

## Conserving Great Lakes Alvars

### 2.2.3 Alvar Savannas and Woodlands

Alvar savanna and woodland communities are distinguished by their partial canopy of trees; savannas have from 10% to 25% cover of trees at least 5 m tall, and woodlands have from 25% to 60% cover of trees. Cover of shrubs, herbs, and nonvascular plants, and the amount of exposed bedrock are variable in these communities. There are three alvar savanna types and two alvar woodland types briefly described below. Field surveys for the Alvar Initiative focused on the open canopy alvar grasslands, pavements, and shrublands; as a result, data on the savanna and woodland types are more limited.

### 9. Shagbark hickory / Prickly ash alvar savanna

This community is only documented from the Flamborough Plains in southern Ontario (Map K), although other examples may exist in the Lake Erie basin. The one documented occurrence of this community has a total area of about 10 acres (4 ha), but a few other similar sites have been reported nearby (Goodban 1995). It has a global rank of G? (denoting uncertainty about its appropriate ranking); total current acreage is unknown. This savanna community has scattered trees forming 10 to 25% canopy cover and a variable understory with shrubby patches and grassy patches.

The dominant tree is shagbark hickory (*Carya ovata*); other characteristic trees include bur oak (*Quercus macrocarpa*), chinquapin oak (*Quercus muehlenbergii*), white ash (*Fraxinus americana*), and rock elm (*Ulmus thomasii*). The most abundant shrub is prickly ash (*Zanthoxylum americanum*); other characteristic shrubs are gray dogwood (*Cornus foemina* spp. *racemosa*), buckthorn (*Rhamnus cathartica*), chokecherry (*Prunus virginiana*), and snowberry (*Symphoricarpos albus*).

Characteristic herbs of grassy patches in the groundlayer are poverty grass (*Danthonia spicata*), tall hawkweed (*Hieracium piloselloides*), Philadelphia panic grass (*Panicum philadelphicum*), Pennsylvania sedge (*Carex pennsylvanica*), Canada bluegrass (*Poa compressa*), and gray goldenrod (*Solidago nemoralis*). Small outcrops of dolostone pavement are common; characteristic herbs on pavement patches include false pennyroyal (*Trichostema brachiatum*), Bicknell's cranebill (*Geranium bicknellii*), and panic grasses (*Panicum* spp.)

Diagnostic characteristics of shagbark hickory / prickly ash alvar savanna are:

- partial canopy ranging from 10% to 25% cover of trees over 5 m tall
- variable cover of shrubs (0.5 to 5 m tall), ranging from 2% to 55% cover

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- variable cover of herbs (including grasses and sedges) forming a dry, grassy meadow between the trees and shrubs
- soils are shallow loams (usually 10 to 20 cm deep) over dolostone bedrock; they are well-drained and usually very dry in mid-summer
- characteristic species include shagbark hickory, prickly ash, poverty grass, Philadelphia panic grass, and Pennsylvania sedge.

### 10. Chinquapin oak / nodding onion alvar savanna

This community is only documented from Pelee Island, Ontario in western Lake Erie (Map K) (Kirk 1992). This one occurrence has a total area of 30

acres (12 ha). No other occurrences of this type were located, although it is possible that other examples may occur in the western Lake Erie area. It has a global rank of G1? (denoting some uncertainty about the ranking).

This is a savanna community with scattered trees forming 10% to 25% canopy cover and a variable understory with shrubby patches and grassy patches. Chinquapin oak (*Quercus muehlenbergii*) is the most abundant tree, but swamp white oak (*Q. bicolor*), blue ash (*Fraxinus quadrangulata*), and eastern red cedar (*Juniperus virginiana*) are also characteristic trees. The most abundant shrubs in the shrubby patches are rough-leaved dogwood (*Cornus drummondii*), downy arrow-wood (*Viburnum rafinesquianum*), fragrant sumac (*Rhus aromatica*), prickly ash (*Zanthoxylum americanum*), staghorn sumac (*Rhus typhina*), and snowberry (*Symphoricarpos albus*).

