
D2 Community Elements

D2.1 Matrix Communities

D2.1.1 *Pinus ponderosa* / *Physocarpus monogynus* Forest, ponderosa pine / mountain ninebark forest

SPECS GROUP

Ponderosa Pine Forest and Woodland Alliances, Black Hills Group

MINIMUM SIZE

2 ha

EO SEPARATION

EOs are separated by:

- a barrier between patches (*e.g.*, a major two-lane paved highway, urban development, open body of water); or,
- an area of cultural vegetation (including ruderal vegetation, such as old-fields) greater than 0.5 km; or,
- a different intervening natural or semi-natural community greater than 2 km.

SEPARATION JUSTIFICATION

The separation distance for cultural vegetation is based on the suggested minimum value, since little is known about limitations on ponderosa pine or shrub and herb seed dispersal. Seeds of ponderosa pine are reported to travel as far as 120 m from the parent tree (Barret 1978 in Oliver and Ryker 1990). The separation distance for intervening natural or semi-natural communities seems to be a pragmatically useful distance.

EO TYPES

GSPECS AUTHORSHIP

McAdams, A. and D. Faber-Langendoen

GSPECS DATE

1998-06-29

GSPECS NOTES

RANK PROCEDURE

Condition, size, and landscape context are weighted equally for this type because, although it is a matrix type, it occurs within a mosaic of other ponderosa pine community types that together comprise the matrix.

EO RANK FACTOR [1st]

Condition

A SPECS

- a) Overstory structure intact (*i.e.*, average of 25 trees per hectare greater than 40 cm dbh and/or more than 160 years old have not been cut [Mehl 1992]); crown shape mature, flattened; bark yellowish in character;
- b) understory vegetation composed of native species;
- c) shrub layer may or may not be present;
- d) there is evidence of fire as a natural process, including potentially long intervals without fire (>45 years). Such evidence might include fire scars and scorching. Evidence of lack of natural fire

patterns might include increased densities of small diameter trees, increased litter depth, and/or decreased herbaceous production;

- e) stands may have been thinned with minimal disruption of understory (>20 years ago), but little or no exotics are present.

B SPECS

- a) Old growth trees present over greater than 75% of occurrence (i.e. average of 25 trees per hectare greater than 40 cm dbh and/or more than 160 years old have not been cut (Mehl 1992) over most of the area;
- b) if thinning of small diameter trees has occurred, there is little evidence of minimal disruption of understory vegetation;
- c) some light grazing by livestock may have occurred;
- d) exotic species may be present at low densities.

C SPECS

- a) Heavily logged with only small diameter trees remaining and disturbance to understory vegetation (due to logging activities or grazing);
- b) heavy grazing by livestock has severely altered ground layer composition;
- c) some exotic species present (including such species as *Cirsium arvense* [Canada thistle] and/or *Euphorbia esula* [leafy spurge]).

D SPECS

- a) Heavily logged and thinned, perhaps to the point of a clear-cut;
- b) ground very disturbed with major disruptions to vegetation;
- c) large proportion of exotic species, including *Cirsium arvense* (Canada thistle) and/or *Euphorbia esula* (leafy spurge).

RANK SPECS JUSTIFICATION

“A” rating threshold: Old growth criteria are based on those of Mehl (1992), who reviewed these criteria for ponderosa pine forests and other types throughout the Rocky Mountain region. Ponderosa pine forest systems generally depend on some form of fire to maintain overstory and understory composition. Brown and Sieg (1996) show that the range of fire in the Black Hills was between 1-45 years. Lack of fires within this time frame leads to structural changes in ponderosa pine, and alters ground layer composition and diversity. Fire intervals may be even longer in the northern Black Hills.

“C”/“D” threshold: Native ground layer composition is severely altered and unlikely to replace exotics. Recovery of ponderosa pine old-growth structure would take greater than 100 years.

EO RANK FACTOR [2nd]
Size

A SPECS

Very large (≥ 200 ha)

B SPECS

Large (50-199 ha)

C SPECS

Moderate (15-49 ha)

D SPECS

Small (<15 ha)

RANK SPECS JUSTIFICATION

“A” rating threshold: Stands this size would be able to support natural disturbance processes such as fire, and would contain sufficient internal variability to be representative of the type.

“C”/“D” threshold: Stands lack variability, and often are confined to specific aspects or slopes.

The minimum size, even for “D”-ranked occurrences, will rarely fall below 2 ha. Stands below 2 ha become difficult to judge in terms of stand homogeneity, and become heavily influenced by edge effects.

EO RANK FACTOR [3rd]

Landscape context

A SPECS

Highly connected – area around the EO is largely intact natural vegetation, with species interactions and natural processes occurring across communities (>2000 ha).

