

# **A CITIZEN'S GUIDE TO THE BIOLOGICAL ASSESSMENT OF WETLANDS**



## **THE VEGETATION INDEX OF BIOLOGICAL INTEGRITY (IBI)**



**Minnesota Pollution  
Control Agency**

*Field & Laboratory  
Protocols, Pictorial  
Key to the  
Common Wetland  
Plants*



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**A CITIZEN'S GUIDE TO THE  
BIOLOGICAL ASSESSMENT OF WETLANDS**

**THE VEGETATION INDEX**

**OF BIOLOGICAL INTEGRITY (IBI)**

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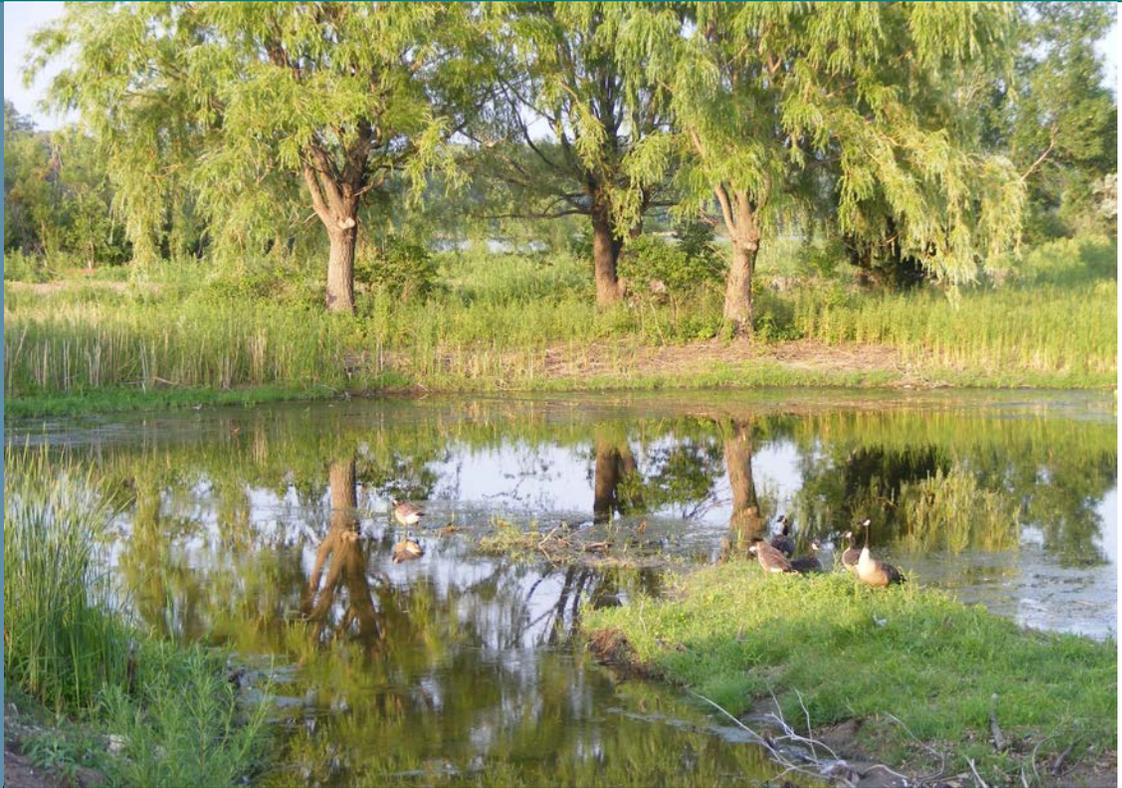
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Eden Prairie wetland

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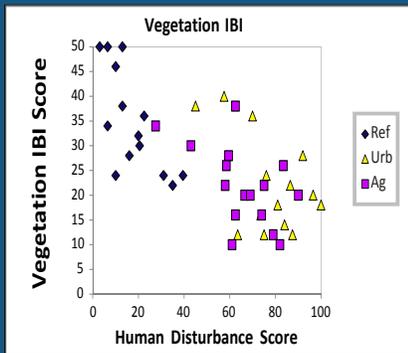
Credits and thanks also are acknowledged for permission to use many excellent plant photos and images available from Katy Chayka and Peter M. Dziuk from the Minnesota Wildflowers <http://www.minnesotawildflowers.info>. Additional photos were obtained and acknowledged from Les Mehrhoff, Discover Life <http://www.discoverlife.org>; Linda W. Curtis, Paul Skawinski, Mathew L. Wagner, and Dennis W. Woodland associated with the University of Wisconsin-Stevens Point; University of Florida FAS Center for Aquatic and Invasive Plants and the Minnesota Board of Water and Soil Resources (BWSR).

The authors provided line drawings of the nonvascular plants and small floating aquatics; the leaf morphology and arrangement diagrams; the lanceolate, ovate and branching leaf shapes; the stem and leaf cross sections; as well as the panicle, two, and three-ranked diagrams. The remaining line drawings were obtained from the USDA-NRCS PLANTS Database (<http://plants.usda.gov>). All of these drawings are in the public domain (not copyrighted) but recognized and acknowledged. Line drawings for *Agrostis*, *Calamagrostis*, *Echinochloa*, *Spartina pectinata*, and *Zizania aquatica* were originally published in Hitchcock, A.S. (rev. A. Chase). 1950. Manual of the grasses of the United States. USDA Misc. Publ. No. 200. Washington, DC. All other illustrations were originally published in Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 168.





# INTRODUCTION



**Figure 1.** Vegetation IBI scores plotted against Human Disturbance Scores (HDS).

HDS incorporates a variety of human disturbance factors such as impervious surfaces, altered hydrology, and chemical disturbances. HDS is used as a baseline of wetland condition to test metrics and develop an IBI. As HDS increases we can assume that wetland condition decreases, as shown above. Metrics that respond along this gradient are combined to produce an IBI that can determine different levels of wetland condition.

This guide provides the basic framework for trained citizens to monitor and assess the condition, or health, of depression-al wetlands in Central Minnesota. The field sampling protocols and biological assessment criteria presented in this guide are based on similar work by professional wetland biologists at the Minnesota Pollution Control Agency (MPCA).

