14940

Laurentian-Acadian Shrub-Herbaceous Wetland Systems

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Vegetation Type

Herbaceous Wetland

Map Zones

41, 50, 51

Geographic Range

These systems occur throughout the upper Great Lakes region in Ontario, Canada, and Michigan, Minnesota, and Wisconsin. In map zones (MZ)s 41, 50, and 51, it occurs throughout Section 212 (Cleland et al. 2007).

Biophysical Site Description

These systems occur on glacial lakebeds, in channels of glacial outwash, and in depressions on glacial outwash and moraines (NatureServe 2005a, NatureServe 2005b, Hoffman 2002, Faber-Langendoen 2001, Reuter 1986, Curtis 1959). They frequently occur along the margins of lakes, ponds and streams where seasonal flooding or beaver-induced flooding is common (Hoffman 2002, Reuter 1986, Curtis 1959).

These systems typically occur on organic soil such as well-decomposed sapric peat (Curtis 1959) but saturated mineral soil may also support these systems (NatureServe 2005a, Hoffman 2002, Faber-Langendoen 2001, Curtis 1959) Soil pH may range from strongly acid to circum neutral (Warners 1993, Curtis 1959, Costello 1939).

These systems often occur as large wetland complexes comprised of northern emergent marsh, northern wet meadow (sedge meadow), northern fen (boreal rich fen), northern shrub thicket and swamp forest (rich conifer swamp, northern swamp, hardwood-conifer swamp). Northern wet meadow and northern fen (sedge meadow) may occur along streams and the grade into northern shrub thicket and swamp forest (Curtis 1959). On the edges of inland lakes, northern wet meadow often borders emergent marsh and less frequently northern fen. These wetland communities may also occur along the Great Lakes shoreline within extensive areas of Great Lakes marsh.

Vegetation Description

These wetland systems may include emergent marsh, northern wet meadow, northern fen, northern shrub thicket and swamp forest (MNFI 2003).

Northern wet meadow is a sedge-dominated system that typically has 100% vegetative cover in the ground layer (Eggers and Reed 1997, Curtis 1959). Sedge meadow is often dominated by *Carex stricta* (tussock sedge) (Kost and De Steven 2000, Warners 1997, Curtis 1959, Costello 1936, Stout 1914). Because the roots of *Carex stricta* form large hummocks or tussocks, the species is often responsible for the community’s hummock and hollow structure. Individual culms of *Carex stricta* grow from the tussocks, which may reach more than one meter in height and half a meter in diameter and live for more than 50yrs (Costello 1936). The *Carex stricta* tussocks can occur at very high densities (1-4 per m2) and occupy more than 40% of a meadow’s area (Costello 1936). Because the shaded areas between tussocks are often covered with standing water and leaf litter, many of the shorter species inhabiting sedge meadows grow almost exclusively from the sides or tops of *Carex stricta* tussocks.

Other sedges that commonly occur in northern wet meadow include: *Carex aquatilis* (water sedge), *C. bebbii* (Bebb’s sedge), *C. buxbaumii* (Buxbaum’s sedge), *C. comosa* (long-hair sedge), *C. hystericina* (bottlebrush sedge), *C. lacustris* (lake or hairy sedge), *C. lanuginose* (woolly sedge), *C. lasiocarpa* (wiregrass sedge), *C. rostrata* (beaked sedge), *C. stipata* (saw-beak sedge), *C. vesicaria* (blister sedge), and *C. vulpinoidea* (fox sedge). Although most of the associated sedge species tend to be randomly interspersed, *Carex lacustris*, *C. lasiocarpa*, *C. rostrate*, and *C. vesicaria* can often occur as dominants or co-dominants.

The most dominant grass species in northern wet meadow is *Calamagrostis canadensis* (blue-joint grass) (Kost and De Steven 2000, Stout 1914). Other common grasses include: *Bromus ciliatus* (fringed brome), *Glyceria canadensis* (manna grass), *G. striata* (fowl manna grass), *Muhlenbergia glomerata* (marsh wild timothy), *Muhlenbergia mexicana* (leafy satin grass), and *Poa palustris* (fowl meadow grass). Spike-rushes (i.e., *Eleocharis erythropoda*), cat-tails (*Typha latifolia* and *Typha angustifolia*), *Cladium marisicoides* (twig-rush) and *Scirpus atrovirens* (green bulrush) are also common graminoids. Sedge meadows disturbed by agricultural use, grazing, drainage and/or filling are frequently dominated by *Phalaris arundinaceae* (reed canary grass), an extremely aggressive grass that forms persistent, monotypic stands (Eggers and Reed 1997).

