Appendix 1: Detailed Community Inventory Methods

Alvar working group collaborators who participated in community field surveys agreed to use consistent field methodologies across all jurisdictions, including the same field forms, for documenting communities at alvar sites. The methodology initially adopted in 1995 followed the guidelines provided by regional ecologists at The Nature Conservancy's Eastern Regional Office (Sneddon 1994). Essentially the same methodology, using similar field forms, has recently been described in detail in a new publication by The Nature Conservancy describing TNC's national vegetation classification (Grossman et al. 1998). Examples of the field forms we used are provided below.

In addition to the standard field forms, Alvar Working Group collaborators designed two "Addendum" forms for field workers to record additional data specifically needed for the Alvar Initiative Project. The Addendum to Community Form 1 (Reconnaissance) was used to record observations of evidence of ecological processes (herbivory, fire, soil moisture regime, land use history) and alvar microhabitat features. The Addendum to Community Form 2 (Community Ranking and Description) was used to record a full species list of plants observed in each alvar structural type at a site; each species listed is assigned an abundance class. Specific instructions for completing the Addendum forms are provided below with the field forms. Definitions of the six alvar structural types are also included.

At the 1996 meeting of the Alvar Working Group, a few collaborators who used the field forms suggested improvements for the field forms that would streamline the data collection process. The suggestions were used to redesign Community Form 1 so that one form (instead of two) could be used to describe the structure and composition of the vegetation, as well as to compile a fairly complete species list for plants observed within the structural type. Basically, the 1996 version of Community Form 1 combined the functions of the 1995 Field Form 1 with the species list in the 1995 Addendum to Community Form 2. One big benefit of the revised field form is that the field worker does not need to repeatedly write species names for each observation point. The following examples of field forms include the Site Survey Summary Form (used to summarize information on all the communities and rare species present at a site); the 1995 Community Forms 1, 2 and 3; the Addendum Forms; and the 1996 revised Community Form 1. Following the field forms are the definitions of the six structural types we used as our initial classification of alvar community types.

Appendix 2: Detailed Community Analysis Methods

Field data collected by collaborators in Michigan, Ontario, and New York were compiled by the Heritage program staff in each jurisdiction, and provided to Carol Reschke (inventory and research coordinator for the Alvar Initiative). With assistance from a contractor (Karen Dietz), field data on vegetation, environment, and evidence of ecological processes from alvar sites were entered into spreadsheets using Lotus 123 and Excel software. Spreadsheets were edited to combine a few ambiguous taxa (e.g. *Sporobolus neglectus* and *S. vaginiflorus*, which look similar and can only be positively distinguished when they are flowering in early fall), incorporate consistent nomenclature, delete duplicates, and delete species that occurred in only one or a few samples. Vegetation data were compiled from two sources: 10 x 10 m square releve plots (Community Form 3) and species lists compiled for each structural type (from the 1995 Addendum to Community Form 2, or 1996 Community Form 1). Corresponding data on the environment and evidence of ecological processes were compiled in two additional spreadsheets. The plot data set consisted of data from 85 sample plots; there were 240 taxa of vascular and nonvascular taxa included in the initial data set. The structural type data set consisted of 120 samples and 335 taxa of vascular and nonvascular plants. All data analyses were completed by Carol Reschke.

Analysis of Releve Plot Data

The plot data set included a great deal of structural detail. If a tree species was present in different vegetation layers, then it was recorded as a separate taxon for each layer in which it occurred; for example, *Thuja occidentalis* might be recorded as a tree (over 5 m tall), a tall shrub (2 to 5 m tall), and a short shrub (05 to 2 m tall). Initially, the full data set of 85 samples by 240 taxa was analyzed using PC-ORD software (McCune and Mefford 1995). Vegetation data on percent cover were relativized for each sample and then transformed with an arcsine - square root transformation. This standardization is recommended for percentage data (McCune and Mefford 1995).

Two kinds of classification and two kinds of ordination procedures were run on the full data set. Classification procedures used were: 1) cluster analysis with group average (or UPGMA) group linkage method and Sorenson's distance measure, and 2) TWINSPAN with the default settings. The two ordination procedures used were 1) Bray-Curtis ordination with Sorenson's distance and variance-regression endpoint selection, and 2) non-metric multidimensional scaling (NMS) using Sorenson's distance and the coordinates from the Bray-Curtis ordination as a starting configuration.

Environmental data recorded for each plot and data on evidence of ecological processes were used as overlays in ordination graphs to interpret ordination patterns and relationships between samples.

The classification dendrograms and ordination graphs were presented to a core group of ecologists to discuss the results. Participants in the data analysis discussions were: Wasyl Bakowsky, Don Faber-Langendoen, Judith Jones, Pat Comer, Don Cuddy, Bruce Gilman, Dennis Albert, and Carol Reschke. The two classifications were compared to see how they grouped plots, and ordinations were consulted to check and confirm groupings of plots suggested by the classification program. At the end of the first meeting to discuss the data analysis, collaborating ecologists agreed on eight alvar community types, and suggested another four or five that had been observed in field surveys but were not represented in the plot data set. The group also recommended some refinements to the data analysis.

Following the recommendations of the ecology group, the plot data were modified in two ways. For nonvascular plants, the first data set included data on individual species or genera, as well as taxa representing simple growth forms. Since only a few collaborators could identify nonvascular plants in the field, we had agreed to describe the nonvascular plants in plots by their growth form and collect a specimen if the species had at least 5% cover in the plot. If nonvascular species were identified by the surveyor, or from the collected specimen, the species were included in the data set. We decided this may have biased the results, because the plots sampled by folks who knew the nonvascular plants had a greater potential diversity than plots in which only a few growth forms were identified. So all data on nonvascular taxa were lumped into nine growth form categories: foliose algae (e.g. *Nostoc*), rock surface algae, microbial crusts, turf or cushion mosses, weft mosses, thalloid bryophytes, crustose lichens, foliose lichens, and fruticose lichens. The second modification involved lumping the different structural growth forms of woody taxa into a single taxon; for example, trees, tall shrubs and short shrubs forms of *Thuja occidentalis* were lumped into a single taxon.

These modifications reduced the dimensions of the plot data set to 85 plots by 199 taxa with the nonvascular taxa lumped, and even fewer taxa with the woody growth forms lumped. The analyses were run again using the procedures described above with the modified data sets. It turned out that lumping the nonvascular plants improved the classification and ordination results (yielding more clearly defined groups), but lumping the growth forms of tree species was actually detrimental to the results. The final classification that we used was produced from an analysis of the data set with nonvascular plants lumped into nine growth forms, and multiple growth forms of tree species kept separated.

Analysis of Structural Type Data

Once the optimal procedure for classifying and ordinating the plot data was determined, the same procedures were applied to the structural type data set. The primary difference in the structural type data set was that abundance for each species was recorded in one of four broad cover classes so the abundance data entered were midpoints of the four cover classes. In other words, the data were less precise in terms of percent cover than the plot data.

Our intent in analyzing the structural type data was to test the classification results from the analysis of the plot data. We wanted to know if the structural type data would be classified into the same community types as the plot data. The results from the analysis of the structural type data set were very ambiguous and very different from the results of the plot data. After reviewing and discussing the data with collaborators (mostly in conference calls), we realized that the ambiguous results were an artifact of our sampling procedure. For example, if a site has two types of grassland present (e.g. poverty grass dry alvar grassland and tufted hairgrass wet alvar grassland) and the structural type data were collected from the portion of the site with "grassland" structure, then the structural type data for that particular site actually includes species from two different community types. Some of the structural type data may have included only one community type, but it was difficult, and sometimes impossible, to tell from the field data. So we discarded the analysis of structural type data and used only the plot data for describing the community types.