The basic approach is to use standard sampling methods to gather wetland plant community data, evaluate the data using multiple plant metrics, and determine a wetland condition assessment. A metric is a measurement of a plant community characteristic that is known to change in a predictable way in response to varying degrees of human influence from undisturbed to extremely disturbed conditions. The combination of multiple metrics into a single composite index results in a robust and reliable indicator of wetland condition (Figure 1). The final result is called an Index of Biological Integrity or IBI.

This guide includes wetland sampling protocols, data sheets, and metric scoring sheets used to score the IBI. A wetland plant identification guide is also included to help users identify the common wetland plants of Central Minnesota. The materials within this guide serve as primary training materials for the Minnesota Wetland Health Evaluation Program (WHEP) citizen volunteer monitoring group. This guide may also be well suited for wetland education purposes outside of WHEP.



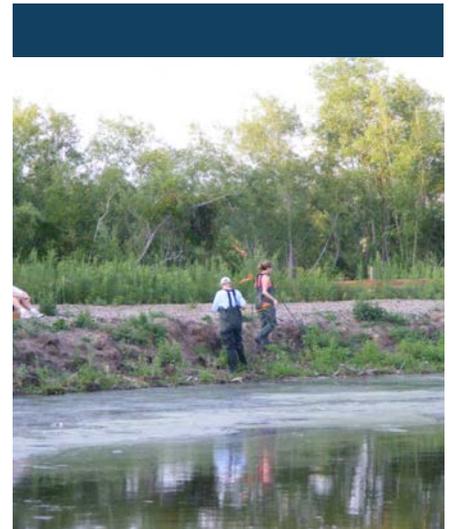
## Why Wetlands?

Wetlands are important water resources which often influence the quality of higher profile lakes and streams. Thus, the recreational opportunities and drinking water that lakes and streams provide, as well as the aesthetic beauty of these waters, often depend on wetlands. Many wetland conservation efforts are initiated under the auspices of improving the quality of lakes and streams. Wetlands however, are a valuable water resource in their own right and deserve similar attention.

Historically, wetlands have often been thought of as “wastelands”, and many have been destroyed in favor of more economically productive land or more efficient waterways. Putting this idea into perspective, it has been estimated that Minnesota has lost approximately 52% of its pre-European settlement wetland acreage due to draining and filling activities. In addition to this loss in area, the biological condition of many existing wetlands is decreasing due to a variety of factors such as pollution, hydrologic changes, and introduced invasive species. As environmental awareness increased during the latter half of the twentieth century, wetland conservation issues began to receive attention. By the late 1980's and early 90's the federal government adopted a national policy to achieve “no net loss” of wetland acreage in an attempt to halt the loss of wetlands. In addition, the Clean Water Act (1972) and the Minnesota Wetland Conservation Act (1991) set forth clear goals of maintaining and promoting the biological integrity and diversity of wetlands in Minnesota. While some of these legislative goals have been in place for over thirty years it is only now that the tools are being developed to begin to assess and monitor the condition of wetlands.

## Benefits of Wetlands:

- ◆ Water quality improvement
- ◆ Fisheries habitat
- ◆ Wildlife habitat
- ◆ Natural filter for runoff
- ◆ Flood control
- ◆ Recreation
- ◆ Scenic





## Why Plants?

Along with algae, plants are primary producers and are the base of the wetland food chain. This is reason enough for plants to be recognized as important to wetland ecology. Plants, however, do much more. They play important roles in many of the physical and chemical processes that occur in wetlands. They provide habitat and structure for other aquatic life. Wetland plants are associated with many of the services from wetlands that we find valuable. For example, plants can slow the movement of water, thereby allowing sediments to settle out of the water column and increasing downstream water quality. Wetland plants can also increase water quality by taking up nutrients and chemicals from the water column and sediments and incorporate them into their tissues.

Wetland plants have adapted to the natural conditions present in wetlands and are therefore often ill adapted to changes in those conditions. This includes nutrient regimes, water clarity, hydrology and many other factors. Thus, plants are responsive to their environment and often can indicate a past or ongoing disturbance. Plants are found in almost all wetlands and they are relatively easily identified by people with a minimum amount of training. As a result, plants can be effective indicators of wetland condition and the IBI is an important tool that can be used to interpret often complex changes occurring in wetlands.





## Citizen IBI Metrics:

- 1) Vascular Genera
- 2) Nonvascular Taxa
- 3) Grasslike Genera
- 4) Carex Cover
- 5) Utricularia Presence
- 6) Aquatic Guild
- 7) Persistent Litter

## CITIZEN VEGETATION IBI

Humans have developed a multitude of indicators that range in use from assessing our personal health to assessing the global economy. In the most basic sense, an indicator is a measurement that we can easily obtain that helps to explain a complex phenomenon. An example of this is human body temperature and human health. In general, human health is a very complex subject that depends on many factors and definitions. However, we know that when we are “healthy” we have a fairly constant body temperature. If there is a deviation from that temperature, such as a fever, this indicates an “unhealthy” condition. The purpose behind the citizen vegetation IBI is to indicate whether a wetland is “healthy” or “unhealthy”.

The IBI, or multimetric, approach consists of determining multiple attributes of the biological community that change in predictable ways in response to human disturbances from sites with the least amount of human disturbance to sites that are very disturbed. Once individual metrics are identified, scoring criteria are established so that the different metrics can be combined together to produce an IBI. The advantage of this approach is that different aspects of the biological community can be integrated into one encompassing index. IBI methodology was first developed for fish communities in streams during the 1980's. Since then, IBIs have been applied to many different types of organisms, ecosystems, and geographic settings.

The citizen vegetation IBI presented here is an outgrowth from a technical IBI developed by biologists at the MPCA. There are two main differences between these two IBIs. The first is the level of plant identification. The technical IBI relies on species level identification, whereas the citizen IBI more or less relies on genus level identification. In the hierarchy of biological naming, the genus level of clas-



Mud Lake in West St Paul

sification is slightly less detailed than species. The second difference is the number of metrics. The technical IBI has ten metrics and the citizen IBI has seven.