B SPECS

Moderately connected – area around the EO is moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality due to overgrazing or recent logging (>2000 ha).

C SPECS

Moderately fragmented – area around the EO is largely a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots.

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

RANK SPECS JUSTIFICATION

“A” rating threshold: Landscapes could sustain natural disturbance regimes. Definitions for minimum dynamic area (*i.e.*, the area of land necessary so that the proportion of the landscape in early, middle and late successional stages will remain constant over time, given the occurrence of windstorms and fires) proposed by Shugart (1984) – fifty times the average disturbance size, or Johnson and Van Wagner (1985) – two times the maximum disturbance size (see also Frelich 1995), can be used as a rough guide to landscape size. If disturbance regimes are virtually unknown, the minimum “C”-rated size (15-49 ha) can be used as a starting point and multiplied by fifty. Thus, “A”-rated ponderosa pine landscapes may need to be 750-2500 ha in size.

“C”/“D” threshold: Processes such as natural disturbances are essentially irretrievable.

GRANKSPECS AUTHORSHIP

McAdams, A. and D. Faber-Langendoen

GRANKSPECS DATE

1998-06-29

GRANKSPECS NOTES

**D2.1.2 *Quercus alba* – *Quercus rubra* – *Quercus macrocarpa* / *Carpinus caroliniana* Forest,
white oak – red oak – bur oak / musclewood forest**

SPECS GROUP

Quercus alba – (*Quercus rubra*, *Carya* spp.) Forest Alliance

MINIMUM SIZE

2 ha

EO SEPARATION

EOs are separated by:

- a barrier between patches (*e.g.*, a four-lane highway, urban development, open body of water); or,
- an area of cultural vegetation (including ruderal vegetation, such as old-fields) greater than 0.5 km; or,
- a different intervening natural or semi-natural community greater than 4 km.

SEPARATION JUSTIFICATION

The separation factors are based on seed dispersal of *Quercus* and *Carya* spp., which are dependent on squirrels and jays. These dispersers can move considerable distances between patches in intact or fragmented landscapes, from several hundred meters to 4 or 5 km (Harrison and Werner 1984, Crow 1988, Johnson and Webb 1989).

EO TYPES

GSPECS AUTHORSHIP

Dunevitz, H. and D. Faber-Langendoen

GSPECS DATE

1998-06-29

GSPECS NOTES

RANK PROCEDURE

Condition, size and landscape context are weighted equally for this type. Although matrix types typically consider condition to be of less importance than size and landscape context, this community type has been extensively cleared throughout its range, and choosing among remaining examples requires a greater consideration of condition because of the potential for extensive alteration of the groundlayer.

EO RANK FACTOR [1st]

Condition

A SPECS

For types that attain old-growth status:

- a) age of forest is typically old growth (120 years old or more);
- b) human-induced disturbance is minimal, including light selective logging that occurred in the past (>80 years ago);
- c) structure is all-aged with multi-layered canopies and some mesophytic species, such as *Acer saccharum* or *Fraxinus americana*, which may only be in the subcanopy or understory;
- d) a proportion of the *Quercus* spp. exceed 70 cm diameter at breast height, depending on site condition;
- e) few or no exotic species occur in the overstory or understory, with little evidence of livestock grazing within the last 80 years.

For types that do not attain old-growth status and require disturbance for regeneration:

- a) forest is typically older (>100 years old or more) and of natural origin (regenerating following natural disturbance such as fire or wind-storm);
- b) there is little or no human-induced disturbance, except natural area management such as prescribed burning or light selective logging that occurred in the past (>80 years ago);
- c) structure is even or all-aged, with single or multi-layered canopies;
- d) shrub layer is not composed predominantly of species that follow livestock grazing, but instead is composed of *Corylus americana* (hazel), *Prunus virginiana* (chokecherry), *Cornus* spp. (dogwood, including *C. florida*) and/or *Vaccinium* spp. (blueberry);
- e) ground layer is composed of native species typical of oak forests;
- f) there is evidence of fire in the last fifty years.

B SPECS

- a) Typically a mature or nearly mature forest, younger than old-growth, but with intact canopy;
- b) if logging occurred, it was either long ago (>60 years ago), very light selective cutting, or was done as a deliberate management strategy to approximate natural disturbance such as fire;
- c) at most, very light livestock grazing occurred within the last 60 years.

