
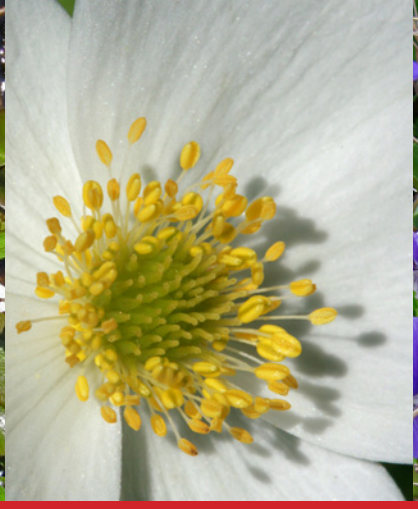

U.S. Army Corps of Engineers

Regulatory Branch
St. Paul District

WETLAND PLANTS and PLANT COMMUNITIES of MINNESOTA and WISCONSIN

Version 3.2 - July 2015

By Steve D. Eggers and Donald M. Reed

REPORT DOCUMENTATION

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Key Words: Bogs, fens, wet meadows, marshes, swamps, wetland plants, hydrophytes, wetland plant communities

Abstract: Wetlands of Minnesota and Wisconsin are categorized into 15 plant communities. Each community is described and illustrated by color photographs along with descriptions, color photographs and ink drawings of 317 representative plant species. Descriptions include taxonomic characteristics, habitat and notes on wildlife use and economic values.

AUTHORS

Steve D. Eggers is a senior ecologist and Professional Wetland Scientist with the Regulatory Branch of the St. Paul District Corps of Engineers. He has 36 years of experience with the Corps regulatory program under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 and is a member of the National Advisory Team for Wetland Delineation and the National Technical Committee for Wetland Vegetation. Mr. Eggers graduated from the University of Wisconsin-La Crosse with a Bachelor of Science degree in Biology and has completed additional coursework in plant taxonomy at the University of Minnesota. He has photographed wetland flora and fauna from the Everglades to Denali National Parks.

Donald M. Reed was the chief biologist for the Southeastern Wisconsin Regional Planning Commission until the fall of 2014. He had been with the Commission for over 42 years. Dr. Reed received a Bachelor of Science degree in Biology and Geography from Carroll College in May 1972, a Master of Science degree in Botany/Zoology from the University of Wisconsin-Milwaukee in May 1985, and a Ph.D. from the University of Wisconsin-Milwaukee in 2002. His areas of study include wetland plant ecology and soils, particularly those of calcareous fens. He is a recipient of the 1996 National Wetlands Award for Outstanding Wetlands Program Development awarded by the Environmental Law Institute and the U.S. Environmental Protection Agency. Dr. Reed was also the recipient of a Lifetime Achievement Award from the Wisconsin Coastal Management Program in 1998 for his wetland boundary identification training work.

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Acknowledgments

This pictorial guide to wetland plants is not an original idea. Pictorial guides covering other groups of plants have also been used as models for this guide, such as *Wildflowers of the Northern Great Plains* by Vance *et al.* (1984). Furthermore, we have borrowed extensively from the authoritative botanical references by Gleason and Cronquist (1991), Swink and Wilhelm (1994), Voss (1972, 1985, 1996), Chadde (2002, 2011), Smith (2003, 2008) and others. We acknowledge this fact by citing these references throughout the guide.

We are indebted to Charles J. Newling (formerly with the U.S. Army Corps of Engineers, Waterways Experiment Station-Vicksburg) and Dr. James H. Zimmerman who were instrumental in formulating the guide. We are also grateful to Dr. Daniel E. Wujek (Central Michigan University), Welby R. Smith (Minnesota Natural Heritage Program) and John M. Kittelson (formerly with the St. Paul District-Corps) for their review and comments on the draft manuscript. Other individuals on the staffs of the St. Paul District-Corps and Southeastern Wisconsin Regional Planning Commission who assisted in preparation of the guide are too numerous to list, but are gratefully acknowledged.

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Foreword

Wetlands are very much in the news today, as their many functions and values are becoming recognized. The belated interest in this neglected natural resource has led to a flurry of efforts to protect, maintain, and restore wetlands in the face of insufficient basic knowledge and educational materials. While these deficiencies are being remedied, many questions are being raised by attempts to regulate uses and to minimize abuses and further losses of this resource. Much of the confusion over the values of wetlands and how to maintain these values arises from the great diversity of systems-hydrological and biological-that is included in the term "wetlands."

Questions that need quick, accurate answers include: How does one recognize a wetland and know what kind of wetland it is? Where does the wetland stop and the upland begin? What particular values does this wetland have -- for the owner and for the public? Which human impacts will affect these values? How might lost values be replaced? In creating or restoring a wetland, what type and/or functions should be stressed, among those that are practical? All these questions share an important principle, that of site specificity. Since each place on Earth is unique, we need "ground truth" to make wise decisions about natural resource husbandry. Thus, the decision-maker must be knowledgeable in the field.

For a start, we certainly need a detailed field guide to wetlands. Plenty of guide books exist for identifying species of plants or animals in the field. However, guides to ecosystems are rare and often too technical and specialized for general use. One reason is that a guide covering a continent or part of one would span too many geographic areas and climates to cover the same species throughout. The complexity of such a guide would thereby be unmanageable.

Here, however, we have a relatively small geographic area -- two states which share just two floristic provinces: the Great Lakes or northern conifer-hardwood forest region and the prairie-hardwood forest transition region. These provinces are separated by a comparatively narrow or steep gradient of climate and vegetation -- the "tension zone" of John Curtis. It is true that similar hydrologic systems and geologic origins may lead to different vegetation in the two zones. For example, a pothole (glacial kettle) may have marsh in the prairie and prairie-oak regions, and swamp forest in the more humid north and east regions where tree seeds can grow on downed logs and water levels fluctuate less drastically.

Nevertheless, the variation in wetlands within Wisconsin and Minnesota is small enough to be manageable, and this guide begins with a simple and workable outline-key for recognizing the main wetland types, which number only fifteen. Vegetation is the handle by which wetland types can be most easily recognized. Of course, vegetation is by no means the only element in wetlands. However, plant life is visible to the unaided eye at all seasons; it reflects the water regime and water quality faithfully; and it influences the wetland type and function. Vegetation also reflects historical factors such as climate, fires, and use/abuse intensity by animals and man. An example of human abuse is the introduction of alien pest species such as carp and purple loosestrife.

To this end, this guide provides relevant information on vegetation and does so in the best way -- by stressing groups of plant species which together characterize each wetland type. The three advantages of using floras -- that is, groups of plant species -- as indicators of wetlands, wetland types, and wetland values are:

1. An individual species used alone might be misidentified and confused with a similar upland plant or one belonging in a different kind of wetland.

2. Individual species have individual limits on their distribution that do not exactly coincide with those of any other, whereas a given wetland is sure to have several, if not all, of the characteristic species present.

3. Since one type of wetland may grade into another, so that several types may occur in a single valley or basin, the locations of groups of species will help describe the actual situation, by mapping for the eye the gradients in environmental conditions that cause the wetland and its functions to vary from place to place. (For example, a peatland may grade from fen to bog, telling you that groundwater discharges at the former end while the latter is rainfed.)

The authors — biologists respectively for the U.S. Army Corps of Engineers, St. Paul District and the Southeastern Wisconsin Regional Planning Commission, Waukesha — represent wide experience in real life situations of wetland identification and natural resource planning. In other words, they know what information is pertinent and what questions to address. In this still experimental area (in both ecology and law), we can trust the direction they give us to understanding the wetland resource.

This work will be invaluable in enabling citizens, organizations, and agency personnel to interpret and apply regulations for land use to specific sites, and to prioritize acquisition and other protection strategies. It is the perfect companion to such publications as Paulson's *Wetlands and Water Quality: A Citizen's Handbook on How to Review Section 404 Permits*. We hope this work will stimulate generation of similar guides to wetlands in other regions.

James Hall Zimmerman
November 12, 1986

Dr. James H. Zimmerman passed away on September 28, 1992. Whether in the classroom or the field, his expertise and insight had a profound influence on many ecologists and botanists, including the authors. We would like to dedicate this wetland plant guide to his memory.

SDE, DMR

SECTION 1

Introduction

PURPOSE

The primary purpose of this guide is to assist U.S. Army Corps of Engineers (Corps) personnel working with the regulatory program under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. It provides an easy-to-use, pictorial guide to wetlands primarily for individuals who are not botanists, although botanists may also find it useful. A secondary purpose is to provide a guide for individuals working with other agencies and programs dealing with wetlands. Finally, this guide serves to enhance public awareness of wetlands by illustrating their diversity and values.

APPLICABILITY

The guide specifically addresses wetland plants and plant communities of Minnesota and Wisconsin (Figures 1 and 2), but is applicable in general to wetlands of the entire Great Lakes Region. Note that the 317 plant species included in the guide do not represent, nor are they intended to represent, a listing of all plant species found in wetlands of Minnesota and Wisconsin. For a complete listing of these species, refer to the botanical references listed in the bibliography.

ORGANIZATION

This guide is organized by wetland plant community. In general, the wetland plant communities are organized according to water permanence, depth and degree of soil saturation. Thus, the guide progresses from deepwater wetlands (I. Shallow, Open Water Communities) to temporary water-holding wetlands (VIII. Seasonally Flooded Basins). Photographs and descriptions are provided for each of the 15 wetland plant communities along with representative plant species of each. A particular plant species can occur not only in the wetland plant community under which it is listed, but in other wetland communities, and in some cases, upland communities. The other communities in which an individual plant species may frequently occur are provided under ECOLOGICAL NOTES. Note that upland plants occasionally occur in wetlands and, conversely, wetland plants occasionally occur in upland habitats. This is especially true in transitional areas between wetlands and uplands.

WETLAND DEFINITION

The definition of wetlands used by the Corps in its regulatory program is:

> Wetlands are those areas inundated or saturated by surface or ground-water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328).

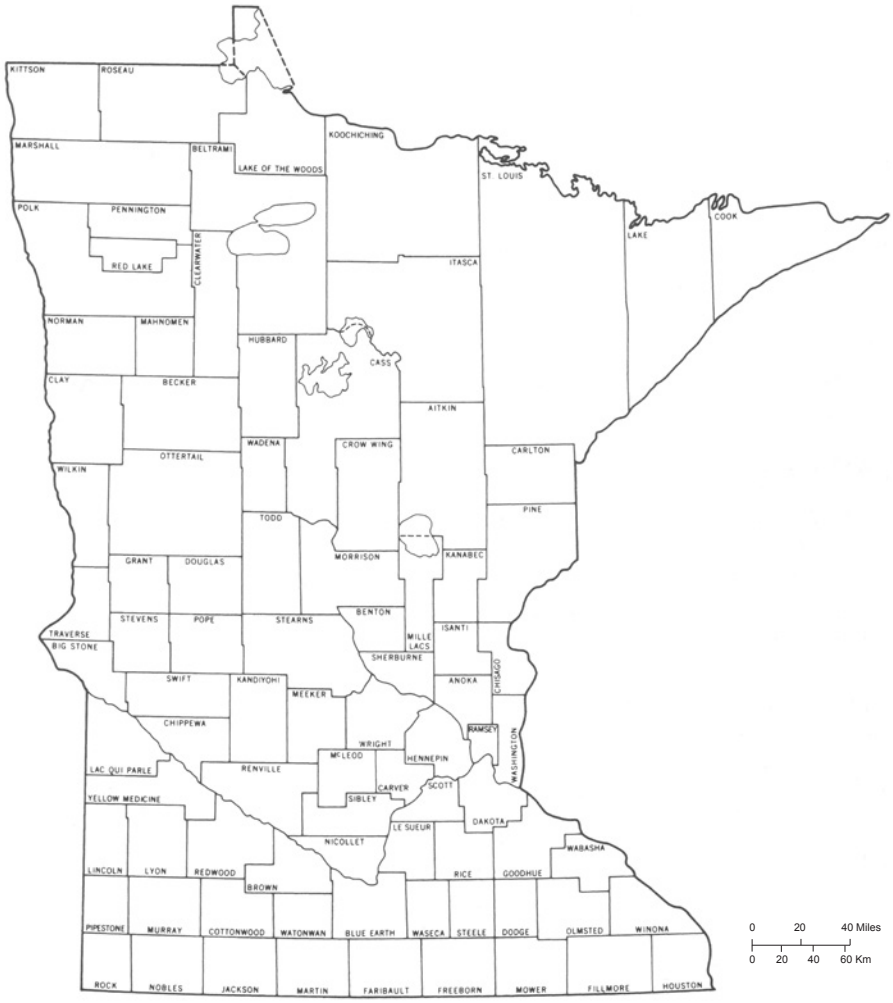


FIGURE 1 - **Counties of Minnesota**

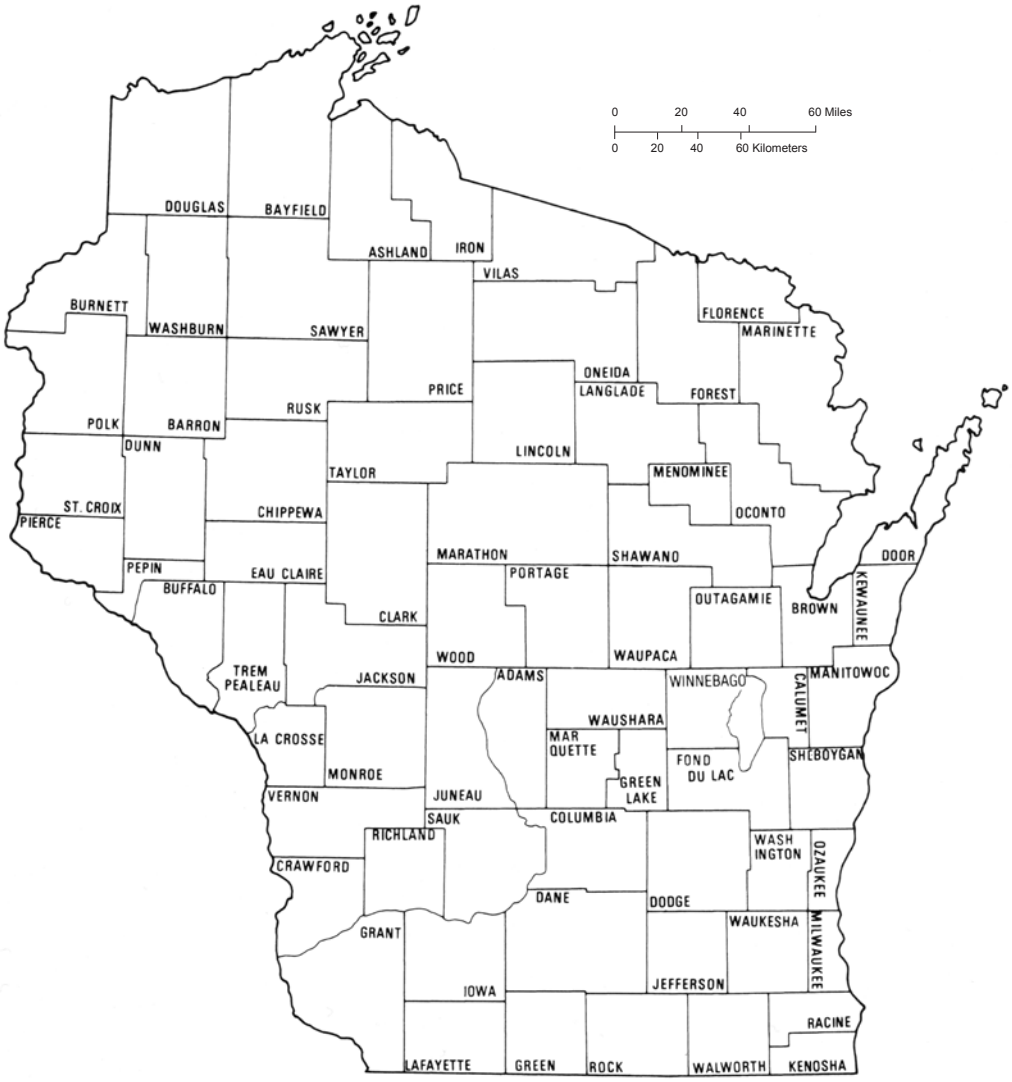


FIGURE 2 - **Counties of Wisconsin**

Refer to the current Corps of Engineers Wetland Delineation Manual, and applicable regional supplement, for a methodology to apply this definition in the field.

CONCEPT OF A HYDROPHYTE

Wetland plants are hydrophytes (hydro = water, phyte = plant).[1] These are plants growing in water or on a substrate that at least periodically is deficient in oxygen due to excessive water content. Hydrophytes have morphological, physiological and reproductive adaptations that allow them to thrive in inundated or saturated soils where non-hydrophytes (upland plants) cannot. Communities dominated by hydrophytes are referred to as hydrophytic plant communities.

CLASSIFICATION OF WETLANDS

A number of wetland classification schemes have been developed. Table 1 compares the 15 plant communities of this guide to classification systems developed by Shaw and Fredine (1971), Cowardin *et al.* (1979), Curtis (1971), and the Wisconsin Wetland Inventory. As shown in Table 1, the 15 plant communities of this guide correspond most closely to the wetland plant communities described by Curtis (1971) in *The Vegetation of Wisconsin*.