Once the classification results were finalized and agreed upon by collaborators, the community type numbers were entered into the vegetation spreadsheets, and the plot data were sorted into groups by community type. Within each community type, species composition was then summarized by calculating average percent cover for each species and then sorting the species in order of average percent cover across all the samples from the community type. The most abundant species in each vegetation layer were included in the community descriptions in Chapter 2.

Vegetation data recorded at reconnaissance observation points (on Community Form 1) were reviewed, and each observation point was assigned to one of the 13 alvar or three other (non-alvar) community types recognized in data analyses. Although the vegetation data from observation points were not entered in spreadsheets, the data on environment and evidence of ecological processes (recorded on the Addendum to Community Form 1) were entered into spreadsheets. Once the final community types were assigned to

each observation point, data on ecological processes were evaluated for each community type.

Availability of Data

Spreadsheet files with compiled vegetation data from plots and structural types will be available from TNC's Great Lakes Program Office or from the state or provincial Heritage Programs. Original field forms are already filed at state/provincial Heritage Programs.

Appendix 3: Alvar Community Technical Descriptions and Element Occurrence Ranking Specifications

Final Alvar Initiative Community Types Recognized:
(community type numbers in parentheses)

Open Grasslands and Pavements:

Tufted hairgrass wet alvar grassland   (type # 2)
Little bluestem alvar grassland   (type # 3)
Annual alvar pavement-grassland   (type # 4)
Alvar nonvascular pavement   (type # 7)
Poverty grass dry alvar grassland   (type # 13)

Shrublands:

Creeping juniper - shrubby cinquefoil alvar pavement   (type # 5)
Scrub conifer / dwarf lake iris alvar shrubland   (type # 6)
Juniper alvar shrubland   (type # 8)

Savannas and Woodlands:

Shagbark hickory / prickly ash alvar savanna   (type # 10)
Chinquapin oak - nodding onion alvar savanna   (type # 11)
White cedar - jack pine / shrubby cinquefoil alvar savanna   (types # 14 & 15)
Mixed conifer / common juniper alvar woodland   (type # 16)
Red cedar / early buttercup alvar woodland   (type # 17)

Communities similar to alvar communities (EO specifications not included):

River ledge limestone pavement   (type # 1)
Great Lakes limestone bedrock lakeshore   (type # 9)
Bur oak limestone savanna   (type # 12)
Midwest wet-mesic dolomite prairie   (IL reports)

Comparable names for these communities within the state or provincial jurisdictions that have previously recognized alvar communities are shown on Table 11.

orig. type number	Alvar Initiative Community Type (BCD Synonym)	Ontario NHIC classification equivalent	New York HP classification equivalent	Michigan NFI equivalent
Table 11: Comparison of Alvar Community Types with State / Provincial Heritage Classifications - December 15, 1998
2	tufted hairgrass wet alvar grassland	Fresh - Moist Tufted Hairgrass Open Alvar Meadow Type	Alvar grassland	Alvar - grassland, or Alvar - pavement
3	little bluestem alvar grassland	Dry - Fresh Little Bluestem Open Alvar Meadow Type	(not known from NY)	Alvar - grassland, or Limestone pavement lakeshore
4	annual alvar pavement-grassland	Dry Annual Open Alvar Pavement Type	patches within Alvar grassland	(not known from Michigan)
7	alvar nonvascular pavement	Dry Lichen - Moss Open Alvar Pavement Type	patches within Calcareous pavement barrens	(not known from Michigan)
13	poverty grass dry alvar grassland	Dry - Fresh Poverty Grass Open Alvar Meadow Type	patches within Calcareous pavement barrens	Alvar - grassland
5	creeping juniper - shrubby cinquefoil alvar pavement	Creeping Juniper - Shrubby Cinquefoil Dwarf Shrub Alvar Type	(not known from NY)	Alvar - glade
6	scrub conifer / dwarf lake iris alvar shrubland	Scrub Conifer - Dwarf Lake Iris Shrub Alvar Type	(not known from NY)	Alvar - glade
8	juniper alvar shrubland	Common Juniper Shrub Alvar Type	Calcareous pavement barrens	Alvar - pavement, or Alvar - grassland
10	shagbark hickory / prickly ash alvar savanna (Flamborough Pl. type)	Shagbark Hickory - Prickly Ash Treed Alvar Type	(not known from NY)	(not known from Michigan)
11	Chinquapin oak - nodding onion alvar savanna (Pelee Island type)	Chinquapin Oak - Nodding Onion Treed Alvar Type	(not known from NY)	(not known from Michigan)
14 & 15	white cedar - jack pine / shrubby cinquefoil alvar savanna	White Cedar - Jack Pine Treed Alvar Type	(not known from NY)	glade zone of Limestone pavement lakeshore
16	mixed conifer / common juniper alvar woodland	Jack Pine - White Cedar - White Spruce Treed Alvar Type	some patches within Limestone woodland (coniferous type)	(not reported from Michigan)
17	red cedar / early buttercup alvar woodland	Red Cedar - Early Buttercup Treed Alvar Type	~ Calcareous pavement barrens, OR ~ Red cedar successional woodland	(not reported from Michigan)
OTHER COMMUNITIES STUDIED		*(alvar-related communities that occur on limestone or dolomite outcrops, but are not considered alvar types for this project; data were collected from a few examples of these types for the alvar initiative project.)*		
1	river ledge limestone pavement	(not currently in ONHIC classification)	(not currently in NYHP classification)	Alvar - grassland
9	Great Lakes limestone bedrock lakeshore	Shrubby Cinquefoil Carbonate Open Bedrock Beach Type	Calcareous shoreline outcrop	Limestone pavement lakeshore
12	bur oak limestone savanna	Bur Oak Treed Alvar Type	(not known from NY)	??
IL reports	midwest wet-mesic dolomite prairie	(not known from ON)	(not known from NY)	??

Tufted hairgrass wet alvar grassland   (type # 2)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
Deschampsia cespitosa - (Sporobolus heterolepis - Schizachyrium scoparium) - Carex
        crawei - Senecio pauperculus herbaceous vegetation
Proposed Common Name:
        Tufted hair grass - (prairie dropseed - little bluestem) - Crawe's sedge -
        balsam ragwort herbaceous vegetation
Proposed Synonym:
        Tufted hairgrass wet alvar grassland
GRank: G2
Sites where plots were sampled: Belanger Bay (ON), Carden Alvar (#1 - Morton)
(ON), Carden Alvar (#2a - Jesin) (ON), Carden Alvar (#5c - Lepone), Gretna Alvar
(ON), Lucky Star Alvar (NY), Chaumont Barrens (NY), Three Mile Creek Barrens
(NY), Maxton Plains (MI)

EOSPECS:
        Occurrences of the community must have a minimum of 1.25 acres (0.5 ha) of
        grassland dominated by characteristic native species, such as Deschampsia
        cespitosa, Carex crawei, Sporobolus heterolepis, Senecio pauperculus,
        Sporobolus neglectus, S. vaginiflorus, Solidago ptarmicoides, Trichostema
        brachiatum, Eleocharis compressa, and Allium schoenoprasum. Typically
        there are several turf and weft mosses forming a patchy mat at the base of
        grasses and forbs; typical mosses are Bryum pseudo-triquetrum, Abietinella
        abietinum, Tortella tortuosa, and Drepanocladus spp. This community
        occurs in small to large patches. Soils are very shallow (usually less than 10
        cm deep) and patchy over limestone bedrock. Sizes of currently known
        occurrences range from under 2 acres to about 100 acres (0.8 to 40 ha). The
        grassland may have been disturbed by grazing, as long as characteristic
        native species are still common. The characteristic soil moisture regime of
        seasonal flooding and saturation in early spring and late fall, combined with
        summer drought in most years (except unusually wet years) must be intact.
        The physiognomy of the vegetation meets the following criteria:
        a)   there is less than 10% cover of trees over 5 m tall; average cover of trees
        is less than 1% cover
        b)   there is usually less than 10% cover of shrubs; average cover of shrubs is
        less than 1% cover
        c)   there is at least 50% cover of graminoid plants; average cover of herbs
        (including graminoids) is over 80% cover
        d)   there is a variable cover of mosses, lichens, and algae; average cover of
        lichens, mosses, and algae is about 45% cover
        e)   less than 50% of the ground surface is exposed bedrock (including bedrock
        covered with nonvascular plants: lichens, mosses, algae); average amount of
        exposed bedrock is about 10% of the surface area.