C SPECS

- a) EO may have been grazed by livestock, but not heavily enough to destroy groundlayer or result in dominance by armed shrubs that characteristically follow grazing;
- b) selective logging may have recently occurred (20- 60 years ago), but community composition has remained intact and some tree regeneration (including *Quercus* spp.) is occurring;
- c) also includes young second-growth (20-60 year old) stands that originated with good regeneration following clearcutting or burning.

D SPECS

Heavily cut or heavily grazed forest with a dense shrub layer of *Xanthoxylum americanum* (prickly ash), *Ribes* spp. (gooseberries), or *Rhamnus cathartica* (buckthorn), with a ground layer generally containing low diversity, either packed or very loose soil with few herbaceous plants, or dominated by weedy grasses and sedges or by exotic species, such as *Alliaria petiolata* (garlic mustard).

RANK SPECS JUSTIFICATION

“A” rating threshold: Parker (1989) required that old-growth conditions for central hardwoods, including oak forests, was >150 years, but noted that distinctions between old forest (100-150 years) and old-growth forests have not been developed. Frelich (1995) used 120 years to define old growth oak-hickory forests in the Lake States of Michigan, Minnesota, and Wisconsin. Parker (1989) also restricted old growth to stands with >80 years with no livestock grazing. The role of fire in oak forests is not clear, but some type of ground fire with occasional catastrophic disturbances has been noted (Guntenspergen 1983, Parker 1989, Abrams 1992, Olson 1996). Ground-layer characteristics of fire-maintained oak forests are poorly understood, but *Quercus* spp. regeneration may be enhanced through fires.

“C”/“D” threshold: *Quercus* spp. regeneration is unlikely, and exotics will have altered the ground-layer, preventing re-establishment of native species. *Alliaria petiolata* is difficult to eradicate (Nuzzo 1991, Schwartz and Heim 1996).

EO RANK FACTOR [2nd]
Size

A SPECS

Very large (≥ 100 ha)

B SPECS

Large (40-99 ha).

C SPECS

Moderate (10-39 ha).

D SPECS

Small (< 10 ha)

RANK SPECS JUSTIFICATION

“A” rating threshold: In a study of one township in southeastern Wisconsin, Guntenspergen (1983), reported that nineteenth century stands of forest rarely exceeded 200 ha, and averaged 40 ha. Currently few stands exceed 30 ha throughout the central hardwoods of the United States (Parker 1989).

“C”/“D” threshold: Guntenspergen (1983) found that below the 10 ha limit, edge effects became pronounced. Brothers (1992, 1993) reported that stands at or above 10 ha in size were fairly resistant to invasion by shade-intolerant exotics (e.g., *Taraxacum officinale* [dandelion], *Rosa multiflora* [multiflora rose], and *Chenopodium album* [goosefoot]). However shade-tolerant exotics (e.g., *Alliaria petiolata* [garlic mustard], *Lonicera japonica* and *L. tatarica* [honeysuckles]), may be able to spread into small fragments far more easily.

The minimum size, even for “D”-ranked occurrences, is not likely to fall below 2 ha. Stands below 2 ha become difficult to judge in terms of stand homogeneity, and become heavily influenced by edge effects, which can extend 50 m from the edge (Guntenspergen 1983, Brothers 1992).

EO RANK FACTOR [3rd]
Landscape context

A SPECS

Highly connected – area around the EO is largely intact natural vegetation, with species interactions and natural processes occurring across communities (> 500 ha).

B SPECS

Moderately connected – area around the EO is moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality due to overgrazing or recent logging (> 500 ha).

C SPECS

Moderately fragmented – area around the EO is largely a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots (total area no smaller than ten times the minimum “C”-rated size [> 100 ha]).

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

RANK SPECS JUSTIFICATION

“A” rating threshold: Definitions for minimum dynamic area (i.e., the area of land necessary so that the proportion of the landscape in early, middle and late successional stages will remain constant over time, given the occurrence of windstorms and fires) proposed by Shugart (1984) – fifty times the average disturbance size, or by Johnson and Van Wagner (1985) – two times the maximum disturbance size (see also Frelich

1995), can be used as a rough guide to landscape size. If disturbance regimes are virtually unknown, as they are for oak forests, the minimum "C"-rated size (10-39 ha) can be used as a starting point and multiplied by fifty. Thus, "A"-rated oak forest landscapes may need to be about 500-2000 ha in size.

"C"/"D" threshold: "C"-rated landscapes still provide a buffer against some edge effects on an EO and provide some connectivity to other natural communities.

