood.org

### MIMKUTAQO'Q Striped Maple (Moosewood) *Acer pensylvanicum*

Striped Maple Favourable Conditions:

Soils Drainage:	Common on sandy loams, moist, acid soils, well drained, fine, sandy loam. Moderate to well drained
Sub-Surface Drainage:	Sandy loam soil parent material. Moderate to well drained
Sun Exposure:	Shade
Habitat Type:	Deep valleys and on cool, moist, shaded, north-facing slopes. Occurrences increased on slopes
Slopes:	Yes



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Paul Wray, Iowa State University, Bugwood.org

### **SNAWEY Sugar Maple *Acer saccharum***

#### Sugar Maple Favourable Conditions:

Soils Drainage:	Typically does best on deep, moist, fertile, well-drained soils. It grows on sand, loamy sand, sandy loam, silty loam and loam. Moderate to well drained
Sub-Surface Drainage:	Commonly associated with alluvial or calcareous soils, it will also grow on stabilized dunes. Moderate to well drained
Sun Exposure:	Very tolerant of shade and can persist for long periods beneath a dense forest canopy. It is noted for its ability to quickly occupy gaps created in the forest canopy
Habitat Type:	Often associated with stream terraces, streambanks, valleys, canyons, ravines and wooded natural levees; occasionally found on dry rocky hillsides. Mixed woods
Slopes:	Yes



Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

### **PESAQANATKW Sphagnum Moss *Sphagnum spp.***

#### Sphagnum Moss Favourable Conditions:

Soils Drainage:	Poorly drained
Sub-Surface Drainage:	Poorly drained
Sun Exposure:	Full
Habitat Type:	Found in damp or wet places beside streams, in wet woodland, on moorland and, in particular, bogs and coastal bogs
Slopes:	N/A





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### **KJIMSKIKU Sweetgrass *Hierochloa odorata***

Sweetgrass Favourable Conditions:

Soils Drainage:	Moist (/oderate)
Sub-Surface Drainage:	Moderate
Sun Exposure:	Full sun
Habitat Type:	Moist heavy soils, tidal marsh, inland shores
Slopes:	N/A



Joseph O'Brien, USDA Forest Service, Bugwood.org

### **KA'QAJU'MANNAQSI Teaberry (Wintergreen) *Gaultheria procumbens***

Teaberry Favourable Conditions:

Soils Drainage:	Sandy
Sub-Surface Drainage:	Well drained to poorly drained
Sun Exposure:	Partial shade
Habitat Type:	Dry to wet woods and clearings, sphagnum bogs, barrens, swamps, oldfield/pasture and forest edges
Slopes:	N/A







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### MITI Trembling Aspen (Poplar) *Populus tremuloides*

Trembling Aspen Favourable Conditions:

Soils Drainage:	From shallow and rocky to deep, heavy clays, including: infertile dry sands, rich loams, waterlogged mineral soils and peats. Growth generally best on rich, moist loams or on well-drained silt or clay loams
Sub-Surface Drainage:	Silt and clay parent material. Poor to well drained
Sun Exposure:	Extremely intolerant of shade; nearly full sunlight is necessary for good growth and survival
Habitat Type:	One of several species that colonizes immediately after landslides and often re-forests mining waste dumps and abandoned borrow pits. Abandoned pastures and talus slopes
Slopes:	Yes



Paul Wray, Iowa State University, Bugwood.org

### MASKWI White Birch *Betula papyrifera*

White Birch Favourable Conditions:

Soils Drainage:	Grows best on deep, well-drained to moderately well-drained sandy or silty soils common on glacial deposits
Sub-Surface Drainage:	A wide range of soil textures from gravels to silts and in organic bog and peat soils, well drained to moderately well-drained



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Sun Exposure:	Shade-intolerant; abundant on burned or cut lands, often in pure stands. Restricted to openings in older forests
Habitat Type:	Abundant on rolling upland terrain and floodplain sites and also grows on open slopes, avalanche tracks, swamp margins and in bogs. Also, mountain slopes, open slopes, rock slides, muskegs and borders of bogs and swamps. Rapidly colonizes open disturbed sites created by wildfire or wind-throw. Mixed wood and hardwood cover
Slopes:	Yes