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as

      herbicide-treated roadsides of a paved, two-lane road;
- an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
- a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
- different, intervening, alvar community types that separate patches of alvar grassland by more than 3.1 mi (5 km);
- a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
      Wet alvar grasslands usually occur as small to large patches within an alvar landscape. Sometimes there are small patches of an alvar pavement of a different alvar grassland community within a large patch of these wet alvar grasslands. The grassland patches within the same alvar landscape matrix may share hydrological processes, although the hydrology of these grasslands is not fully understood.

RANK PROCEDURE:
      Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: grassland has minimal human disturbance evident: few or no ruts, no barbed wire fences, no artificial berms, and no structures that could alter drainage or hydrologic regime. The grassland has no more than trace amounts of exotic species other than Poa compressa and Hypericum perforatum. Diversity of the invertebrate fauna has not been reduced by pesticide spraying.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, barbed wire fences, or some light grazing; but the disturbance has had little apparent impact on overall composition of the community: the grassland is predominantly native species. Characteristic invertebrate fauna are present.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the establishment of exotic plants, reduction in the abundance or diversity of characteristic native plants, or reduction in the diversity of characteristic invertebrate fauna. Exotics are widespread. Abundances of native species have been reduced, but native species are persistent. The hydrologic regime can be maintained or restored over a predominant portion of the occurrence.

"D" - rated condition: Severely degraded by trampling, grazing, creation of berms, or soil removal; exotics are often abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The alternating wet/dry hydrologic regime is a key ecological process that seems to maintain the grassland vegetation and may

prevent the establishment of trees and most shrubs. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 20 acres (8 + ha)
"B" - rated size: 5 to 20 acres (2 to 8 ha)
"C" - rated size: 2 to 5 acres (0.8 to 2 ha)
"D" - rated size: less than 2 acres (< 0.8 ha)

Justification for "A" - rated criteria: Very few occurrences are larger than 20 acres (8 ha); the median size from sites sampled with plots is 50 acres (20 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, and sparsely vegetated pavements. The grassland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the grassland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: fluctuating water levels and alternating saturation and drought conditions as well as natural fire regime in adjacent alvar communities. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by

providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-03-05

Little bluestem alvar grassland (type # 3)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
Sporobolus heterolepis - Schizachyrium scoparium - (Carex scirpoidea / Juniperus
        horizontalis) herbaceous vegetation
Proposed Common Name:
        Prairie dropseed - little bluestem - (sedge - creeping juniper) herbaceous
        vegetation
Proposed Synonym:
        Little bluestem alvar grassland
GRank: G2
Sites where plots were sampled: Maxton Plains (MI), Thunder Bay Island (MI),
Niibin Alvar (ON), Pendall Lake Alvar (ON), Barney Lake Alvar (ON), Carden Alvar
(#5c - Lepone) (ON), Tamarack Harbour (ON), Foxy Prairie (ON), LaCloche Alvar
(ON), Dyer's Bay (ON), Misery Bay (ON), Scugog Lake Alvar (ON)

EOSPECS:
        Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of
        grassland dominated by characteristic native species, such as Sporobolus
        heterolepis, Schizachyrium scoparium, Juniperus horizontalis, Carex
        scirpoidea, Deschampsia cespitosa, Senecio pauperculus, and Carex crawei.
        This community occurs in small to large patches, and as a matrix. Soils are
        very shallow (usually less than 20 cm deep, average is about 6 cm deep) and
        patchy over limestone or dolostone bedrock. Sizes of currently known
        occurrences range from under 5 acres to about 7000 acres (2 to 2800 ha). The
        grassland may have been disturbed by grazing, as long as characteristic
        native species are still common. The characteristic soil moisture regime of
        seasonal flooding and saturation in early spring and late fall, combined with
        summer drought in most years (except unusually wet years) must be intact.
        The physiognomy of the vegetation meets the following criteria:
        a)   there is less than 10% cover of trees over 5 m tall
        b)   there is usually less than 10% cover of shrubs over 0.5 m tall; however
        there may be as much as 50% cover of dwarf shrubs (under 0.5 m tall)
        especially Juniperus horizontalis. This dwarf shrub is shorter than the
        dominant grasses, so the physiognomic type is here considered a grassland
        (in spite of relatively high cover of dwarf shrubs).
        c)   there is at least 50% cover of graminoid plants
        d)   less than 50% of the ground surface is exposed bedrock (including bedrock
        covered with nonvascular plants: lichens, mosses, algae)

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as
        herbicide-treated roadsides of a paved, two-lane road;
·   an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than
        0.3 mi (0.5 km) across;
·   a different, intervening, natural community type that is not typically part of an
        alvar landscape matrix and is greater than 0.6 mi (1 km) across;

·   different, intervening, alvar community types that separate patches of alvar
     grassland by more than 3.1 mi (5 km);
·   a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
        Alvar grasslands can occur as small to large patches within an alvar
landscape, and in some cases they can form the matrix of an alvar landscape, with
patches of other alvar or woodland community types occurring within the grassland
matrix and in between patches of alvar grassland. The grassland patches within the
same alvar landscape matrix may share hydrological processes, although the
hydrology of these grasslands is not well understood.

RANK PROCEDURE:
        Ranking follows standard TNC ranking procedures described in the February
5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: grassland has minimal human disturbance evident: few or no
ruts, no barbed wire fences, no artificial berms, and no structures that could alter
drainage or hydrologic regime. The grassland has no more than trace amounts of
exotic species other than Poa compressa and Hypericum perforatum. Diversity of
the invertebrate fauna has not been reduced by pesticide spraying.

"B" - rated condition: there may be some evidence of human disturbance, such as
ruts, barbed wire fences, or some light grazing; but the disturbance has had little
apparent impact on overall composition of the community. The grassland is
predominantly native species. Characteristic invertebrate fauna are present.

"C" - rated condition: there is substantial evidence of human disturbance, and the
disturbance has resulted in the establishment of exotic plants, reduction in the
abundance or diversity of characteristic native plants, or reduction in the diversity
of characteristic invertebrate fauna. Exotics are widespread. Abundances of native
species have been reduced, but native species are persistent. The hydrologic regime
can be maintained or restored over a predominant portion of the occurrence.