GRANKSPECS AUTHORSHIP

Dunevitz, H. and D. Faber-Langendoen

GRANKSPECS DATE

1998-06-29

GRANKSPECS NOTES

**D2.1.3 *Tsuga canadensis* – (*Betula alleghaniensis*) Mesic Forest,
eastern hemlock – (yellow birch) mesic forest**

SPECS GROUP

Tsuga canadensis Forest Alliance Group

MINIMUM SIZE

2 ha

EO SEPARATION

EOs are separated by:

- a barrier between patches (*e.g.*, a four-lane highway, urban development, open body of water); or,
- an area of cultural vegetation (including ruderal vegetation, such as old-fields) greater than 0.5 km; or,
- a different intervening natural or semi-natural community greater than 2 km.

SEPARATION JUSTIFICATION

The separation distance for cultural vegetation is based on the suggested minimum value, since little is known about limitations on seed dispersal. The separation distance of 2 km for intervening natural or semi-natural communities seems to be a pragmatically useful distance.

EO TYPES

GSPECS AUTHORSHIP

Faber-Langendoen, D.

GSPECS DATE

1998-06-29

GSPECS NOTES

RANK PROCEDURE

Size is the primary factor, landscape context is the secondary factor, and condition is the tertiary factor. The primary and secondary factors are weighted equally, and weighted more heavily than the tertiary factor. The rationale for the sequence is that this is a matrix type, less affected by condition than size and landscape context. Note however, that size can be naturally very variable in this type (Mladenoff et al. 1993).

EO RANK RACTOR [1st]

Condition

A SPECS

- a) Overstory structure intact (*i.e.*, old-growth has not been cut), generally 150 years old or more;
- b) understory vegetation composed of native species;
- c) stands may have been thinned with minimal disruption of understory (>20 years ago), but little or no exotics are present.

B SPECS

- a) Overstory structure intact, with perhaps some selective logging. Stand age may range from 80-150 years;
- b) if thinning of small diameter trees has occurred, there is little evidence of disruption of understory vegetation;
- c) some light grazing by livestock may have occurred;

- d) exotic species may be present at low densities.

C SPECS

- a) Heavily logged with only small diameter trees remaining and disturbance to understory vegetation (due to logging activities or grazing); stand age may range from 50-80 years;
- b) heavy grazing by livestock or by deer has severely altered ground layer composition;
- c) some exotic species present.

D SPECS

- a) Heavily logged and thinned, perhaps to the point of a clear-cut; stand age less than 50 years;
- b) ground very disturbed with major disruptions to vegetation;
- c) large proportion of exotic species.

RANK SPECS JUSTIFICATION

“A” rating threshold: Hemlock forest systems begin to take on old-growth characteristics only after 150 years, and may even go through a series of old-growth changes between 180 and 400 years (Tyrrell and Crow 1994). Forest stands of this type experience relatively low disturbance rates, so under natural disturbance regimes most of the stands should be in old-growth.

“C”/“D” threshold: Native ground layer composition is severely altered and unlikely to replace exotics. Recovery of hemlock old-growth structure would take greater than 100 years. Overgrazing by deer could prevent hemlock regeneration (Mladenoff and Stearns 1993).

EO RANK FACTOR [2nd]
Size

A SPECS

Very large (≥ 400 ha)

B SPECS

Large (40-399 ha)

C SPECS

Moderate (4-39 ha)

D SPECS

Small (< 4 ha)

RANK SPECS JUSTIFICATION

“A” rating threshold: Stands this size would be able to support natural disturbance processes such as wind blowdowns, and would contain sufficient internal variability to be representative of the type. Studies of old-growth landscapes in the Great Lakes region show that stands can attain this size (Mladenoff *et al.* 1993).

“C”/“D” threshold: Studies by Mladenoff *et al.* (1993) found that in one old-growth landscape, patches of hemlock stands ranged in size from 2 ha to over 1,000 ha, and that the average stand was 21 ha. Stands much below this average (*i.e.*, less than 4 ha) will be dominated by edge effects throughout the stand.

The minimum size, even for “D”-ranked occurrences, will rarely fall below 2 ha. Stands below 2 ha become difficult to judge in terms of stand homogeneity, and become heavily influenced by edge effects. Note, however, that size can be naturally quite variable in this type (Mladenoff *et al.* 1993).

EO RANK FACTOR [3rd]
Landscape context

A SPECS

Highly connected – area around the EO is largely intact natural vegetation, with species interactions and natural processes occurring across communities (>5000 ha).

B SPECS

Moderately connected – area around the EO is moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality due to overgrazing or recent logging (>5000 ha).

C SPECS

Moderately fragmented – area around the EO is largely a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots.

