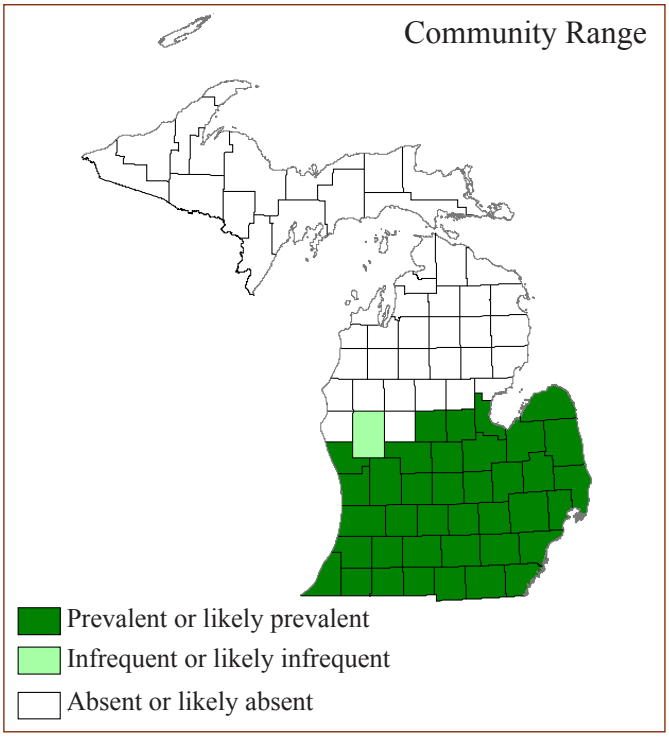
Southern Wet Meadow Community Abstract

Photo by Diane De Steven



Overview: Southern wet meadow is an open, groundwater-influenced (minerotrophic), sedge-dominated wetland that occurs in mid and southern Lower Michigan. Sedges in the genus *Carex*, in particular *Carex stricta*, dominate the community.