VEGETATION TENSION ZONE

Throughout the guide are references to a vegetation tension zone. The flora of Minnesota and Wisconsin is arranged in two major floristic provinces. A floristic province is a large area with a relatively uniform flora, delineated by a tension zone in which many species reach a common range boundary (Curtis 1971).

The vegetation tension zone then is a band between two floristic provinces marked by the intermingling of species from both (Curtis 1971). The two floristic provinces in Minnesota and Wisconsin are the "northern forest floristic province" and the "prairie-forest floristic province," located to the north and south of the vegetation tension zone, respectively. The vegetation tension zone and the floristic provinces are illustrated on page 8. The vegetation tension zone through Wisconsin is shown according to Curtis (1971). A tentative vegetation tension zone through Minnesota is extrapolated from the original vegetation map of Minnesota compiled by Marschner (1930).

[1] See Tiner (1991).

TABLE 1

COMPARISON OF WETLAND CLASSIFICATION SYSTEMS

Wetland Plant Community Types of this Guide	Vegetation of Wisconsin (Curtis 1971)	Wisconsin Wetland Inventory	Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et al. 1979)	Fish and Wildlife Service Circular 39 (Shaw and Fredine 1971)
Shallow, Open Water	Submergent aquatic community	Aquatic bed, submergent and floating	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved	Type 5: Inland open fresh water
Deep Marsh	Emergent and submergent aquatic community	Aquatic bed,sub-mergent, and floating; and persistent emergent, and nonpersistent	Palustrine or lacustrine, littoral; aquatic bed; submergent, floating, and floating-leaved; and emergent; persistent and nonpersistent	Type 4: Inland deep fresh marsh
Shallow Marsh	Emergent aquatic community	Persistent and nonpersistent, emergent	Palustrine; emergent; persistent and nonpersistent	Type 3: Inland shallow fresh marsh
Sedge Meadow	Northern and southern sedge meadow	Narrow-leaved persistent, emergent/ wet meadow	Palustrine; emergent; narrow-leaved persistent	Type 2: Inland fresh meadow
Fresh (Wet) Meadow		Broad- and narrow-leaved persistent, emergent/wet meadow	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Wet to Wet-Mesic Prairie	Low (wet to wet-mesic) prairie	Broad- and narrow-leaved persistent, emergent/wet meadow	Palustrine; emergent; broad- and narrow-leaved persistent	Type 1: Seasonally flooded basin or flat; Type 2: Inland fresh meadow
Calcareous Fen	Fen	Narrow-leaved, per-sistent, emergent/wet meadow; and broad-leaved deciduous, scrub/shrub	Palustrine; emergent; narrow-leaved persistent; and scrub/shrub; broad-leaved deciduous	Type 2: Inland fresh meadow; Type 6: shrub swamp
Open Bog	Open bog	Moss; and broad-leaved evergreen, scrub/shrub	Palustrine; moss/lichen; and scrub/shrub; broad-leaved evergreen	Type 8: Bog
Coniferous Bog	Northern wet forest	Needle-leaved evergreen and deciduous, forested	Palustrine; forested: needle-leaved evergreen and deciduous	Type 8: Bog

TABLE 1

COMPARISON OF WETLAND CLASSIFICATION SYSTEMS *(cont.)*

Wetland Plant Community Types of this Guide	Vegetation of Wisconsin (Curtis 1971)	Wisconsin Wetland Inventory	Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et al. 1979)	Fish and Wildlife Service Circular 39 (Shaw and Fredine 1971)
Shrub-Carr	Shrub-carr	Broad-leaved deciduous, scrub/ shrub	Palustrine; scrub/shrub; broad-leaved deciduous	Type 6: Shrub swamp
Alder Thicket	Alder thicket	Broad-leaved deciduous, scrub/ shrub	Palustrine; scrub/ shrub; broad-leaved deciduous	Type 6: Shrub swamp
Hardwood Swamp	Northern wet-mesic forest and southern wet to wet-mesic forest	Broad-leaved deciduous, forested	Palustrine; forested; broad-leaved deciduous	Type 7: Wooded swamp
Coniferous Swamp	Northern wet-mesic forest	Needle-leaved deciduous and evergreen, forested	Palustrine; forested; needle-leaved deciduous and evergreen	Type 7: Wooded swamp
Floodplain Forest	Northern and southern wet-mesic forest	Broad-leaved deciduous, forested	Palustrine; forested; broad-leaved deciduous	Type 1: Seasonally flooded basin or flat
Seasonally Flooded Basin		Flats/unvegetated wet soil; and persistent and non-persistent, emergent /wet meadow	Palustrine; emergent; persistent and non - persistent	Type 1: Seasonally flooded basin or flat

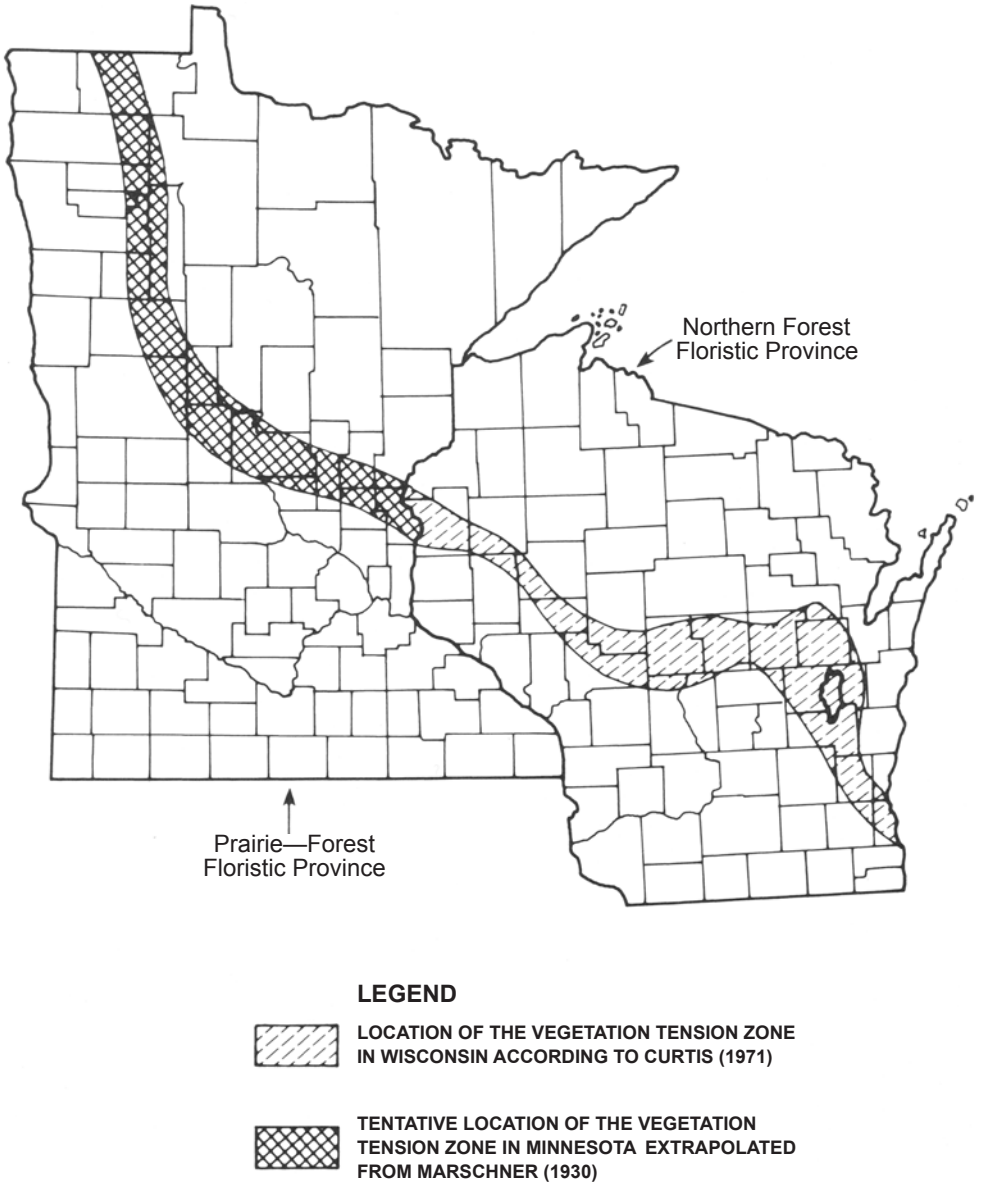


FIGURE 3

(The Wisconsin portion of this figure is adapted from an illustration copyrighted by the University of Wisconsin Press. It is used here by permission.)

PRAIRIE POTHOLES

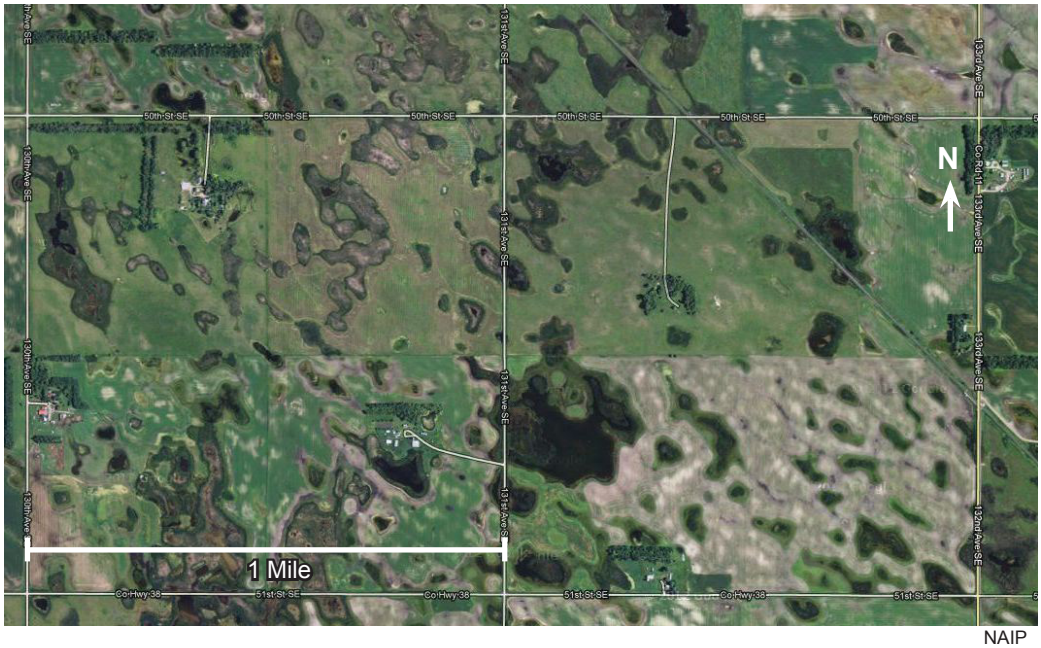
A portion of the "prairie-forest floristic province" in southern and western Minnesota deserves special mention. It is part of the Prairie Pothole Region (Figure 4). Prairie potholes are shallow, water-holding depressions of glacial origin found in the prairies of north-central United States and south-central Canada (Sloan 1972). These wetlands have great variability in size, depth, water permanence, and water chemistry (Sloan 1972; Stewart and Kantrud 1972). For example, prairie potholes range in size from less than one quarter acre to several thousand acres. In terms of water permanence and depth, prairie potholes range from seasonally flooded basins that hold water for only a few weeks each year, to wet prairies, to shallow and deep marshes, to permanent open water. Water chemistry ranges from fresh, mixosaline, saline, to hypersaline. Multiple year wet and drought cycles are typical in the Prairie Pothole Region.

FIGURE 4
Generalized Original Limits of the Prairie Pothole Region of the U.S. and Prairie Provinces of Canada (adapted from Sanders 1982)**.**

Prairie potholes are extremely important for North American waterfowl production. Although prairie potholes comprise only 10 percent of potential waterfowl breeding habitat in North America, it is estimated that 50 percent of waterfowl production occurs in these wetlands, with an even higher percentage occurring in wet years (Sloan 1972). Agricultural practices continue to degrade or destroy these important wetlands. However, there are federal, state and private programs and participants working to restore prairie potholes and the important functions and values they provide.

© Steve D. Eggers

The above photograph is a deep marsh prairie pothole dominated by river bulrush (*Schoenoplectus fluviatilis*) and hardstem bulrush (*Schoenoplectus acutus*) located within the Victory Wildlife Management Area in Big Stone County, Minnesota.



NAIP

An aerial photograph illustrating a landscape view of the diversity in size and type, as well as density, of prairie potholes.

PATTERNED PEATLANDS

North of the vegetation tension zone is another group of wetlands deserving special mention. These are the patterned peatlands of northern Minnesota. A notable example is the Red Lake Peatland, which covers nearly 500 square miles (1,295 km^2) making it one of the largest continuous tracts of peatlands in the conterminous United States (Glaser *et al.* 1981). "Patterned" refers to the distinct and frequently striking landforms that compose these peatlands. Flarks, strings, ovoid islands, teardrop islands, raised bogs and fens are examples of names applied to these patterned landforms. Some of the plant associations of the patterned peatlands correspond to the communities described herein. However, other associations of patterned peatlands are not specifically described as discussion of these specialized plant associations goes beyond the scope of this generalized guide. For a detailed description of the patterned peatland communities, refer to Glaser *et al.* (1981), Wright *et al.* (1992) and Minnesota Department of Natural Resources (2003).

The following page is a color infrared aerial photograph showing a portion (approximately 16 square miles (41.4 km^2)) of the Red Lake Peatland in Beltrami County, Minnesota. Visible peat landforms and vegetation patterns include the following (numbers correspond to those on the photograph):

1. Water tract where runoff is channeled across the peat surface; includes strings (peat ridges) and flarks (pools) arranged perpendicular to the direction of water flow. Dominant vegetation includes sedges (*Carex*).

2. Streamlined tree islands (mostly tamarack with some black spruce) tapered in the direction of water movement.

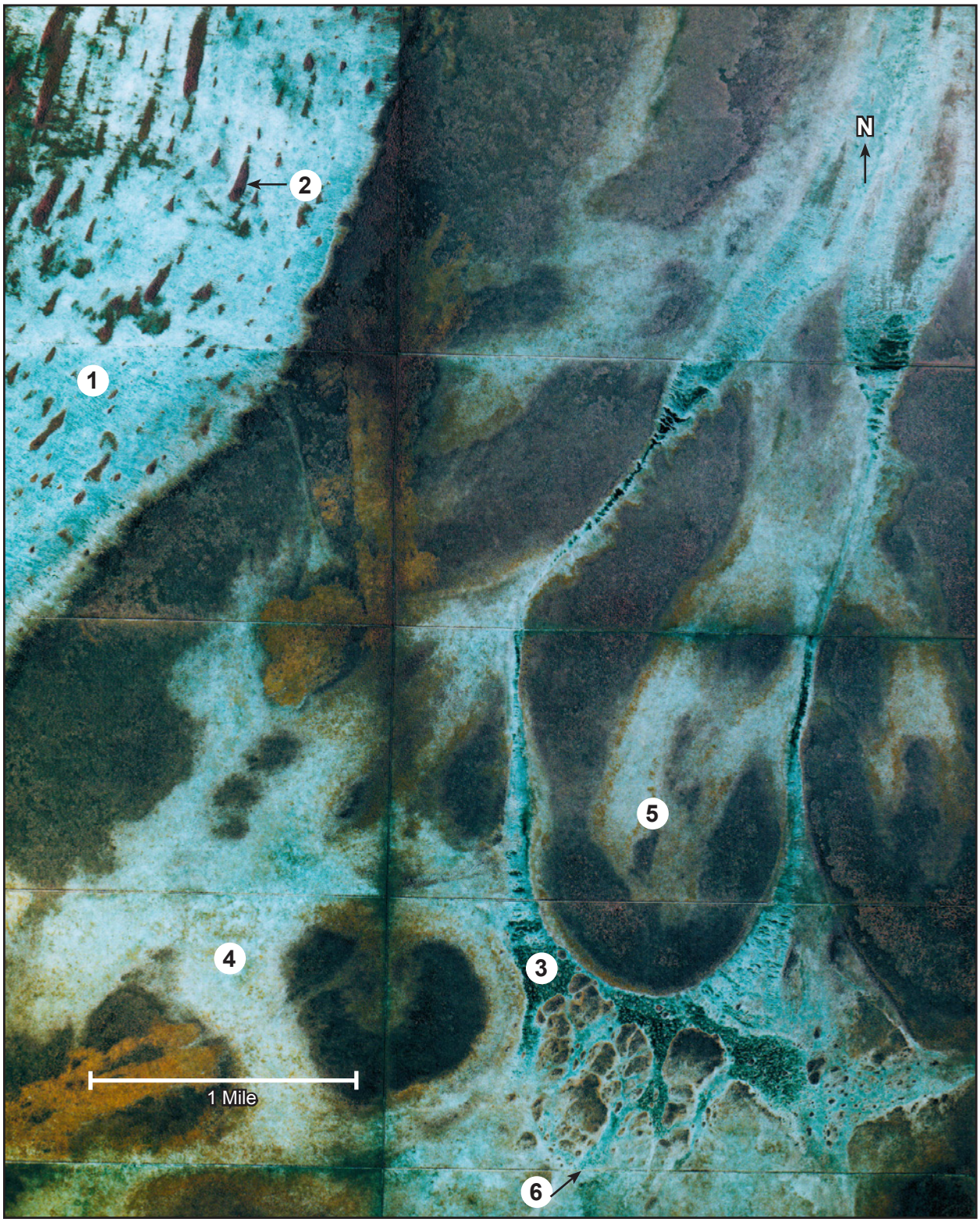
3. A smaller internal water tract.