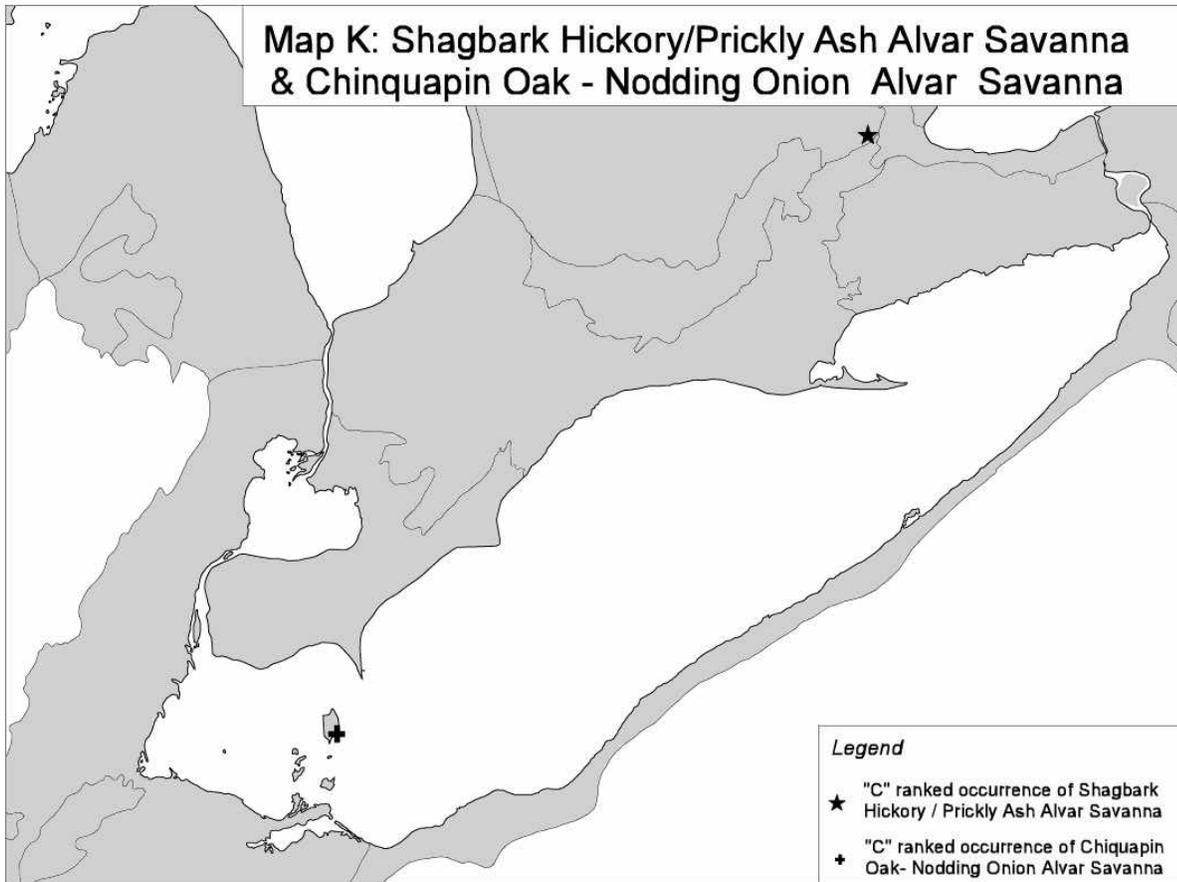
Shagbark Hickory / Prickly Ash Alvar Savanna  
at Hayesland Alvar, Flamborough Plains, Ontario

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photo by Anthony Goodban

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Chinquapin Oak - Nodding Onion Alvar  
Savanna at Stone Road Alvar, Pelee Island, Ontario