"D" - rated condition: Severely degraded by trampling, grazing, creation of berms, or
soil removal; exotics are often abundant to dominant. The community is so severely
disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The alternating wet/dry hydrologic regime is a
key ecological process that seems to maintain the grassland vegetation and may
prevent the establishment of trees and most shrubs. Disturbances from trampling
or moving the shallow soils may alter surface flow hydrology, altering the natural
drainage regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and
unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 75 acres (30 + ha)
"B" - rated size: 25 to 75 acres (10 to 30 ha)
"C" - rated size: 5 to 25 acres (2 to 10 ha)
"D" - rated size: less than 5 acres (< 2 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 75 acres (30 ha); the median size from our sites sampled with plots is 45 acres (18 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, and sparsely vegetated pavements. The grassland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the grassland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: fluctuating water levels and alternating saturation and drought conditions as well as natural fire regime in adjacent alvar communities. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Conserving Great Lakes Alvars

Author: Carol Reschke
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Date: 1998-03-05

Annual alvar pavement-grassland   (type # 4)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
Sporobolus neglectus - S. vaginiflorus - Trichostema brachiatum - Panicum
      philadelphicum - (Poa compressa) herbaceous vegetation
Proposed Common Name:
      Small rush grass - sheathed rush grass - false pennyroyal - panic grass -
      (Canada bluegrass) herbaceous vegetation
Proposed Synonym:
      Annual alvar pavement-grassland
GRank: G2
Sites where plots were sampled: Foxy Prairie (ON), Burnt Lands (ON), Asselstine
Alvar (ON), Salmon River Alvar (ON)

EOSPECS:
      Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of
      pavement - grassland mosaic dominated by characteristic native species, such
      as Sporobolus neglectus, S. vaginiflorus, Panicum philadelphicum, Poa
      compressa, Solidago ptarmicoides, Danthonia spicata, Trichostema
      brachiatum, Senecio pauperculus, Carex crawei, and Panicum flexile.
      Lichens and mosses are common on "pavement" rock outcrops that occur as
      patches within this mosaic. This community usually occurs in small to large
      patches. Soils are very shallow (usually less than 10 cm deep) over limestone
      or dolostone bedrock. Sizes of currently known occurrences range from under
      2 acres to about 200 acres (0.8 to 81 ha). The grassland may have been
      disturbed by grazing, as long as characteristic native species are still
      common. The characteristic soil moisture regime of seasonal flooding and
      saturation in early spring and late fall, combined with summer drought in
      most years (except unusually wet years) must be intact. The physiognomy of
      the vegetation meets the following criteria:
      a)   there is less than 10% cover of trees over 5 m tall
      b)   there is usually less than 10% cover of shrubs
      c)   there is about 50% cover of herbaceous plants (including graminioids),
      and about 50% cover of nonvascular plants (lichens, mosses, algae)
      d)   usually about 50% of the ground surface is exposed bedrock (including
      bedrock covered with nonvascular plants: lichens, mosses, algae)

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as
      herbicide-treated roadsides of a paved, two-lane road;
·   an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than
      0.3 mi (0.5 km) across;
·   a different, intervening, natural community type that is not typically part of an
      alvar landscape matrix and is greater than 0.6 mi (1 km) across;
·   different, intervening, alvar community types that separate patches of alvar
      grassland by more than 3.1 mi (5 km);
·   a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:

Alvar grassland-pavement mosaics can occur as small to large patches within an alvar landscape, with patches of other alvar or woodland community types between patches of alvar grassland-pavement mosaic. The grassland-pavement mosaic patches within the same alvar landscape matrix may share hydrological processes, although the hydrology of these mosaics is not well understood.

RANK PROCEDURE:

Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: grassland has minimal human disturbance evident: few or no ruts, no barbed wire fences, no artificial berms and no structures that could alter drainage or hydrologic regime. The grassland has no more than trace amounts of exotic species other than Poa compressa and Hypericum perforatum. Diversity of the invertebrate fauna has not been reduced by pesticide spraying.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, barbed wire fences, or some light grazing; but the disturbance has had little apparent impact on overall composition of the community: the grassland is predominantly native species. Characteristic invertebrate fauna are present.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the establishment of exotic plants, reduction in the abundance or diversity of characteristic native plants, or reduction in the diversity of characteristic invertebrate fauna. Exotics are widespread. Abundances of native species have been reduced, but native species are persistent. The hydrologic regime can be maintained or restored over a predominant portion of the occurrence.

"D" - rated condition: Severely degraded by trampling, grazing, creation of berms, or soil removal; exotics are often abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The alternating wet/dry hydrologic regime is a key ecological process that seems to maintain the grassland vegetation and may prevent the establishment of trees and most shrubs. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 5 acres (2 + ha)
"B" - rated size: 3 to 5 acres (1.2 to 2 ha)
"C" - rated size: 1 to 3 acres (0.5 to 1.2 ha)
"D" - rated size: less than 1.25 acres (< 0.5 ha)

Justification for "A" - rated criteria: Very few occurrences are larger than 5 acres (2 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, shrublands, grasslands, and sparsely vegetated pavements. The grassland-pavement mosaic EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the grassland-pavement EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture or forestry, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: fluctuating water levels and alternating saturation and drought conditions as well as natural fire regime in adjacent alvar communities. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY

Date: 1998-03-06

Alvar nonvascular pavement   (type # 7)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
Tortella tortuosa - Cladonia pocillum - Placynthium spp. sparse vegetation
Proposed Common Name:
        Twisted moss - cup lichen - crustose lichen sparse vegetation
Proposed Synonym:
        Alvar nonvascular pavement
GRank: G2
Sites where plots were sampled: Lucky Star Alvar (NY), Three Mile Creek Barrens (NY), Burnt Lands (ON)

EOSPECS:
        Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of
        pavement that is sparsely vegetated with characteristic native species, such
        as Cladonia pocillum, Tortella tortuosa, Saxifraga virginiensis, Penstemon
        hirsutus, Potentilla norvegica, Trichostema brachiatum, Fragaria virginiana,
        Solidago nemoralis, Symphoricarpos albus, Vitis riparia, Aquilegia
        canadensis, Arenaria stricta, Houstonia longifolia and Hieracium
        piloselloides.   A few trees and shrubs are usually rooted in deep crevices of
        the pavement; characteristic trees and shrubs that occur sparsely include
        Thuja occidentalis, Juniperus communis, Betula papyrifera, Juniperus
        virginiana, Juglans cinerea, and Picea glauca.   This community usually
        occurs in small patches. Soils are either lacking or very shallow (usually less
        than 10 cm deep in crevices) over limestone or dolostone bedrock. Sizes of
        currently known occurrences range from under 1.25 acres to about 25 acres
        (0.5 to 10 ha). The pavement may have been disturbed by trampling, as long
        as characteristic native species are still common.   The characteristic soil
        moisture regime of severe summer drought must be intact.   The
        physiognomy of the vegetation meets the following criteria:
        a)   there is less than 10% cover of trees
        b)   there is usually less than 10% cover of shrubs
        c)   there is usually less than 15% cover of herbaceous plants
        d)   more than 50% of the ground surface is exposed bedrock (including
        bedrock covered with nonvascular plants: lichens, mosses, algae); average is
        about 25% unvegetated, exposed bedrock, and about 55% bedrock covered
        with nonvascular plants.

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as
     herbicide-treated roadsides of a paved, two-lane road;
·   an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than
     0.3 mi (0.5 km) across;
·   a different, intervening, natural community type that is not typically part of an
     alvar landscape matrix and is greater than 0.6 mi (1 km) across;
·   different, intervening, alvar community types that separate patches of alvar

pavement by more than 3.1 mi (5 km);

· a different, intervening substrate that is not a limestone or dolostone pavement.
Justification:

Alvar pavements usually occur as small patches within an alvar landscape, with larger patches or a matrix of other alvar or woodland community types surrounding patches of alvar pavement. The pavement patches within the same alvar landscape matrix may share hydrological processes, although the hydrology of these pavements is not well understood.