4. A *Sphagnum* lawn.

5. Ovoid island with a horseshoe-shaped black spruce forest and a non-forested interior.

6. Straight lines are drainage ditches, the result of a failed attempt to drain the peatland during 1905-1929.

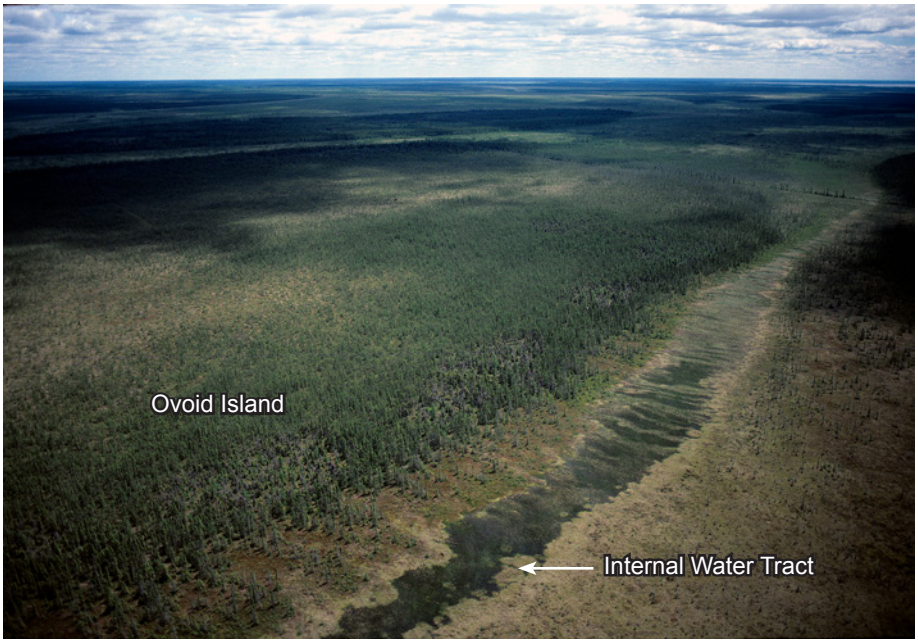
Interpretation of aerial photography is from Wright *et al.* (1992).



Minnesota DNR

Red Lake Peatland

The above is a color infrared aerial photograph illustrating an example of the striking landforms within the Red Lake Peatland in Beltrami County, Minnesota.



The above are oblique aerial photographs illustrating examples of the landforms within the Red Lake Peatland.

FARMED WETLANDS

Millions of acres of wetlands in Minnesota and Wisconsin have been effectively drained and converted to non-wetland during the past 150 years, primarily for agricultural use. Millions of additional acres of existing wetlands are: (1) partially drained and cropped; or (2) cropped under natural conditions (e.g., during dry periods). Partially drained refers to cases where wetland hydrology has been altered by ditching, tiling and/or pumping, but the area still retains sufficient hydrology to meet wetland criteria. An example is a deep marsh plant community that was ditched and converted to a fresh (wet) meadow community.

© Photos by Steve D. Eggers

A wetland within a cropped field in Kenosha County, Wisconsin.

The example of a farmed wetland shown by the photograph below is a shallow marsh prairie pothole basin that had been plowed and planted to corn (*Zea mays*), an upland species, at the start of the growing season. By midsummer, ponding and saturated soil conditions had resulted in drown out and crop stress (yellowed, stunted corn). The dark green vegetation in the far background of the basin is softstem bulrush (*Schoenoplectus tabernaemontani*), an obligate wetland plant recolonizing the basin in spite of plowing earlier in the growing season.

A farmed wetland in Ottertail County, Minnesota.

NATIONAL WETLAND PLANT LIST

As part of the National Wetland Inventory undertaken by the U.S. Fish and Wildlife Service (Service), a wetland plant list was developed by the Service in cooperation with federal interagency review panels (Reed 1988, 1996). Responsibility for the *National Wetland Plant List* was transferred to the Corps in 2006. An updated *National Wetland Plant List* (NWPL) was developed during 2008-2012 and implemented in June 2012. Annual updates to the NWPL were effective in September 2013 and May 2014.

This list ranks individual plant species according to their probability of occurrence in wetlands as shown below:

INDICATOR CATEGORIES:

Wetland Indicator Status	**Description** (Lichvar and Gillrich 2011)	**Estimated Frequency of Occurrence in Wetlands**
Obligate (OBL)	Require standing water or seasonally saturated soils near the surface to assure adequate growth, development, and reproduction and to maintain healthy populations.	>99%
Facultative Wetland (FACW)	Depend on and predominately occur with hydric soils, standing water, or seasonally high water tables in wet habitats for assuring optimal growth, development, and reproduction and for maintaining healthy populations. These plants often grow in geomorphic locations where water saturates soils or floods the soil surface at least seasonally.	67-99%
Facultative (FAC)	These plants can occur in wetlands or nonwetlands. They can grow in hydric, mesic, or xeric habitats.	34-66%
Facultative Upland (FACU)	These plants are not wetland dependent. They can grow on hydric and seasonally saturated soils, but they develop optimal growth and healthy populations on predominately drier or more mesic sites.	1-33%
Upland (UPL)	These plants occupy mesic to xeric nonwetland habitats. They almost never occur in standing water or saturated soils.	<1%

A wetland indicator status that is in brackets [ ] reflects the opinion of the authors as to the occurrence in wetlands of that particular species.

Figure 5 illustrates the regions used by the *National Wetland Plant List* for the Lower 48 States. Three of the regions extend into Minnesota and Wisconsin: Great Plains (GP), Midwest (MW) and Northcentral/Northeast (NC/NE). In cases where a different indicator status for a particular species is assigned among the three regions, the description of that species will list all of the indicator statuses along with the abbreviation for each region.

FIGURE 5

COEFFICIENT OF CONSERVATISM (C of C)

The C of C is a numerical rating of 0 to 10 that expresses an individual species' relative fidelity, or conservatism, to specific natural habitats. High values indicate that the species is restricted to a very narrow range of habitats. For example, the white lady's-slipper (*Cypripedium candidum*) is found only in intact calcareous fens and wet prairies and has a C of C of 10 in Minnesota and Wisconsin. Conversely, low values indicate low conservatism to specific natural habitats. Species with low values tend to be more ubiquitous in their distributions, tolerating a broader range of environmental conditions including human impacts. Box elder (*Acer negundo*), which has a C of C of 1 in Minnesota and 0 in Wisconsin, is a natural component of floodplain forests; however, box elder has little fidelity to this habitat and can be found in numerous other habitats, including disturbed lands, throughout the region.

Species that are not native have not had specific C of C values assigned but are typically treated as having a C of C of 0.

The C of C is the central component of a vegetation based assessment technique called the Floristic Quality Assessment (FQA). FQA consists of a class of metrics that are derived from vegetation data and the C of C values, such as the mean C of C and the Floristic Quality Index. These metrics have

been repeatedly found to be effective wetland condition indicators (Mack and Kentula 2010). FQA could be used to assess the floristic quality of wetlands within a particular planning area or project site. It could also be used to determine compensatory mitigation requirements as well as set performance standards for compensatory mitigation. It is essential that comparisons using FQA be made on an "apples to apples" basis. In other words, FQA is only used to compare plant communities of the same type, e.g., the FQA of a sedge meadow within a project area is only compared to the FQA of other sedge meadows. As discussed by Milburn *et al.* (2007), FQA metric values and expected ranges can vary considerably between the wetland plant communities described herein. For example, the highest FQA metric values for deep marsh communities were found to be considerably lower than those for alder thicket and coniferous swamp communities. This does not mean that deep marshes have a low condition value; rather, it means that the floristic composition of deep marshes is *different* compared to other wetland plant communities and those differences are reflected in the metric scores.

Both Minnesota and Wisconsin have published C of C values for their respective wetland floras (Milburn *et al.* 2007; Bernthal 2003). The text herein will note whether each species is native or introduced as well as list its C of C. For example: **C of C:** Native (5). In some instances, different C of C values were assigned by each state. Both values are shown in those cases.

WETLANDS DOMINATED by FACULTATIVE UPLAND SPECIES

FACU species can, in some cases, be dominant species in wetlands. Examples include white pine (*Pinus strobus*) and jack pine (*Pinus banksiana*) swamps. The photograph below shows a swamp dom-

A white pine swamp in Monroe County, Wisconsin.

inated by white pine in Monroe County, Wisconsin. Soils are Dawson peat, a very poorly-drained organic soil. Hydrology is primarily groundwater seepages. No hydrologic modifications (e.g., ditching, tiling, groundwater extraction) have occurred. Other plant species present are OBL or FACW species including speckled alder (*Alnus incana* ssp. *rugosa*), skunk cabbage (*Symplocarpus foetidus*) and cinnamon fern (*Osmundastrum cinnamomeum*). Mature white pines have formed raised hummocks caused by shallow rooting, an apparent response to saturated soil conditions.

Another case where FACU species can dominate are seasonally flooded basins and vernal pools that are ponded early in the growing season, but are dry for much of the remainder of the growing season. In addition, FACU species can become established and even dominate wetland basins during periods of drought, such as the multiple year drought cycles experienced in the Prairie Pothole Region.

NOMENCLATURE

Nomenclature generally follows that of the Biota of North America Program (Kartesz 1994), which is used for the *National Wetland Plant List*. One difference is that some varieties and subspecies are used herein. For purposes of assigning an indicator status, the *National Wetland Plant List* does not recognize varieties and subspecies due to insufficient data to assign different indicator statuses within the same species. Common names were selected at the discretion of the authors.

MEASUREMENTS

Occasionally, the following format is used for listing measurements of a given character: (2)3-5(6) mm. This means the character is typically 3 to 5 mm. in size, but can range from a minimum of 2 mm. to a maximum of 6 mm.

ABBREVIATIONS

The following abbreviations are used in the text.
mm. -- millimeter(s)
cm. -- centimeter(s)
m. -- meter(s)
km. -- kilometer
sp. and spp. -- species (singular) and species (plural)
ssp. -- subspecies
var. -- variety
dbh -- diameter at breast height
GP -- Great Plains Region (see Figure 5)
MW -- Midwest Region
NC/NE -- Northcentral/Northeast Region

PHOTOGRAPHY CREDITS

Photography is by Steve D. Eggers except for the following:
Gary B. Walton: Swamp red currant, dark-scale cottongrass, bristle-berry, clustered bur-reed and rough bedstraw.
Keith Bowman: *Sphagnum capillifolium, S. teres, S. fuscum* and *S. wolfii*.
Minnesota Department of Natural Resources: high altitude aerial photograph of the Red Lake Peatland.

SECTION 2

Key to the Wetland Plant Communities

Key to the Wetland Plant Communities

1A. Mature trees (dbh >6 inches) are present and form closed stands (>17 trees/acre; >50 percent areal cover)……2

2A. Hardwood trees are dominant (>50 percent areal cover or basal area of the tree stratum); soils are alluvial, peaty/mucky, or poorly-drained mineral..……3

3A. Floodplains that are temporarily inundated during flood events, but are relatively well-drained for much of the growing season; silver maple, American elm, river birch, green ash, black willow, swamp white oak, box elder and/or plains cottonwood are dominant ……**FLOODPLAIN FOREST**

3B. Ancient lake basins, closed depressions, or retired riverine oxbows, that have longer term inundation/saturation during the growing season..……4

4A. Black ash, green ash, yellow birch, red maple, quaking aspen, balsam poplar, silver maple, black willow and/or plains cottonwood are dominant; northern white cedar may be subdominant; growing on poorly-drained mineral or peat/muck soils often associated with ancient lake basins and retired riverine oxbows.……**HARDWOOD SWAMP**

4B. Quaking aspen, plains cottonwood, red maple, American elm, silver maple, yellow-bud hickory and/or green ash are dominant growing in seasonally ponded depressions……**HARDWOOD SWAMP (Vernal Pool Subtype)**

2B. Coniferous trees are dominant (>50 percent areal cover or basal area of the tree stratum); soils usually mucky/peaty..……5

5A. Tamarack and/or black spruce are dominant; growing on a nearly continuous *Sphagnum* moss mat and acidic, mineral-poor, peat soils……**CONIFEROUS BOG**

5B. Northern white cedar and/or tamarack are dominant; nearly continuous *Sphagnum* moss mat absent; usually growing on neutral to alkaline, minerotrophic, peats or mucks.....**CONIFEROUS SWAMP**

1B. Mature trees are absent or, if present, form open, sparse stands; other woody plants, if present, are shrubs, saplings, or pole size trees (dbh <6 inches) less than 20 feet in height……6

6A. Community dominated (>50 percent areal cover) by woody shrubs……7

7A. Low, woody shrubs usually <3 feet in height; *Sphagnum* moss mat layer may or may not be present……8

8A. Shrubs are ericaceous (Heath family) and evergreen growing on a *Sphagnum* moss mat and acidic, mineral-poor, peat soils; common…..……**OPEN BOG**

8B. Shrubs are deciduous, mostly shrubby cinquefoil, often growing on sloping sites with a spring-fed supply of internally flowing, calcareous waters; calcium-tolerant plants (calciphiles) are dominant; *Sphagnum* moss mat layer absent; muck soils are alkaline and minerotrophic; rare..... **CALCAREOUS FEN**

7B. Tall, deciduous shrubs usually >3 feet in height; *Sphagnum* moss mat absent..... 9

9A. Speckled alder is dominant; usually growing on acidic hydric soils in and north of the vegetation tension zone..... **ALDER THICKET**

9B. Willows, red-osier dogwood, silky dogwood, meadowsweet and/or steeplebush are dominant; usually growing on neutral to alkaline hydric soils; found both north and south of the vegetation tension zone. NOTE: Non-native buckthorns (*Rhamnus cathartica* and *Frangula alnus*) can occur as dominant shrubs or small trees in disturbed sites ..... **SHRUB-CARR**

6B. Community dominated (>50 percent areal cover) by herbaceous plants..... 10

10A. Aquatic emergent and terrestrial vegetation layers absent; dominated by floating, floating-leaved and/or submergent species; water depths up to 6.6 feet..... **SHALLOW, OPEN WATER COMMUNITIES**

10B. Aquatic emergent and/or terrestrial vegetation layers present; standing water may or may not be present..... 11

11A. Permanently to seasonally inundated by water depths up to 3 feet or more during most growing seasons; dominated by perennial aquatic emergent, floating, floating-leaved and/or submergent vegetation layers[1]..... 12

12A. Inundated by water depths of 6 inches to 3 feet or more throughout the growing season in most years; community a mixture of aquatic emergent, floating, floating-leaved and/or submergent layers..... **DEEP MARSH**

12B. Inundated by water depths up to 6 inches, often drying down to saturated soils during the latter half of most growing seasons; aquatic emergent layer is dominant; floating and floating-leaved layers may be present but not dominant..... **SHALLOW MARSH**

11B. Temporarily inundated to saturated soils during most growing seasons; floating, floating-leaved and submergent layers absent..... 13

13A. Temporarily inundated for a few weeks in spring giving way to mudflats and then dry for the remainder of the growing season; annuals (e.g., smartweeds, wild millet) typically dominate by the late growing season; often cultivated for row crops; geomorphic position consists of basins or flats..... **SEASONALLY FLOODED BASIN**

[1] Wild rice, an annual, can also be a dominant in marshes.

13B. Saturated soils, at most briefly inundated; typically 75-100 percent of total areal cover is by perennial vegetation; geomorphic position variable.....14

14A. Nearly continuous *Sphagnum* moss mat on acidic, peat soils; sedges and forbs tolerant of low nutrient/mineral conditions are characteristic…...……**OPEN BOG**

14B. Nearly continuous *Sphagnum* moss mat absent or sparse; soils typically circumneutral to alkaline peats, mucks or hydric mineral soils…….....….……..……..15

15A. Spring-fed supply of internally flowing, calcareous groundwater; dominated by calcium-tolerant species (calciphiles) such as sterile sedge, Grass of Parnassus and beaked spike-rush; typically on sloping or domed muck soils; rare…….…….**CALCAREOUS FEN**

15B. Calciphiles not dominant; water source/chemistry/soils not restricted to the above; both common and rare communities…….…….16

16A. Dominated by sedges, primarily *Carex*..…….…....…..……17

17A. A floating mat primarily composed of wiregrass sedge (*Carex lasiocarpa*) and/or bog sedge (*C. oligosperma*); common associates are other sedges, Canada blue-joint grass, marsh fern and various forbs…….....…….....**SEDGE MEADOW (Sedge Mat Subtype)**

17B. Floating mat absent; well developed peat, muck or hydric mineral soils dominated by hummock sedge (*Carex stricta*) and/or other sedges[2]…...……**SEDGE MEADOW**

16B. Dominated by grasses and/or forbs ....…..……..……..18

18A. Dominated by native prairie grasses (e.g., prairie cord-grass, big bluestem, narrow reedgrass, switch grass) with native prairie forbs; growing on hydric mineral soils; predominately occurs south of the vegetation tension zone; rare...**WET to WET-MESIC PRAIRIE**

18B. Dominated by Canada blue-joint grass, non-native grasses (e.g., reed canary grass, redtop) and/or forbs not restricted to prairies; soils are peats, mucks or hydric mineral; occurs in both floristic provinces and tension zone; common..……...……19

19A. Dominated by Canada blue-joint grass and/or native forbs ....……**FRESH (WET) MEADOW (Native Subtype)**

19B. Dominated by non-native grasses and/or forbs indicative of disturbance (e.g., stinging nettle, giant ragweed)…… ……..….**FRESH (WET) MEADOW (Disturbed Subtype)**

[2]Some sedges (e.g., *Carex lacustris*) can dominate shallow marshes. Use couplet 11 to differentiate sedge-dominated shallow marshes from sedge meadows.