A wide variety of wetland forbs occur scattered in northern wet meadow. Due to the high moisture conditions during the spring, many of the forbs bloom in the summer and fall (Curtis 1959). The following are some of the more common species: *Anemone canadensis* (Canada anemone), *Asclepias incarnata* (swamp milkweed), *Aster lanceolatus* (panicled aster), *A. lateriflorus* (calico aster), *A. puniceus* (swamp aster), *A. umbellatus* (flat-topped aster), *Campanula aparinoides* (marsh bellflower), *Cicuta bulbifera* (water-hemlock), *C. maculata* (water-hemlock), *Cirsium muticum* (swamp thistle), *Epilobium strictum* (downy willowherb), *Eupatorium maculatum* (Joe-pye-weed), *Eupatorium perfoliatum* (boneset), *Euthamia graminifolia* (flat-topped goldenrod), *Galium asprellum* (rough bedstraw), *G. trifidum* (threepetal bedstraw), *Impatiens capensis* (spotted touch-me-not), *Iris versicolor* (wild blue flag), *Lathyrus palustris* (marsh pea), *Lycopus americanus* (American water-horehound), *L. uniflorus* (northern bugleweed), *Lysimachia thyrsifolia* (tufted loosestrife), *Mentha arvensis* (wild mint), *Polygonum amphibium* (water smartweed), *Rumex orbiculatus* (greater water dock), *Sagittaria latifolia* (duck-potato or common arrowhead), *Scutellaria galericulata* (marsh skullcap), *Solidago canadensis* (Canada goldenrod), *S. gigantea* (late goldenrod), *S. patula* (rough-leaved goldenrod or swamp goldenrod), *Thalictrum dasycarpum* (purple meadow-rue), *Triadenum fraseri* (marsh St. John’s-wort), *Verbena hastata* (blue vervain), and *Viola cucullata* (marsh violet). Characteristic fern or fern allies include *Dryopteris cristata* (crested woodfern), *Equisetum arvense* (field horsetail), *E. fluviatile* (water horsetail), *Onoclea sensibilis* (sensitive fern), and *Thelypteris palustris* (marsh fern).

Northern wet meadow can also contain numerous, scattered shrub and tree species. Shrub and tree encroachment is especially pronounced in sites that have altered flooding or fire regimes. Prevalent shrubs include *Alnus rugosa* (speckled alder), *Betula pumila* (bog birch), *Cornus stolonifera* (red-osier dogwood), *Potentilla fruticosa* (shrubby cinquefoil), *P. palustris* (marsh cinquefoil), *Salix* spp. (willows), *Spiraea alba* (meadowsweet), and *S. tomentosa* (steeplebush). Scattered trees and tree saplings are often found invading northern wet meadow. Typical tree species include *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), *Larix laricina* (tamarack), *Populus balsamifera* (balsam poplar), *Populus tremuloides* (quaking aspen), and *Thuja occidentalis* (northern white cedar). (Above species lists compiled from Michigan Natural Features Inventory database, NatureServe 2005a, Faber-Langendoen 2001, Eggers and Reed 1997, Reuter 1986, Curtis 1959).

Northern shrub thicket vegetation is characterized by an overwhelming dominance of speckled alder, which forms dense (often monotypic) thickets with canopy coverage ranging between 40-95% and stand height typically between 1-3m. The community exhibits a high degree of floristic homogeneity due to the dominance of alder. Floristic diversity is usually correlated with the degree of shrub canopy closure, with more diversity being found in the more open sites. The understory, which is comprised of species from both meadow and forest, is dominated by an array of short shrubs, forbs, grasses, sedges and ferns. Prevalent herbs of northern shrub thickets include: *Aster puniceus* (swamp aster), *Caltha palustris* (marsh marigold), *Campanula aparinoides* (marsh bellflower), *Eupatorium maculatum* (Joe-pye-weed), *E. perfoliatum* (boneset), *Galium asprellum* (rough bedstraw), *Impatiens capensis* (spotted touch-me-not), *Iris versicolor* (wild blue flag), *Lycopus uniflorus* (northern bugleweed or water-horehound), *Mentha arvensis* (wild mint), *Mimulus ringens* (monkey-flower), *Scutellaria galericulata* (marsh skullcap), *S. lateriflora* (mad-dog skullcap), *Senecio aureus* (golden ragwort), *Solidago canadensis* (Canada goldenrod), *S. gigantea* (late goldenrod), *S. rugosa* (rough-leaved goldenrod), *Symplocarpus foetidus* (skunk cabbage), and *Thalictrum dasycarpum* (purple meadow-rue). Characteristic ferns and fern allies include *Equisetum arvense* (field horsetail), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *O. regalis* (royal fern), and *Thelypteris palustris* (marsh fern). Short shrubs include *Myrica gale* (wax-myrtle or bayberry), *Potentilla palustris* (marsh cinquefoil), *Ribes americanum* (wild black currant), *Rubus hispidus* (swamp dewberry), *R. pubescens* (dwarf raspberry), *R. strigosus* (wild red raspberry), and *Spirea alba* (meadowsweet). Where alder does not form a monospecific shrub layer, associates of the tall shrub layer can include *Aronia prunifolia* (chokeberry), *Betula pumila* (bog birch), *Cornus amomum* (silky dogwood), *C. stolonifera* (red-osier dogwood), *Ilex verticilata* (winterberry), *Salix bebbiana* (Bebb’s willow), *S. discolor* (pussy willow), *S. exigua* (sandbar willow), *S. petiolaris* (slender willow), *Viburnum cassinoides* (wild-raisin), and *V. opulus* (highbush-cranberry). Scattered trees and tree saplings are often found invading northern shrub thickets. Typical tree species include balsam fir, red maple, black ash, tamarack, black spruce, balsam poplar, quaking aspen and white pine and northern white cedar.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CAST8 | *Carex stricta* | Upright sedge |
| CACA4 | *Calamagrostis canadensis* | Bluejoint |
| THOC2 | *Thuja occidentalis* | Arborvitae |
| CALA11 | *Carex lasiocarpa* | Woollyfruit sedge |
| SALA2 | *Sagittaria latifolia* | Broadleaf arrowhead |
| ALIN2 | *Alnus incana* | Gray alder |
| BEPU4 | *Betula pumila* | Bog birch |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