RANK PROCEDURE:

Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: pavement has minimal human disturbance evident: few or no vehicle tracks, no barbed wire fences, no artificial berms, no garbage dumps, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The pavement has no more than trace amounts of exotic species and there is little or no evidence of deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred, but they are infrequent. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as vehicle tracks, berms, cut stumps, garbage dumps, barbed wire fences, or some light trampling, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The pavement is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past trampling or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent, and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, trampling, severe deer browsing, creation of berms, garbage dumping, or removal of

rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the pavement vegetation and may prevent the establishment of most trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 20 acres (8 + ha)
"B" - rated size: 5 to 20 acres (2 to 8 ha)
"C" - rated size: 2 to 5 acres (0.8 to 2 ha)
"D" - rated size: less than 2 acres (< 0.8 ha)

Justification for "A" - rated criteria: Very few occurrences are larger than 20 acres (8 ha). Stands this size are likely to have intact natural processes if they occur within a matrix with other alvar communities.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, and grasslands. The pavement EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the pavement EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential

development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and infrequent natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
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Date: 1998-04-03

Poverty grass dry alvar grassland   (type # 13)

Draft   EO SPECS and EO RANK SPECS:

Proposed GNAME:
　　　Danthonia spicata - Poa compressa - (Schizachyrium scoparium) herbaceous vegetation
Proposed Common Name:
　　　Poverty grass - Canada bluegrass - (little bluestem) herbaceous vegetation
Proposed Synonym:
　　　Poverty grass dry alvar grassland
GRank:　G2?
Sites where plots were sampled:
　　　No plots sampled of this type; reconnaissance observation points were recorded at Burnt Lands, Carden Alvar #5c, Bend Bay Valley, Limerick Cedars, and elsewhere.

EOSPECS:
　　　Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of grassland dominated by characteristic species, such as Danthonia spicata and Poa compressa, sometimes with Schizachyrium scoparium. Lichens and mosses may occur on small "pavement" rock outcrops that occur as patches within this grassland. This community usually occurs in small to large patches. Soils are very shallow (usually less than 10 cm deep) over limestone or dolostone bedrock. Sizes of currently known occurrences range from under 2 acres to about 100 acres (0.8 to 40.5 ha). The grassland may have been disturbed by grazing, as long as characteristic native species are still common. The characteristic soil moisture regime of summer drought in most years must be intact. The physiognomy of the vegetation meets the following criteria:
　　　a)　there is less than 10% cover of trees over 5 m tall
　　　b)　there is less than 25% cover of shrubs
　　　c)　there is about 50% cover of herbaceous plants (including graminioids), and about 50% cover of nonvascular plants (lichens, mosses, algae)
　　　d)　usually about 50% of the ground surface is exposed bedrock (including bedrock covered with nonvascular plants: lichens, mosses, algae)

Individual EOs are separated by one of the following:
·　　a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
·　　an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
·　　a different, intervening, natural community type that is not typically part of an alvar landscape matrix, and is greater than 0.6 mi (1 km) across;
·　　different, intervening, alvar community types that separate patches of alvar grassland by more than 3.1 mi (5 km);
·　　a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:

Dry alvar grasslands can occur as small to large patches within an alvar landscape, with patches of other alvar or woodland community types between patches of dry alvar grassland. The grassland patches within the same alvar landscape matrix may share hydrological processes, although the hydrology of these grasslands is not well understood.

RANK PROCEDURE:

Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: grassland has minimal human disturbance evident: few or no ruts, no barbed wire fences, no artificial berms, and no structures that could alter drainage or hydrologic regime. The grassland has no more than trace amounts of exotic species other than Poa compressa and Hypericum perforatum. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, barbed wire fences, or some light grazing; but the disturbance has had little apparent impact on overall composition of the community: the grassland is predominantly native species. Characteristic invertebrate fauna are present.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the establishment of exotic plants, reduction in the abundance or diversity of characteristic native plants, or reduction in the diversity of characteristic invertebrate fauna. Exotics are widespread. Abundances of native species have been reduced, but native species are persistent.

"D" - rated condition: Severely degraded by trampling, grazing, creation of berms, or soil removal; exotics are often abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that may be important to maintain the vegetation and may prevent the establishment of most trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 30 acres (12 + ha)
"B" - rated size: 5 to 30 acres (2 to 12 ha)
"C" - rated size: 2 to 5 acres (1 to 2 ha)
"D" - rated size: less than 2 acres (< 1 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 30 acres (12 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, shrublands, grasslands, and sparsely vegetated pavements. The grassland-pavement mosaic EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the grassland-pavement EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture or forestry, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: fluctuating water levels and alternating saturation and drought conditions as well as natural fire regime in adjacent alvar communities. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
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Date: 1998-09-25

Creeping juniper - shrubby cinquefoil alvar pavement   (type # 5)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
> Juniperus horizontalis - Pentaphylloides floribunda / Schizachyrium scoparium - Carex richardsonii dwarf-shrubland

Proposed Common Name:
> Creeping juniper - shrubby cinquefoil / little bluestem - Richardson's sedge dwarf-shrubland

Proposed Synonym:
> Creeping juniper - shrubby cinquefoil alvar pavement

GRank: G2

Sites where plots were sampled: Pine Tree Harbour (ON), Scugog Lake Alvar (ON), Pendall Lake Alvar (ON)

EOSPECS:
> Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of dwarf shrubland on dolostone pavement dominated by characteristic native species, such as Juniperus horizontalis, Potentilla fruticosa, Schizachyrium scoparium, Carex richarsonii, C. scirpoidea, Pinus banksiana, Thuja occidentalis, Danthonia spicata, Solidago ptarmicoides, Senecio pauperculus, Calamintha arkansana, and Hymenoxys herbacea. Much of the exposed rock surface is covered with microscopic algae (e.g. Gloeocapsa alpina). Mosses and lichens are common, including the mosses Tortella tortuosa and Schistidium rivulare, and the lichens Placynthium nigrum and Cetraria arenaria. This community occurs in small to large patches, and as a matrix. Soils are very shallow (usually less than 10 cm deep) over dolostone bedrock. Sizes of currently known occurrences range from under 5 acres to about 1000 acres (2 to 405 ha). The shrubland may have been disturbed by off-road vehicles, as long as characteristic native species are still common. These pavements are typically very droughty in summer, except immediately after rainfall, when shallow pools can form on the bedrock. The physiognomy of the vegetation meets the following criteria:
> a)   there is less than 10% cover of trees over 5 m tall
> b)   there is usually about 25% cover of shrubs, and the dominant shrubs are less than 0.5 m tall;
> c)   there is usually less than 50% cover of herbaceous plants (including graminoids); average cover of herbs is 33% cover
> d)   less than 50% of the ground surface is exposed bedrock (including bedrock covered with nonvascular plants: lichens, mosses, algae); average cover of mosses, lichens, and algae is 47% cover

Individual EOs are separated by one of the following:
· a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
· an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than

0.3 mi (0.5 km) across;
· a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
· different, intervening, alvar community types that separate patches of alvar dwarf shrubland by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
    Alvar dwarf shrublands can occur as small to large patches within an alvar landscape, and in some cases they can form the matrix of an alvar landscape, with patches of other alvar or woodland community types occurring within the dwarf shrubland matrix and in between patches of alvar dwarf shrubland.