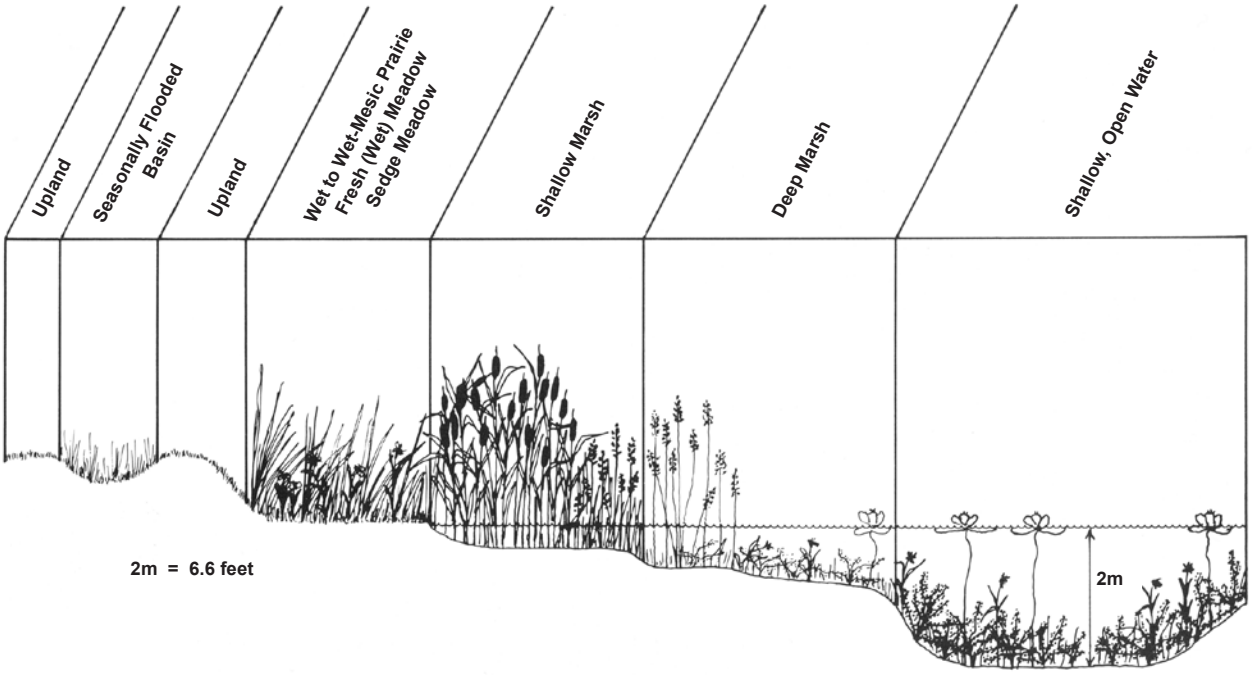


FIGURE 6 - **Generalized Cross Section of a Meadow-Marsh-Open Water Complex**

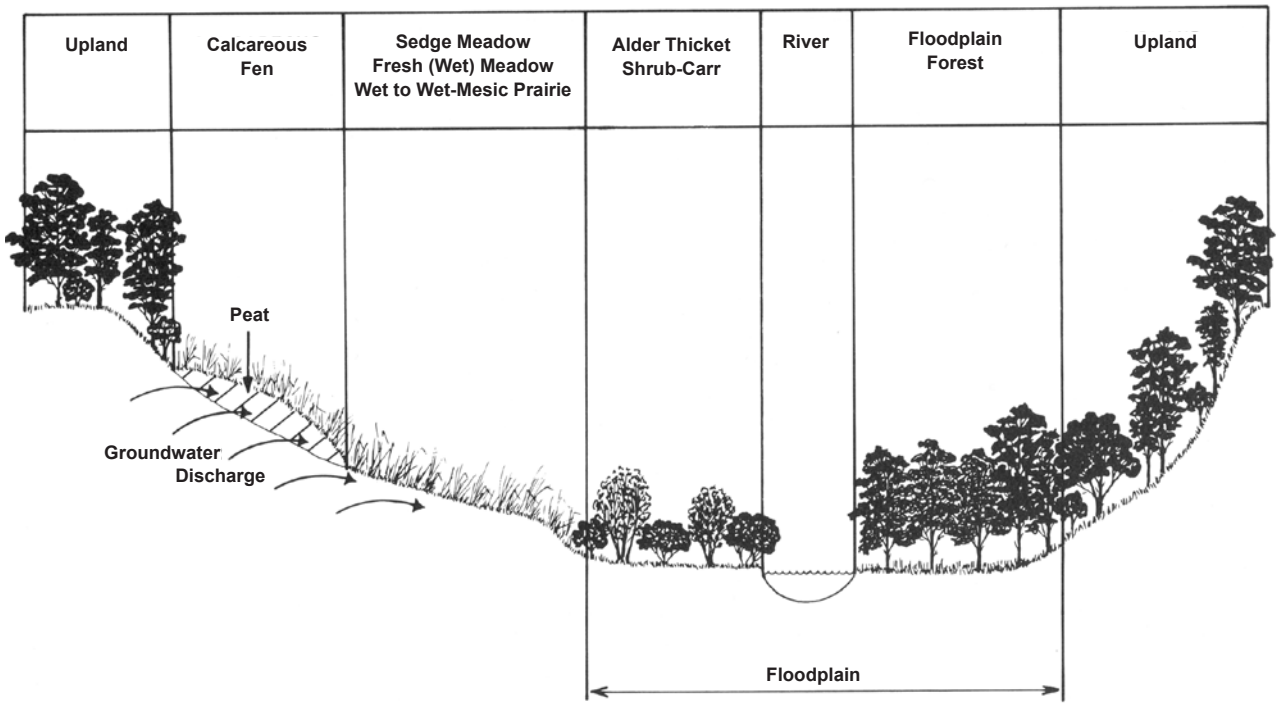


FIGURE 7 - **Generalized Cross Section of Wetland Plant Communities in a River Valley**

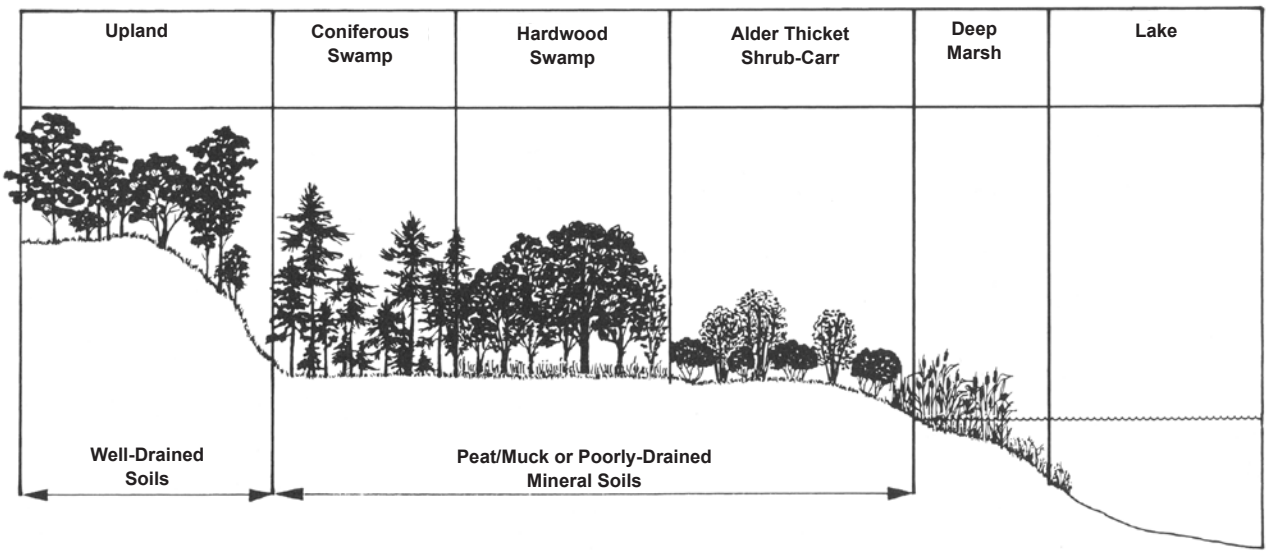


FIGURE 8 - **Generalized Cross Section of Wetland Plant Communities in a Lake Basin**

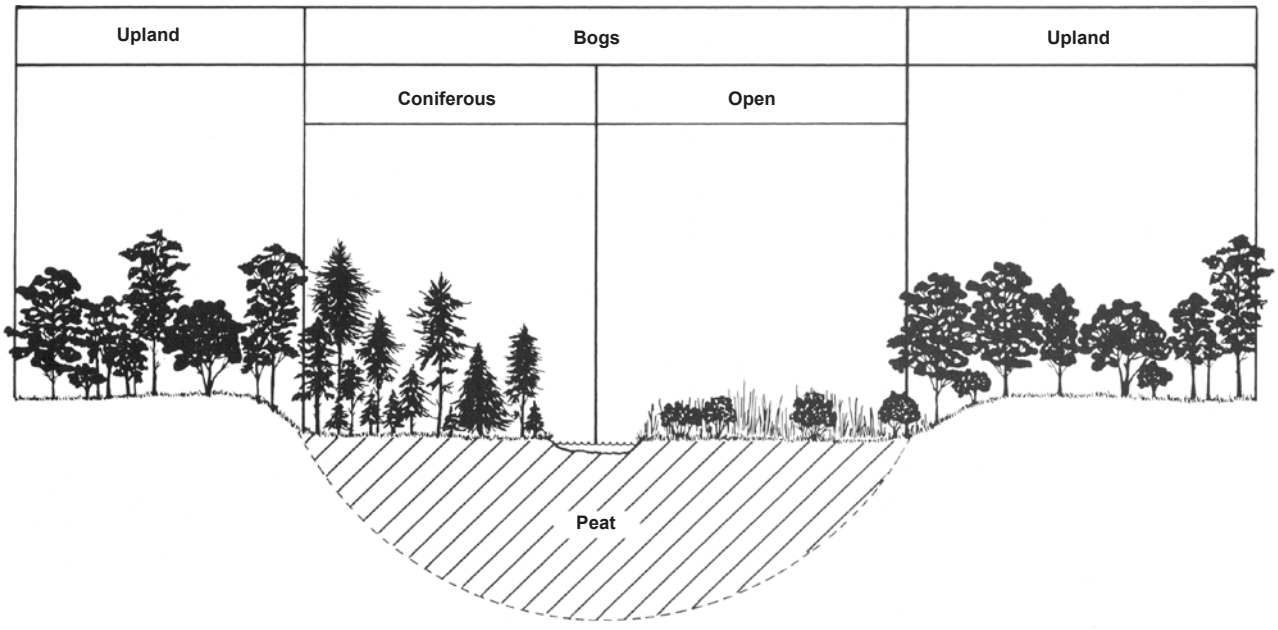


FIGURE 9 - **Generalized Cross Section of a Bog**

SECTION 3

Wetland Plants and Plant Communities

I. Shallow, Open Water Communities

Shallow, open water plant communities generally have water depths of less than 6.6 feet (2 meters). Submergent, floating and floating-leaved aquatic vegetation including pondweeds, water-lilies, water milfoil, coontail and duckweeds characterize this wetland type. Size can vary from a one-quarter acre pond, to a long oxbow of a river, or shallow bay of a lake. The presence or absence of floating vegetation depends upon the effects of the season, wind, availability of nutrients, and aquatic weed control efforts.

Shallow, open water communities differ from deep and shallow marshes in that they are seldom, if ever, drawn down. As a result, emergent aquatic vegetation cannot establish and persist.

Shallow, open water communities provide important habitat for waterfowl, terns, furbearers, fish, frogs, turtles and aquatic invertebrates. For example, the submergent plants and aquatic invertebrates provide food for waterfowl, which is especially important during migration. The permanent to semi-permanent water regime of these deep-water wetlands results in their being especially important for waterfowl production in drought years when other wetlands become dry. Also provided is habitat for spawning beds and nursery areas for both game and nongame fish. Finally, these areas of open water provide a valuable aesthetic resource important to municipalities and landowners.

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Franklin's gulls and white pelicans using habitat provided by a shallow, open water wetland.

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VEGETATION: White water-lily (*Nymphaea odorata*), yellow water-lily (*Nuphar variegata*), flat-stem pondweed (*Potamogeton zosteriformis*), curly pondweed (*Potamogeton crispus*), common water-milfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), common bladderwort (*Utricularia macrorhiza*), white water crowfoot (*Ranunculus longirostris*), water star-grass (*Heteranthera dubia*), elodea (*Elodea canadensis*), water smartweed (*Persicaria amphibia*), big duckweed (*Spirodela polyrhiza*), lesser duckweed (*Lemna minor*), watermeal (*Wolffia columbiana*) and star duckweed (*Lemna trisulca*).

SOILS: Lacustrine deposits and sediments.

HYDROLOGY: Permanently inundated.

LOCATION: Lake Marion, Dakota County, Minnesota.

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VEGETATION: Water shield (*Brasenia schreberi*) is the dominant species. Also present are ribbon-leaf pondweed (*Potamogeton epihydrus*), flat-stem pondweed (*Potamogeton zosteriformis*), common water-milfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), water purslane (*Didiplis diandra*), common bladderwort (*Utricularia macrorhiza*), elodea (*Elodea canadensis*), big duckweed (*Spirodela polyrhiza*), lesser duckweed (*Lemna minor*) and star duckweed (*Lemna trisulca*). A fringe of greenfruit bur-reed (*Sparganium emersum*) is present.

SOILS: Twelve to 36 inches of peat over sand.

HYDROLOGY: Permanently inundated (a man-made impoundment of a tamarack swamp).

LOCATION: Jackson County, Wisconsin.

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VEGETATION: Long-leaf pondweed (*Potamogeton nodosus*), leafy pondweed (*Potamogeton foliosus*) and wild celery (*Vallisneria americana*) dominate this example. Also present are curly pondweed (*Potamogeton crispus*), wavy water-nymph (*Najas flexilis*), common bladderwort (*Utricularia macrorhiza*), Eurasian water-milfoil (*Myriophyllum spicatum*), elodea (*Elodea canadensis*), coontail (*Ceratopyllum demersum*), big duckweed (*Spirodela polyrhiza*), lesser duckweed (*Lemna minor*) and watermeal (*Wolffia columbiana*).

SOILS: Lacustrine and riverine sediments.

HYDROLOGY: Permanently inundated; impoundment of the Mississippi River.

LOCATION: Weaver Bottoms, Pool 5 of the Mississippi River, Wabasha County, Minnesota.

© Photos by Steve D. Eggers

SAGO PONDWEED

(*Stuckenia pectinata* (L.) Boerner)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (3) **IND. STATUS:** OBL

SYNONYM: *Potamogeton pectinatus* L.

FIELD CHARACTERISTICS: An aquatic, perennial herb from rhizomes tipped with a tuber. Stems are 30-100 cm. long and 1-2 mm. wide. This pondweed has a bushy appearance because of its much-branched stems and numerous thread-like leaves spreading in a fan-like fashion. Leaves are all submerged and very narrow (0.2-1(1.7) mm. wide) tapering to sharply pointed tips. Flowers are in submergent, cylindrical spikes 1-5 cm. long with 2-5 whorls of flowers. Nutlets are (2.5)3-4.5 mm. long not including the tiny beak. In flower June-September.

ECOLOGICAL NOTES: Sago pondweed is found in marshes, lakes, streams, Mississippi River backwaters, and prairie potholes, usually at depths to 5 feet, rarely to 10 feet, especially in calcareous, mixosaline and saline waters. The pondweeds (*Stuckenia* spp. and *Potamogeton* spp.) in general are among the most important of all aquatic plants for wildlife food, and sago pondweed may be the most important because of its abundant production of fruit and tubers. The entire plant is relished as food by waterfowl and it provides good fish habitat.

SOURCE: Martin *et al.* (1951); Chadde (2002); and Voss (1972).