Global and State Rank: G4?/S3

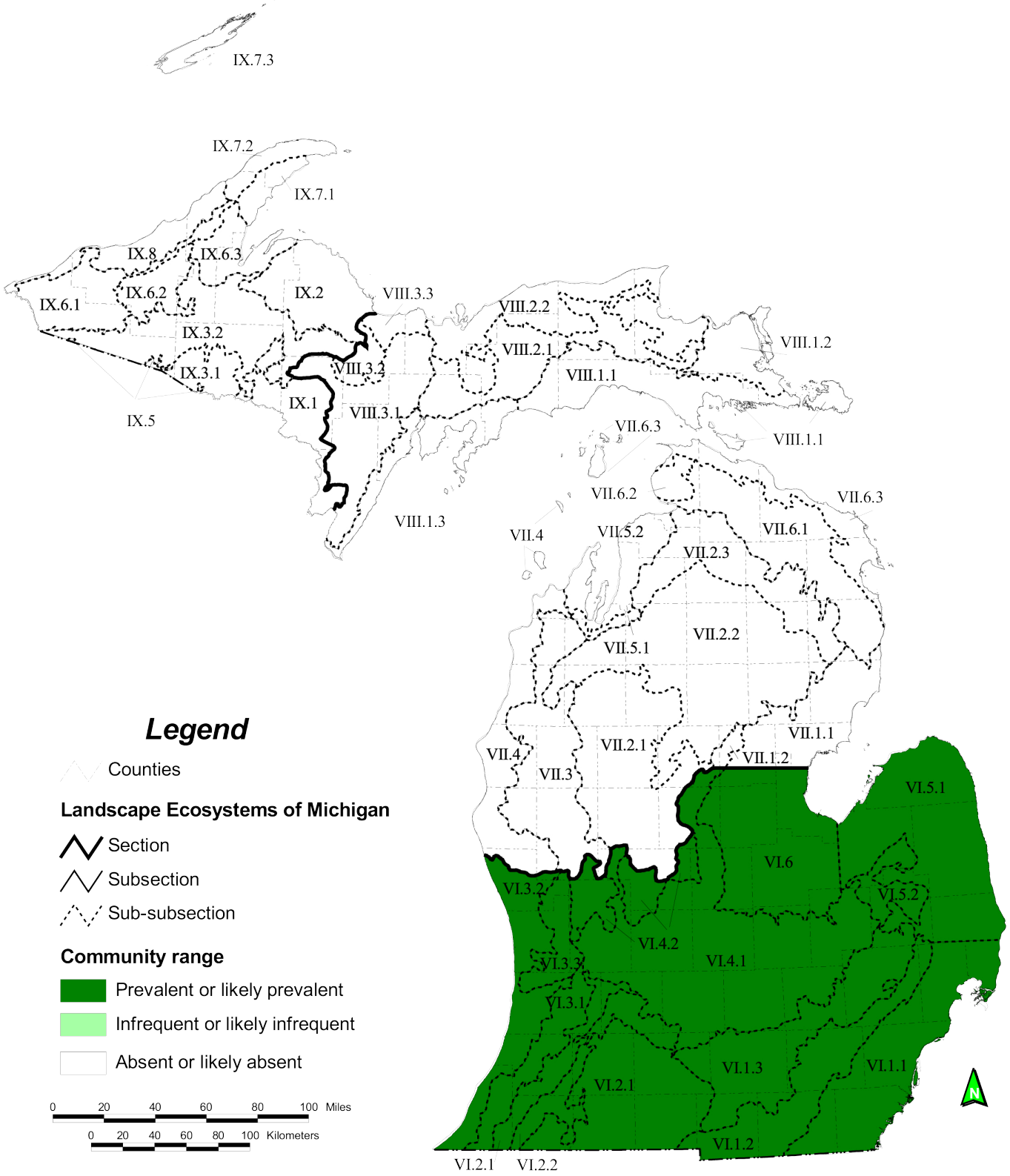
Range: Southern wet meadow, which is commonly referred to as sedge meadow, occurs in Iowa, Illinois, Indiana, Michigan, Minnesota, North Dakota, Wisconsin and Ontario. In Michigan, southern wet meadow is thought to be restricted to the southern Lower Peninsula and to differ from sedge meadows in northern Michigan (see northern wet meadow, Kost et al. 2007). However, no detailed study of the differences between northern and southern types has been undertaken. Curtis (1959) studied sedge meadows in northern and southern Wisconsin and found them to be floristically similar but concluded that northern meadows had consistently lower soil pH values and were frequently wetter and smaller than many southern wet meadows. Another sedge-dominated natural community, poor fen, also occurs in Michigan but differs markedly from southern wet meadow because of its strongly acidic, organic soils and the prevalence of *Carex oligosperma* and other open bog species (Kost et al. 2007).

Rank Justification: Because southern wet meadow often occurs as a zone within large wetland complexes, information on its presettlement extent and present acreage is not readily available. However, in Wisconsin, where 459,000 ha (1,130,000 acres) of sedge meadow are thought to have existed prior to settlement (Curtis 1959), it is estimated that less than 1 percent remain intact (Reuter 1986). It is likely southern wet meadow acreage has declined similarly in other Midwest states, such as Michigan, where similar agricultural methods have been practiced.

Southern wet meadows have been extensively utilized for agriculture. Prior to the 1950s mowing for marsh hay was widely practiced (Stout 1914, Curtis 1959). Wet meadows were frequently tiled, ditched, drained, and converted to pasture, row crops or mined for peat (Costello 1936, Curtis 1959, Reuter 1986). In addition, fire suppression has facilitated shrub encroachment with many southern wet meadows converting to shrub-carr (Curtis 1959, Davis 1979). This is especially evident where the water table has been lowered though tiling or ditching and the practice of mowing for marsh hay has been abandoned (White 1965).

Landscape and Abiotic Context: Southern wet meadow occurs on glacial lakebeds, and in depressions on glacial outwash and moraines (Curtis 1959). The

Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552



Ecoregional map of Michigan (Albert 1995) depicting distribution of southern wet meadow (Albert et al. 2008)

Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552

community frequently occurs along the margins of lakes and streams where seasonal flooding or beaver-induced flooding is common.

Southern wet meadow typically occurs on organic soils such as muck and peat (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 southern wet meadow, its wet soils contain high levels of dissolved minerals such as calcium and magnesium. Southern wet meadow soil pH values range between 7.0 to 7.8 in southeastern Michigan and 7.2 to 8.5 in southern Wisconsin and indicate that the community typically occurs on neutral to strongly alkaline soils (Costello 1939, Curtis 1959, Warners 1993).