Gil Wojciech, Polish Forest Research Institute, Bugwood.org

### **White Wood Sorrel *Oxalis acetosella***

#### White Wood Sorrel Favourable Conditions:

Soils Drainage:	Soils are shallow sandy loams to loamy tills. Saturated soils may be poor to moderately well drained
Sub-Surface Drainage:	Tills, moderate to well drained
Sun Exposure:	Ability to grow in deep shade
Habitat Type:	Occurs on level to steep slopes and any aspect with the ability to grow on steep ground. Moss coverage can be low to high. Often grows in humus on bedrock in spruce-fir forests
Slopes:	Yes







Kristian Peters

### **ALAWAY Wild Pea *Lathyrus palustris***

#### Wild Pea Favourable Conditions:

Soils Drainage:	Moist (moderate to poorly drained)
Sub-Surface Drainage:	Moderately to poorly drained
Sun Exposure:	Full sun
Habitat Type:	Wet to moist; meadows, shores, marshes, freshwater-marsh, bogs/fens. Also coastal headlands, roadsides, fields, thickets, waste grounds and urban
Slopes:	N/A



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### **NIMNOQN Yellow Birch *Betula alleghaniensis***

#### Yellow Birch Favourable Conditions:

Soils Drainage:	Grows best on well-drained, fertile loams and moderately well-drained sandy loams. Moderate to well drained
Sub-Surface Drainage:	Moderate to well drained
Sun Exposure:	Yellow birch is intermediate in shade tolerance
Habitat Type:	Found on glacial tills, outwash sands, lacustrine deposits, shallow loess deposits, and residual soils derived from sandstone, limestone, and igneous and metamorphic rock. Hardwood and mixed wood forests. Found on lowlands and slopes and requires disturbance for seeding
Slopes:	Yes



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James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org

### **Yellow Wood-Sorrel *Oxalis stricta***

Yellow Wood-Sorrel Favourable Conditions:

Soils Drainage:	Moist, prefers loam soils having a friable crumb structure
Sub-Surface Drainage:	Moderate
Sun Exposure:	Full sun
Habitat Type:	Urban, cultivated fields, roadsides, woodland edges
Slopes:	N/A





# Ground Truth Results

Overall results of the Fieldwork and Ground Truth Analyses varied among the individual plant species where some species were elusive to the field crews, but scored “Very Good” in the Predictive Rating category of the Ground Truth Analysis. It was rare that a plant species found and recorded in the field had three or more supportive habitat map layers at the exact plant location. However, it was more likely that an additional supportive habitat map layer was within a short distance of 31 m (100 ft.) to the plant location.

As previously described in the Methodology, Field Crews chose fieldwork stage 2 and 3 target points that were accessible by public roads, and recorded any other culturally significant plants found near the target points. New GPS points were not created for target species not found, nor were new GPS points created for other plant locations found near the target point. New GPS points that were created are representative of all culturally significant plants found within the vicinity of the original target species point. However, in post processing of the collected field data, each individual plant was separated from other plants represented by the field GPS point, and each provided a new GIS point with the same coordinates as the original GPS point.

An example of a fieldwork scenario is that a field crew stopped on the road side, or walked a short distance into nearby woods or field looking for a target species. The field crew spots several species within the vicinity of the target at various distances, such as across the road, at the edge of the field, or within a few paces of the target point. Occasionally, plants not included in any of the priority plant lists were recorded out of interest but not included in further GIS mapping or Ground Truth results.

A system of rating the predictive ability of the Grey Tone method chosen for this project must consider field data collection methods in which each point is not necessarily an exact location of a plant species found. Another consideration is the various scales of the habitat data utilized in the Grey Tone mapping. Some of the data sources are at provincial scale whereas the Cape Breton data was extracted from a larger province-wide source, such as the Surficial Geology data used for this project. Other sources of data are at a national or provincial scale, but the detail provided is comparable to a local scale where individual habitats such a field, quarry or forest clear-cut are identifiable.