RANK PROCEDURE:
    Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: dwarf shrubland has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, dwarf shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The dwarf shrubland has no more than trace amounts of exotic species. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred, but they are infrequent. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling; but the disturbance has had little apparent impact on overall composition of the community. The dwarf shrubland is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate(e.g. contribute additional moisture) the characteristic mid-summer drought conditions. Exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent, and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting,

creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the dwarf shrubland vegetation and may prevent the establishment of most trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 125 acres (50 + ha)
"B" - rated size: 25 to 125 acres (10 to 50 ha)
"C" - rated size: 5 to 25 acres (2 to 10 ha)
"D" - rated size: less than 5 acres (< 2 ha)

Justification for "A" - rated criteria: Very few occurrences are larger than 125 acres (50 ha); the median size from our sites sampled with plots is 15 acres (6 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, shrublands, grasslands, and sparsely vegetated pavements. The dwarf shrubland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the dwarf shrubland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive

agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and infrequent natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-03-06

Scrub conifer / dwarf lake iris alvar shrubland (type # 6)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
  Picea glauca - Thuja occidentalis - Juniperus communis / Iris lacustris - Carex eburnea shrubland
Proposed Common Name:
  White spruce -northern white cedar - old field juniper / dwarf lake iris - sedge shrubland
Proposed Synonym:
  Scrub conifer / dwarf lake iris alvar shrubland
GRank: G1G2
Sites where plots were sampled: Garden Southeast Glade - 8th Ave. (MI), Kregg Bay Glade (MI), Sucker Lake Alvar (MI)

EOSPECS:
  Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of shrubland dominated by characteristic native species, such as Iris lacustris, Carex eburnea,Picea glauca, Juniperus communis, Arctostaphylos uva-ursi, Thuja occidentalis, Carex richardsonii, Larix laricina, Danthonia spicata, Prunus virginiana, Diervilla lonicera, Shepherdia canadensis, Abies balsamea, Cornus stolonifera, and Rhamnus alnifolia. This community usually occurs in small patches (less than 50 acres). Soils are very shallow (usually less than 10 cm deep) over limestone or dolostone bedrock. Sizes of currently known occurrences range from under 30 acres to about 200 acres (12 to 80 ha). The shrubland may have been disturbed by trampling or logging, as long as characteristic native species are still common. The characteristic soil moisture regime of seasonal flooding or saturation in early spring and late fall, combined with summer dry periods in most years (except unusually wet years) must be intact. The physiognomy of the vegetation meets the following criteria:
  a) there is less than 10% cover of trees over 5 m tall
  b) there is at least 25% cover of shrubs (including scrub forms of trees less than 5 m tall)
  c) there is usually over 50% cover of herbaceous plants; average cover of herbs is 82%, with Iris lacustris and Carex eburnea typically forming a dense "lawn"
  d) less than 10% of the ground surface is exposed bedrock (including bedrock covered with nonvascular plants: lichens, mosses, algae); average area of exposed bedrock is less than 1% and average cover of mosses and lichens is 4%.

Individual EOs are separated by one of the following:
· a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
· an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
· a different, intervening, natural community type that is not typically part of an

alvar landscape matrix and is greater than 0.6 mi (1 km) across;
· different, intervening, alvar community types that separate patches of alvar shrubland by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
Moist northern alvar shrublands occur as small patches within an alvar landscape, with a matrix of other alvar or forest community types occurring in between patches of moist alvar shrubland.

RANK PROCEDURE:
Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: shrubland has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts or firewood), and little or no evidence of past grazing or deer browsing. The shrubland has no more than trace amounts of exotic species. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred, but they are infrequent. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, some light trampling, or some evidence of past grazing or deer browsing; but the disturbance has had little apparent impact on overall composition of the community: the shrubland is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, past grazing, or heavy deer browsing, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. Exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent, and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, past grazing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration

would not be feasible.

Justification for "A" - rated criteria: The alternating wet/dry hydrologic regime is a key ecological process that seems to maintain the shrubland vegetation and may prevent or slow the establishment of a full forest canopy.   The moist shrubland patches may also be an artifact of infrequent blowdown or fire disturbances; and these sites may eventually succeed to forest types without such occasional disturbances. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.   Our current understanding of disturbance regimes in this community is rudimentary; we don't know how to do effective restoration of this type, and we're uncertain of proper management techniques.

SIZE SPECS:

"A" - rated size: over 125 acres (50 + ha)
"B" - rated size: 25 to 125 acres (10 to 50 ha)
"C" - rated size: 5 to 25 acres (2 to 10 ha)
"D" - rated size: less than 5 acres (< 2 ha)

Justification for "A" - rated criteria: Very few occurrences are larger than 125 acres (50 ha); the median size from our sites sampled with plots is 140 acres (57 ha). Stands this size are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that are usually forests, but may include a mosaic of forests, woodlands, shrublands, grasslands, and sparsely vegetated pavements. The shrubland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the shrubland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and infrequent natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-03-26
Juniper alvar shrubland   (type # 8)

EO SPECS and EO RANK SPECS:

Proposed GNAME:
Juniperus communis - (J. virginiana) - Rhus aromatica - Viburnum rafinesquianum /
    Solidago ptarmicoides shrubland
Proposed Common Name:
    Old field juniper - (Eastern red cedar) - fragrant sumac - downy arrow-wood /
    upland white aster shrubland
Proposed Synonym:
    Juniper alvar shrubland
GRank: G3
Sites where plots were sampled: Burnt Lands (ON), Carden Alvar (#1 - Morton) (ON), Carden Alvar (#5c - Lepone) (ON), Beautiful Bend Bay Alvar (ON), Evansville Shrubland (ON), Limerick Cedars (NY), Three Mile Creek Barrens (NY), Chaumont Barrens (NY), Big Knob Campground Road (MI), East Lake Alvar (MI), Grand Lake Alvar (MI), Huron Bay Road (MI), Jones Lake - Drummond Island (MI), The Rock (MI)

EOSPECS:
    Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of shrubland dominated by characteristic native species, such as Juniperus communis, Danthonia spicata, Arctostaphylos uva-ursi, Cornus foemina ssp. racemosa, Prunus virginiana, Juniperus virginiana, Solidago ptarmicoides, Toxicodendron radicans, Rhus aromatica, Thuja occidentalis, Carex umbellata, and Quercus macrocarpa. This community occurs in small to large patches, and as a matrix. Soils are very shallow (usually less than 0.3 m deep) over limestone bedrock. Sizes of currently known occurrences range from under 10 acres to about 500 acres (4 to 200 ha). The shrubland may

have been disturbed by grazing, as long as characteristic native species are still common. The characteristic soil moisture regime of summer drought in most years (except unusually wet years) must be intact. The physiognomy of the vegetation meets the following criteria:

a) there is less than 10% cover of trees; average cover of trees is less than 5%

b) there is at least 25% cover of shrubs; average cover of shrubs is about 43%, mostly short shrubs, with less than 10% cover of tall shrubs

c) there is variable cover of herbaceous plants; average cover of herbs is about 23%

d) less than 50% of the ground surface is exposed bedrock (including bedrock covered with nonvascular plants: lichens, mosses, algae); average is about 14% of ground surface that is exposed bedrock, and about 22% cover of non-vascular plants.

Individual EOs are separated by one of the following:
· a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
· an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
· a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
· different, intervening, alvar community types that separate patches of alvar shrubland by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
　　　　Alvar shrublands can occur as small to large patches within an alvar landscape, and in some cases they can form the matrix of an alvar landscape, with patches of other alvar or woodland community types occurring within the shrubland matrix and in between patches of alvar shrubland. The shrubland patches within the same alvar landscape matrix may share hydrological processes, although the hydrology of these shrublands is not well understood.

RANK PROCEDURE:
　　　　Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: shrubland has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The shrubland has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred, but they are infrequent. There have been no

alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The shrubland is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the shrubland vegetation and may prevent the establishment of most trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 125 acres (50 + ha)
"B" - rated size: 25 to 125 acres (10 to 50 ha)
"C" - rated size: 5 to 25 acres (2 to 10 ha)
"D" - rated size: less than 5 acres (< 2 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 125 acres (50 ha); the median size from our sites sampled with plots is 75 acres (30 ha). Stands over 125 acres are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, grasslands, and sparsely vegetated pavements. The shrubland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the shrubland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and infrequent natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-03-24

Shagbark hickory / prickly ash alvar savanna   (type # 10)

Draft EO SPECS and EO RANK SPECS:

Proposed GNAME:
> Carya ovata / Zanthoxylem americanum / Panicum philadelphicum - Carex pensylvanica wooded herbaceous vegetation

Proposed Common Name:
> Shagbark hickory / prickly ash / panic grass - Pennsylvania sedge wooded herbaceous
> vegetation

Proposed Synonym:
> Shagbark hickory / prickly ash alvar savanna

GRank: G?