Both the technical and citizen IBIs were developed for use in depressional wetlands (i.e. wetlands not associated with a stream or a lake) normally with a column of water that have marsh vegetation in the North-Central Hardwood Forest region of the state (commonly known as the deciduous forest which includes most of the Twin Cities metro area). Marshes are characterized as being open (i.e. they do not have trees growing over the entire basin), having standing water for the majority of the growing season (up to a meter deep), with a mixture of herbaceous (non-woody) emergent and aquatic plants. Because the citizen IBI was developed within these constraints, users are advised to not apply the IBI for management purposes to other wetland types or wetlands in other regions of the state.

## Citizen IBI Metrics

The citizen vegetation IBI includes the following seven metrics:

### 1) Vascular Genera

In many different ecosystems, it has been observed that the number of different organisms (i.e. richness) decreases as human disturbance increases. In wetlands, undisturbed plant communities usually have a rich set of native plants, but as they become more disturbed they are often overrun by a handful of tolerant species (these tend to be introduced invasive species). Based on this principle, the Vascular Genera metric measures the richness, or number of different kinds, of vascular plant genera.



## Citizen IBI Metrics:

- 1) Vascular Genera
- 2) Nonvascular Taxa
- 3) Grasslike Genera
- 4) Carex Cover
- 5) Utricularia Presence
- 6) Aquatic Guild
- 7) Persistent Litter

### 2) Nonvascular Taxa

This metric is similar to the Vascular Genera metric in principle, but it evaluates a different group of wetland plants, the nonvascular plants which includes mosses, liverworts, and lichens. With the exception of blue-green and green filamentous algae, which are not included in this metric, the richness of nonvascular plants tends to decrease with increased disturbance.

### 3) Grasslike Genera

The Grasslike Genera metric is also similar to the Vascular Genera metric but it measures the richness of a more specific type of vascular plant. The grasslike plants include the Grasses as well as the Sedges, Bulrushes, true Rushes, and related genera that have similar growth forms and structure. A minimally disturbed wetland typically supports five or more genera of Grasslikes, some of which are dominant (i.e. very abundant) and some that are more sparsely growing.

### 4) Carex Cover

This metric is based on the extent of the wetland covered by members of the genus Carex (Sedge). There are several Carex species that are common dominant wetland species in Minnesota. The abundance of these species tends to decrease with an increase in disturbance, therefore the greater extent of Carex in the wetland the higher the score.

### 5) Utricularia Presence

Utricularia (Bladderwort) is a genus of carnivorous plants that feed on microinvertebrates. As such, presence or absence of Utricularia is indicative of stresses to both wetland plants and animals. Bladderwort's presence in a wetland suggests good condition.

### 6) Aquatic Guild

Ecologists have long sought to classify plants into groups based on growth forms or how they function in the environment. This metric specifically considers the aquatic plants (plants that float on the water surface or grow entirely underwater). Because of their habitat requirements, aquatic plants can be sensitive to changes in the aquatic environment, such as turbidity. The richness of aquatic plants tends to decrease as human disturbance increases.



# WETLAND CONDITION ASSESSMENT

Wetland condition assessment using the citizen vegetation IBI can be broken down into four basic steps:

**1 SITE SELECTION**

**2 FIELD SAMPLING**

**3 METRIC SCORING**

**4 IBI INTERPRETATION**

Before you can go through this process it is important that you identify why you want to do a wetland condition assessment. Ask yourself the following questions:

- *What are the specific questions that need to be answered by conducting assessments?*
- *Is this a WHEP sponsored activity and if so are there any specific outcomes?*
- *Are there specific educational goals?*

A good plan will aid you throughout the entire process by highlighting some overall goals and objectives.



## 1 SITE SELECTION

There are three major factors that need to be considered when you are selecting potential wetland study sites:

### 1) Is the site samplable?

The IBI is designed for use in depressional wetlands with emergent marsh vegetation in Central Minnesota. The applicability of the IBI in other wetland types and geographic areas has not been tested; therefore, it is unknown whether the IBI can perform well as an indicator in other wetland settings. Because of this, use of the IBI to assess river floodplains wetlands, lakeshore, temporary forest pools, bogs, forested wetlands, and wet meadows is discouraged.

### 2) What are the needs of your WHEP sponsor?

If you are assessing wetlands as part of a WHEP sponsored effort, the sponsor (e.g. city, county, etc) may have specific wetlands they need to have assessed.

### 3) Is the wetland or access to the wetland on private property; and if so, do you have permission to sample?

Many of the wetlands in the Twin Cities metro area are on public lands. However, smaller wetlands and wetlands outside of the metro may be privately owned. Also, a wetland may be publicly owned but completely surrounded by private land. Always obtain landowner permission before entering private property.

## 2 FIELD SAMPLING

The vegetation IBI requires information about the different kinds of plants growing in the wetland as well as information about how abundant those plants are. There are numerous ways to sample plant communities to gather these data. You may have heard about sample plots or sampling along transects. The sampling technique presented here is a method adapted from the Department of Natural Resources County Biological Survey and Natural Heritage Program (<http://www.dnr.state.mn.us/mbs/index.html>). This sampling method originates from Europe and is called a releve (pronounced rel-eh-vay) sample. Essentially a releve is one large plot which is used to characterize the target plant community.





The sampling protocol consist of six parts:

- 1) Record Site Information
- 2) Determine a location for a representative plot
- 3) Lay-out the plot
- 4) Record releve information
- 5) Identify plants within the plot
- 6) Estimate Cover

## 1) Record site information

Some basic site information should be recorded when you arrive at a selected wetland. Please record this in the site information field sheet (p.87). You should record location information, a brief site description, and draw a rough sketch of the wetland.

The location information is extremely important to document because wetlands can sometimes be confused with each other, particularly in an area that has many wetlands. If a Global Positioning System (GPS) unit is available from your local sponsor or someone in your team has one or GPS coordinates are available by smart phone or other mobile device, please record the coordinates of the wetland in UTM (Universal Transverse Mercator) units, giving the easting (x) and northing (y) coordinates and the GPS datum. If a GPS is not available, the next preferred method of location information is recording Township, Range, and Section coordinates from US Geological Survey topographic maps. Your local sponsor may be able to provide the maps to you. Finally, if neither of these two options is available, please record detailed street directions to the wetland.