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

RANK SPECS JUSTIFICATION

“A” rating threshold: Landscapes could sustain natural disturbance regimes. Definitions for minimum dynamic area (*i.e.*, the area of land necessary so that the proportion of the landscape in early, middle and late successional stages will remain constant over time, given the occurrence of windstorms and fires) proposed by Shugart (1984) – fifty times the average disturbance size, or Johnson and Van Wagner (1985) – two times the maximum disturbance size (see also Frelich 1995), can be used as a rough guide to landscape size. Frelich and Lorimer (1991) showed that the average disturbance size in these hemlock-hardwood forests was about 100 ha, so that landscapes of over 5,000 ha would be needed to sustain old-growth characteristics.

“C”/“D” threshold: Processes such as natural disturbances are essentially irretrievable.

GRANKSPECS AUTHORSHIP

Faber-Langendoen, D.

GRANKSPECS DATE

1998-06-29

GRANKSPECS NOTES

D2.2 Large Patch Communities

D2.2.1 *Artemisia tridentata* spp. *tridentata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation, basin big sagebrush / bluebunch wheatgrass shrub herbaceous vegetation

SPECS GROUP

Artemisia tridentata Shrub Herbaceous Alliance, zonal or loamy soil group

MINIMUM SIZE

0.4 ha

EO SEPARATION

EOs are separated by:

- a barrier between patches (*e.g.*, a four-lane highway, urban development, open body of water); or,
- an area of cultural vegetation (including ruderal vegetation, such as old-fields) greater than 0.5 km; or,
- a different intervening natural or semi-natural community greater than 2 km.

SEPARATION JUSTIFICATION

The separation distances for cultural vegetation are based primarily on the suggested minimum value, since little is known about limitations on sagebrush and herb seed dispersal. The separation distance for intervening natural or semi-natural communities seems to be a pragmatically useful distance. Primary criteria considered are the reaction of native species to disturbance, seed dispersal by dominant shrubs, and biology of shrub-steppe passerines.

EO TYPES

GSPECS AUTHORSHIP

Chappell, C., D. Faber-Langendoen, and R. Crawford

GSPECS DATE

1997-07-02

GSPECS NOTES

RANK PROCEDURE

Condition is the primary factor, size is the secondary factor, and landscape context is the tertiary factor. The primary and secondary factors are weighted equally, and weighted more heavily than the tertiary factor.

EO RANK FACTOR [1st]

Condition

A SPECS

- a) Cryptogamic crust intact, covering >80% of vascular plant interspace; high diversity of lichens and/or mosses in crust;
- b) non-native species and native annual increasers (*e.g.*, *Plantago patagonica*, annual fescues) absent or incidental;
- c) fire-sensitive shrubs mature and recovered from past fires; shrubs well-spaced if present (generally <20-25% cover);
- d) diverse forb layer within expected range for the type; native perennial increasers not particularly prominent. This is now very rare to non-existent and is meant to represent a community that is indistinguishable from a community that has never been grazed and has not burned for some time.

Fire was probably part of the “natural” landscape, but fires have increased in frequency unnaturally such that unburned areas are of greater natural value than recently burned areas. Fire frequency has decreased in some parts of the range (e.g., Pacific Northwest).

B SPECS

- a) Cryptogamic crust well-developed, >60% cover of vascular plant interspace; cryptogamic crust little disturbed or may have recovered well from long-past grazing; cryptogamic crust diverse in species composition (at least 3-4 species prominent);
- b) community dominated by natives; non-natives and native annual increasers <10% total cover and <20% relative cover in the herb layer; cheatgrass *not* thick under shrub crowns;
- c) fire-sensitive shrubs prominent, but may not be mature or fully recovered from fire; shrubs well spaced if present; diverse forb layer within expected range for the type; native perennial increasers do not predominate. This is generally the best of what remains in the landscape.

C SPECS

- a) Cryptogamic crust moderately degraded or recovering, >30% cover of vascular plant interspace (although monotypic early-successional moss may be more abundant); species diversity of crust may be relatively low; lichens likely to have low percent cover;
- b) community clearly dominated by natives in the herb layer; non-natives and native annual increasers <20% total cover and <30% relative cover in the herb layer; bunchgrasses >50% relative cover in the herb layer; indicator bunchgrasses (*Pseudoroegneria spicata*, *Festuca idahoensis*) clearly more important than increasers or non-natives; forb diversity may be somewhat lower than expected for the type; native perennial increasers may be relatively prominent but do not dominate. Cheatgrass can often be dense under shrub crowns;
- c) fire-sensitive shrubs may be present or absent; shrubs that increase (e.g., *Artemisia tridentata* spp. *tridentata*) may be somewhat more dense than pre-disturbance, but still <35% cover.