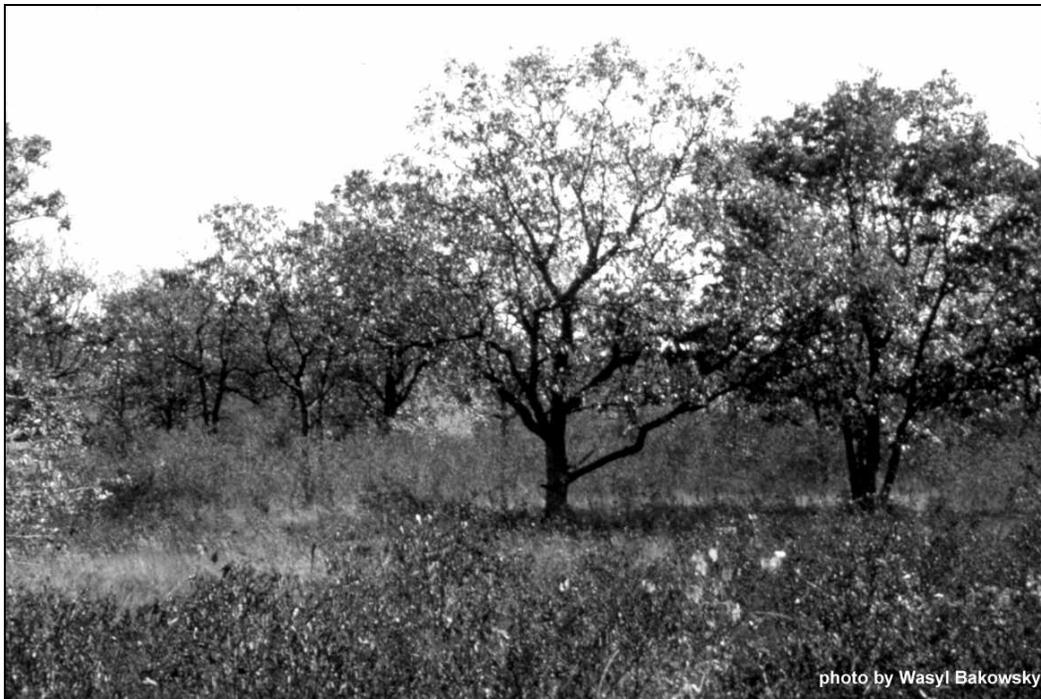


photo by Wasył Bakowsky

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The dominant grass in the grassy patches is Canada bluegrass (*Poa compressa*); other characteristic herbs include nodding onion (*Allium cernuum*), troublesome sedge (*Carex molesta*), balsam ragwort (*Senecio pauperculus*), wiry panic grass (*Panicum flexile*), and false pennyroyal (*Trichostema brachiatum*). Most of the area within this community has been grazed and several weedy exotic species are common, including Kentucky bluegrass (*Poa pratensis*) and St. John's-wort (*Hypericum perforatum*).

Diagnostic characteristics of chinquapin oak / nodding onion alvar savanna are:

- partial canopy ranging from 10% to 25% cover of trees over 5 m tall
- variable cover of shrubs (0.5 to 5 m tall), ranging from 2% to 55% cover
- variable cover of herbs (including grasses and sedges) forming a dry, grassy meadow between the trees and shrubs
- soils are shallow loams (usually about 10 cm deep) over limestone bedrock, seasonally flooded, and usually very dry in midsummer
- characteristic species include chinquapin oak, swamp white oak, blue ash, rough-leaved dogwood, nodding onion, and Canada bluegrass.

### 11. White cedar - jack pine / shrubby cinquefoil alvar savanna

This community was reported from Manitoulin Island and the Bruce Peninsula (Map L), with 11 occurrences and a total area of over 812 acres (330 ha). More surveys of this community are needed to map and determine acreage of occurrences. It has a global rank of G1G2. This is a savanna community with scattered trees forming a canopy with 10% to 25% cover and a variable understory with shrubby, grassy, and pavement patches.

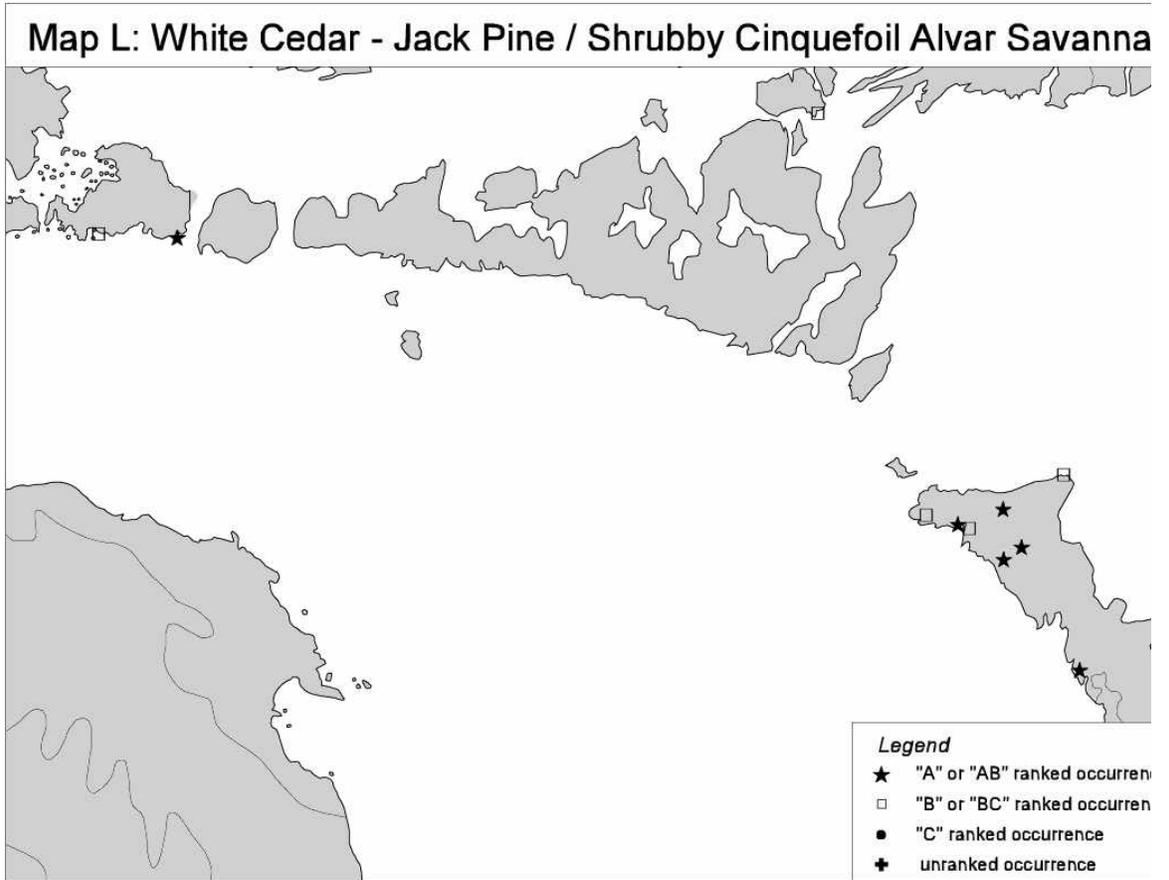
The most abundant trees are eastern white cedar (*Thuja occidentalis*) and jack pine (*Pinus banksiana*); tamarack (*Larix laricina*) is a common associate. This community has a fairly diverse shrub and herb layer. The most abundant shrubs are dwarf shrubs (under 0.5 m tall), including shrubby cinquefoil (*Pentaphylloides floribunda*) and creeping juniper (*Juniperus horizontalis*).