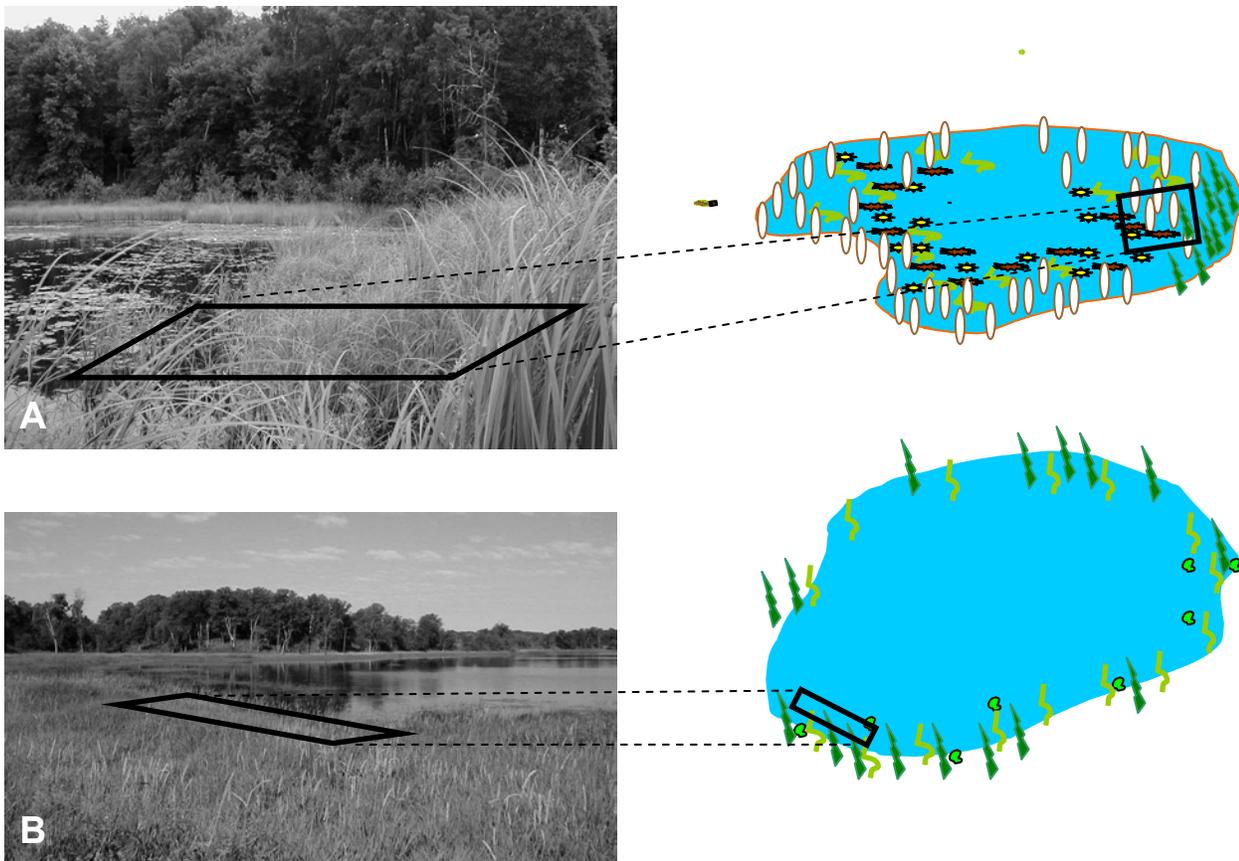
The site description and site sketch should include a lot of the same information. Please describe/sketch the different vegetation zones in the wetland, the approximate wetland size, the water pathways (inlets/outlets), surrounding land use practices, and any point source pollution inputs such as stormwater pipes.

## 2) Determine a location for a representative plot

The releve sampling method relies on the observer finding a “representative” location in the wetland that best characterizes the vegetation of the entire wetland to place the sampling plot. Keeping this in mind, you should spend some time determining the major plant communities in the wetland. This can be done while you are completing part 1. Ideally, you should find a place to view the entire wetland. If this can’t be done, spend some time walking around the margin of the wetland. Note the major vegetation types in the wetland. Don’t focus on specific plant species; instead look at the general vegetation patterns.

After you have identified the major vegetative patterns, determine where you would place one 100 m<sup>2</sup> sampling plot that would best capture or represent the vegetation types found in that wetland. This is usually at the emergent/aquatic vegetation interface (Figure 2). If the wetland has predominantly emergent vegetation, locate the plot in the wettest location of the wetland. If there is not an extensive emergent community present, locate the plot where you think one should be. None of the plot should be on higher ground that is not wet. Show the location of your plot on the site sketch.

The sampling methods presented here rely on a sampling plot with a standard size (100 m<sup>2</sup>). The shape of the plot though can be altered depending on the wetland vegetation. The majority of the time, you will use a sampling plot that is square and is 10 m on each side. However, when a wetland has a very narrow emergent fringe the plot can be altered to better capture the emergent/aquatic interface (Figure 2B). In this case you should lay-out a plot that is 5 m wide x 20 m long. As a general rule, only use the 5 x 20 m plot shape when the emergent vegetation fringe is < 5 m wide from the upland boundary to the aquatic vegetation/open water boundary.



**Figure 2.** Hypothetical lay-out of a 10 x 10 m (A) and a 5 x 20 m (B) plot in two wetlands. In wetland A there is a relatively wide and diverse emergent wetland fringe. Wetland B, on the other hand, has a very narrow emergent fringe. In the diagrams on the right the symbols represent different vegetation communities. In both cases the plots are located at the emergent/aquatic vegetation interface to capture as many of the different vegetation types as possible.