To analyze the utility of the project GIS database and mapping method in predicting and locating Culturally Significant Plant Species to the Mi'kmaq, the following criteria was used to assess the Ground Truth results:

Ground Truth Predictive Rating –Aug. 05 to Oct. 21, 2010				
Accumulation of Habitat Support Layers	Habitat Support Layer at Point Location	Proximity of Nearest Additional Habitat Support Layer		
		Within 31m (100ft)	Beyond 31m (100ft)	n/a's
0 Habitat Support Layers	Poor	Fair	Poor	Poor
1 Habitat Support Layer	Fair	Good	Fair	Fair
2 Habitat Support Layers	Good	Very Good	Good	Good
3+ Habitat Support Layers	Very Good	Very Good	Very Good	Very Good

Where a High Priority or Medium Priority plant was not located in the field, or fewer than three locations were found, plant locations derived from Cape Breton University (CBU) Archives were mapped and included with the assessment of Ground Truth points. Lower Priority plants were not targeted in the field work and not all were located in the field. Similar to the High and Medium Priority plants, CBU archive points were utilized to represent Lower Priority plants with fewer than three Ground Truth point locations. Latitude and Longitude coordinate locations of CBU archive points are rounded off to the nearest minute and were mapped with a 60-second window where the plant location may exist. For this reason the same criteria for assessing Ground Truth results utilized for field points was utilized for CBU archive plant point locations with the addition of the 60-second window:



Ground Truth Predictive Rating –CBU Archive Points Only				
Accumulation of Habitat Support Layers	Habitat Support Layer at Point Location	Proximity of Nearest Additional Habitat Support Layer*		Within Lat-Long 60" Window
		Within 31m (100ft)	Beyond 31m (100ft)	
0 Habitat Support Layers	Poor	Fair	Poor	Poor
1 Habitat Support Layer	Fair	Good	Fair	Fair
2 Habitat Support Layers	Good	Very Good	Good	Good
3+ Habitat Support Layers	Very Good	Very Good	Very Good	Very Good

\* Only applies to areas outside the Lat-Long 60" window

A total of 429 individual plants were identified and recorded by the field crews, representing all the new GPS points created in all the combined stages of fieldwork. In addition to coordinate locations and plant species and GPS reference number, the GPS points are supplemented by hardcopy field notes which further record date, regional location, GPS point reference number, sunlight conditions, canopy closure, soil type, habitat type, moisture conditions, abundance, and any other relevant notes associated with the point location.

Not all 429 plants identified in the field were carried through to final analysis, as some were not on the priority lists or the specific species were not identified, such as was the case with alders and willows. The analysis consists of counting the number of supporting habitat layers at each individual plant location, the number of support habitat layers available within the GIS map for each individual plant species, and measured proximity of nearest additional mapped habitat support layer to each individual plant location.

The Ground Truth Results Analysis information was assessed using the Ground Truth Predictive Rating tables applied to assign a Predictive Rating of "Poor", "Fair", "Good", or "Very Good" for each individual plant location. The Predictive Ratings were then totalled within each plant species to assign an Overall Assessment of the predictive utility of the method chosen to map and locate the plant species of Cultural Significance to Mi'kmaq. The Overall Assessment consists of the same ratings as the Predictive Ratings with the exception of ties in the Predictive Ratings, or differences of only one between two ratings totals in which case both ratings are assigned to the Overall Assessment (eg. Fair = 1, Good = 2, Overall: Fair to Good).

Elder Plant Gathering Area Predictive Rating 2010 Elder Interviews			
Accumulation of Habitat Support Layers	Support Layers Within Plant Gathering Area	Proximity of Nearest Additional Habitat Support Layer	
		Within 61m (200ft)	Beyond 61m (200ft)
0 Habitat Support Layers	Poor	Fair	Poor
1 Habitat Support Layer	Fair	Good	Fair
2 Habitat Support Layers	Good	Very Good	Good
3+ Habitat Support Layers	Very Good	Very Good	Very Good





The following is a summary of the plant species Overall Assessment ratings for predictive utility derived from the Ground Truth Results Analysis table:

<b>High Priority Plants</b>	
Balsam Poplar	Overall: Good
Beaked Hazelnut	Overall: Good
Bloodroot	No Data
Large-tooth Aspen	Overall: Very Good
Ostrich Fern	Overall: Very Good
Snowberry	Overall: Fair to Good
Staghorn Sumac	Overall: Very Good
Sweetflag	Overall: Poor to Fair
Toothwort	Overall: Good
Wild Cucumber	Overall: Very Good
<b>Medium Priority Plants</b>	
American Mountain Ash	Overall: Fair
Common Elder	Overall: Very Good
Gooseberry	Overall: Good
Highbush Cranberry	Overall: Good
Red Osier Dogwood	Overall: Good
<b>Lower Priority Plants</b>	
Balsam Fir	Overall: Very Good
Bayberry	Overall: Poor to Fair
Beach Pea	Overall: Fair
Bearberry	Overall: Poor
Black Ash	No Data
Low Bush Blueberry	Overall: Poor to Fair
Velvet Leaved Blueberry	Overall: Fair to Good
Bunchberry	Overall: Good
White (Cat) Spruce	Overall: Good
Choke Cherry	Overall: Good to Very Good
Cloudberry	Overall: Very Good
Common Blackberry	Overall: Fair
Common Juniper	Overall: Fair
Common Mullein	Overall: Poor to Fair
Common Plantain	Overall: Poor to Fair
Common Wild Rose	Overall: Poor to Fair
Cow (Yellow Pond) Lily	No Data
Cow Parsnip (Masterwort)	Overall: Fair
Dog Berry (Mountain Ash)	Overall: Good
Downy Alder	Overall: Fair
Tamarack (Eastern Larch)	Overall: Fair
Fineberry Hawthorn	Overall: Fair
Foxberry	Overall: Fair to Good
Labrador Tea	Overall: Good



Gold Thread	Overall: Fair to Good
Mint (Field Mint)	Overall: Good to Very Good
Mint (Lemon Mint)	No Data
Mint (Peppermint)	No Data
Mint (Spearmint)	No Data
Pin Cherry	Overall: Fair to Good
Pitcher Plant	No Data
Pussy Willow	Overall: Good to Very Good
Red Raspberry	Overall: Good
Sarsaparilla	Overall: Good
Small Cranberry	Overall: Poor
Smooth Serviceberry	Overall: Fair
Speckled Alder	Overall: Good
Sphagnum Moss	No Data
Striped Maple	Overall: Very Good
Wild Strawberry	Overall: Fair to Good
Sugar Maple	Overall: Very Good
Sweet Grass	Overall: Good
Tea Berry (Wintergreen)	Overall: Fair to Good
Trembling Aspen	Overall: Good
White Birch	Overall: Good
White Wood Sorrel	Overall: Good
Yellow Birch	Overall: Good
Yellow Wood Sorrel	No Data

Total Number of Plant Species	= 65	100.00%	= 57	100.00%
Total Poor	= 2	3.07%	= 2	3.51%
Total Poor to Fair	= 6	9.23%	= 6	10.52%
Total Fair	= 9	13.85%	= 9	15.79%
Total Fair to Good	= 7	10.77%	= 7	12.28%
Total Good	= 20	30.77%	= 20	35.09%
Total Good to Very Good	= 4	6.15%	= 4	7.02%
Total Very Good	= 9	13.85%	= 9	15.79%
Total No Data	= 8	12.31%	N/A	

The combined priority lists of Culturally Significant Plants to Mi'kmaq consist of a total 65 plant species of which 57 species were carried through to final analysis within the **Ground Truth Results Analysis** table. The distribution of Overall Assessment ratings indicate a positive result for the mapping and predictive utility of the project methodology with 57.90% of the 57 plant species analyzed rated Good or Better, and 85.97% rating Fair or Better. The Poor and Poor to Fair ratings accounted for 14.03% of the 57 plant species. Of the total 65 plants, 12.31% of species had No Data and were not included in the Ground Truth analysis.

With the exception of Bloodroot, most species with No Data were Lower Priority plants and were not specifically targeted in the fieldwork. Also there was no CBU Archive plant location points for those species or none was available. The High Priority plant species, Bloodroot, may have slipped through the cracks as that plant did not seem to be an elusive plant that field crews were eagerly trying to locate, as were Wild Cucumber, High Bush Cranberry, Ostrich Fern and Largetooth Aspen. No Wild Cucumber plants were located in the field and the final analysis had to rely on CBU archive plant locations. Perhaps it was too late in the season for Wild Cucumber, or it was not a flowering season where the top half of the plant's two foot height is absent. However, Wild Cucumber did rate Very Good in the Ground Truth Results Analysis and that may have been a result of refining the mapping with additional habitat research post-fieldwork data collection.