Southern wet meadow typically occurs adjacent to other wetland communities in large wetland complexes. In southern Michigan's interlobate region where ground water seeps occur at the base of moraines, southern wet meadow often borders prairie fen. In depressions on ground moraine or lakeplain, southern wet meadow may grade into wet prairie or lakeplain wet prairie up slope and emergent marsh in lower areas. On the edges of inland lakes, southern wet meadow often borders emergent marsh. It may also occur along the Great Lakes shoreline within extensive areas of Great Lakes marsh. In all of these landscape settings, southern wet meadow may border shrub-carr and swamp forest.

Natural Processes: Southern wet meadow is a groundwater-dependent, *Carex stricta*-dominated wetland community. Water levels in southern wet meadow fluctuate seasonally, reaching their peak in spring and lows in late summer (Costello 1936, Warners 1993). However, water levels typically remain at or near the soil's surface throughout the year (Costello 1936, Curtis 1959, Warners 1993). The community's structure may depend on maintaining a consistently high water table. Costello (1936) states that the *Carex stricta* tussocks disappeared within 10 years from a meadow where the water levels were reduced to 2 to 4 feet below the surface as a result of tiling.

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 presettlement maps indicate that southern wet meadow is a fire-dependent natural community (Curtis 1959, Davis 1979). 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. Additional evidence for the role of fire in maintaining sedge meadows in an open condition comes from presettlement maps. In southern Wisconsin, where prevailing westerly winds carry fires eastward, sedge 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 (Warners 1997, Kost and De Steven 2000). 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 sedge meadow is its ability to temporarily reduce shrub cover (Reuter 1986).

In the absence of fire or flooding, all but the wettest sedge meadows typically convert to shrub-carr 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 (Curtis 1959, White 1965).

Vegetation Description: Southern wet meadow is typically dominated by *Carex stricta* (Stout 1914, Costello 1936, Curtis 1959, Warners 1997, Kost and De Steven 2000). 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 1 m in

Early spring photo of *Carex stricta* tussocks and encroaching shrubs. A prescribed fire removed the litter from tussocks in the background, while a thick layer of litter remains on unburned tussocks in the foreground.

height and 0.5 m in diameter and live for more than 50 years (Costello 1936). The *Carex stricta* tussocks can occur at very high densities (1 to 4 per m^2) 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 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*) (Stout 1914, Kost and De Steven 2000). 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. The following table contains many of the more commonly occurring southern wet meadow species.

SCIENTIFIC NAME	COMMON NAME
Asclepias incarnata	swamp milkweed
Aster puniceus (*A. firmus*)	swamp aster
Aster lanceolatus	eastern lined aster
Aster lateriflorus	side flowering aster
Calamagrostis canadensis	blue joint grass
Campanula aparinoides	marsh bellflower
Carex aquatilis	sedge
Carex hystericina	sedge
Carex lacustris	sedge
Carex lanuginosa	sedge
Carex lasiocarpa	sedge
Carex prairea	sedge
Carex sartwellii	sedge
Carex stipata	sedge
Carex stricta	sedge
Cicuta bulbifera	water hemlock
Cirsium muticum	swamp thistle
Eleocharis erythropoda	spike rush
Equisetum fluviatile	water horsetail
Eupatorium maculatum	joe pye weed
Eupatorium perfoliatum	common boneset
Galium asprellum	rough bedstraw
Glyceria striata	fowl manna grass
Impatiens capensis	jewelweed
Iris virginica	southern blue flag
Lathyrus palustris	marsh pea
Lycopus uniflorus	northern bugle weed
Lysimachia thyrsiflora	tufted loosestrife
Mentha arvensis	wild mint
Muhlenbergia glomerata	marsh wild timothy
Muhlenbergia mexicana	leafy satin grass
Onoclea sensibilis	sensitive fern
Pilea pumila	clearweed
Polygonum amphibium	water smartweed
Pycnanthemum virginianum	mountain mint
Rumex orbiculatus	great water dock
Sagittaria latifolia	common arrowhead
Scutellaria galericulata	common skullcap
Solidago canadensis	canada goldenrod
Solidago gigantea	late goldenrod
Solidago patula	swamp goldenrod
Thalictrum dasycarpum	purple meadow rue
Thelypteris palustris	marsh fern
Triadenum fraseri	marsh st. john's wort
Typha latifolia	broad leaved cattail
Viola cucullata	marsh violet

Southern wet meadow is an open, groundwater-influenced, sedge-dominated wetland that occurs in central and southern Lower Michigan. Open conditions are maintained by seasonal flooding, beaver-induced flooding, and fire. Photos by Joshua G. Cohen.

Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552

Michigan indicator species: *Carex stricta*, *Carex lacustris*, blue joint grass, swamp aster, joe pye weed, common boneset, northern bugleweed, great water dock, marsh bellflower, and tufted loosestrife.

Other noteworthy species: Rare plants associated with southern wet meadow include white lady slipper (*Cypripedium candidum*, state threatened), stiff gentian (*Gentianella quinquefolia*, state threatened), and broad-leaved mountain mint (*Pycnanthemum muticum*, state threatened). Wing-stemmed monkey flower (*Mimulus alatus*, presumed extirpated from Michigan) likely occured historically in southern wet meadows. Rare animal species associated with southern wet meadow include: swamp metalmark (*Calephelis mutica*, state special concern), Mitchell's satyr butterfly (*Neonympha m. mitchellii*, federal and state endangered), eastern massasauga (*Sistrurus c. catenatus*, state special concern), Blanding's turtle (*Emydoidea blandingii*, state special concern), spotted turtle (*Clemmys guttata*, state threatened), marsh wren (*Cistothorus palustris*, state special concern), northern harrier (*Circus cyaneus*, state special concern), short eared owl (*Asio flammeus*, state endangered), and American bittern (*Botaurus lentiginosus*, state special concern).

Conservation/management: Southern wet meadows contribute significantly to the overall biodiversity of southern Michigan by providing habitat to a wide variety of plant and animal species including many rare species.

Protecting the hydrology of southern wet meadow is imperative for the community's continued existence. This may include avoiding surface water inputs to the meadow from drainage ditches and agricultural fields, and protecting groundwater recharge areas by maintaining native vegetation types in the uplands around the community.

Management for southern wet meadow should include the use of prescribed fire (Curtis 1959). Prescribed fire can help reduce litter, stimulate seed germination, promote seedling establishment, and bolster grass, sedge, and perennial and annual forb cover (Bowles et al. 1996, Warners 1997, Kost and De Steven 2000). While prescribed fire can be an important tool for rejuvenating southern wet meadow seed banks, it can also help ensure that the community remains in an open condition by temporarily setting back invading woody species (Reuter 1986). Using prescribed fire to control shrub invasion in sedge meadows has also been shown to be 85% less expensive to implement than manual cutting (Reuter 1986). The use of prescribed fire should be avoided during periods of drought to avoid igniting the community's organic soils (Curtis 1959, Vogl 1969).

Invasive species that can occur in southern wet meadow include purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), reed (*Phragmites australis*), and glossy buckthorn (*Rhamnus frangula*). Each of these species is capable of significantly altering community structure and dramatically reducing species richness. Management should strive to prevent the further spread of these invasive species and implement control measures when possible.

Restoration of degraded southern wet meadows depends on the occurrence of water-saturated peat and muck soils, maintaining water levels very near the soil surface throughout the year, providing protection from shrub encroachment and invasive species, and the availability of appropriate seed stock (Reuter 1986). Finding viable seed for *Carex stricta*, the species responsible for the overall structure of southern wet meadow, may be a difficult task. Costello (1936) reports that in more than six years of studying *Carex stricta*-dominated sedge meadows he did not find a single seedling of the species. Because of the difficulty of restoring southern wet meadow in the absence of favorable hydrology and intact organic soils, conservation efforts should focus on protecting the remaining community occurrences (Reuter 1986).

Research needs: Research on methods for establishing and maintaining *Carex stricta* in wetland mitigation or degraded sites will facilitate restoration efforts for southern wet meadow. Further work on community classification is needed to elucidate differences among sedge meadow types both within and among ecoregions. Research is needed on plant and animal community responses to the frequency and seasonal timing of prescribed burning. Research on the importance of the community for maintaining certain rare species will help stimulate southern wet meadow conservation and management.

Similar communities: emergent marsh, northern wet meadow, poor fen, prairie fen, wet prairie, wet-mesic prairie, lakeplain wet prairie, lakeplain wet-mesic prairie, wet-mesic sand prairie, Great Lakes marsh and southern shrub-carr.

Other Classifications:

Michigan Natural Features Inventory Pre-settlement Vegetation (MNFI):
wet meadow (6224)

Michigan Department of Natural Resources (MDNR): L, lowland brush; N, marsh; V, bog or muskeg.