Characteristic herbs are similar to little bluestem alvar grassland, including little bluestem (*Schizachyrium scoparium*), prairie dropseed

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(*Sporobolus heterolepis*), northern singlespike sedge (*Carex scirpoidea*), Richardson's sedge (*C. richardsonii*), ebony sedge (*C. eburnea*), and limestone calamint (*Calamintha arkansana*). This is sometimes a near-shore alvar community, occurring along and near the south shore of Manitoulin Island and the west shore of the Bruce Peninsula.

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White Cedar - Jack Pine / Shrubby Cinquefoil Alvar Savanna at LaCloche Alvar, North of Manitoulin Island, Ontario



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Diagnostic characteristics of white cedar - jack pine / shrubby cinquefoil alvar savanna:

- partial canopy ranging from 10% to 25% cover of trees over 5 m tall
- variable cover of shrubs (0.5 to 5 m tall)
- variable cover of herbs (including grasses and sedges) forming a moist, grassy meadow between the trees and shrubs
- soils are shallow loams (usually less than 30 cm deep) over dolostone bedrock
- characteristic species include eastern white cedar, jack pine, shrubby cinquefoil, creeping juniper, northern singlespike sedge, limestone calamint, and ebony sedge.

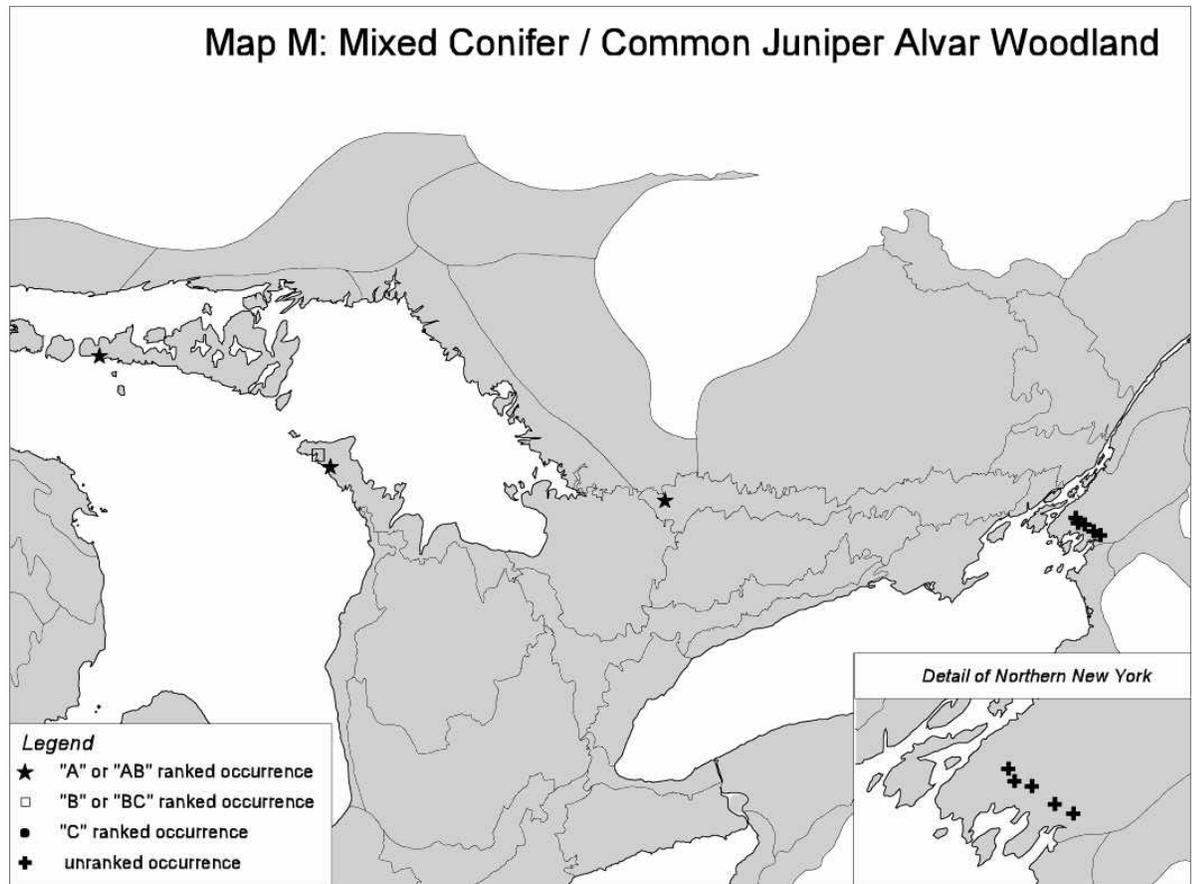
### 12. Mixed conifer / common juniper alvar woodland