© Photos by Steve D. Eggers

FLOATING-LEAF PONDWEED

(*Potamogeton natans* L.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (5) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb. Stems (labeled 3 on the photograph above right) are usually unbranched and 50-200 cm. long and 1-2 mm. wide. Blades of the floating leaves (labeled 1 above) are heart-shaped to somewhat heart-shaped at the base, and 2-4.7 cm. wide and (3.2)3.7-9(10) cm. long. Larger leaves have (18)21-35 nerves. Submerged leaves (labeled 2 above) are linear and 10-30 cm. long and only 1-2 mm. wide. Flowers are on emerged, cylindrical spikes 2-5 cm. long. Mature nutlets are (3.6)3.7-4.5 mm. long (including the beak). In flower July-September.

ECOLOGICAL NOTES: Floating-leaf pondweed is common in marshes, lakes, rivers, ditches and bog ponds — typically in water depths to 5 feet — but it can be found at more than twice that depth. Good fish habitat is provided by this aquatic plant.

SOURCE: Voss (1972); and Gleason and Cronquist (1991).


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ILLINOIS PONDWEED

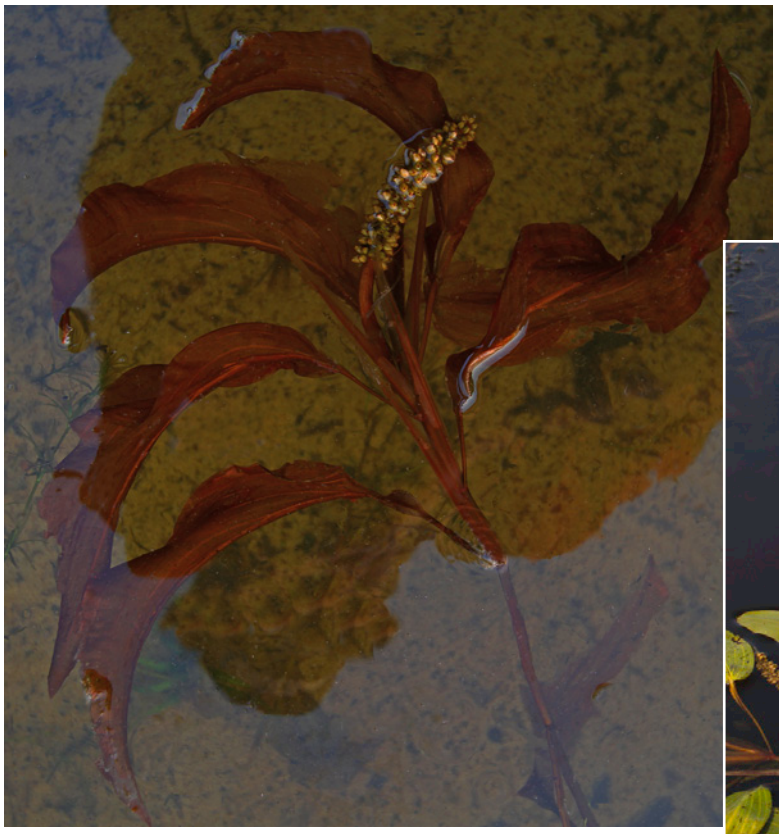
(*Potamogeton illinoensis* Morong)

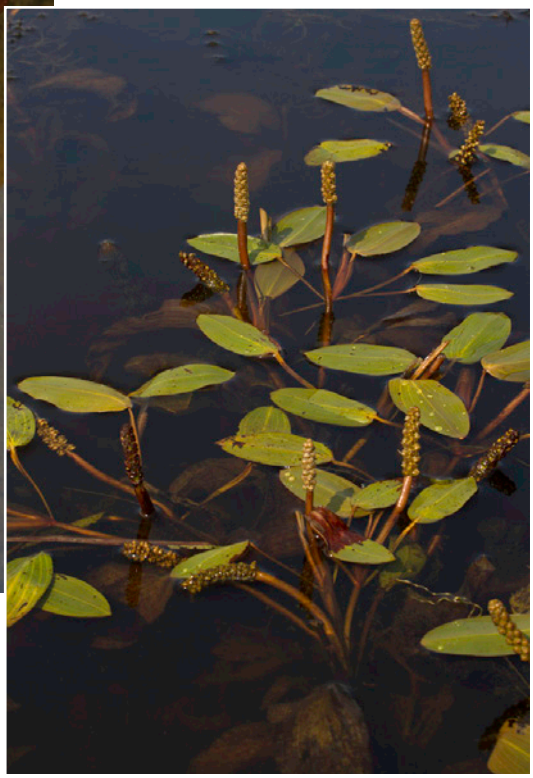
PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (6) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with stems to 2 m. long and 2-5 mm. wide. Submerged leaves are sessile or on petioles not over 2 cm. long. Submerged leaves are 0.8-3.2(5) cm. wide with (7)9-19 nerves and have a pointed tip that can be up to 4(5) mm. long. Floating leaves (if present) have blades 1.7-3(3.5) cm. wide with petioles that are shorter than the blades. Flowers are on emerged, cylindrical spikes 2-6 cm. long. The olive-green nutlets are 3-4 mm. long and somewhat sharply keeled. In flower July-September.

ECOLOGICAL NOTES: Illinois pondweed is found in lakes and rivers, especially calcareous waters, in depths to 15 feet.

SOURCE: Fernald (1970); Chadde (2002); and Voss (1972).





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LARGE-LEAF PONDWEED

(*Potamogeton amplifolius* Tuckerman)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (7) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with usually unbranched stems to 1 m. or more long and 2-4 mm. wide. Fully developed submerged leaves have a characteristic quarter-moon shape because of their strongly-arched, folded condition. Submerged leaves are (2.5)3.5-7.2 cm. wide with 24-40(52) nerves. Floating leaves (if present) are elliptical, 4-10 cm. long with 28-50 nerves. Flowers are in dense, cylindric spikes 3-6 cm. long. Nutlets are green brown to brown and 4-5 mm. long including the 1 mm. beak. In flower July-September.

ECOLOGICAL NOTES: Large-leaf pondweed is found in lakes and rivers, usually at depths less than 9 feet, but it has been found in waters to 18 feet in depth.

SOURCE: Fernald (1970); Chadde (2002); and Voss (1972).

LEAFY PONDWEED
(*Potamogeton foliosus* Raf.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (6) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb growing to 80 cm. in length. Stems are only 1 mm. wide and slightly compressed. Leaves are all submersed, linear, 1.5-8 x 0.5-2 mm., 1- to 3-veined, with an acute tip. Stipules are free and 0.5-2 cm. long. Glands are usually absent at the base of stipules. Flowers are in rounded to short-cylindric spikes 2-7 mm. long with axillary stalks 5-15 mm. long. Nutlets (achenes) are green-brown, winged, 1.5-3 mm. long with a beak of 0.5 mm. In flower June-August.

ECOLOGICAL NOTES: Leafy pondweed is occasional to common in lakes, ponds, rivers and Mississippi River backwaters in water depths up to 12 feet.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1972).

CURLY PONDWEED
(*Potamogeton crispus* L.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Introduced, invasive (0) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with stems growing to 80 cm. long and 1-2 mm. wide. Leaves are all submersed, oblong, 3-9 cm. long and 5-10 mm. wide, rounded at the tip, stalkless, 3-5 veined with wavy, crisped margins that are finely serrate. Stipules are 4-10 mm. long and joined at the base of the leaf. Flowers are in dense, cylindrical spikes 1-2 cm. long on stalks 2-6 cm. long. Nutlet (achene) is brown, ovoid, 3 mm. long, shallowly pitted, with 3 round, dorsal keels and a prominent beak 2-2.5 mm. long. In flower April-June, noticeably earlier than native pondweeds.

ECOLOGICAL NOTES: Curly pondweed is a native of Europe that has become widely established in our waters, especially those with high nutrient levels. It inhabits shallow to deep waters of lakes, ponds, rivers and ditches, including the Great Lakes and Mississippi River backwaters, and can become a nuisance to fishing, boating and swimming.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1972).

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RIBBON-LEAF PONDWEED

(*Potamogeton epihydrus* Raf.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (8) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb to 2 m. in length. Leaves are of two types. Submersed leaves are linear, ribbon-like, 10-20 cm. long and 3-8 mm. wide with the midrib flanked by a pair of conspicuous bands of pale green to translucent cells. Stipules are 1-3 cm. long and not joined to the leaf. Floating leaves are usually present and are oval to obovate, 3-8 cm. long and 1-2 cm. wide, mostly obtuse to abruptly short-awned at the tip, and 11-25 veined. Stipules are 1-3 cm. long and free from the leaf. Flowers are in dense, cylindric spikes 2-3 cm. long on stalks 2-6 cm. long. Nutlets (achenes) are olive to brown, 2-3 mm. long, shallowly pitted, with three dorsal keels and a tiny beak. In flower July-September.

ECOLOGICAL NOTES: Ribbon-leaf pondweed is found in deep marshes, lakes, rivers, ponds and cranberry operation impoundments in water depths to 6 feet.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1972).

Submersed leaf

© Photos by Steve D. Eggers

LONG-LEAF PONDWEED
(*Potamogeton nodosus* Poir.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (7 WI)(6 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with stems to 2 m. in length and 1-2 mm. wide. Leaves are of two types. Larger submersed leaves with blades 1-2.5(3) cm. wide on petioles 4-11 cm. long, 7-15 veined, translucent and usually decayed by fruiting time. Floating leaves are oval, 5-12 cm. long and 1-5 cm. wide, tapered at both ends and many veined. Petioles are somewhat winged, 5-20 cm. long and 2-3 mm. wide. Stipules are not joined with the leaf. Flowers are in emergent, dense, cylindric spikes 2-6 cm. long on stalks 3-15 cm. long. Nutlets (achenes) are red-brown to brown, 3-4 mm. long with a short beak. In flower July-August.

ECOLOGICAL NOTES: Long-leaf pondweed is occasional to common in deep marshes, lakes and rivers to a depth of 6 feet. It can be a dominant in Mississippi River backwaters (see photograph on page 29).

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1972).

VASEY'S PONDWEED

(*Potamogeton vaseyi* J.W. Robbins)

PONDWEED FAMILY (Potamogetonaceae) **IND. STATUS:** OBL

C of C: Native (10), a species of special concern in Wisconsin

FIELD CHARACTERISTICS: An aquatic, annual herb with threadlike stems 20-100 cm. long. Leaves are of two types. Submersed leaves are linear, transparent, 2-6 cm. long, up to 1 mm. wide and tapered to a sharp tip. Stipules are free, linear, white and 1-2 cm. long. Floating leaves are sparingly produced on some plants of a colony. Blades of floating leaves are spatulate to obovate, 8-15 mm. long, 5-9 veined, leathery, the veins sunken on the underside. Flowers are in cylindric spikes 3-8 mm. long. Nutlets (achenes) are 2-3 mm. long with a short beak.

ECOLOGICAL NOTES: Vasey's pondweed is rare to uncommon in lakes in northern Minnesota and Wisconsin.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1972).

© Photos by Steve D. Eggers

FLAT-STEM PONDWEED

(*Potamogeton zosteriformis* Fern.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (6) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with strongly flattened, sometimes winged, stems to 1 m. long and 1-3 mm. wide. Leaves are all submersed and linear, 5-20 cm. long and 3-5 mm. wide, and taper to a tip or sharp point. Stipules are free, white and 1-4 cm. long. Flowers are in cylindric spikes 1-2.5 cm. long. Nutlets (achenes) are dark green to brown, 4-5 mm. long with a short, blunt beak. In flower July-August.

ECOLOGICAL NOTES: Flat-stem pondweed is one of the most common and distinctive pondweeds (Voss 1972). It is found in streams and shallow to deep lakes.

SOURCE: Gleason and Cronquist (1991); Chadde (2011); and Voss (1972).

© Steve D. Eggers

GRASS-LEAF PONDWEED

(*Potamogeton gramineus* L.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (7) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with slender stems to 80 cm. long and 1 mm. wide. Leaves are of two types. Submersed leaves are variable in shape from linear to lance-shaped to oblong lance-shaped, 3-9 cm. long and 3-12 mm. wide, with 3-7 veins. Floating leaves are oval, 2-6 cm. long and 1-3 cm. wide with 11-19 veins. Stipules are free, persistent and 1-4 cm. long. Flowers are in cylindric spikes 1.5-4 cm. long. Nutlets (achenes) are dull green and 2-3 mm. long. In flower June-August.

ECOLOGICAL NOTES: Grass-leaf pondweed is found in shallow to deep waters of ponds, lakes and streams.

SOURCE: Gleason and Cronquist (1991); Chadde (2011); and Voss (1972).

© Photos by Steve D. Eggers

CLASPING-LEAF PONDWEED

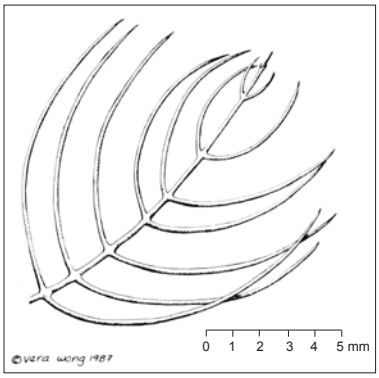
(*Potamogeton richardsonii* (Benn.) Rydb.)

PONDWEED FAMILY (Potamogetonaceae) **C of C:** Native (5) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with round stems 30-100 cm. long and 1-2.5 mm. wide. Leaves are all submersed, lance-shaped, 5-12 cm. long and 1-2.5 cm. wide, with 13 or more prominent veins. Leaves have a heart-shaped base clasping the stem. Leaf margins are entire and wavy. Stipules are free, 1-2 cm. long, then shredding and persisting as fibers (stipular fibers). Flowers are in cylindric spikes 1.5-4 cm. long. Nutlets (achenes) are green to brown, 2-4 mm. long, with a short beak. In flower July-August.

ECOLOGICAL NOTES: Clasping-leaf pondweed is found in shallow to deep waters of streams and lakes.

SOURCE: Gleason and Cronquist (1991); Chadde (2011); and Voss (1972).



Leaf shape

© Photos by Steve D. Eggers

Emersed flower spikes

COMMON WATER-MILFOIL

(*Myriophyllum sibiricum* Komarov)

WATER-MILFOIL FAMILY (Haloragaceae) **C of C:** Native (6 WI)(7 MN) **IND. STATUS:** OBL

SYNONYM: *Myriophyllum exalbescens* Fern.

FIELD CHARACTERISTICS: A perennial, aquatic herb with stems 1 m. or more in length. Leaves are in whorls of 3-4, 1-4 cm. long, with mostly 5-10 thread-like segments on each side of the midrib. Flowers are in emerged spikes 4-10 cm. long. Flowers and bracts are whorled. Staminate and pistillate flowers are separate with the uppermost flower whorls being staminate and lower being pistillate. Staminate flowers have pinkish petals 2-3 mm. long. Floral bracts are much smaller than the leaves and are entire (not segmented). Fruit is 2-3 mm. long. In flower June-September.

ECOLOGICAL NOTES: Common water-milfoil is found in shallow to deep water of lakes, ponds, marshes, ditches and slow moving streams.

SOURCE: Gleason and Cronquist (1991); Swink and Wilhelm (1994); and Voss (1985).

EURASIAN WATER-MILFOIL

(*Myriophyllum spicatum* L.)

WATER-MILFOIL FAMILY (Haloragaceae) **IND. STATUS:** OBL

C of C: Introduced, invasive (0)

FIELD CHARACTERISTICS: A perennial, aquatic herb very similar to the native common water-milfoil (*M. sibiricum*). To distinguish the two species:

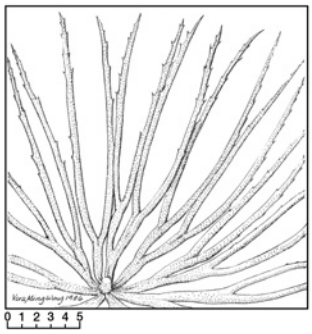
Leaves with 5-10 thread-like segments on each side of the midrib; submerged leaves stiff when removed from the water ..... *M. sibiricum*

Leaves with 12-22 thread-like segments on each side of the midrib; submerged leaves collapse when removed from the water . . . . . *M. spicatum*

ECOLOGICAL NOTES: Eurasian water-milfoil is found in shallow to deep water of lakes, ponds and Mississippi River backwaters. This highly invasive species can become a nuisance by forming dense mats that interfere with boating, fishing and swimming.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1985).

Nutlet, 4-6 mm. long, with one terminal and two basal spines.



Leaves

COONTAIL

(*Ceratophyllum demersum* L.)

HORNWORT FAMILY (Ceratophyllaceae) **C of C:** Native (3 WI)(2 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: A submerged herb lacking true roots, but may be anchored by modified leaves. Leaves are in whorls of 5-12 and are stiff and dichotomously forked. Leaves have thread-like divisions with teeth along one side. The leaves are usually much more crowded toward the tip; thus, the "coontail" appearance. There is great variability in the length and crowding of the leaves. Flowers are unisexual. Fruit is a nutlet 4-6 mm. long with two spines near the base and a terminal spine. In flower July-September.