D SPECS

- a) Cryptogamic crust degraded or absent, <30% cover of vascular plant interspace; crust often low diversity;
- b) community may not be clearly dominated by natives; herb layer is a mix of natives and non-natives; native annual increasers or non-native invaders may be >20% cover and >30% relative cover in the herb layer; native indicator bunchgrasses (*Pseudoroegneria spicata*, *Festuca idahoensis* combined) >5-10% cover;
- c) shrubs may be quite dense, with >40% cover.

RANK SPECS JUSTIFICATION

“A”-rating threshold: The “A” rated criteria are based on descriptions of relict communities and reactions of key plant species to anthropogenic disturbances.

“C”/“D” threshold: This threshold is intended to separate “C”-rated occurrences that will naturally improve in condition when released from livestock or other anthropogenic disturbance, from “D”-rated occurrences that will not improve and are prone to irreversible changes in composition.

EO RANK FACTOR [2nd]
Size

A SPECS

Very Large (>=200 ha)

B SPECS

Large (80-199 ha)

C SPECS

Moderate: (20-79 ha)

D SPECS

Small (<20 ha)

RANK SPECS JUSTIFICATION

“A”-rating threshold: Stands this size would be able to support natural disturbance processes such as fire, and would contain sufficient internal variability to be representative of the type.

“C”/“D” threshold: Stands lack variability, and are prone to being eliminated by a single disturbance event.

The primary criteria considered are seed dispersal by dominant shrubs, biology of shrub steppe passerines, and the likelihood of an area completely burning in a single event.

EO RANK FACTOR [3rd]

Landscape context

A SPECS

Highly connected – landscape has been little altered, and the EO is completely surrounded by other high quality communities *and* extensive shrub-steppe (> 400 ha).

B SPECS

Moderately connected – EO is surrounded by moderate to extensive (>400 ha) low quality shrub-steppe, an extensive landscape that is used or has been extensively used for grazing or training.

C SPECS

Moderately fragmented – EO is surrounded by a mix of intensive agriculture and adjacent natural/semi-natural shrub-steppe, or by a relatively small area (total area smaller than twice the minimum EO size) of shrub-steppe in an agriculturally fragmented landscape.

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities. The surrounding landscape is primarily intensive agriculture or suburban development.

RANK SPECS JUSTIFICATION

“A” rating threshold: Natural disturbances, such as fire, can occur on a scale that permits maintenance of patches of the community in a variety of conditions.

“C”/“D” threshold: Processes such as natural disturbances are essentially irretrievable.

The primary criteria considered are seed dispersal by dominant shrubs, biology of shrub steppe passerines, and the likelihood of an area completely burning in a single event.

GRANKSPECS AUTHORSHIP

Chappell, C., D. Faber-Langendoen, and R. Crawford

GRANKSPECS DATE

1997-07-02

GRANKSPECS NOTES

**D2.2.2 *Thuja occidentalis* – (*Picea mariana* – *Abies balsamea*) / *Alnus incana* Wetland Forest,
eastern white cedar – (black spruce – balsam fir) / speckled alder wetland forest**

SPECS GROUP

Thuja occidentalis Saturated Forest Alliance Group

MINIMUM SIZE

0.4 ha

EO SEPARATION

EOs are separated by:

- a substantial barrier (e.g., two lane highways or larger); or
- an area of cultural vegetation greater than 0.5 km; or
- a different intervening natural or semi-natural community greater than 1 km.

SEPARATION JUSTIFICATION

Because white cedar swamps are dependent on saturated hydrological processes, the effects of even small roads may create substantial barriers between occurrences.

Boundaries can usually be determined from aerial photos. Difficulties in distinguishing this type from balsam fir, black spruce, or black ash swamps may require mapping as a complex.

EO TYPES

GSPECS AUTHORSHIP

Aaseng, N. and D. Faber-Langendoen

GSPECS DATE

1997-07-02

GSPECS NOTES

RANK PROCEDURE

Condition is the primary factor, size is the secondary factor, and landscape context is the tertiary factor. The primary and secondary factors are weighted equally, and weighted more heavily than the tertiary factor.

EO RANK FACTOR [1st]

Condition

A SPECS

- a) Site dominated by mature *Thuja occidentalis* generally >150 years old, with lesser cover of *Abies balsamea* and/or *Picea mariana*;
- b) extensive areas (>5 ha) with sufficient tree cover (50-100%) to favor development of typical shade-tolerant flora; species diversity high (>65 species);
- c) no obvious impact on vegetation from flooding or lowering of water table by activities such as road construction, ditching, or mining;
- d) surface disturbance due to winter roads, selective logging, and utility corridors limited to small percentage (<5%) of swamp;
- e) no exotic species present;

- f) absence of overgrazing by deer, as inferred by presence of white cedar reproduction;
- g) Downgrading of rank because of greater disturbance may be offset by significant presence of rare species such as *Cypripedium arietinum*, *Ranunculus lapponicus*, *Geocaulon lividum*, *Arethusa bulbosa*, *Polemonium occidentale*, or important concentrations of several species of orchid.