This rare community probably occurs scattered through the Great Lakes basin in Ontario, Michigan, and New York (Map M), but it has not been well documented during Alvar Initiative surveys. Nine occurrences of this community were documented, with a total of over 1334 acres (540 ha). It has a global rank of G2? (denoting some uncertainty about the ranking).

This is a woodland community: the trees form a partial canopy with 25% to 60% cover. The tree canopy consists of a variable mixture of white spruce (*Picea glauca*), eastern white cedar (*Thuja occidentalis*), jack pine (*Pinus banksiana*), balsam fir (*Abies balsamea*), and white pine (*Pinus strobus*). The understory of this woodland is a mosaic of shrubby patches, exposed pavement, and grassy patches. The most abundant shrub is common juniper (*Juniperus communis*); other characteristic shrubs include creeping juniper (*J. horizontalis*), buffaloberry (*Shepherdia canadensis*) and bearberry (*Arctostaphylos uva-ursi*).

Characteristic herbs include false pennyroyal (*Trichostema brachiatum*), Crawe's sedge (*Carex crawei*), balsam ragwort (*Senecio pauperculus*), ebony sedge (*Carex eburnea*), Richardson's sedge (*C. richardsonii*), and sheathed rush grass (*Sporobolus vaginiflorus*). Areas of exposed limestone or dolostone pavement are common, usually with a cover of mosses such as twisted moss (*Tortella* spp.) and common grimmia (*Schistidium* spp.), lichens such as reindeer 'moss' (*Cladina rangiferina*) and dog lichen (*Peltigera canina*), and rock surface algae (*Gloeocapsa alpina*).