### 3) Lay-out the plot

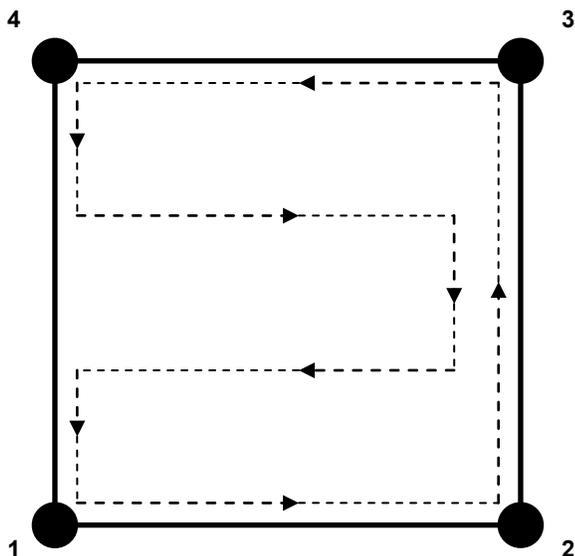
Once you have decided on the location and shape of the plot, you can begin to lay-out the plot. Keep in mind that you want to capture the emergent/aquatic vegetation interface; therefore a portion of the plot should be in each vegetation type. To lay-out the plot, first pick a point to be corner #1. Stake this corner with a tall gardening pole or wooden dowel. Using a tape measure (a 50 m vinyl tape measure is recommended), mark off the first side of the plot, holding the tape measure away from your body and walking outside of the plot area to avoid excessive trampling of the vegetation inside the plot. Stake this point (corner #2). Now turn 90 degrees using a compass, or your best visual judgment, and measure out the second side to corner #3. Repeat these steps, establishing corner #4 and enclosing the plot with four sides. The plot should have an area equal to 100 m<sup>2</sup>. Adjust the corners and sides if necessary.

### 4) Record releve information

A releve data sheet is provided on p. 88. At the top of this sheet there is space to record information about the sample plot. Record the releve shape, whether the location of the releve represents the vegetation of the wetland, the shallowest and deepest water depth in the plot, and a brief description of the wetland bottom, or substrate, in this space.

### 4) Identify plants within the plot

Next, inventory the plants within the plot. This is done by “walking the plot” (Figure 3). You must be careful to minimize trampling within the plot. It is ideal if only one or two people walk the plot while a third person records data. For the 10 x 10 m plot shape, begin by starting in corner #1 and walk just inside the plot toward corner #2.



Identify and record plants as you go. Proceed around the remaining edge of the plot. After passing corner #4 go about 1/3 of the way down the remaining side of the plot and cut through to the opposite side to observe the vegetation in the interior. When you get to the opposite side, move down another 1/3 of that side and cut through the plot again. Finally, return to corner #1. The plant inventory should now be complete. In very dense emergent vegetation it may be necessary to do a third interior path to be able to see the entire plot. For the 5 x 20 m plot shape, 4-5 interior paths may be necessary to complete the plant inventory.

Plants need to be identified to the genus level (there are a few general exceptions, see the identification guide p. 15). The common wetland plant genera for Central Minnesota are listed on the releve data sheet alphabetically within a descriptive grouping. These are the same plants described in the identification guide. There are also blank spaces provided to record plants that are not already listed on the releve data sheet. Record the genera you encounter in the plot by checking the “Pres”, or present, box on the releve data sheet for a corresponding genus.

Plants that are rooted outside of the plot but have stems or leaves extending over and into the plot, should also be included in the sample. For example, if there is a shrub that is clearly rooted outside of the plot, but the branches overhang the vegetation in the plot, that shrub should be recorded as present and the overhanging portion should be given a cover estimate.

There will be plants that you will not be able to identify in the field. It is still important to record these. The data can be used because most of the metrics don't require that you know exactly what a plant is, only that it's in a different genus than the others. If you can't identify a plant in the field, label it as an unknown plant (e.g. unknown grass #1) on the releve sheet. If you think you can identify the plant at home or in a lab, collect the plant in a plastic bag. Be sure to clearly label the bag with the site name, date, unknown plant name assigned to the plant, and the collector name. Plants can keep for several days in the refrigerator. If you can't get to the plant within this time period your best option is to press and dry the plant. Once you have identified the plant please make any necessary corrections to the releve data sheets before scoring the metrics.

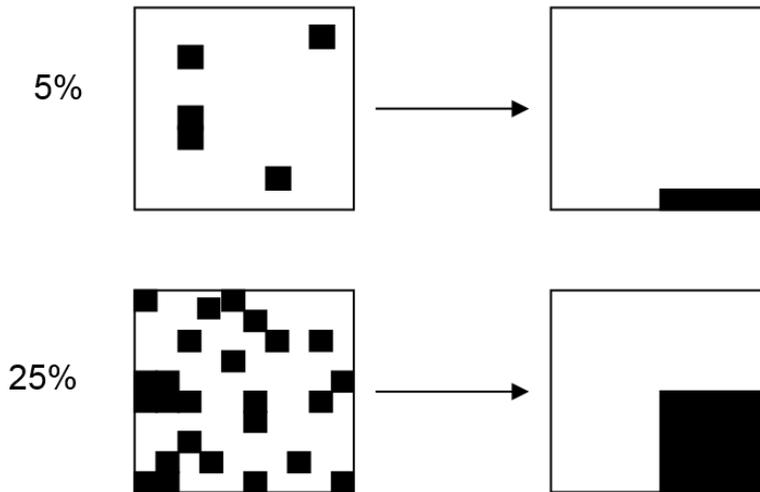
#### 4) Estimate Cover

Once all of the plants have been identified within the plot, the abundance of those plants can be estimated. Along with richness, abundance data is a basic ecological measurement. Abundance data can be collected in many ways, but probably the easiest method for plants is called cover estimation. Cover is the proportion, or percentage, of the plot area taken up by a particular plant when looking straight down on the plot. Cover estimations have been simplified by using a Cover Class (CC) system. A CC is a representation of a range of cover values (Table 1). Therefore, the observer only has to determine the range of cover a plant has instead of determining the exact cover percentage, making data collection easier.