B SPECS

- a) A stand with the above "A"-rated condition characteristics, but partially degraded by surface activities such as selective logging;
- b) a stand with the above "A"-rated condition characteristics, but impacts due to water table alteration are present (although limited to a narrow band along ditch, road, *etc.*);
- c) a stand with mature cedar and typical structure, but with depauperate ground flora due to alteration of groundwater by ditching.

C SPECS

- a) Stand has structure and species composition significantly altered from its presettlement character by flooding, lowering of water table, or surface activities;
- b) lowering of water table may result in reduction or near total loss of ground flora;
- c) has more than occasional occurrence of exotic or non-typical cedar-spruce swamp species, but has enough structure and typical species so that the community is still recognizable.

D SPECS

A site where the hydrology has been severely altered or the surface drastically disturbed such that restoration is unlikely to occur.

RANK SPECS JUSTIFICATION

"A"-rating threshold: Maintenance of natural groundwater flow patterns is essential to the condition of this community. Use of rare species is suggested here because of their value as an indicator of natural processes.

"C"/"D" threshold: Groundwater flow has been severely altered such that the community is not likely to persist.

EO RANK FACTOR [2nd]
Size

A SPECS

Very Large (≥ 40 ha)

B SPECS

Large (20-39 ha)

C SPECS

Moderate (4-19 ha)

D SPECS

Small (< 4 ha)

RANK SPECS JUSTIFICATION

"A"-rating threshold: In the United States, white cedar swamps can occur in stands of over 40 ha, and sometimes as large as 200 ha, but this is relatively unusual.

"C"/"D" threshold: White cedar swamps often occur in small, concentrated areas where minerotrophic flows occur. In the New England region, the average occurrence size is 19 ha, and the mode and median sizes are 8 ha. These averages are within the size range specified for "C"-rated occurrences. The minimum viable size of this community is set fairly low at 4 ha.

EO RANK FACTOR [3rd]

Landscape context

A SPECS

Highly connected – area around the EO is largely intact natural vegetation, with species interactions and natural processes occurring across communities (>1000 ha).

B SPECS

Moderately connected – area around the EO is moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality due to overgrazing or recent logging (>1000 ha).

C SPECS

Moderately fragmented – area around the EO is largely a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots.

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

RANK SPECS JUSTIFICATION

“A”-rating threshold: Landscape context meeting these criteria provides a buffer against hydrologic changes.

“C”/“D” threshold: EO is subject to direct hydrologic inputs from adjacent land use that will alter the water quality; maintenance of natural hydrologic dynamics will be very difficult.

The landscape context is somewhat small, and partially reflects the small to moderate scale of EO size requirements. Landscape requirements for white cedar swamps need investigation, particularly as they relate to groundwater flows.

GRANKSPECS AUTHORSHIP

Aaseng, N. and D. Faber-Langendoen

GRANKSPECS DATE

1997-07-02

GRANKSPECS NOTES

D2.3 Small Patch Communities

D2.3.1 *Carex lasiocarpa* – *Carex buxbaumii* – *Scirpus cespitosus* Boreal Herbaceous Vegetation, wiregrass sedge – Buxbaum's sedge – tufted club-rush boreal herbaceous vegetation

SPECS GROUP

Carex lasiocarpa Saturated Herbaceous Alliance Group

MINIMUM SIZE

0.05 ha

EO SEPARATION

EOs are separated by:

- a substantial barrier (*e.g.*, two lane highways or larger); or
- an area of cultural vegetation greater than 0.5 km; or
- a different intervening natural or semi-natural community greater than 1 km.

SEPARATION JUSTIFICATION

Because fens are dependent on hydrological processes, the effects of even small roads may create substantial barriers between occurrences.

Note that occurrences of this community may be difficult to distinguish from other communities. Possible difficulties include:

- a) distinguishing between rich fen and wet meadow on aerial photographs (fens usually appear light blue in color on IR NAP [infra-red national aerial photography] photographs, while wet meadows appear white); and
- b) defining boundaries between rich fen and poor fen. In the absence of field data, these types can often be distinguished on the basis of landform position and inferred surface chemistry and water flow. Poor fens are often distinguished by the abundance of ericaceous shrubs, which appear somewhat orange in color on NHAP (national high altitude photography) photographs.