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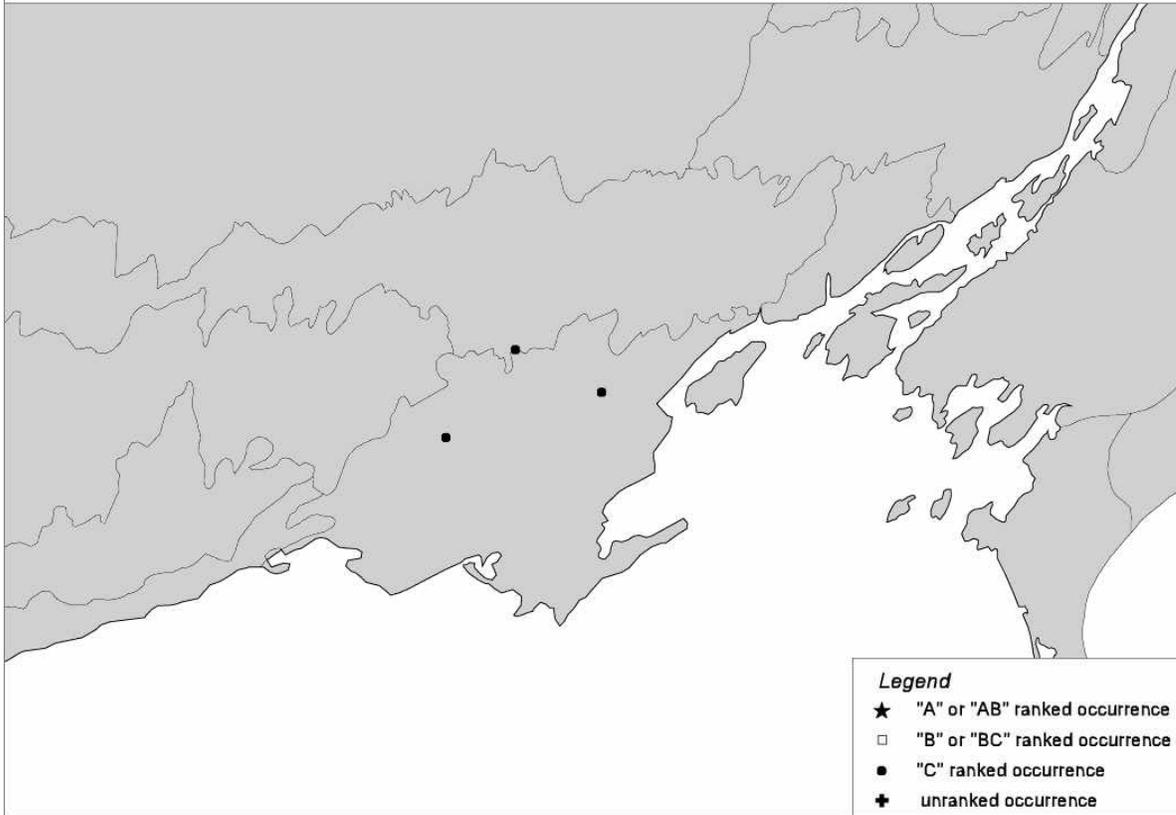
This community is closely related to juniper alvar shrubland and may represent a later successional stage of that community. The main difference between mixed conifer / common juniper alvar woodland and juniper alvar grassland is the cover of trees that are over 5 m tall.

Diagnostic characteristics of mixed conifer / common juniper alvar woodland are:

- partial canopy ranging from 25% to 60% cover of trees over 5 m tall
- variable cover of shrubs (0.5 to 5 m tall)
- variable cover of herbs (including grasses and sedges) in a mosaic with exposed patches of limestone or dolostone bedrock pavement
- soils are shallow loams (usually less than 30 cm deep)
- characteristic species include white spruce, eastern white cedar, jack pine, white pine, common juniper, false pennyroyal, and ebony sedge.

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Map N: Red Cedar / Early Buttercup Alvar Woodland



Red Cedar / Early Buttercup Alvar Woodland  
at Salmon River Alvar, Napanee Plains, Ontario



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### 13. Red cedar / early buttercup alvar woodland

This community occurs in Ontario, and possibly in New York (Map N), with three documented occurrences and a total area of over 110 acres (45 ha) currently mapped. This community was not well documented during Alvar Initiative surveys; surveys are needed to search for additional examples and to map the extent of these communities. It has a global rank of G3?, reflecting the impression that there are many more occurrences to document. This is a woodland community as the trees form a partial canopy with 25% to 60% cover. Red cedar (*Juniperus virginiana*) is usually the most abundant tree, but eastern white cedar (*Thuja occidentalis*) may also be present. There are very few shrubs.

The groundlayer is a mosaic of grassy patches and exposed limestone pavement. Characteristic herbs in the grassy patches include Canada bluegrass (*Poa compressa*), early buttercup (*Ranunculus fascicularis*), sheathed rush grass (*Sporobolus vaginiflorus*), Philadelphia panic grass (*Panicum philadelphicum*), wiry panic grass (*P. flexile*), and upland white aster (*Solidago ptarmicoides*). Patches of exposed pavement typically are covered with tufts of mosses such as twisted moss (*Tortella* spp.) and lichens.

Diagnostic characteristics of red cedar / early buttercup alvar woodland are:

- partial canopy ranging from 25% to 60% cover of trees over 5 m tall
- variable cover of shrubs (0.5 to 5 m tall)
- variable cover of herbs (including grasses and sedges) in a mosaic with exposed patches of limestone or dolostone bedrock pavement
- soils are shallow loams (usually less than 20 cm deep)
- characteristic species include red cedar, poverty grass, and early buttercup.