Another source for checking the predictive utility of the project methodology is the Elders' interviews conducted in the earlier phase of the project. Elders provided known locations from personal knowledge of various plant species. Using topographic map sheets, Elders transferred their knowledge by circling areas of plant locations and providing details such as the season, method, and time frame (years) in which they gather plants at these locations.

The knowledge provided by the Elders was then processed and entered into a GIS Database. The topographic map information was digitized into geographic-referenced GIS polygons and included in the earlier phase of GIS mapping. This phase of the project also included the Elders' plant locations in the GIS Database and GIS mapping, initially as background information to determine fieldwork target locations during field trips that were accompanied by an Elder or Knowledge Holder. The Elders' information can now be utilized in an analysis of the predictive utility of the project methodology to supplement the Ground Truth Analysis.

A total of 157 Elders' plant location polygons from the earlier phase were brought forward into this phase of the project and included in the GIS mapping of each plant species. Although not included in the hardcopy maps of this phase, the Elders' information is accessible within each plant species electronic version of the GIS map when zoomed in from 1:50,000 to 1:1. Of the 157 Elders' polygons, 132 polygons representing 40 plant species were selected for further analysis based on clarity of plant species identified. Some plant species polygons were not included in the analysis due to ambiguity in the exact species identified, such as the alders, poplars, mountain ash, willows, and spruce. The Grey Tone mapping is very species specific and an analysis of these ambiguous species would not be valid. In some cases, such as blueberry and mint, the assumption was made that these plants are low-bush blueberry and field mint.

The Elders transferred their plant location knowledge to 1:50,000 topographic sheets, circling locations with a pen. Taking this into consideration, the digitized GIS polygons were given an additional 61 m (200 ft.) outside-buffer distance for consideration in the analysis. Similar to the Ground Truth Analysis, the Elders' Gathering Area Analysis criteria consider the number of accumulative, supporting habitat layers within the plant location polygon, and within the 61 m buffer as follows:

Accumulative number of Habitat Support Layers within the plant location GIS polygon.

Distance of nearest additional Habitat Support layer within or beyond 61 m (200ft.) of plant location GIS polygon.

The Elders' Plant Gathering Area Results Analysis information was assessed using the Elders' Plant Gathering Area Predictive Rating table applied to assign a Predictive Rating of "Poor", "Fair", "Good" or "Very Good", for each individual plant location. The Predictive Ratings were then totalled within each plant species to assign an Overall Assessment of the predictive utility of the method chosen to map and locate the plant species of Cultural Significance to Mi'kmaq. The Overall Assessment consists of the same ratings as the Predictive Ratings with the exception of ties in the Predictive Ratings, or differences of only one between two ratings totals in which case both ratings are assigned to the Overall Assessment (eg. Fair = 1, Good = 2, Overall: Fair to Good).

## Elders' Plant Gathering Areas



The following is a summary of the plant species Overall Assessment ratings for predictive utility derived from the Elders' Plant Gathering Area Results Analysis Table:

High Priority Plants	
Balsam Poplar	No Data
Beaked Hazelnut	Overall: Very Good
Bloodroot	Overall: Very Good
Large-tooth Aspen	No Data
Ostrich Fern	Overall: Very Good
Snowberry	Overall: Fair to Good
Staghorn Sumac	Overall: Very Good
Sweetflag	Overall: Fair
Toothwort	Overall: Good
Wild Cucumber	Overall: Very Good
Medium Priority Plants	
American Mountain Ash	No Data
Common Elder	No Data
Highbush Cranberry	No Data
Red Osier Dogwood	Overall: Fair to Good
Gooseberry	Overall: Good to Very Good
Lower Priority Plants	
Balsam Fir	Overall: Very Good
Bayberry	Overall: Good to Very Good
Beach Pea	Overall: Very Good
Bearberry	Overall: Fair
Black Ash	No Data
Low Bush Blueberry	Overall: Good
Velvet Leaved Blueberry	No Data
Bunchberry	Overall: Good
Choke Cherry	No Data
White (Cat) Spruce	No Data
Cloudberry	Overall: Very Good
Common Blackberry	Overall: Fair
Common Juniper	Overall: Good
Common Mullein	Overall: Good to Very Good
Common Plantain	Overall: Good to Very Good
Common Wild Rose	Overall: Good to Very Good
Cow (Yellow Pond) Lily	Overall: Good to Very Good
Cow Parsnip (Masterwort)	Overall: Good
Dog Berry (Mountain Ash)	No Data
Downy Alder	No Data
Tamarack (Eastern Larch)	Overall: Very Good
Fineberry Hawthorn	Overall: Good
Foxberry	Overall: Good to Very Good
Gold Thread	Overall: Poor to Fair





Labrador Tea	Overall: Good
Mint (Field Mint)	Overall: Fair
Mint (Lemon Mint)	No Data
Mint (Peppermint)	No Data
Mint (Spearmint)	Overall: Poor to Fair
Pin Cherry	No Data
Pitcher Plant	Overall: Very Good
Pussy Willow	Overall: Very Good
Red Raspberry	No Data
Sarsaparilla	Overall: Very Good
Small Cranberry	No Data
Smooth Serviceberry	Overall: Very Good
Speckled Alder	No Data
Sphagnum Moss	No Data
Strawberry (Wild)	Overall: Good
Striped Maple	Overall: Very Good
Sugar Maple	No Data
Sweet Grass	Overall: Very Good
Tea Berry (Wintergreen)	Overall: Very Good
Trembling Aspen	No Data
White Birch	No Data
White Wood Sorrel	No Data
Wild Pea	Overall: Poor
Yellow Birch	No Data
Yellow Wood Sorrel	No data

Total Number of Plant Species	= 65	100.00%	= 40	100.00%
Total Poor	= 1	1.54%	= 1	2.50%
Total Poor to Fair	= 2	3.08%	= 2	5.00%
Total Fair	= 4	6.15%	= 4	10.00%
Total Fair to Good	= 2	3.08%	= 2	2.50%
Total Good	= 8	12.30%	= 8	20.00%
Total Good to Very Good	= 7	10.77%	= 7	17.50%
Total Very Good	= 16	24.62%	= 16	40.00%
Total No Data	= 25	38.46%	N/A	

The combined priority lists of Culturally Significant Plants to Mi'kmaq consists of a total of 65 plant species of which 40 species were carried through to final analysis within the Elders' Gathering Area Results Analysis Table. The distribution of Overall Assessment ratings again indicate a positive result for the mapping and predictive utility of the project methodology, with 77.50% of the 40 plant species analyzed rated Good or better and 92.5% rating Fair or better. The Poor and Poor to Fair ratings accounted for 7.50% of the 40 plant species analyzed. Of the total 65 plants of all priority lists, 38.46% of species had No Data, mostly due to an ambiguity in exact species.



The project GIS database and GIS Grey Tone mapping provide useful tools in assisting Mi'kmaq, researchers, and the forestry industry in predicting the distribution and location of culturally significant plants to the Mi'kmaq in Cape Breton Island (Unama'ki).

Habitat requirements were extensively researched and the GIS database continually refined and updated throughout the duration of the project, as were the GIS maps. Lessons learned during early fieldwork were carried forward and improved upon for subsequent fieldwork throughout the project, such as refining habitat requirements and developing more intuitive skills about possible plant locations through additional research and field experience.

The GIS database and GIS Mapping can still be improved over time. Plant species that rated Poor and Poor to Fair may be still be missing a key habitat requirement not obvious in the project research to date, slope aspect, or temperature requirements (as influenced by altitude and topography) being possible examples.

The large percentage of plant species rating Good and better in both the Ground Truth and Elders' Gathering Area overall assessment ratings indicates a strong predictive utility in the GIS database and GIS Grey Tone mapping method. The project methodology attempts to explicitly state all data inputs and processes throughout all stages of the project so that others can duplicate the results or improve project methodology.

## Conclusion









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