14930

Central Interior and Appalachian Shrub-Herbaceous Wetland Systems

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Woody Wetland

Map Zones

41, 42, 44, 50

Geographic Range

These systems occur throughout the Great Lakes region and Midwest in Ontario, Canada, and IA, IL, IN, MI, MN, MO, ND, OH, SD and WI. In MZs 41, 50 and 51, it occurs in 222Ja, Jc, Jf, Ud, Ue, Ua, Jg, Je, Jh, Jb, Ja, Ji, Ke, Kf, Kg, Lc, Ld, Le, Kh, Kd, Ke, Kb and Kc.

Biophysical Site Description

These systems occur on glacial lakebeds and in depressions on glacial outwash and moraines (Curtis 1959). The community frequently occurs along the margins of lakes and streams where seasonal flooding or beaver-induced flooding is common.

The soils are typically organic sediments (Curtis 1959) but saturated mineral soil may also support the community (Costello 1936). Because of the calcareous nature of the glacial drift in the regions occupied by these systems, wet soils contain high levels of dissolved minerals such as calcium and magnesium and pH values are frequently circum neutral to strongly alkaline (6.5-8.5) (Warners 1993, Curtis 1959, Costello 1936).

These systems typically occur in large wetland complexes and may be comprised of several different wetland communities. Where ground water seepage occurs at the bases of moraines, sedge meadow (southern wet meadow) may border calcareous fen (prairie fen), with shrub-carr and emergent marsh occurring in well-drained or poorly drained areas, respectively. In depressions on ground moraine or lakeplain, sedge meadow may grade into wet prairie, lakeplain wet prairie and shrub-carr up slope, and emergent marsh in lower areas. On the edges of inland lakes, sedge meadow and calcareous fen often border emergent marsh. These systems may also occur along the Great Lakes shoreline within extensive areas of Great Lakes marsh. In all of these landscape settings, sedge meadow may border shrub-carr and swamp forest.

Vegetation Description

These wetland systems include southern wet meadow, prairie fen and southern shrub-carr (MNFI 2003). Southern wet meadow is typically dominated by Carex stricta (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 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 0.5m 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 southern wet meadows grow almost exclusively from the sides or tops of Carex stricta tussocks.

Other sedges that commonly occur in southern wet meadow include: Carex aquatilis, C. comosa, C. bebbii, C. hystericina, C. lacustris, C. lanuginosa, C. lasiocarpa, C. prairea, C. rostrata, C. sartwellii, C. stipata and C. vulpinoidea. Although most of the associated sedge species tend to be randomly interspersed, Carex lacustris often occurs in dense patches.

The most dominant grass species in southern wet meadow is blue joint grass (Calamagrostis canadensis) (Kost and De Steven 2000, Stout 1914). Other common grasses include: fringed brome (Bromus ciliatus), fowl manna grass (Glyceria striata), marsh wild timothy (Muhlenbergia glomerata), leafy satin grass (Muhlenbergia mexicana) and fowl meadow grass (Poa palustris).

A wide variety of wetland forbs occur in southern wet meadow including, Aster puniceus, A. firmus, Campanula aparinoides, Asclepias incarnata, Cicuta bulbifera, Cirsium muticum, Eleocharis erythropoda, Eupatorium perfoliatum, Eupatorium maculatum, Galium asprellum, Impatiens capensis, Lycopus uniflorus, Mentha arvensis, Onoclea sensibilis, Pilea pumila, Polygonum amphibium, Pycnanthemum virginianum, Rumex orbiculatus, Solidago gigantea, Scutellaria galericulata, Sagittaria latifolia, Solidago patula, Thalictrum dasycarpum, Thelypteris palustris, Thelypteris palustris, Triadenum fraseri, Typha latifolia and Viola cucullata.

Prairie fens typically contain several distinct vegetation zones, which may include emergent marsh, marl flat, sedge meadow and wooded fen. The zones correspond to differing levels of groundwater influence and alkalinity and past natural and anthropogenic disturbances.

Emergent marsh can occur in low, level areas and near the margins of streams and lakes. Dominant species in this zone include Scirpus acutus (hardstem bulrush), Scirpus americanus (three-square), Carex lacustris, C. aquatilis (sedges), wide-leaved cattail (Typha latifolia) and arrowhead (Sagittaria latifolia).