### 2.3 Other Communities Studied

Four other communities similar to alvar communities were studied and evaluated to determine if they should be considered alvar types. These communities have species composition and physiognomy that are close to alvar communities. After careful review of the floristic composition and key ecological

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processes influencing these communities, collaborators agreed to recognize these types as related to, but distinct from, alvar communities.



photo by Carol Reschke

Alvar communities sometimes occur as many small patches intermingled in a mosaic; for example, this is a mosaic of Little Bluestem Alvar Grassland and Alvar Non-Vascular Pavement at Misery Bay Alvar, Manitoulin Island, Ontario

### 14. River ledge limestone pavement

This pavement community is known from four sites: two in northern Michigan along the Escanaba River, one in Ontario along the Maitland River, and one in New York along the Black River, although a few other examples may occur elsewhere. Only preliminary surveys have been conducted at the Ontario and New York sites and their sizes are unknown; the Michigan sites have a total area of 45 acres (15 ha). The community has a global rank of G1.

River ledge limestone pavements occur as small patches. This community occurs on limestone ledges along a river's shore; these ledges are scoured by river water and ice during periods of peak water flow.

Typically a river ledge limestone pavement has an open canopy with less than 10% cover of trees, and few shrubs: less than 10% cover of shrubs.

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The groundlayer is dominated by grasses and sedges, or a mosaic of pavement patches and grassy patches. Cover of herbs (grasses, sedges, and forbs) is variable, with some areas having nearly 100% cover, and other areas having a lot of exposed rock pavement and as little as 15% cover of herbs confined to linear rock crevices. Characteristic species include prairie cordgrass (*Spartina pectinata*), mat muhly grass (*Muhlenbergia richardsonis*), prairie dropseed (*Sporobolus heterolepis*), upland white aster (*Solidago ptarmicoides*), and flat-topped goldenrod (*Euthamia graminifolia*).

This community is not considered alvar because the river shoreline processes (including annual flooding and ice-scouring) seem to be more important influences to plant community structure and composition than the processes characteristic of alvar communities (such as alternating wet and dry soil moisture regime, and infrequent fire). This community also seems distinct from alvar types because of the dominance of prairie cordgrass and mat muhly grass instead of typical alvar grassland species.

### 15. Great Lakes limestone bedrock lakeshore

These sparsely vegetated lakeshores are found along the Great Lakes shorelines of Wisconsin, Michigan, Ontario, Ohio, and New York (Comer et al. 1997, Albert et al. 1997; 1995;1994). Similar communities are found along the shores of Lake Champlain in New York and Vermont (Reschke 1990; Catling and Brownell 1995). These communities are found along Great Lakes shores where exposed flat limestone or dolostone bedrock slopes gently into the lake (average 1%

Great Lakes Limestone Bedrock Lakeshore  
at Huron Bay, Drummond Island, Michigan

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slope). The surface of the bedrock has numerous cracks and crevices where most of the plants are rooted. Two vegetation zones may be present in this lakeshore community. The wave-washed and ice-scoured zone adjacent to the lake is very sparsely vegetated (average 2% cover); the most common plants are rush (*Juncus balticus*), silverweed (*Potentilla anserina*), and balsam poplar (*Populus balsamifera*). The next zone away from the lake typically has about 20% vegetative cover, including Arkansas mint (*Calamintha arkansana*), shrubby cinquefoil (*Pentaphylloides floribunda*), silverweed (*Potentilla anserina*), panic grass (*Panicum lindheimeri*), eastern white cedar (*Thuja occidentalis*), tufted hair grass (*Deschampsia cespitosa*), bog violet (*Viola nephrophylla*), birdseye primrose (*Primula mistassinica*), and Kalm's lobelia (*Lobelia kalmii*). Reports from Michigan described a third, wooded vegetation zone that occurs further inland (Albert et al. 1997, 1995, 1994) called a glade; this glade community is equivalent to the mixed conifer / common juniper alvar woodland described above.

This community is not considered alvar because the shoreline processes (including wave-wash and ice-scouring) and shoreline climate (frequent fog and exposure to winds) seem to be more important influences to plant community structure and composition than the processes characteristic of alvar communities (such as alternating wet and dry soil moisture regime and infrequent fire). This community also seems distinct from alvar types because of the dominance by forbs (broad-leaf herbs) instead of dominance by graminoids (grasses and sedges) or shrubs, which is characteristic of many alvar types.

### 16. Bur oak limestone savanna

This oak savanna community was studied in Sheguiandah Township on Manitoulin Island in an area that is known to have sustained a catastrophic fire in 1865. Similar savannas are reported from a few other sites in Ontario, such as Foxy Prairie on Manitoulin Island and the Squire Creek Headwater in the Lower Trent area. The Sheguiandah area has been grazed by cattle in the recent past, and almost all the currently known sites continue to be used as pasture. However, there does not seem to be a clear correlation between the structure or openness of the canopy and the intensity of current grazing.