Sites where plots were sampled: Hayesland Alvar (Flamborough Plains, ON)

EOSPECS:
> Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of savanna: partially wooded vegetation with 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 (Zanthoxylem 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 pensylvanica), 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.).   Soils are shallow loams (usually 10 to 20 cm deep) over dolostone bedrock, they are well-drained, and usually very dry in mid-summer. The physiognomy of the vegetation meets the following criteria:
> > a)   there is a partial canopy with 10% to 25% cover of trees over 5 meters tall
> > b)   there is variable cover of shrubs 0.5 to 5 meters tall, ranging from 2% to 55% cover
> > c)   there is variable cover of herbs (including grasses and sedges) forming a dry, grassy meadow between the trees and shrubs

Individual EOs are separated by one of the following:
- a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
- an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
- a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
- different, intervening, alvar community types that separate patches of alvar

savanna by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
Alvar savannas can occur as small to large patches within an alvar landscape. The savanna patches within the same alvar landscape matrix may share ecological processes (e.g. fire regime), although the ecology of these savannas is not well understood.

RANK PROCEDURE:
Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: savanna has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The savanna has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The savanna is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent, and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that

restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the savanna vegetation and may limit the establishment of trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb and shrub composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 10 acres (4 + ha)
"B" - rated size: 5 to 10 acres (2 to 4 ha)
"C" - rated size: to 5 acres (1 to 2 ha)
"D" - rated size: less than 2 acres (< 1 ha)

Justification for "A" - rated criteria: No occurrences are currently known to be larger than 10 acres (4 ha).

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, grasslands, and sparsely vegetated pavements. The savanna EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the savanna EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime and natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-12-29

Chinquapin oak / nodding onion alvar savanna (type # 11)

Draft EO SPECS and EO RANK SPECS:

Proposed GNAME:
> Quercus muhlenbergii / Poa spp. - Allium cernuum - Eleocharis compressa / Aulacomnium palustre - Bryum spp. wooded herbaceous vegetation

Proposed Common Name:
> Chinquapin oak / bluegrass - nodding onion - flat-stemmed spike-rush / aulacomnium moss - bryum moss wooded herbaceous vegetation

Proposed Synonym:
> Chinquapin oak / nodding onion alvar savanna

GRank: G1?

Sites where plots were sampled: Stone Road Alvar (Pelee Island, ON)

EOSPECS:
Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of savanna: partially wooded vegetation with 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 (Zanthoxylem americanum), staghorn sumac (Rhus typhina), and snowberry (Symphoricarpos albus). 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). Soils are shallow loams (usually about 10 cm deep) over limestone bedrock, seasonally flooded, and usually very dry in mid-summer. The physiognomy of the vegetation meets the following criteria:

   a) there is a partial canopy with 10% to 25% cover of trees over 5 meters tall
   b) there is variable cover of shrubs 0.5 to 5 meters tall
   c) there is variable cover of herbs (including grasses and sedges) forming a grassy meadow between the trees and shrubs

Individual EOs are separated by one of the following:
· a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
· an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
· a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
· different, intervening, alvar community types that separate patches of alvar savanna by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
     Alvar savannas can occur as small to large patches within an alvar landscape. The savanna patches within the same alvar landscape matrix may share ecological processes (e.g. fire regime), although the ecology of these savannas is not well understood.

RANK PROCEDURE:
     Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: savanna has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The savanna has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall

composition of the community. The savanna is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the savanna vegetation and may limit the establishment of trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb and shrub composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 10 acres (4 + ha)
"B" - rated size: 5 to 10 acres (2 to 4 ha)
"C" - rated size: to 5 acres (1 to 2 ha)
"D" - rated size: less than 2 acres (< 1 ha)

Justification for "A" - rated criteria: No occurrences are currently known to be larger than 30 acres (12 ha).

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests,

woodlands, sparse woodlands, shrublands, grasslands, and sparsely vegetated pavements. The savanna EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the savanna EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-12-29

White cedar - jack pine / shrubby cinquefoil alvar savanna (types # 14 & 15)

Draft EO SPECS and EO RANK SPECS:

Proposed GNAME:
> Thuja occidentalis - Pinus banksiana / Pentaphylloides floribunda / Calamintha arkansana wooded herbaceous vegetation

Proposed Common Name:
> Northern white cedar - jack pine / shrubby cinquefoil / low calamint wooded herbaceous vegetation

Proposed Synonym:
> White cedar - jack pine / shrubby cinquefoil alvar savanna

GRank: G1G2

Sites where plots were sampled: No plots sampled of this type; reconnaissance observation points were recorded at Pine Tree Harbour (ON), George Lake Alvar (ON), Dyer's Bay Road / Brinkman's Corners (ON), Pendall Lake Alvar (ON), Pike Bay Alvar (ON), Bass Cove (MI), Huron Bay (MI), Sideroad Creek Alvar (ON), Cabot Head Alvar (ON), Barney Lake Alvar (ON), and LaCloche Area Alvar (ON).

EOSPECS:
> Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of savanna: partially wooded vegetation with 10% to 25% canopy cover, and a variable understory with shrubby patches and grassy 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 meters 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 (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. Soils are shallow loams (usually less than 30 cm deep) over dolostone bedrock. The physiognomy of the vegetation meets the following criteria:
> a) there is a partial canopy with 10% to 25% cover of trees over 5 meters tall
> b) there is variable cover of shrubs 0.5 to 5 meters tall
> c) there is variable cover of herbs (including grasses and sedges) forming a moist, grassy meadow between the trees and shrubs

Individual EOs are separated by one of the following:
· a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
· an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
· a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;

· different, intervening, alvar community types that separate patches of alvar savanna by more than 3.1 mi (5 km);
· a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
Alvar savannas can occur as small to large patches within an alvar landscape. The savanna patches within the same alvar landscape matrix may share ecological processes (e.g. fire regime), although the ecology of these savannas is not well understood.

RANK PROCEDURE:
Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: savanna has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The savanna has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The savanna is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil;

exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: The soil moisture regime characterized by severe summer drought (usually in late July or August) is a key ecological process that seems to maintain the savanna vegetation and may limit the establishment of trees. Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb and shrub composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 100 acres (40 + ha)
"B" - rated size: 50 to 100 acres (20 to 40 ha)
"C" - rated size: 10 to 50 acres (4 to 20 ha)
"D" - rated size: less than 10 acres (< 4 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 100 acres (40 ha); the size of examples surveyed ranges from about 3 acres to 300 acres (1 to 121 ha). Stands over100 acres are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, woodlands, sparse woodlands, shrublands, grasslands, and sparsely vegetated pavements. The savanna EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the savanna EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential

development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-12-29

Mixed conifer / common juniper alvar woodland   (type # 16)

Draft EO SPECS and EO RANK SPECS:

Proposed GNAME:
    Pinus banksiana - Thuja occidentalis - Picea glauca / Juniperus communis woodland
Proposed Common Name:
    Jack pine - northern white cedar - white spruce / common juniper woodland
Proposed Synonym:
    Mixed conifer / common juniper alvar woodland
GRank: G2?
Sites where plots were sampled: No plots sampled of this type; reconnaissance observation points were recorded at East side of Quarry Bay (ON), Pine Tree Harbour (ON), Carden Alvar (#3A) (ON), and Sideroad Creek Alvar (ON).