Determine a CC (1 – 6) for each plant found in the plot and record this in the corresponding CC box on the Releve Data

**Table 1.** Cover Classes and corresponding ranges of cover.

Cover Class (CC)	Percent Cover Range
6	75-100%
5	50-75%
4	25-50%
3	5-25%
2	1-5%
1	0-1%



sheet. An easy way to do this is to visually pack plants into a corner and use that area as a reference (Figure 4). Another way to estimate cover for plants that are sparse is to count individual percentage points and add them up. As a point of reference for this approach, 1% of the plot equals 1 m<sup>2</sup>. This is because each plot is 100 m<sup>2</sup>. Don't labor over determining CC values. Discuss differing values as a team, and come to a decision as soon as possible.

**Additional Sampling Comments**

- A field equipment list is provided in Appendix 1 (p. 84).
- The field sheets provided in Appendix 2 (p. 88-89). Please photocopy these and record data on the photocopies.
- Sample during July and early August. The majority of wetland plants can be identified and peak annual growth occurs during this time frame.
- Because of the way that the plants are listed in the releve data sheet, two genera are listed multiple times, such as Potamogeton and Polygonum. Potamogeton has members that are either submergent or floating leaved aquatic forbs. Polygonum is a special case because one species (Polygonum amphibium) is a floating leaved aquatic forb and is counted in the Aquatic Guild metric, while the other species in the genus are all emergent forbs. If, or when, you encounter these particular duplicates you should count these separately and determine individual CCs and record a CC for the entire genus combined in the space for additional comments. This is because in some metrics they should be counted separately and in others they need to be combined.

**3 METRIC SCORING**

Before an IBI can be calculated for a wetland the individual metrics need to be scored. There are two reasons for this:

- All of the metrics need to be on the same scale. Some metrics are based on counts and others are based on percentages and cannot be combined before they are properly scaled.
- All of the metrics need to relate to human disturbance in the same way. Some of the metrics increase with increased disturbance and some decrease.

Metric scoring solves both of these problems. As an example, consider both the Vascular Genera and Persistent Litter metrics. The Vascular Genera metric is a count and ranges from 0 to over 20. The Persistent Litter metric is a percentage, so it really ranges from 0 to 1. If we were to add these two metrics together the Vascular Genera metric would “count” for much more of the total just because the scale is so different. In addition, the Vascular Genera metric tends to decrease with increased disturbance and the Persistent Litter metric tends to increase with disturbance. Again, if these two metrics were added together before being scored, they would have a tendency to cancel each other out in the IBI.

The most common IBI scoring convention is to assign a numerical rating to a raw metric value. The scoring criteria, or the “ratings”, are derived by what a biologist would expect the raw metric value to be at minimally disturbed sites (5), moderately disturbed sites (3), and very disturbed or degraded sites (1). For example, the Vascular Genera metric has the following scoring criteria:

<b>Plot Tally</b>	<b>Score</b>
≥20	5
9 - 19	3
0 - 8	1

If 22 different genera were found in a sample plot, that value would be considered indicative of a minimally disturbed wetland and the metric score would be 5. Once all of the metric values are reduced to a score they can be added together to compute the IBI.

Metric scoring sheets are provided on p.90 There are specific instructions and scoring criteria for each metric on the scoring sheets. As with the field data sheets, the scoring sheets should be used as templates. Please photocopy these and use the copies to score metrics.



## 4 IBI INTERPRETATION

An IBI score can be interpreted as a wetland condition assessment according to the IBI assessment guidelines provided in the summary section on the scoring sheets (p. 92). These guidelines are based on the same principles used to score the individual metrics. Meaning that at minimally disturbed, or reference, wetlands we would expect most of the metrics, and therefore, the IBI to score high and vice versa at severely disturbed sites.

The vegetation IBI has been developed to be a reliable indicator of wetland condition; however, ecological condition can be defined in different ways and people can make mistakes that can lead to interpretation inconsistencies. Keeping this in mind, take a moment to evaluate your IBI assessment and comment on it in the additional site remarks space on the last page of the scoring sheets (p. 93). You should ask yourself if the IBI was applied under the correct wetland type, geographic setting, and season. You should also ask if the releve sample accurately characterized the vegetation in the wetland. If, for example, a wetland was a mosaic of Cattail (*Typha*) patches and aquatic communities and the sample plot was located only on a *Typha* patch, the IBI score for the wetland would be artificially low because the entire plant community was not represented adequately in the releve. These are the types of errors you should pay particular attention to. In addition, sometimes a native wetland plant community can be low in diversity but have an “excellent” condition. An example of this are Wild Rice (*Zizania*) ponds which can be relatively low in diversity but known to have a high condition because *Zizania* is very sensitive to hydrologic changes and sedimentation. The important thing to account for is if the IBI assesses the site accurately and why.

## WETLAND PLANT IDENTIFICATION GUIDE

The Wetland Plant Identification Guide on pages 16-81 is intended for use in depressional wetlands in Central Minnesota; therefore, the accuracy of the key decreases if used in different wetland types and in different geographic regions.

Plants are identified to the genus level with two general exceptions. The first is the use of higher taxonomic divisions for the nonvascular plants (Mosses and Lichens), because identification of these plants to genus is too difficult for this guide. The second is the use of full species names for some selected plants that only occur in wetlands. The plant guide primarily uses Latin scientific names as opposed to common names (though common names are given in parentheses), because they are more precise and in general more stable.

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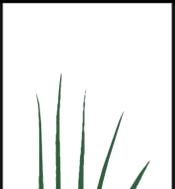
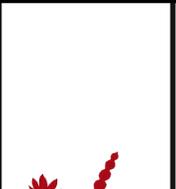


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Woody Plants	Moss & Lichen	Emergent Plants	Grasslike Plants	Floating Rooted Plants	Submersed Plants	Free Floating Plants
						
Page 24	Page 31	Page 32	Page 50	Page 57	Page 59	Page 64

## How to Use the Plant Key

Botanists use what are called dichotomous keys to identify plants. Dichotomous keys consist of a series of pairs, or “couplets”, of descriptions which are pathways for identifying an unknown plant. A plant is identified by choosing the description in a couplet that best applies to the plant and then the user proceeds to the next couplet indicated. This is repeated until ultimately the plant is identified.