This savanna community has from 10% to 25% cover of trees and an open, grassy groundlayer that gives the community a pleasant, park-like quality. The community occurs on shallow loam soils over limestone pavement. The dominant tree is bur oak (*Quercus macrocarpa*) and the ground flora includes many species characteristic of alvars, such as poverty grass (*Danthonia spicata*), upland white aster (*Solidago ptarmicoides*),

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Virginia saxifrage (*Saxifraga virginensis*), chickweed (*Cerastium arvense*), prairie smoke (*Geum triflorum*), Canada bluegrass (*Poa compressa*), and early buttercup (*Ranunculus fascicularis*). Shrubs occur in rings around the trees; most common are downy arrow-wood (*Viburnum rafinesquianum*), snowberry (*Symphoricarpos albus*), and common

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Bur Oak Limestone Savanna in  
Sheguiandah Township, Manitoulin Island, Ontario



juniper (*Juniperus communis*). Most sites have a significant amount of exotic flora present, including weeds and typical pasture plants such as orange hawkweed (*Hieracium aurantiacum*), white clover (*Trifolium repens*), and cinquefoil (*Potentilla recta*).

A study of the land surveyor's records was undertaken in Sheguiandah Township because the area was initially surveyed the year before the fire (1864) and then resurveyed the year after the fire, because the fire destroyed the survey markers. This unique record allowed a comparison of conditions just before and after the fire with present day vegetation (Jones 1997). This comparison showed that 81% of the areas currently in bur oak savanna were hardwood forests before the fire. Since the fire regime, and possibly also grazing, seem to be key ecological processes influencing this community, it was not considered an alvar type.

### 17. Midwest wet-mesic dolomite prairie

This grassland community occurs on shallow, temporarily flooded or frequently saturated soils overlying dolomite bedrock. It is only known from northeastern Illinois. This grassland has a dense cover of herbaceous vegetation, while woody species are virtually absent. The

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most abundant species include bluejoint grass (*Calamagrostis canadensis*), sedges (*Carex sartwellii*, *C. scoparia*, *C. sterilis*), arnoglossum (*Arnoglossum plantagineum*), tufted hairgrass (*Deschampsia cespitosa*), Arkansas mint (*Calamintha arkansana*), little bluestem (*Schizachyrium scoparium*), Ohio goldenrod (*Solidago ohioensis*), and prairie cordgrass (*Spartina pectinata*).

Although this grassland has a soil moisture regime very similar to alvar grasslands, the soils are generally deeper and this community seems to be dependent upon frequent fires. The combination of the fire regime and the relative abundance of many characteristic prairie species are the main reasons this community is considered a prairie instead of an alvar.

### 2.4 Evaluating Alvar Occurrences and Sites for Conservation Planning

Element occurrence data from alvar sites in the Great Lakes have been compiled into a summary table (see Table 2 below). The table is sorted by state or province, and then by site name. For each site, the table lists the communities and target rare species that occur, along with the global rank of the species or community and the EO rank for that particular occurrence. In addition, Table 2 shows the approximate acreage of each community, the ecoregion unit where the site is located, and the type of landowner.

To identify priorities for conservation planning, each community occurrence was assigned a conservation priority rank based on a combination of its global rank, EO rank, and the relative quality of occurrences in each ecoregion subsection or site district:

Conservation priority rank "1" (high priority):

G1, G1G2, or G2 element occurrences with an EO rank of A, AB, or B;

G3 element occurrences with an EO rank of A or AB.

Conservation priority rank "2" (medium priority):

G1, G1G2, or G2 element occurrences with an EO rank of C;

G3 element occurrences with an EO rank of B or BC.

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Conservation priority rank "3" (low priority):

- G1, G1G2, or G2 element occurrences with an EO rank of D;
- G3 element occurrences with an EO rank of C or D.

If there were no community occurrences in the ecoregion unit with a priority rank of 1, then the largest or best example ranked 2 was upgraded to a priority rank of 1. Likewise, if there were no community occurrences in the ecoregion unit with a priority rank of 1 or 2, then the best one ranked 3 was upgraded to a priority rank of 2. This assured that the best examples of each community in each subsection/site district would be assigned a high conservation priority rank. In some cases where the viability of an occurrence was uncertain, the highest conservation priority rank given (even for the largest in the ecoregion unit) was a 2 for medium priority. If the community is known to be extant (EO rank of "e"), but the quality is unknown, it received a conservation priority rank of 3. The conservation priority ranks are shown in Table 2 below.

From the table, it is clear that several alvar communities with the high conservation priority often occur together at the same sites. A further analysis to target the most critical sites for conservation activities is presented in Chapter 5.