These wetland systems are groundwater-dependent. Water levels fluctuate seasonally, reaching their peak in spring and lows in late summer (Warners 1993, Costello 1936,). However, water levels typically remain at or near the soil’s surface throughout the year (Eggers and Reed 1997, Warners 1993, Curtis 1959, Costello 1936). For northern wet meadows, in addition to seasonal flooding, beaver-induced flooding may also play an important role in maintaining the community by occasionally raising water levels and killing encroaching trees and shrubs. Beaver may also help create new northern wet meadows by flooding swamp forests and northern shrub thickets and thus creating suitable habitat for the growth of shade-intolerant wet meadow species.

Evidence from wetland peat cores and circa 1800 vegetation maps indicate that wet meadow is a fire-dependent natural community (Davis 1979, Curtis 1959). Analysis of wetland peat cores shows that charcoal fragments are consistently associated with sedge and grass pollen (Davis 1979). Conversely, charcoal fragments are lacking from sections of peat cores dominated by shrub pollen. Fires typically occur in sedge meadows during dry conditions of early spring or late fall (White 1965). By reducing leaf litter and allowing light to reach the soil surface and stimulate seed germination, fire can play an important role in maintaining wet meadow seed banks (Kost and De Steven 2000, Warners 1997). Fire also plays a critical role in preventing declines in species richness in many community types by creating micro-niches for small species (Leach and Givnish 1996). In the absence of fire, a thick layer of leaf litter can develop that stifles seedling establishment and seed bank expression. Another critically important attribute of fire for maintaining open sedge meadow is its ability to temporarily reduce shrub cover (Hoffman 2002, Reuter 1986, White 1965). In the absence of fire or flooding, all but the wettest sedge meadows typically convert to shrub thicket and eventually swamp forest (Curtis 1959). Because many of the species that inhabit wet meadow are shade-intolerant, species richness usually declines following shrub and tree invasion (Reuter 1986, White 1965, Curtis 1959).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 18 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 18 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

None

Adjacency or Identification Concerns

These communities may occur within depressions surrounded by either fire-dependent uplands such as pine barrens, oak-pine barrens, and mixed pine systems (dry- and dry-mesic northern forest) or systems in which fire is thought to be very infrequent such as northern mesic forest (northern hardwood forest - sugar maple, American beech, basswood and eastern hemlock). Thus, fire frequency within the graminoid-dominated wetlands is strongly influenced by vegetation composition of adjacent uplands.

Issues or Problems

The timeframe of the model (1,000yrs) does not allow for an adequate description of hydrarch succession. Also, the diversity of herbaceous wetland communities is not fully described within the models created for MZs 41, 50, and 51.