The key provided in this guide relies on similar principles. Plants are identified by following a series of descriptions. To identify a plant, first start at the top of the next page. Choose the description that best fits the plant in question and go to the corresponding page given. Once at that page, start at the top and repeat the same process until you have identified the plant. The additional information given in the detailed plant descriptions (pp. 66-77) will also be useful for identification. The corresponding plant description # can be found next to the common name for each plant.



**WOODY PLANTS**

*p. 24-30*

Plants with woody stems, such as shrubs, vines, and trees.



**MOSS & LICHEN**

*p. 31*

Nonvascular plants growing on various surfaces like rocks and downed trees.



**EMERGENT PLANTS**

*p. 32-48*

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .



**GRASSLIKE PLANTS**

*p. 50-56*

Plants with flat linear leaves arising from distinct stems or basal, or leaves round and like the stem in appearance.



**FLOATING ROOTED PLANTS**

*p. 57-58*

Aquatic plants that are rooted in the bottom of the wetland and have leaves that float on top of the water surface.



**SUBMERSED PLANTS**

*p. 59-63*

Aquatic plants that have stems and leaves that grow entirely underwater growing near shore to the deepest part of the littoral zone.



**FREE FLOATING PLANTS**

*p. 64-65*

Aquatic plants that float on the surface of the water, such as duckweed.



## Woody Plants

Plants with woody stems, such as shrubs, vines, and trees.

### VINES

#### VITIS riparia

(Wild Grape) #88

*Leaves:* simple, alternate, cordate, toothed margins

*Flowers:* tiny white flowers, May-June

*Fruit:* blue-black grape, 6-15mm, Aug-Oct

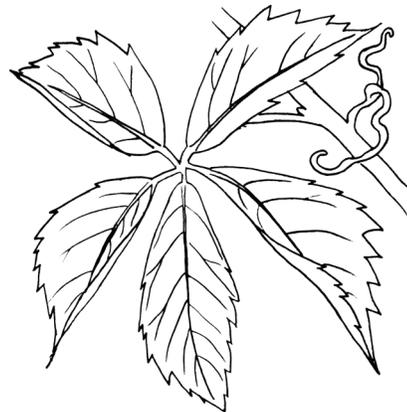


#### PARTHENOCISSUS

(Virginia Creeper) #52

*Leaves:* compound, 5 leaflets, alternate, toothed margins, young leaflets are red and turn green as they mature

*Flowers:* tiny yellowish-green clustered flowers, June-Aug





## SHRUBS OR TREES

***Opposite, compound leaves: go to page 26***



***Opposite, simple leaves: go to page 27***



***Alternate, compound leaves: go to page 28***



***Alternate, simple leaves: go to pages 28-30***





## Woody Plants

Plants with woody stems, such as shrubs, vines, and trees.

### SHRUBS OR TREES

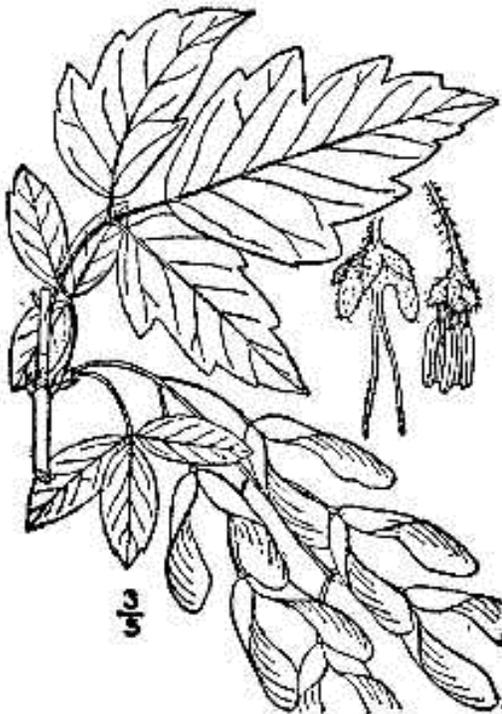
#### Opposite, compound leaves

##### **ACER negundo**

(Box Elder) #2

*Leaves:* compound, 3-5 notched or lobed leaflets, toothed margins, dark green above and lighter green below

*Bark:* twigs are green to purplish, bark is finely ridged, grayish to dark brown, sometimes with a greenish tinge



##### **FRAXINUS**

(Ash) #31

*Leaves:* compound, 7-11 leaflets, smooth or finely toothed margins

*Bark:* smooth on a young tree, diamond-like pattern on mature trees





## SHRUBS OR TREES



### Opposite, simple leaves

#### ACER

(Maple) #1

*Leaves:* 3 lobed or 5 lobed, leaf margins deeply cut, toothed margins, turns red or yellow in fall

*Bark:* smooth grey bark on a young tree, scaly plates on mature trees



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#### RHAMNUS cathartica

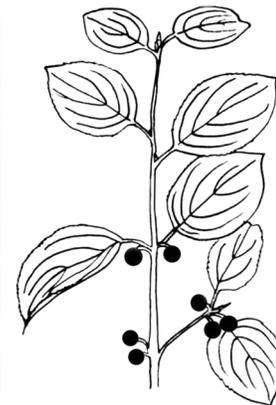
(Common Buckthorn) #64

*Leaves:* oval-shaped with pointed tip, glossy, finely toothed margins, 3-5 pairs of leaf veins, can be opposite and/or alternate, tips of twigs armed with a short, sharp thorn

*Bark:* smooth, greyish bark on a young trees with raised light horizontal bumps, flaked bark on mature trees, cut exposes orange heartwood



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#### CORNUS

(Dogwood) #20

*Leaves:* ovate, leaf veins curve parallel to the margins, smooth or wavy edges, turns red in fall

*Bark:* scaly, can pull off pieces



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## Woody Plants

Plants with woody stems, such as shrubs, vines, and trees.