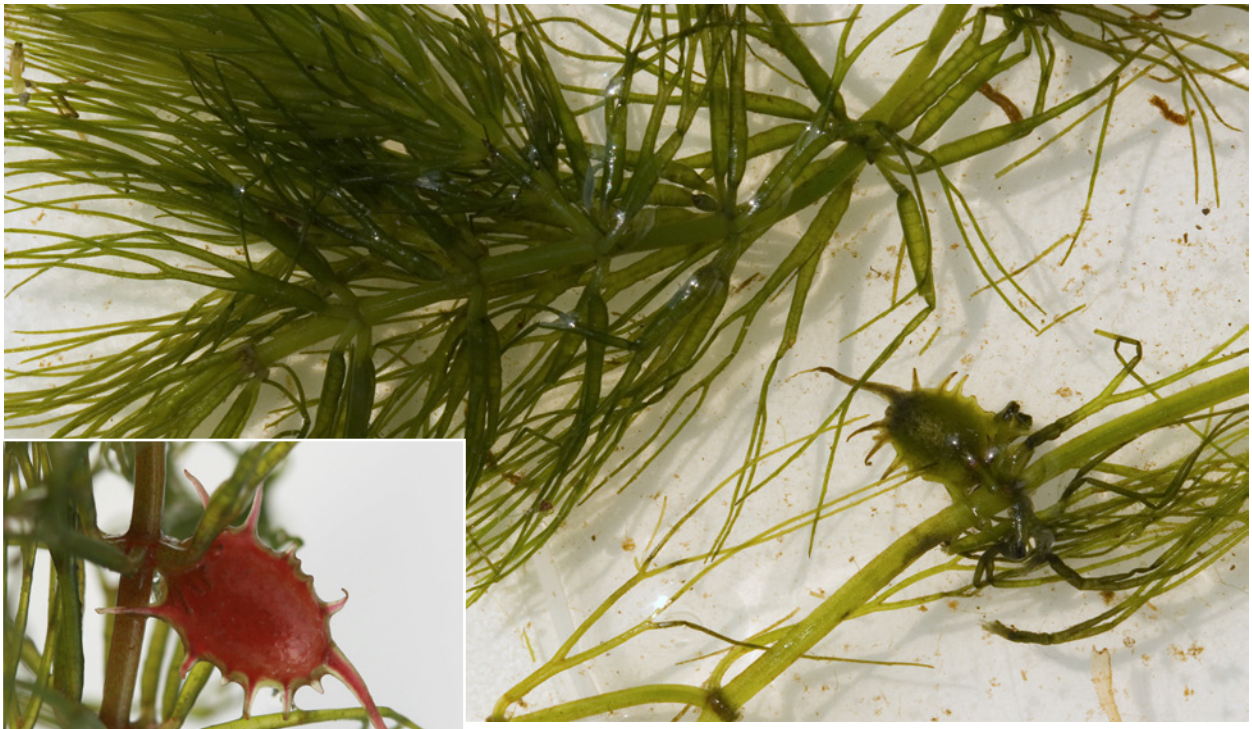
ECOLOGICAL NOTES: Coontail is one of the most abundant submergent plants in lakes, streams, marshes, ditches, stormwater ponds, and Mississippi River backwaters, in shallow water to depths of 18 feet. Coontail is tolerant of nutrient-rich waters and fluctuating water levels. It can become a nuisance by forming thick masses that interfere with swimming, fishing and boating.

Most reproduction is by fragmentation of the stem. Pollination is by a unique method. The staminate flowers are released underwater and float to the surface. Pollen is then released and drifts downward through the water column where it may, by chance, land on a pistillate flower.

SOURCE: Fassett (1957); Gleason and Cronquist (1991); Martin *et al.* (1951); and Voss (1985).

© Photos by Steve D. Eggers

Coontail
(*Ceratophyllum demersum*)



© Photos by Steve D. Eggers

Nutlet, 4-6 mm. long, with many spines along the margin.

SPINY COONTAIL

(*Ceratophyllum echinatum* Gray)

HORNWORT FAMILY (Ceratophyllaceae) **IND. STATUS:** OBL

C of C: Native (10), a species of special concern in Wisconsin

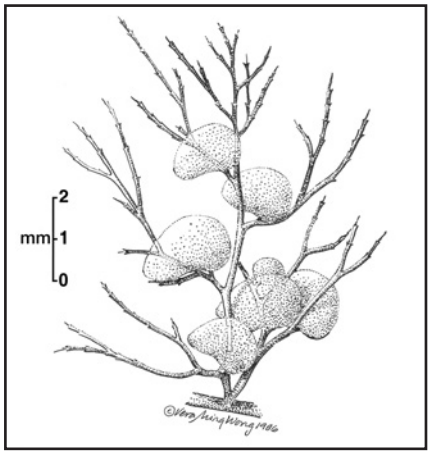
FIELD CHARACTERISTICS: A floating, perennial, rootless, aquatic herb with elongate stems. Much like coontail (*C. demersum*). To distinguish between the two species:

Leaves usually stiff, forked 1-2 times, margins coarsely toothed; nutlets with two basal spines . . . . . *C. demersum*

Leaves limp, some larger leaves forked 3-4 times, margins not toothed; nutlets with several spines along each margin . . . . . *C. echinatum*

ECOLOGICAL NOTES: Spiny coontail is rare to uncommon in lakes, ponds and quiet waters of rivers and streams, preferring acidic waters.

SOURCE: Gleason and Cronquist (1991); and Chadde (2002).



Leaf and bladders

© Photos by Steve D. Eggers

COMMON BLADDERWORT

(*Utricularia macrorhiza* Le Conte)

BLADDERWORT FAMILY (Lentibulariaceae) **IND. STATUS:** OBL

C of C: Native (7 WI)(5 MN) **SYNONYM:** *Utricularia vulgaris* L.

FIELD CHARACTERISTICS: An aquatic, free-floating herb. Leaves are numerous and highly dissected with bladders scattered throughout. The naked (leafless) stems are emergent, 6-20 cm. high, with 6-20 flowers. Flowers are bright yellow and composed of 2 lips 1-2 cm. long, and a short spur, which is about two-thirds as long as the lower lip. In flower June-August.

ECOLOGICAL NOTES: This bladderwort is found in quiet waters of lakes, rivers and marshes. Other species of bladderworts (*Utricularia* spp.) inhabit bogs and calcareous fens. See Appendix C for a key to bladderworts in our area. Bladderworts are insectivorous plants that derive their name from the small bladders used to capture minute animal life. The bladders have "trigger hairs" which, when brushed by a small aquatic invertebrate, cause the bladder to rapidly inflate and draw in the unfortunate organism. The victim is then "digested" as glands absorb nutrients and expel water.

SOURCE: Gleason and Cronquist (1991); and Kartesz (1994).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WAVY WATER-NYMPH

(*Najas flexilis* (Willd.) Rostk. & Schmidt)

WATER-NYMPH FAMILY (Najadaceae) **C of C:** Native (6 WI)(5 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An annual, aquatic herb with branched stems 5-40 cm. long. Leaves are linear, 1-4 cm. long and up to 0.5 mm. wide, densely clustered at the tips of stems. Margins of leaves have tiny serrations. Flowers are unisexual, separate on the same plant. Nutlets (achenes) are oval, olive-green to red, with a beak 1 mm. or more long. In flower July-September.

ECOLOGICAL NOTES: Wavy water-nymph found in shallow to deep water of lakes, ponds, streams and Mississippi River backwaters.

SOURCE: Gleason and Cronquist (1991); and Chadde (2002).

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ELODEA

(*Elodea canadensis* Michx.)

FROG'S-BIT FAMILY (Hydrocharitaceae) **C of C:** Native (3 WI)(4 MN) **IND. STATUS:** OBL

SYNONYM: *Anacharis canadensis* (Michx.) Rich

FIELD CHARACTERISTICS: A submerged, perennial herb with stems 20-100 cm. long. Leaves are whorled in 3's (rarely some opposite), 1.5-4(5) mm. wide (averaging about 2 mm.), entire and 2-5 times as long as wide. The plants are unisexual. Pistillate flowers are in spathes from upper leaf axils, the spathes 10-20 mm. long, and extended to the water's surface by a long, thread-like stalk. The staminate flowers are in an elongated spathe about 10 mm. long and 4 mm. wide that is also extended to the water's surface on a thread-like stalk. Fruit is a capsule 5-6 mm. long tapered to a beak 4-5 mm. long. In flower June-September.

ECOLOGICAL NOTES: Elodea is found in marshes, lakes, rivers and Mississippi River backwaters, often forming large masses. It has been recorded in water deeper than 25 feet.

The staminate flowers split open spreading pollen onto the water's surface where it drifts and may, by chance, reach a pistillate flower. Pollination occurs at the water's surface; however, most reproduction is vegetative via fragmentation of the stem.

SOURCE: Fernald (1970); Chadde (2002); and Voss (1972).

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MUSKGRASS

(*Chara vulgaris* L.)

MUSKGRASS FAMILY (Characeae) **IND. STATUS:** [OBL]

FIELD CHARACTERISTICS: A macroscopic alga with cylindrical, whorled branches. Each joint of the "stem" consists of a single cell. The common name comes from the strong, musk-like odor of this alga.

ECOLOGICAL NOTES: Muskgrass is almost always found in mineral-rich waters and it often has incrustations of lime. The muskgrasses (*Chara* spp.) are an important food for ducks, especially when they bear their microscopic, spore-like oogonia. No C of C values have been assigned by either Minnesota or Wisconsin.

SOURCE: Fassett (1957); and Martin *et al.* (1951).

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WATER PURSLANE

(*Didiplis diandra* (Nutt. ex DC.) Wood)

LOOSESTRIFE FAMILY (Lythraceae) **IND. STATUS:** OBL

C of C: Native (5), a species of special concern in Wisconsin

FIELD CHARACTERISTICS: An aquatic, annual herb submersed or rooting in mud. Stems are weak and branched growing to 10-40 cm. in length. Leaves are of two types. Submersed leaves are linear, sessile, 1-2.5 cm. long and truncate at the base. Emersed leaves, if present, are shorter and more broad being narrowly elliptic, and tapering to the base. Minute greenish flowers are solitary in leaf axils. Fruit is a globose capsule. In flower July-August.

ECOLOGICAL NOTES: Water purslane is an uncommon species of quiet waters of lakes, impoundments and streams.

SOURCE: Gleason and Cronquist (1991); and Chadde (2002).

Staminate plant

WILD CELERY

(*Vallisneria americana* Michx.)

FROG'S-BIT FAMILY (Hydrocharitaceae) **C of C:** Native (6) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with long, ribbon-like leaves (mostly 3-11 mm. wide and 2 m. or more long) in a basal rosette. The leaves have a characteristic three-zoned appearance that distinguishes wild celery from other plants that produce rosettes of ribbon-like, submerged leaves. Plants are unisexual. The pistillate flower is tubular and on a long stalk that carries it to the water's surface. Staminate flowers are densely packed in a submerged spathe. In flower from July-October.

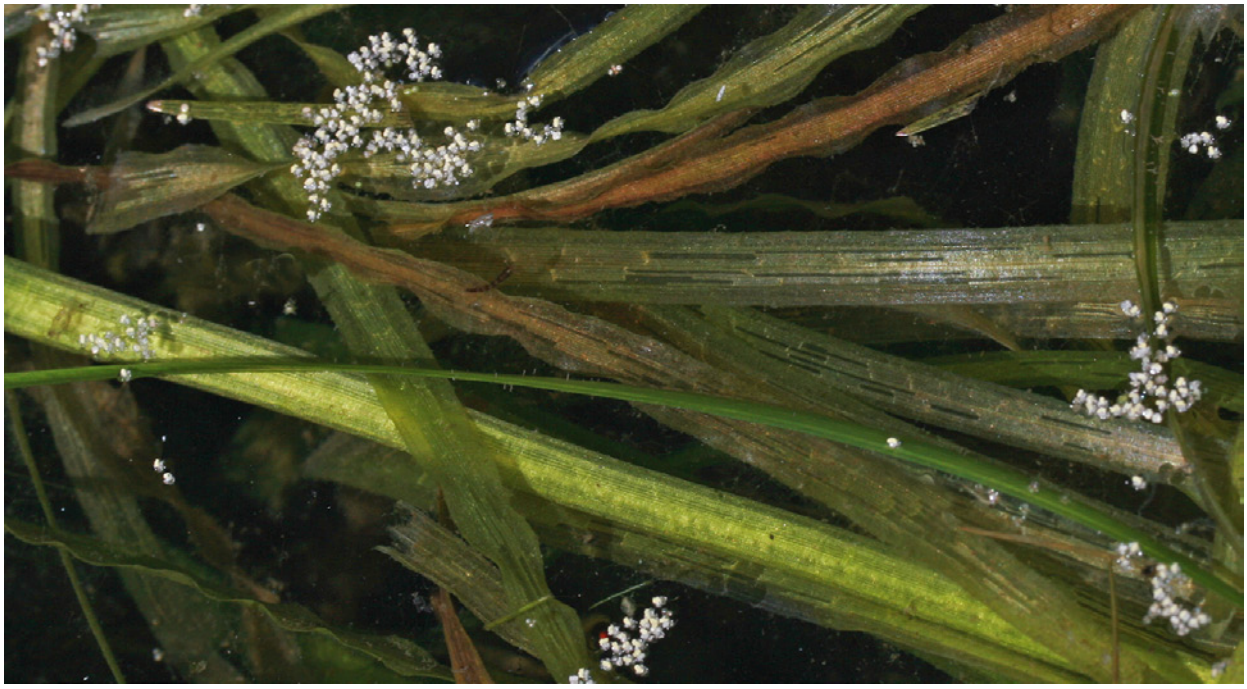
ECOLOGICAL NOTES: Wild celery is found in lakes, streams and Mississippi River backwaters, often in deep water (to 20 feet). It spreads by rhizomes with tuberous tips which, like the fruit and other parts of the plant, are relished as food by waterfowl, especially the canvasback (*Aythya valisineria*), as well as by fish. Staminate flowers are released under water each containing an air bubble that causes it to rise to the surface. Once on the surface, part of the flower opens and acts as a "sail." If the staminate flower randomly floats to a pistillate flower, pollination occurs at the water's surface. The long stalk of the pistillate flower then becomes coiled, pulling the flower below the surface where it develops into the mature fruit (see photograph on following page).

SOURCE: Fernald (1970); and Voss (1972).

© Photos by Steve D. Eggers

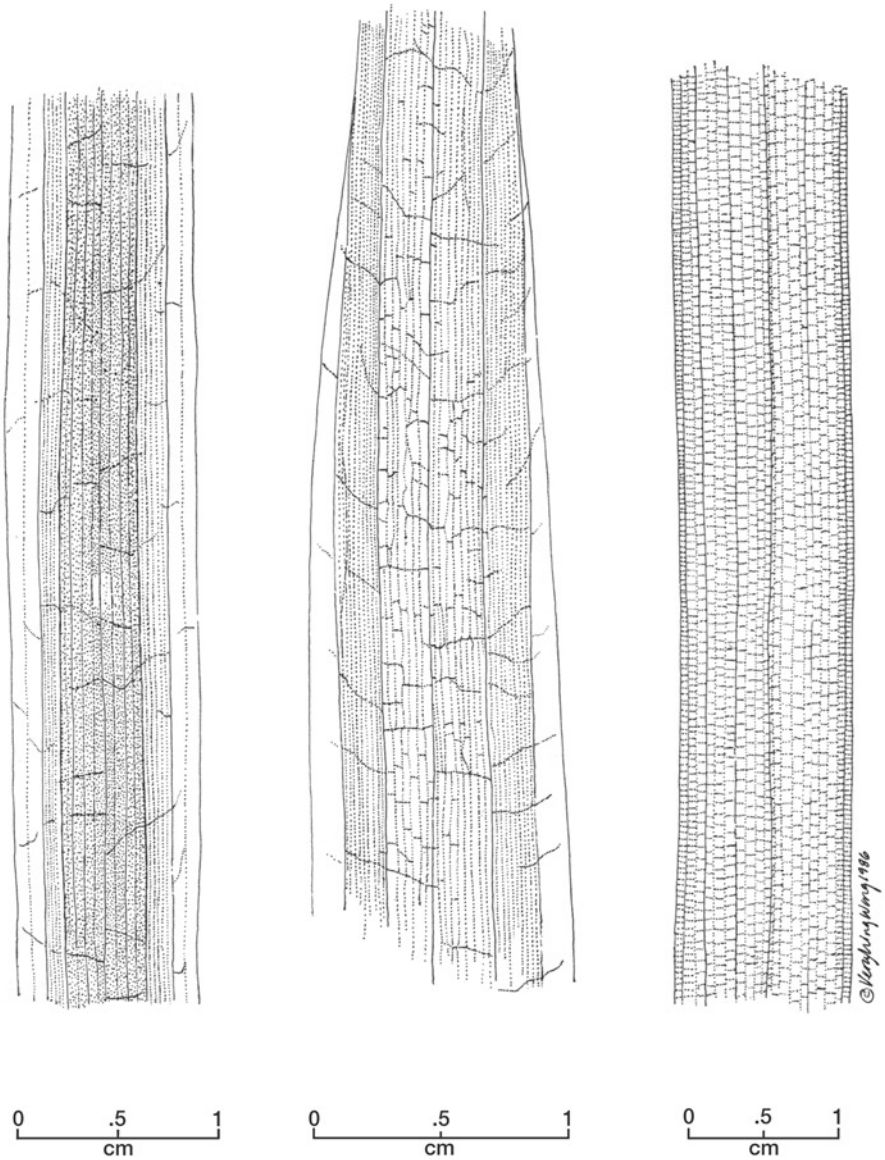
Leaf and a pistillate flower maturing into fruit.