Native Uncharacteristic Conditions

Comments

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | UN | UN | UN | UN | UN |
| Herb | 0.5-1.0 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Herb | >1.0 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Shrub | 0-0.5 | UN | UN | UN | UN | UN | C | C | C | C | C |
| Shrub | 0.5-1.0 | UN | UN | UN | UN | UN | C | C | C | C | C |
| Shrub | 1.0-3.0 | UN | UN | UN | UN | UN | C | C | C | C | C |
| Shrub | >3.0 | UN | UN | UN | UN | UN | C | C | C | C | C |
| Tree | 0-5 | UN | UN | UN | UN | UN | D | D | D | D | D |
| Tree | 5-10 | UN | UN | UN | UN | UN | D | D | D | D | D |
| Tree | 10-25 | UN | UN | UN | UN | UN | D | D | D | D | D |
| Tree | 25-50 | UN | UN | UN | UN | UN | D | D | D | D | D |
| Tree | >50 | UN | UN | UN | UN | UN | D | D | D | D | D |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 7 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SALA2 | Sagittaria latifolia | Broadleaf arrowhead | Lower |
| POCO14 | Pontederia cordata | Pickerelweed | Lower |
| TYLA | Typha latifolia | Broadleaf cattail | Lower |
| CAST8 | Carex stricta | Upright sedge | Lower |

Description

This class represents a beaver meadow with emergent marsh vegetation. This is an early seral stage with open water and emergent vegetation such as *Sagittaria latifolia*, *Pontedaria cordata*, *Nuphar variegata*, *Carex stricta*, and *Typha latifolia*. Absence of flooding can be caused by periodic drought or local extirpation of beaver due to trapping or predation by wolves.

*Maximum Tree Size Class*  
None

Class B 57 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CAST8 | Carex stricta | Upright sedge | Lower |
| CACA4 | Calamagrostis canadensis | Bluejoint | Lower |
| CAAQ | Carex aquatilis | Water sedge | Lower |
| EUMA6 | Eupatorium maculatum | Spotted joepyeweed | Lower |

Description

This class represents sedge-dominated northern wet meadow (northern sedge meadow) and northern fen (boreal rich fen), which is dominated by *Carex stricta* or *Carex lasiocarpa* and other sedges along with bluejoint grass (*Calamagrostis canadensis*), and other grasses, rushes, and forbs. Frequent replacement fires and seasonal flooding help to maintain open conditions and structural and species diversity.

*Maximum Tree Size Class*  
None

Class C 31 Late Development 2 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ALIN2 | Alnus incana | Gray alder | Middle |
| BEPU4 | Betula pumila | Bog birch | Middle |
| ILVE | Ilex verticillata | Common winterberry | Middle |
| CACA4 | Calamagrostis canadensis | Bluejoint | Lower |

Description

Northern shrub thicket, a type dominated by tag alder (*Alnus incana*). Other shrubs such as bog birch (*Betula pumila*), Michigan holly (*Ilix veticillata*), and meadow sweet (*Spirea alba*). The ground layer of shrub-carr is typically diverse with a mix of wet meadow and forested wetland vegetation. Many of the sedges formerly abundant continue to be present but in a relatively suppressed condition due to the lower light levels under the cover of alder and other shrubs. In the absence of beaver flooding, trees become established and the community succeeds to swamp forest.

*Maximum Tree Size Class*  
None

Class D 5 Late Development 3 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| THOC2 | Thuja occidentalis | Arborvitae | Upper |
| FRNI | Fraxinus nigra | Black ash | Upper |
| PIST | Pinus strobus | Eastern white pine | Upper |
| BEAL2 | Betula alleghaniensis | Yellow birch | Upper |

Description

This class represents swamp forest, which is typically dominated by conifers, especially northern white-cedar (*Thuja occidentalis*). However, hardwoods or a mix of both hardwoods and conifers may be dominant including tamarack (*Larix laricina*), white pine (*Pinus strobus*), black ash (*Fraxinus nigra*), American elm (*Ulmus americana*), red maple (*Acer rubrum*) and yellow birch (*Betula allegheniensis*).

*Maximum Tree Size Class*  
Medium 9-21"DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Late1:OPN | 50 |
| Late1:OPN | 51 | Late1:OPN | 999 |
| Late2:CLS | 51 | Late3:CLS | 151 |
| Late3:CLS | 152 | Late3:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Alternative Succession | Early1:OPN | Late1:OPN | 0.05 | 20 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late2:CLS | 1 | 1 | Yes | 60 |
| Optional 1 | Late1:OPN | Early1:OPN | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late1:OPN | Late1:OPN | 0.1 | 10 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.5 | 2 | No | 0 |
| Optional 1 | Late2:CLS | Early1:OPN | 0.005 | 200 | Yes | 0 |
| Optional 2 | Late2:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |
| Wind or Weather or Stress | Late2:CLS | Late2:CLS | 0.1 | 10 | No | 0 |
| Optional 1 | Late3:CLS | Early1:OPN | 0.005 | 200 | Yes | 0 |
| Optional 2 | Late3:CLS | Late1:OPN | 0.01 | 100 | Yes | 0 |
| Wind or Weather or Stress | Late3:CLS | Late3:CLS | 0.1 | 10 | No | 0 |

Optional Disturbances

Optional 1: severe beaver flooding

Optional 2: less severe beaver flooding

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