Michigan Resource Information Systems (MIRIS): 622 (emergent wetland).

The Nature Conservancy National Classification (Faber-Langendoen 2001, Natureserve 2001)**:**

CODE; ALLIANCE; ASSOCIATION; COMMON NAME

V.A.5.N.k; Carex stricta Seasonally Flooded Herbaceous Alliance; *Carex stricta* – *Carex* spp. Herbaceous Vegetation; Tussock Sedge – Sedge Species Herbaceous Vegetation; Tussock Sedge Wet Meadow.

Related Abstracts: small white lady's slipper, mat muhly, prairie dropseed, short-eared owl, northern harrier, spotted turtle, Blanding's turtle, Mitchell's satyr butterfly, eastern massasauga, lakeplain wet prairie, lakeplain wet-mesic prairie, prairie fen, Great Lakes marsh, and rich tamarack swamp.

Selected References:

Albert, D.A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: A working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: USDA, Forest Service, North Central Forest Experiment Station, St. Paul, MN. http://nrs.fs.fed.us/pubs/242 (Version 03JUN1998)

Albert, D.A., J.G. Cohen, M.A. Kost, B.S. Slaughter, and H.D. Enander. 2008. Distribution Maps of Michigan's Natural Communities. Michigan Natural Features Inventory, Report No. 2008-01, Lansing, MI. 174 pp.

Bowles, M., J. McBride, N. Stynoff, and K. Johnson. 1996. Temporal changes in vegetation composition and structure in a fire-managed prairie fen. Natural Areas Journal 16: 275-278.

Costello, D. F. 1936. Tussock meadows in southeastern Wisconsin. Botanical Gazette 97: 610-48.

Curtis, J.T. 1959. Vegetation of Wisconsin: An ordination of plant communities. The University of Wisconsin Press, Madison, WI.

Davis, A. M. 1979. Wetland succession, fire and the pollen record: A Midwestern example. The American Midland Naturalist 102: 86-94.

Faber-Langendoen, D. editor. 2001. Plant communities of the Midwest: Classification in and ecological context. Association for Biodiversity Information, Arlington, VA. 61 pp. + appendix (705 pp.).

Leach, M.K. and T.J. Givnish. 1996. Ecological determinants of species loss in remnant prairies. Science 273: 1555-1558.

Kost, M.A. and D. De Steven. 2000. Plant community responses to prescribed burning in Wisconsin sedge meadows. Natural Areas Journal 20: 36-49.

Kost, M.A., D.A. Albert, J.G. Cohen, B.S. Slaughter, R.K. Schillo, C.R. Weber, and K.A. Chapman. 2007. Natural communities of Michigan: Classification and description. Michigan Natural Features Inventory, Report Number 2007-21, Lansing, MI. 314 pp.

NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.4. Arlington (VA): Association for Biodiversity Information. Available: http://www.natureserve.org/. (Accessed: September 4, 2001).

Reuter, D.D. 1986. Sedge meadows of the upper Midwest: A stewardship abstract. Natural Areas Journal 6: 27-34.

Stout, A. B. 1914. A biological and statistical analysis of the vegetation of a typical wild hay meadow. Transactions of the Wisconsin Academy of Sciences, Arts, and Letters 17: 405-57.

Vogl, R. J. 1969. One hundred and thirty years of plant succession in a Southeastern Wisconsin lowland. Ecology 50: 248-55.

Warners, D. P. 1993. Species diversity in southern Michigan sedge meadows: Unpublished report to The Nature Conservancy, Michigan Chapter, East Lansing, MI 35 pp.

Warners, D. P. 1997. Plant diversity in sedge meadows: Effects of groundwater and fire. Ph.D. dissertation, University of Michigan, Ann Arbor, MI. 231 pp.

White, K. L. 1965. Shrub-carrs of southeastern Wisconsin. Ecology 46: 286-304.

Zicker, W.A. 1955. An analysis of Jefferson County vegetation using surveyor's records and present day data. M.S. thesis, University of Wisconsin, Madison, WI.

Abstract Citation:

Kost, M.A. 2001 Natural community abstract for southern wet meadow. Michigan Natural Features Inventory, Lansing, MI. 7 pp.

Updated June 2010.

Funding for abstract provided by Michigan Department of Natural Resources-Forest Management Division and Wildlife Division.