Staminate flowers



Wild Celery
(*Vallisneria americana*)

Comparison of Leaf Venation



Vallisneria americana *Sagittaria* spp. *Sparganium* spp.

© Photos by Steve D. Eggers

YELLOW WATER CROWFOOT

(*Ranunculus flabellaris* Raf.)

BUTTERCUP FAMILY (Ranunculaceae) **C of C:** Native (8 WI)(6 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb, either floating or submerged. Stems are hollow, smooth and elongate growing to 30-70 cm. in length. Leaves are highly variable. The submerged leaves are flattened and dissected into many segments 1-2 mm. wide. Emergent leaves, if present, are 3-parted. Flowers are on emergent, long, thick stalks. Petals number 5-8 and are (6.5)7-14(16) mm. long and golden yellow. Nutlets are 1.7-2.2 mm. long and are arranged in a densely-packed, fruiting head with 50-75 nutlets. Nutlets have a corky margin at maturity. In flower May-June.

ECOLOGICAL NOTES: Yellow water crowfoot is found in shallow, open water and in marshes; sometimes stranded on muddy shores.

SOURCE: Fernald (1970); Gleason and Cronquist (1991); and Voss (1985).

© Photos by Steve D. Eggers

WHITE WATER CROWFOOT

(*Ranunculus longirostris* Godr.)

BUTTERCUP FAMILY (Ranunculaceae) **C of C:** Native (8 WI)(7 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with submersed stems and leaves and emerged flowers. Leaves are highly dissected into filiform (thread-like) segments, 1-2 cm. long, relatively stiff, not collapsing when withdrawn from water. Flowers are white, 1-1.5 cm. wide; stamens number 10-20. Nutlets (achenes) number (7)15-25 per flower and are 0.7-1.5 mm. long with a straight, slender beak. In flower June-August.

ECOLOGICAL NOTES: White water crowfoot occurs in quiet waters of lakes and streams.

SOURCE: Gleason and Cronquist (1991); Chadde (2002); and Voss (1985).

© Photos by Steve D. Eggers

WATER MARIGOLD

(*Bidens beckii* Torr. ex Spreng.)

ASTER FAMILY (Asteraceae or Compositae) **C of C:** Native (8) **IND. STATUS:** OBL

SYNONYM: *Megalodonta beckii* (Torr. ex Spreng.) Greene

FIELD CHARACTERISTICS: An aquatic, perennial herb from rhizomes. Stems grow 40-200 cm. long with little branching. Leaves are of two types. Submersed leaves are thread-like (filiform) and in whorls around the stem. Emersed leaves are simple, lanceolate to ovate, sessile, serrate and 2-4 cm. long. Flower heads are solitary and terminal with a disc 1 cm. wide. Rays are golden-yellow and 1-1.5 cm. long. Nutlets (achenes) are 10-14 mm. in length with 3-6 awns that are longer than the nutlet and retrorsely-barbed (i.e., barbs are backward facing).

ECOLOGICAL NOTES: Water marigold is infrequent in lakes, ponds and impoundments.

SOURCE: Gleason and Cronquist (1991); and Voss (1985).

© Photos by Steve D. Eggers

Rhizome. This example is 2 inches (5 cm.) in diameter.

WHITE WATER-LILY

(*Nymphaea odorata* Ait.)

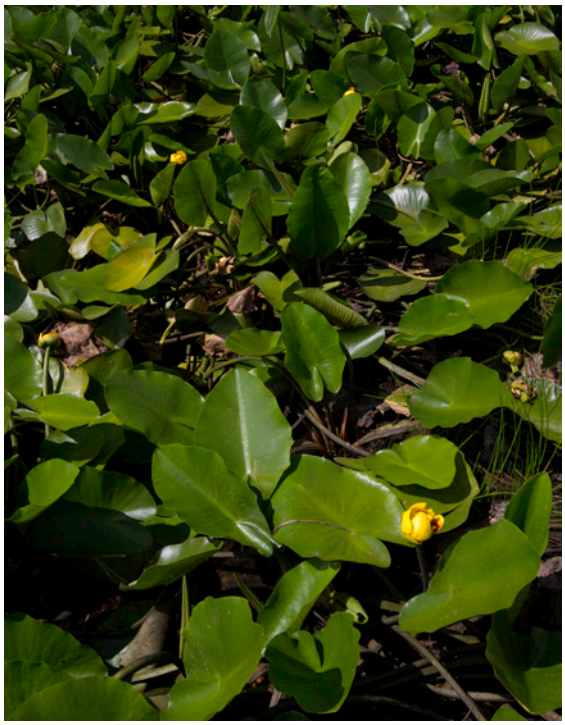
WATER-LILY FAMILY (Nymphaeaceae) **C of C:** Native (6) **IND. STATUS:** OBL

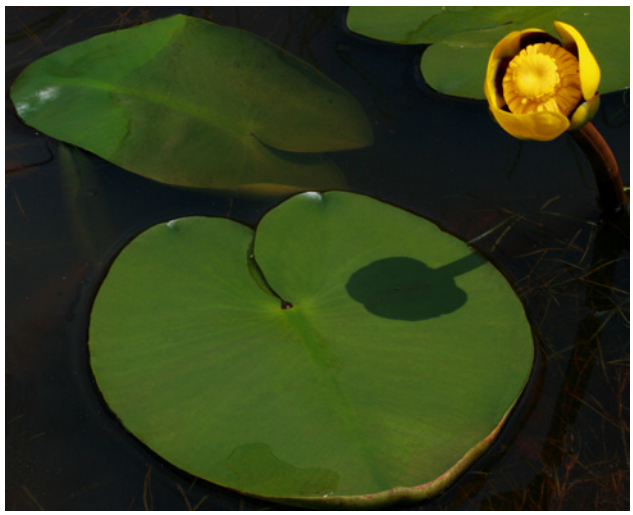
SYNONYM: *Nymphaea tuberosa* Paine

FIELD CHARACTERISTICS: An aquatic, perennial herb with a thick rhizome with many tuber-like branches (see photo). Leaves float on the water's surface or are slightly elevated above it. Leaves are semi-circular with a narrow notch and palmate venation. Leaves can be up to 40 cm. wide. Flowers are white (sometimes pink), 10-20 cm. wide with many petals and float on the water's surface. Flowers are usually fragrant. In flower June-September.

ECOLOGICAL NOTES: White water-lily is common to dominant in lakes, ponds, marshes, slow moving streams and Mississippi River backwaters.

SOURCE: Fernald (1970); Gleason and Cronquist (1991); and Voss (1985).





© Photos by Steve D. Eggers

YELLOW WATER-LILY

(*Nuphar variegata* Dur.)

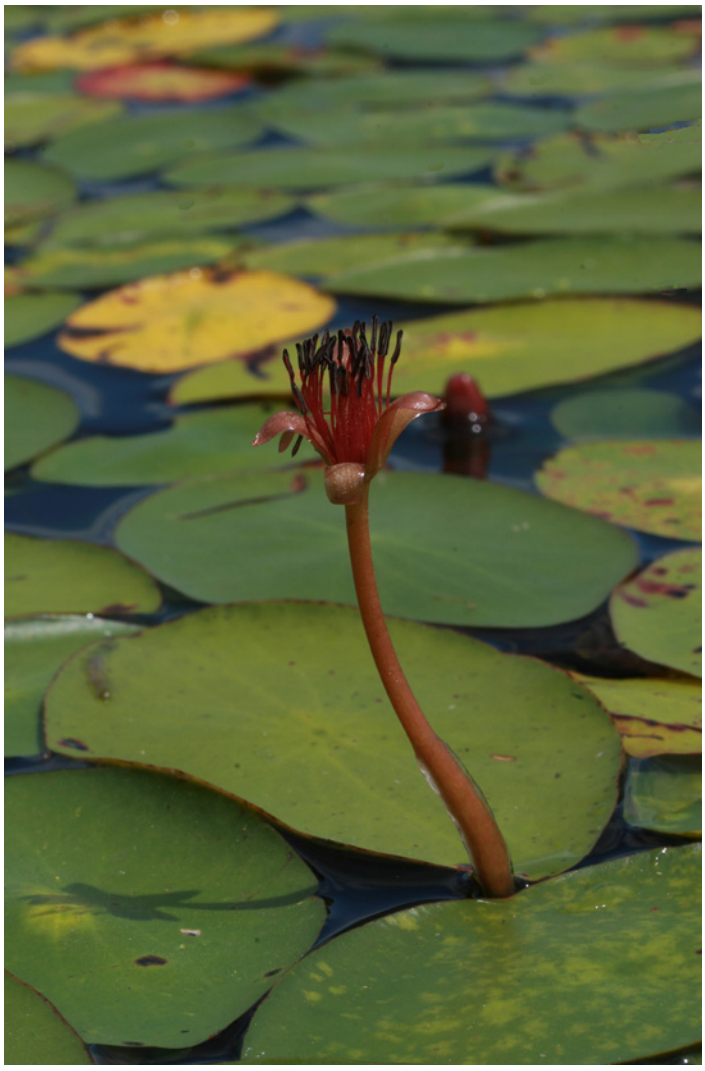
WATER-LILY FAMILY (Nymphaeaceae) **C of C:** Native (6) **IND. STATUS:** OBL

SYNONYM: *Nuphar lutea* (L.) Sm.

FIELD CHARACTERISTICS: An aquatic, perennial herb. Leaves are elliptical with pinnate venation and a deep notch. Leaves can be floating, emerged or submerged. Floating leaves are 7-35 cm. long and 5-25 cm. wide. Flowers are yellow and (2.5)3.5-5 cm. wide. Sepals, usually 6, are petal-like and are usually red within at the base. Petals are small and scale-like. Petioles are flattened on the upper side or even winged. Rhizomes are very thick (to 10 cm.) and spongy with semi-circular to triangular scars of petioles and circular scars of flower stalks. In flower June-September.

ECOLOGICAL NOTES: Yellow water-lily is found in lakes, ponds, streams, marshes, bog ponds and Mississippi River backwaters. The flowers are a favorite food of muskrats. Other common names are cow-lily and spatter dock.

SOURCE: Fernald (1970); Gleason and Cronquist (1991); and Voss (1985).



© Photos by Steve D. Eggers

WATER SHIELD

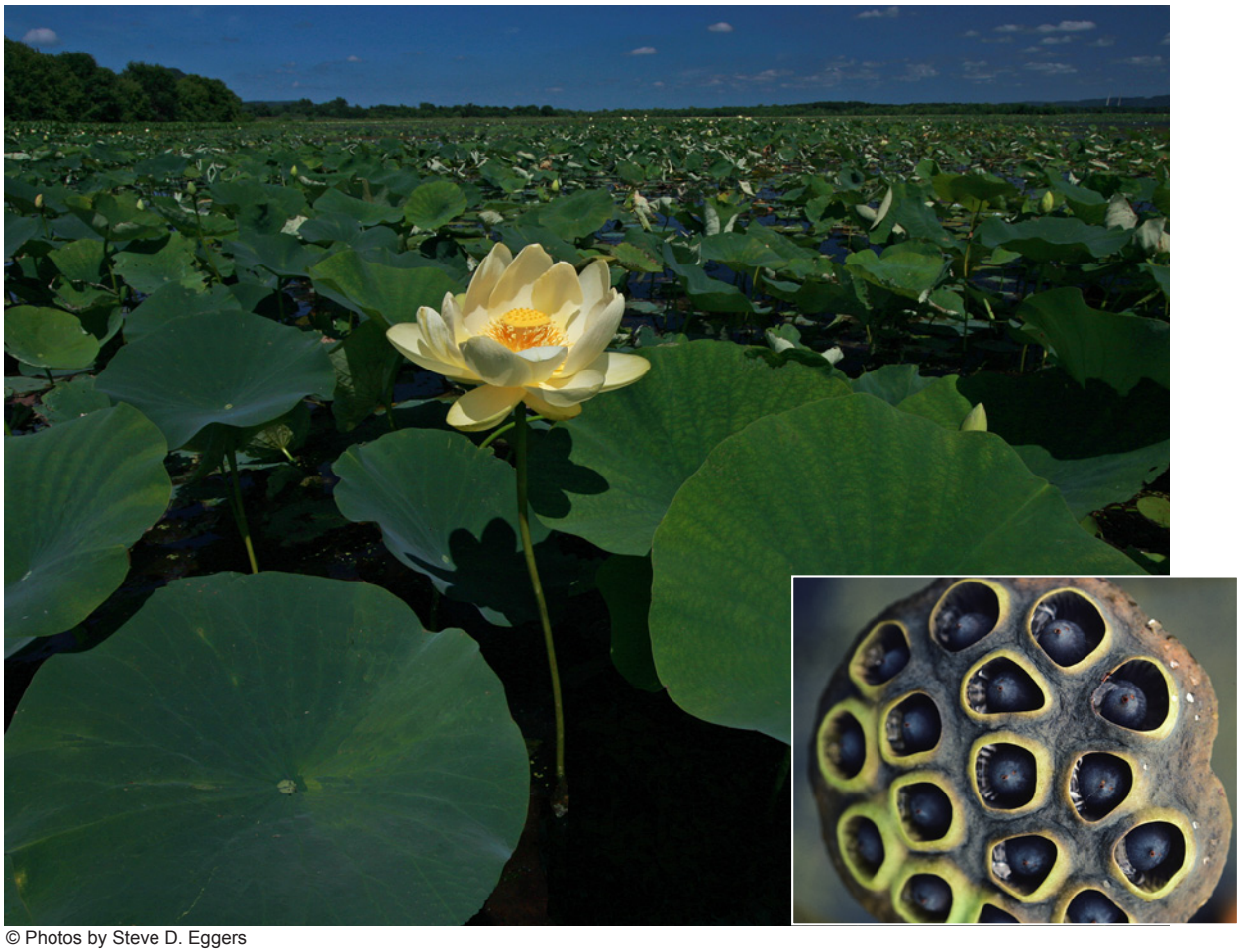
(*Brasenia schreberi* J.F. Gmel.)

WATER SHIELD FAMILY (Cabombaceae) **C of C:** Native (6 WI)(7 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb. Leaves are floating, lack a notch and have petioles that are attached to the middle of the blade. Leaves are 10 cm. or less in diameter and more or less elliptical, scattered on a stem that trails through the water. Flowers are dull purple and 2-3 cm. wide. Sepals and petals usually number 3, sometimes 4. In flower June-September.

ECOLOGICAL NOTES: Water shield is found in lakes, impoundments, marshes, and ponds, including bog ponds. A gelatinous coat covers the stem, petioles and lower surfaces of the leaves.

SOURCE: Fassett (1957); Fernald (1970); Gleason and Cronquist (1991); and Voss (1985).



© Photos by Steve D. Eggers

LOTUS

(*Nelumbo lutea* Willd.)

LOTUS-LILY FAMILY (Nelumbonaceae) **C of C:** Native (7 WI)(8 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: An aquatic, perennial herb with very large leaves (30-70 cm. wide) that are normally emerged, but can be floating. Leaves are unnotched, bluish-green and semi-circular. The center of emerged leaves is cupped or depressed. Flowers are pale yellow, 15-25 cm. wide, with numerous petals and sepals, and elevated on emerged, stout stalks. Fruits, when mature, are acorn-like and embedded in a fleshy, top-shaped receptacle that later becomes dry and woody (inset photo). In flower July-August.

ECOLOGICAL NOTES: In Minnesota and Wisconsin, lotus is primarily found in backwaters of the Mississippi River and its major tributaries. However, it is also found in other rivers and scattered lakes; some of these stands may have been planted. It forms extensive colonies that can cover many acres. The leaves repel water.

SOURCE: Fernald (1970); and Gleason and Cronquist (1991).

THE DUCKWEED FAMILY

The duckweed family consists of floating plants, without leaves; instead with a flattened or globose frond. Plants may or may not have roots. Most reproduction is vegetative by budding. However, the duckweeds do produce flowers and are the world's smallest flowering plants.

Key to the Genera of the Duckweed Family

1A. Roots are usually present and/or plants float beneath the surface. 2

2A. A single root per frond is usually present . . . . *Lemna*

2B. Several roots per frond are present . . . . *Spirodela*

1B. Roots are absent and plant floats at the surface 3

3A. Plants are globular, tiny (0.3-1 mm. long). . . . . *Wolffia*

3B. Plants are strap-shaped, larger (6-8 mm. long). . . . . *Wolffiella*

LESSER DUCKWEED

(*Lemna minor* L.)