Sedge meadow is typically the largest vegetative zone of a prairie fen and is dominated by sedges, grasses, low shrubs and a variety of forbs. Sedge meadow may occur in low, level areas and on slopes, where it often assumes an overall shorter stature. Characteristic sedges include Carex stricta (tussock sedge), C. sterilis, C. lasiocarpa, C. buxbaumii, C. prairea, and C. diandra. Common grasses include big bluestem (Andropogon gerardii), little bluestem (A. scoparia), Indian grass (Sorghastrum nutans), marsh wild-timothy (Muhlenbergia glomerata), fringed brome (Bromus ciliatus), blue-joint grass (Calamagrostis canadensis) and slender wheatgrass (Agropyron trachycaulum). Low shrubs occurring within the sedge meadow zone include shrubby cinquefoil (Potentilla fruticosa), alder-leaved buckthorn (Rhamnus alnifolia), sage willow (Salix candida), meadowsweet (Spiraea alba), and Betula pumila (bog birch). Common forbs include Eupatorium maculatum (joe-pye weed), E. perfoliatum (common boneset), smooth swamp aster (Aster firmus), tall flat-top white aster (A. umbellatus), side-flowering aster (A lateriflorus), swamp aster (A. puniceus), whorled loosestrife (Lysimachia quadriflora), Virginia mountain mint (Pycnanthemum virginianum), Rudbeckia hirta (black-eyed susan), Solidago ohioensis (Ohio goldenrod), Riddell’s goldenrod (S. riddellii), bog goldenrod (S. uliginosa), sensitive fern (Onoclea sensibilis) and Thelypteris palustris (marsh fern).

Marl flats are a distinct feature of fens, forming in areas of calcareous groundwater seepage. Marl flats may occur as small pools or as extensive, level areas. In the later, low peat ridges that support sphagnum mosses (Sphagnum spp.), pitcher plant (Sarracenia purpurea), and stunted tamarack (Larix laricina) may be interspersed throughout the broad marl flats. Because the alkaline conditions permit few species to survive, marl flats are sparsely vegetated. Species occurring within marl flats include the following: sedges (Carex flava, C. leptalea, and C. sterilis), bog lobelia (Lobelia kalmii), grass-of-Parnassus (Parnassia glauca), beak-rushes (Rhynchospora alba and R. capillacea), bog arrow-grass (Triglochin maritimum), twig-rush (Cladium mariscoides), rush (Juncus brachycephalus), golden-seeded spike-rush (Eleocharis elliptica), spike- rush (Eleocharis rostellata), white lady’s slipper (Cypripedium candidum) and white camas (Zigadenus glauca), and carnivorous plants such as round-leaved sundew (Drosera rotundifolia), pitcher plant, flat-leaved bladderwort (Utricularia intermedia) and horned bladderwort (U. cornuta).

In the absence of fire and beaver flooding, the wooded fen zone probably occupies a significantly greater area within the remaining prairie fens than in the past. Woody species commonly occurring include Toxicodendron vernix (poison sumac), silky dogwood (Cornus amomum) C. foemina (gray dogwood), C. stolonifera (red-osier dogwood), Michigan holly (Ilex verticillata), Physocarpus opulifolius (ninebark), bog birch, nannyberry (Viburnum lentago), tamarack (Larix laricina), yellow birch (Betula alleghaniensis), Acer rubrum (red maple) and Ulmus americana (American elm). The area occupied by the wooded fen zone represents portions of the fen that are succeeding to closed-canopy communities such as southern shrub-carr and relict conifer swamp in the absence of natural disturbance and management. As such, many of the herbaceous species from the other zones also occur within wooded fen.

Shrub-carr commonly supports three distinct vegetation layers (White 1965). The most pronounced is the shrub layer, which typically exhibits little stratification or layering, and ranges in height from 5-18ft (ave. 8.6ft) (White 1965). Common species in the shrub layer include bog birch (Betula pumila), dogwoods (Cornus foemina, C. stolonifera, C. amomum), Michigan holly (Ilex verticillata), elderberry (Sambucus canadensis) and willows (Salix bebbiana, S. discolor, S. exigua, S. petiolaris and S. eriocephala). The shrub layer can be dense to patchy depending on the successional state and local site conditions within the community. The second vegetation layer is an intermediate layer of tall herbaceous plants such as water-plantain (Alisma plantago-aquatica), swamp milkweed (Asclepias incarnate), bluejoint grass (Calamagrostis canadensis), water hemlock (Cicuta maculate), water horsetail (Equisetum fluviatile), marsh fleabane (Erigeron philadelphicus), common boneset (Eupatorium perfoliatum), rattlesnake grass (Glyceria canadensis), wild bergamot (Monarda fistulosa), old-field simplex (Potentilla simplex), pasture rose (Rosa carolina), softstem bulrush (Schoenoplectus tabernaemontani), bulrush (Scirpus pendulus), Canada goldenrod (Solidago canadensis), and marsh fern (Thelypteris palustris). There may also be a third vegetative layer of smaller herbaceous species such as bedstraw (Galium spp.), clearweed (Pilea pumila), northern bugle weed (Lycopus uniflorus) and marsh bellflower (Campanula aparinoides). Overall, the vegetation of shrub-carr is highly variable due to frequent disturbances and small-scale differences in micro-topography, soil moisture and nutrient availability (White 1965).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CAST8 | *Carex stricta* | Upright sedge |
| CAAQ | *Carex aquatilis* | Water sedge |
| CACA4 | *Calamagrostis canadensis* | Bluejoint |
| EUMA6 | *Eupatorium maculatum* | Spotted joepyeweed |
| EUPE3 | *Eupatorium perfoliatum* | Common boneset |
| COFO | *Cornus foemina* | Stiff dogwood |
| COAM2 | *Cornus amomum* | Silky dogwood |
| SALA2 | *Sagittaria latifolia* | Broadleaf arrowhead |