EOSPECS:
    Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of woodland: wooded vegetation with 25% to 60% canopy 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). 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 meters tall. Soils are shallow loams (usually less than 30 cm deep). The physiognomy of the vegetation meets the following criteria:

    a)   there is a partial canopy with 25% to 60% cover of trees over 5 meters tall
    b)   there is variable cover of shrubs 0.5 to 5 meters tall
    c)   there is a variable cover of herbs (including grasses and sedges) in a mosaic with exposed patches of limestone or dolostone bedrock pavement

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
·   an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
·   a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
·   different, intervening, alvar community types that separate patches of alvar woodland by more than 3.1 mi (5 km);
·   a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
      Alvar woodlands can occur as small to large patches within an alvar landscape. The woodland patches within the same alvar landscape matrix may share ecological processes (e.g. fire regime), although the ecology of these woodlands is not well understood.

RANK PROCEDURE:
      Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: woodland has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of logging or plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The woodland has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred. There have been no alterations to

soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The woodland is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent, and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

Justification for "C"/"D" threshold: Native herb and shrub composition is severely altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

"A" - rated size: over 50 acres (20 + ha)
"B" - rated size: 20 to 50 acres (8 to 20 ha)
"C" - rated size: 10 to 20 acres (4 to 8 ha)
"D" - rated size: less than 10 acres (< 4 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 50 acres (20 ha); the size of examples surveyed ranges from about 3 acres to over 1000 acres (1 to over 405 ha). Stands over 50 acres are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

"A" - rated landscape context: The surrounding landscape is an intact natural landscape with natural ecological communities that may include a mosaic of forests, savannas, shrublands, grasslands, and sparsely vegetated pavements. The woodland EO is completely surrounded by other viable communities with at least a 500 m to 1000 m buffer of viable communities surrounding the woodland EO.

"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-12-29

Red cedar / early buttercup alvar woodland   (type # 17)

Draft EO SPECS and EO RANK SPECS:

Proposed GNAME:
    Juniperus virginiana / Ranunculus fascicularis woodland
Proposed Common Name:
    Eastern red cedar / early buttercup woodland
Proposed Synonym:
    Red cedar / early buttercup alvar woodland
GRank: G3?
Sites where plots were sampled: No plots sampled of this type; reconnaissance observation points were recorded at Gretna Alvar (ON), Massassauga Point Alvar (ON), and Salmon River Alvar (ON).

EOSPECS:
    Occurrences of the community must have a minimum of 1.25 acre (0.5 ha) of woodland: wooded vegetation with 25% to 60% canopy 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.   Soils are shallow loams (usually less than 20 cm deep). The physiognomy of the vegetation meets the following criteria:
    a) there is a partial canopy with 25% to 60% cover of trees over 5 meters tall
    b) there is a low cover of shrubs 0.5 to 5 meters tall (less than 10% cover)
    c) there is a variable cover of herbs (including grasses and sedges) in a mosaic with exposed patches of limestone or dolostone bedrock pavement

Individual EOs are separated by one of the following:
·   a substantial barrier, such as a river or lake or manmade linear feature such as herbicide-treated roadsides of a paved, two-lane road;
·   an area of cultural vegetation (e.g. farm fields, pasture, plantation) greater than 0.3 mi (0.5 km) across;
·   a different, intervening, natural community type that is not typically part of an alvar landscape matrix and is greater than 0.6 mi (1 km) across;
·   different, intervening, alvar community types that separate patches of alvar woodland by more than 3.1 mi (5 km);
·   a different, intervening substrate that is not a limestone or dolostone pavement.

Justification:
    Alvar woodlands can occur as small to large patches within an alvar landscape. The woodland patches within the same alvar landscape matrix may share ecological processes (e.g. fire regime), although the ecology of these woodlands is not well understood.

RANK PROCEDURE:
    Ranking follows standard TNC ranking procedures described in the February 5, 1997 "Element Occurrence Data Standard" document.

CONDITION SPECS:

"A" - rated condition: woodland has minimal human disturbance evident: few or no ruts or vehicle tracks, no barbed wire fences, no artificial berms, no structures, and no evidence of logging or plant harvesting (e.g. digging up stunted trees, shrubs, or wildflowers for cultivation, or cutting trees for fence posts). The woodland has no more than trace amounts of exotic species; and there is little or no evidence of past grazing or deer browsing. Diversity of the invertebrate fauna has not been reduced by pesticide spraying. Fires may have occurred. There have been no alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) mid-summer drought conditions.

"B" - rated condition: there may be some evidence of human disturbance, such as ruts, berms, cut stumps, barbed wire fences, or some light trampling, past grazing, or deer browsing; but the disturbance has had little apparent impact on overall composition of the community. The woodland is predominantly native species. Characteristic invertebrate fauna are present. There have been minimal alterations to soil cover or drainage that would ameliorate the characteristic mid-summer drought conditions.

"C" - rated condition: there is substantial evidence of human disturbance, and the disturbance has resulted in the reduction in the abundance or diversity of characteristic native plants, establishment of exotic plants, or reduction in the diversity of characteristic invertebrate fauna. There may have been some alterations to soil cover or drainage that would ameliorate (e.g. contribute additional moisture to) the characteristic mid-summer drought conditions. There is substantial evidence of past grazing or heavy deer browsing; exotics may be common to widespread. Abundances of native species have been reduced, but native species are persistent and restoration would be feasible with appropriate management techniques.

"D" - rated condition: Severely degraded by trampling, clearing, plant harvesting, grazing, severe deer browsing, creation of berms, or removal of rocks and/or soil; exotics may be abundant to dominant. The community is so severely disturbed that restoration would not be feasible.

Justification for "A" - rated criteria: Disturbances from trampling or moving the shallow soils may alter surface flow hydrology, altering the natural drainage and drought regime.

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altered and unlikely to replace exotics, even with careful management.

SIZE SPECS:

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"D" - rated size: less than 10 acres (< 4 ha)

Justification for "A" - rated criteria: Few occurrences are larger than 50 acres (20 ha); the size of examples surveyed ranged from 8 acres to about 100 acres (3 to about 40 ha). Stands over 50 acres are likely to have intact natural processes.

Justification for "C"/"D" threshold: Occurrences this small may have limited viability; they may succeed to a different alvar community type; small patches are best considered a habitat variation of the surrounding community type.

LANDSCAPE CONTEXT SPECS:

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"B" - rated landscape context: The surrounding landscape includes partially disturbed natural or semi-natural communities; some of the surrounding communities may be other viable communities, but at least some of the surrounding area does not have viable natural communities.

"C" - rated landscape context: The surrounding landscape is fragmented; the surrounding landscape has a mix of agricultural, residential, and/or commercial land uses along with some patches of natural or semi-natural areas.

"D" - rated landscape context: The surrounding landscape is primarily intensive agriculture, active commercial (e.g. quarrying operations), or residential development.

Justification for "A" - rated criteria: Large landscapes can sustain natural disturbance regimes: droughty summer soil moisture regime, and natural fire regime. Large landscapes would reduce invasion of widespread exotic species that can become established in naturally disturbed soils (turned by needle-ice action) by providing a larger buffer from seed sources.

Justification for "C"/"D" threshold: Intensive use of surrounding landscape would alter natural processes beyond a point where they could be restored.

Conserving Great Lakes Alvars

Author: Carol Reschke
Office: Great Lakes Program, Guilderland, NY
Date: 1998-12-29

Appendix 4: Alvar Working Group Members

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Michigan Natural Features Inventory

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