DUCKWEED FAMILY (Lemnaceae) **C of C:** Native (4 WI)(5 MN) **IND. STATUS:** OBL

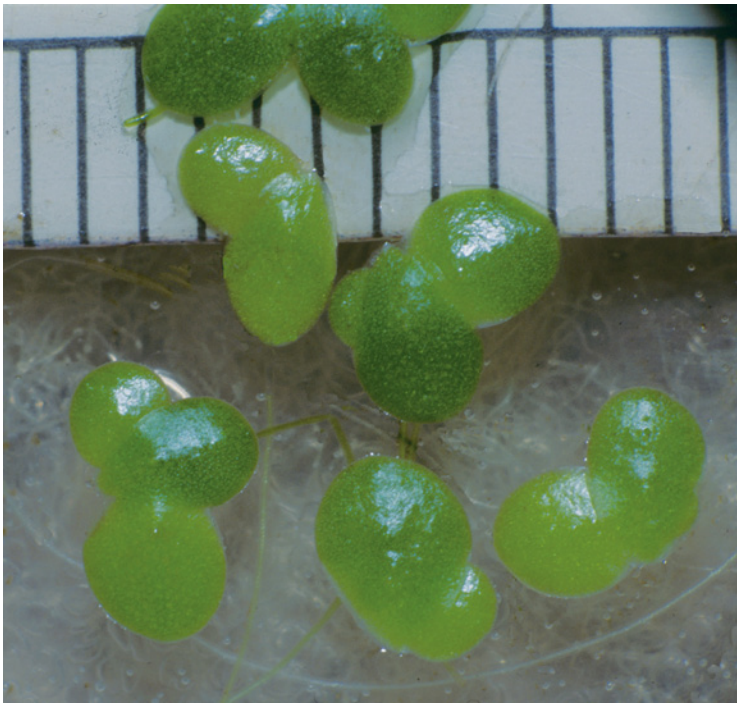
FIELD CHARACTERISTICS: This duckweed has flattened fronds 2-5 mm. long with 3-5 nerves. Frond surfaces are green above and below and each frond has a single root. Microscopic flowers occur in small pouches on the edge of the frond or on its upper surface

ECOLOGICAL NOTES: Lesser duckweed is found in quiet waters, frequently associated with big duckweed (*Spirodela polyrhiza*) and watermeal (*Wolffia* spp.) forming thick mats on the water's surface.

Waterfowl feed on the duckweeds, probably obtaining substantial numbers of minute animal organisms associated with the plants. Some authorities have split *L. minor* into multiple additional species; however, other authorities have not adopted this approach. See discussion in Swink and Wilhelm (1994).

SOURCE: Fassett (1957); Gleason and Cronquist (1991); Swink and Wilhelm (1994) and Martin *et al.* (1951).

A pond covered with duckweeds (*Lemna minor* and *Wolffia columbiana*) in late summer.



© Photos by Steve D. Eggers

Lesser duckweed (*Lemna minor*)
Scale is in mm.


© Steve D. Eggers

STAR DUCKWEED

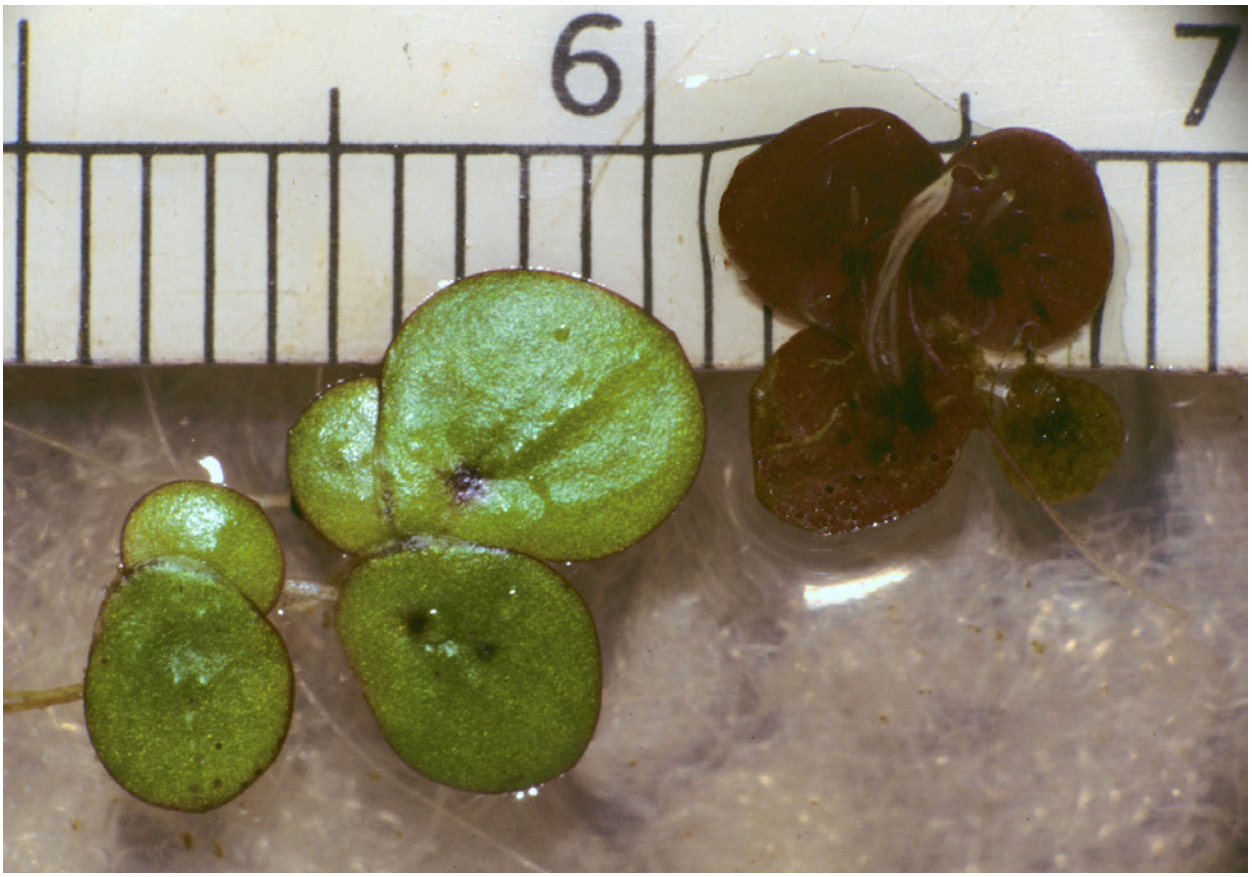
(*Lemna trisulca* L.)

DUCKWEED FAMILY (Lemnaceae) **C of C:** Native (6 WI)(5 MN) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: Star duckweed floats just beneath the surface and has fronds shaped like canoe paddles. Fronds are 4-10 mm. long, tapering to a 4-16 mm. stipe that remains attached to the parent plant. At least some fronds have roots.

ECOLOGICAL NOTES: Star duckweed, or forked duckweed, is found in quiet waters of lakes, impoundments and marshes. It commonly forms tangled colonies beneath the water's surface.

SOURCE: Fassett (1957); Gleason and Cronquist (1991); and Martin *et al.* (1951).



© Steve D. Eggers

Scale is in cm./mm.

BIG DUCKWEED

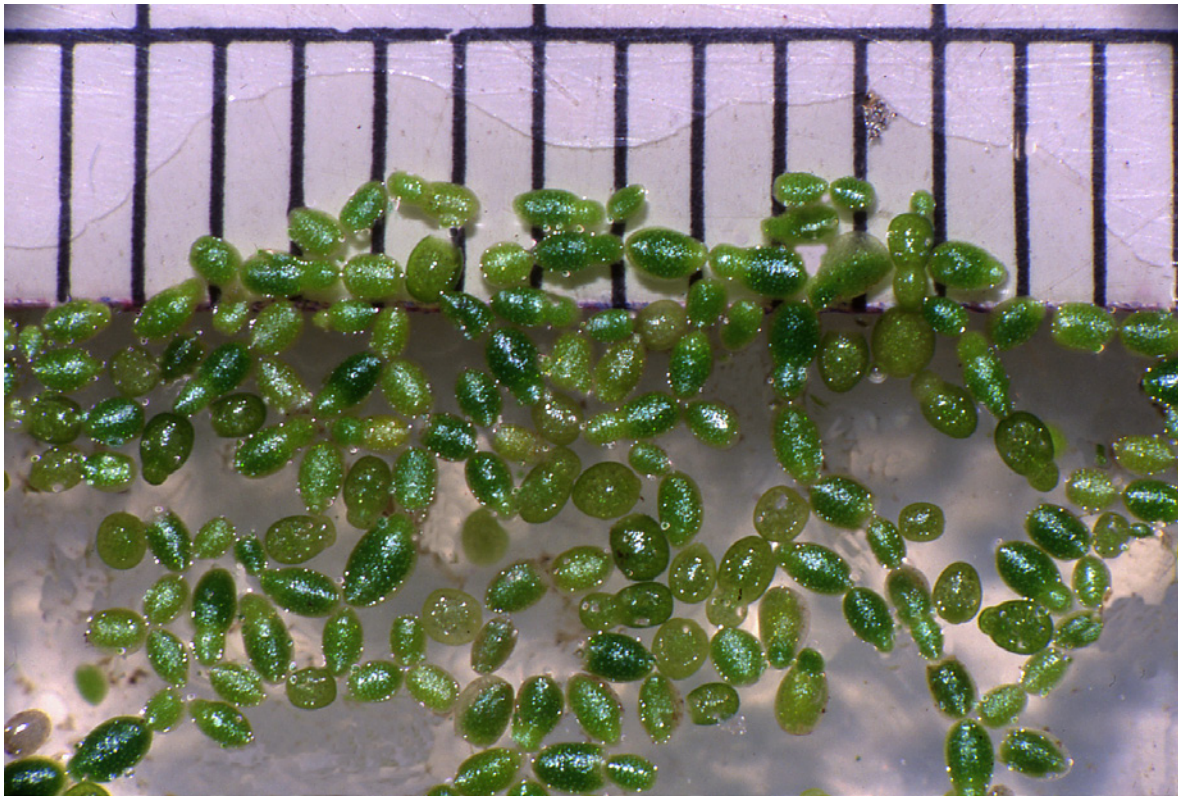
(*Spirodela polyrhiza* (L.) Schleid.)

DUCKWEED FAMILY (Lemnaceae) **C of C:** Native (5) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: This duckweed has flattened fronds 3-10 mm. long, usually with 7 nerves (but can be 5-15 nerved). Frond surfaces are green above and purplish below. Each frond has several to many roots. Flowers are produced in reproductive pouches.

ECOLOGICAL NOTES: Big duckweed occurs in quiet waters of lakes and marshes, frequently forming thick, floating mats with lesser duckweed (*Lemna minor*) and watermeal (*Wolffia* spp.).

SOURCE: Fassett (1957); Gleason and Cronquist (1991); and Martin *et al.* (1951).



© Steve D. Eggers

Scale is in mm.

WATERMEAL

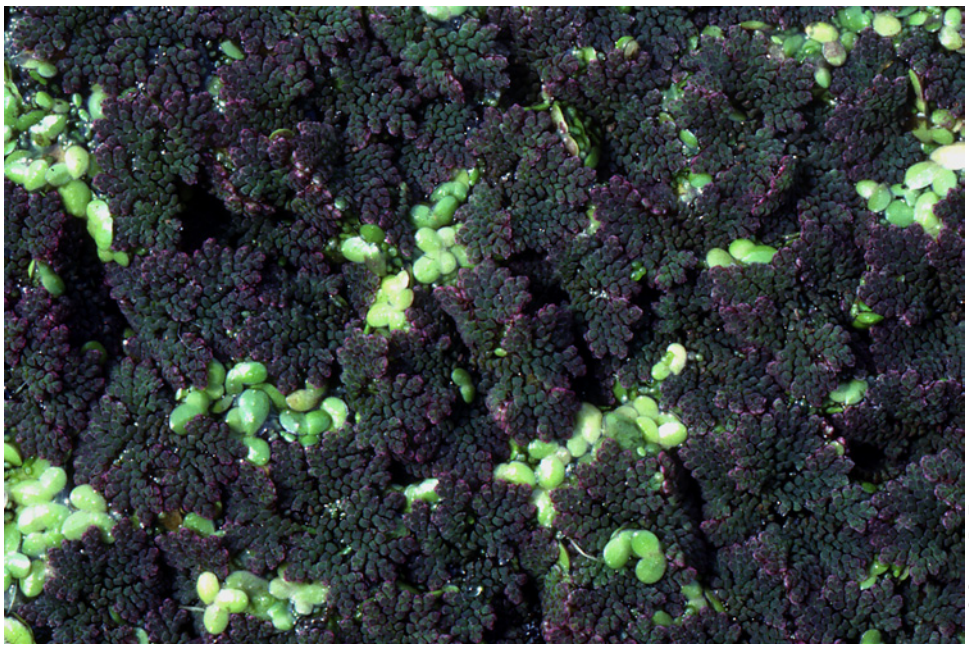
(*Wolffia columbiana* Karst.)

DUCKWEED FAMILY (Lemnaceae) **C of C:** Native (5) **IND. STATUS:** OBL

FIELD CHARACTERISTICS: Tiny plants with a globular frond just 0.3-1 mm. long and floating partially above and partially below the water's surface.

ECOLOGICAL NOTES: Watermeal is abundant in quiet waters of lakes and marshes, frequently associated with other members of the duckweed family. This genus is the world's smallest flowering plants.

SOURCE: Fassett (1957); Gleason and Cronquist (1991); and Martin *et al.* (1951).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A floating mat consisting of mosquito fern (dark green and purple) and lesser duckweed (bright green).

MOSQUITO FERN

(*Azolla microphylla* Kaulfuss)

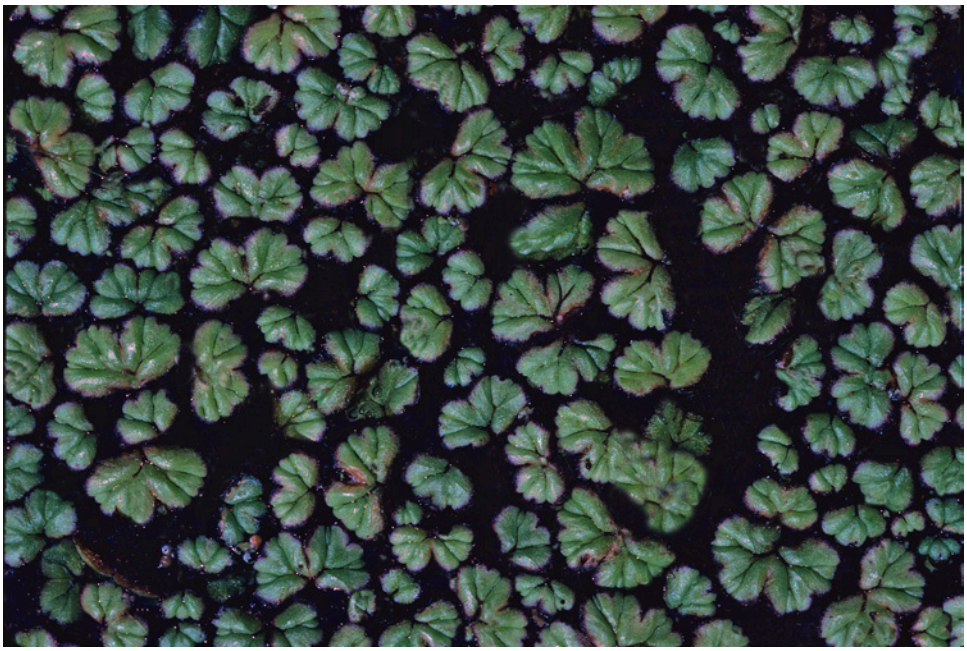
MOSQUITO FERN FAMILY (Azollaceae) **C of C:** Native (10 WI)(3 MN) **IND. STATUS:** OBL

SYNONYM: *Azolla mexicana* Schlecht. & Cham. ex K. Presl

FIELD CHARACTERISTICS: A tiny, annual, aquatic fern that is free-floating (often forming mats) or stranded on mud. Stems are flat and 1-1.5 cm. long, dark green or red, and covered with two rows of overlapping leaves. Upper lobes of leaves are above the water line while lower leaves are larger and below the water line. Roots are few and unbranched.

ECOLOGICAL NOTES: In Minnesota and Wisconsin, mosquito fern is an uncommon species that primarily occurs in quiet backwaters of the Mississippi River downstream of St. Paul, Minnesota.

SOURCE: Fassett (1957); Gleason and Cronquist (1991); and Tryon (1980).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PURPLE-FRINGED RICCIA

(*Ricciocarpus natans* (L.) Corda)

THALLOSE LIVERWORT FAMILY (Ricciaceae) **IND. STATUS:** [OBL]

FIELD CHARACTERISTICS: A free-floating liverwort with fan-shaped leaves (thallus) to 1 cm. long. Leaves are deeply furrowed above and have scalloped edges. Numerous dangling, purplish, root-like structures (rhizoids) are present.

ECOLOGICAL NOTES: Purple-fringed riccia is a non-vascular plant that reproduces by spores and budding. This species frequently occurs with duckweeds (*Lemna, Spirodela, Wolffia*), none of which have the purplish rhizoids. Purple-fringed riccia is found in quiet waters of lakes, ponds and backwaters of streams.

No C of C values have been assigned to this species for Minnesota or Wisconsin.

SOURCE: Fassett (1957); and State of Washington, Department of Ecology.