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 (Warners 1993, Curtis 1959, Costello 1936). For southern 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 southern wet meadows by flooding swamp forests and shrub-carr and thus, creating suitable habitat for the growth of shade-intolerant wet meadow species such as Carex stricta.

Evidence from wetland peat cores and circa 1800s maps indicate that southern 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. In southern WI, where prevailing westerly winds carry fires eastward, southern wet meadow frequently occurred adjacent to fire-dependent natural communities such as oak savannas and prairies on the west side (i.e., windward) of large rivers. While directly east (i.e., leeward) of these same rivers, similar topography supported fire-intolerant tamarack swamps and mesic forests (Zicker 1955 in Curtis 1959).

By reducing leaf litter and allowing light to reach the soil surface and stimulate seed germination, fire can play an important role in maintaining southern 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). Another critically important attribute of fire for maintaining open southern wet meadow is its ability to temporarily reduce shrub cover (Reuter 1986).

In the absence of fire or flooding, all but the wettest southern wet meadows typically convert to shrub-car and eventually swamp forest (Curtis 1959). Because many of the species that inhabit southern wet meadow are shade-intolerant, species richness usually declines following shrub and tree invasion (White 1965, Curtis 1959).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 17 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 17 | 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 oak barrens, oak-pine barrens, oak openings, and dry oak forests or surrounded by systems in which fire is thought to be very infrequent such as southern mesic forest (sugar maple - American beech, basswood forest). 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 (1000yrs) 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 these map zones (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 | UN | UN | UN | UN | UN | UN | UN |
| Herb | 0.5-1.0 | B | B | B | UN | UN | UN | UN | UN | UN | UN |
| Herb | >1.0 | B | B | B | UN | UN | 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 | UN | UN | UN | UN | UN |
| Tree | >50 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |

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 8 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 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 60 Late Development 1 - Open

Indicator Species

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

Description

This class represents sedge-dominated wet meadow (sedge meadow) and prairie fen (calcareous fen), which is dominated by Carex stricta and other sedges along with bluejoint grass (Calamagrostis canadensis), and other grasses, rushes, and forbs. Frequent replacement fires and seasonal flooding help to maintain this class in an open condition and the structural and species diversity. Beaver flooding results in setting-back succession to emergent marsh or beaver meadow. In the absence of natural disturbance results in succession to shrub-carr.

*Maximum Tree Size Class*  
None

Class C 28 Late Development 2 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| COFO | Cornus foemina | Stiff dogwood | Middle |
| COAM2 | Cornus amomum | Silky dogwood | Middle |
| SALA2 | Sagittaria latifolia | Broadleaf arrowhead | Middle |
| ILVE | Ilex verticillata | Common winterberry | Middle |

Description

Class C represents shrub-carr, a shrub-dominated wetland comprised of dogwoods (Cornus foemina, C. stolonifera, C. amomum), Michigan holly (Ilex verticillata), elderberry (Sambucus canadensis) and willows (Salix bebbiana, S. discolor, S. exigua, S. petiolaris and S. eriocephala). 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 in sedge meadow continue to be present but in a relatively suppressed condition due to the lower light levels under the cover of shrubs.

*Maximum Tree Size Class*  
None

Class D 4 Late Development 3 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LALA | Larix laricina | Tamarack | Upper |
| PIST | Pinus strobus | Eastern white pine | Upper |
| ACRU | Acer rubrum | Red maple | Upper |
| FRNI | Fraxinus nigra | Black ash | Upper |

Description

This class represents swamp forest, which may be dominated by conifers, hardwoods, or a mix of both. Dominant tree species may include tamarack (Larix laricina), white pine (Pinus strobus), black ash (Fraxinus nigra), American elm (Ulmus americana), red maple (Acer rubrum), silver maple (Acer saccharinum), 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 | 131 |
| Late3:CLS | 132 | 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 | 0.02 | 50 | 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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