EO TYPES

GSPECS AUTHORSHIP

Aaseng, N. and D. Faber-Langendoen

GSPECS DATE

1997-07-02

GSPECS NOTES

RANK PROCEDURE

Condition is the primary factor, landscape context is the secondary factor, and size is the tertiary factor. The primary and secondary factors are weighted equally, and weighted more heavily than the tertiary factor.

EO RANK FACTOR [1st]
Condition

A SPECS

- a) No obvious impact on vegetation (determined using aerial photos) resulting from alteration of groundwater by activities such as road construction, ditching, utility corridors, or mining activities. Some minor occurrence of abandoned winter vehicle trails is acceptable;
- b) presence of *Drosera anglica*, and particularly *D. linearis*, is a good indicator of pristine condition. Other rare species may be present, such as *Drosera linearis*, *D. anglica*, *Xyris montana*, *Carex exilis*, *Cladium mariscoides*, and *Rhynchospora fusca* in the boreal section of its range, and *Scirpus cespitosus*, *Cladium maricoides*, *Carex viridula*, and *Eleocharis pauciflora* in the southern part of its range;
- c) high flora diversity because of presence of mud-bottomed pools or flarks and moss-covered ridges (these features can be detected on aerial photos); moss layer is well-developed, consisting of genera such as *Campyllum*, *Drepanocladus*, and *Calliergonella*;
- d) no exotic species present.

B SPECS

- a) Sites with "A"-rated condition characteristics, but where surface disturbance over a small to moderate percentage of fen has occurred due to winter roads or utility corridors;
- b) small percentage of fen surface is impacted due to water table alteration (which may be indicated by invasion of *Asclepias incarnata*, *Alnus incana*, or *Cirsium arvense*, or an increase in *Chamaedaphne calyculata*, *Betula glandulifera*, *Larix laricina*, or *Calamagrostis canadensis*);
- c) undisturbed site lacking floristic diversity, fairly monotypic, often with thick thatch; moss layer partially disturbed.

C SPECS

- a) Overall ground water flow intact, but is extensively impacted by ditches and roads; significant portions of fen remain intact;
- b) moss layer may be very patchy.

D SPECS

- a) Hydrology has been severely altered or surface drastically disturbed (*e.g.*, by peat mining) such that restoration is unlikely to occur;
- b) moss layer very sparse; composition may be very simplified.

RANK SPECS JUSTIFICATION

"A"-rating threshold: Maintenance of natural groundwater flow patterns is essential to the condition of this community.

"C"/"D" threshold: Groundwater flow has been severely altered, such that the community is not likely to persist.

Care should be taken not to inflate the rank based on the presence of rare species *per se*; rather, they serve to indicate high quality conditions. Their role as indicators needs further investigation.

EO RANK FACTOR [2nd]
Size

A SPECS
≥20 ha

B SPECS

10-19 ha

C SPECS

4-9 ha

D SPECS

<4 ha

RANK SPECS JUSTIFICATION

“A”-rating threshold: Fens of this size are more likely to have diverse composition.

“C”/“D” threshold: Fens below 4 ha in size are not likely to contain the full range of diversity, and will be easily affected by non-natural processes, should these be occurring nearby.

EO RANK FACTOR [3rd]

Landscape context

A SPECS

Highly connected – area around the EO is largely intact natural vegetation, with species interactions and natural processes occurring across communities (>1000 ha).

B SPECS

Highly connected – area around the EO is moderately intact natural vegetation, with species interactions and natural processes occurring across many communities; landscape includes partially disturbed natural or semi-natural communities, some of it not high quality due to overgrazing or recent logging (>1000 ha).

C SPECS

Moderately fragmented – area around the EO is largely a combination of cultural and natural vegetation, with barriers between species interactions and natural processes across natural communities; EO is surrounded by a mix of intensive agriculture and adjacent forest lots.

D SPECS

Highly fragmented – area around the EO is entirely, or almost entirely, surrounded by agricultural or urban land use; EO is at best buffered on one side by natural communities.

RANK SPECS JUSTIFICATION

“A”-rating threshold: This landscape context provides a buffer against hydrologic changes.

“C”/“D” threshold: EO is subject to direct hydrologic inputs from adjacent land use that will alter the water quality, and maintenance of natural hydrologic dynamics will be very difficult.

Landscape context is fairly small, and partially reflects the smaller scale of EO size requirements. Landscape requirements for fens need investigation.

GRANKSPECS AUTHORSHIP

Aaseng, N. and D. Faber-Langendoen

GRANKSPECS DATE

1997-07-02

GRANKSPECS NOTES

D2.4 Linear Communities

--to be written