### SHRUBS OR TREES

#### Alternate, compound leaves

##### RUBUS

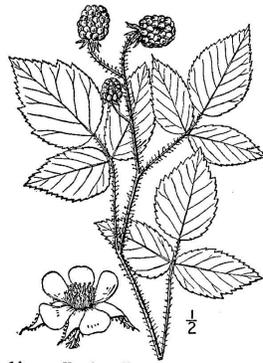
(Raspberry, Blackberry) #67

*Leaves:* compound, 3-5 leaflets per leaf (typically 3), toothed margins

*Stems:* woody, sometimes hairy, with prickles

*Flowers:* 5 petals, white, in mid-May to late June

*Fruit:* red-black berry, mid-late summer



#### Alternate, simple leaves

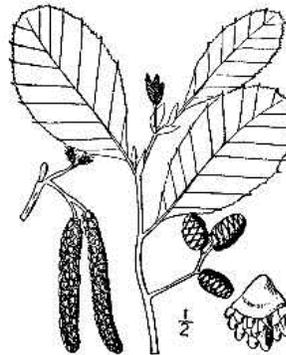
(Pages 28-30)

##### FRANGULA alnus

(Alder Buckthorn) #30

*Leaves:* oblong, elliptical, tip rounded or with an abrupt point, smooth margins, top glossy, bottom smooth or finely haired

*Bark:* reddish bark with white spots on a young tree, grey bark and rarely larger than 4" diameter when mature





**SHRUBS OR TREES**

**Alternate, simple leaves (continued)**



**QUERCUS**

(Oak) #62

*Leaves:* pointed or round lobes, depending on species, sinuses between lobes may be deep or shallow, and wide or narrow, also dependent on species.

*Bark:* hard, grey bark with deep grooves and ridges



**POPULUS**

(Aspen, Popple, Cottonwood) #59

*Leaves:* oval-shaped, short pointed at the end, finely to coarsely toothed margins, 1" - 4"

*Bark:* smooth, light grey to greenish grey bark with dark brown or black areas at base of limbs or bottom of trunk on young trees, warty and deeply furrowed on mature trees

*Seeds:* cottony mass (catkin) in late spring



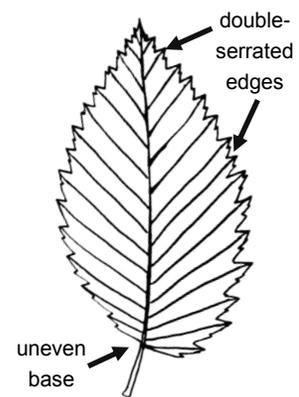
**ULMUS**

(Elm) #83

*Leaves:* oval, base of leaf is uneven, double-toothed margins

*Bark:* light grey to dark gray-brown, rough and coarse, with intersecting ridges

*Seeds:* round, flat and covered by a thin, paper-like casing that hooks at the top in late spring





## Woody Plants

Plants with woody stems, such as shrubs, vines, and trees.

### SHRUBS OR TREES

#### Alternate, simple leaves (continued from Page 29)

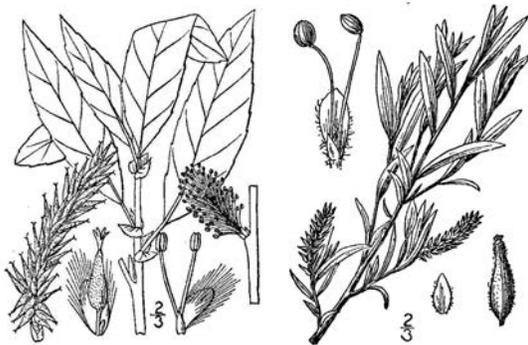
#### SALIX

(Willow) #70

**Leaves:** linear-lanceolate, margins serrate or entire, darker green upper and light green/gray on underside of leaf

**Bark:** gray, smooth or slightly rough

**Flowers:** in catkins in the spring



#### SPIRAEA alba

(Meadowsweet) #78

**Leaves:** narrow, oval-elliptic with a pointed tip, sharply serrated margins, hairless, short stalk

**Stem:** smooth, woody and dull brown-reddish

**Flowers:** 5 white petals on flowers in densely packed clusters, almost look fuzzy, in summer



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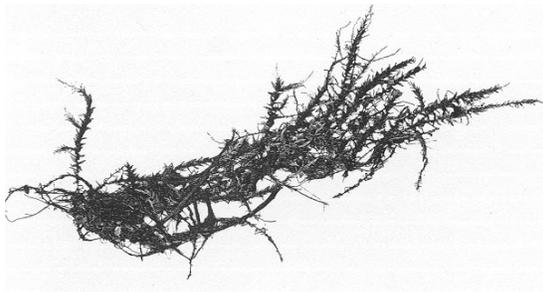


# Moss & Lichen

*Nonvascular plants growing on various surfaces like rocks and downed trees*

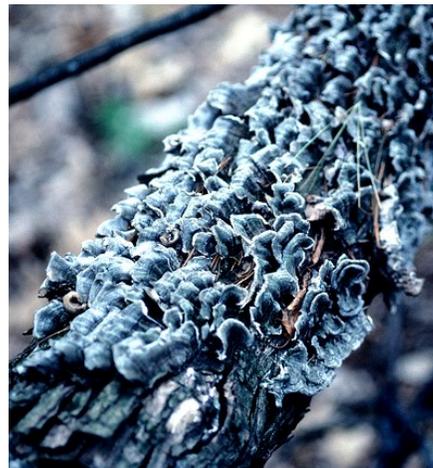
## MOSS Non vascular

**Characteristics:** simple type of plant, flowerless, grows in moist locations, reproduces through regeneration from tiny pieces of leaves or stem or by spores, spores grow into a branching green thread, usually multiple plants will grow together, forming dense clumps or mats



## LICHEN Non vascular

**Characteristics:** not really a plant, created from the symbiosis of fungus and algae, no roots, most often looks leaf-like, flattened, lobed, sometime take on a scale-like appearance on rocks or branches

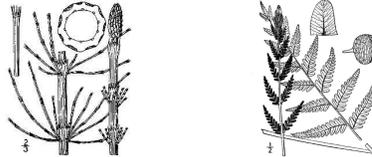




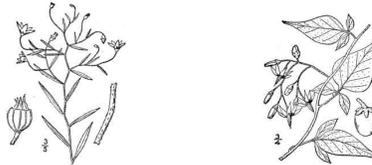
## Emergent Plants

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .

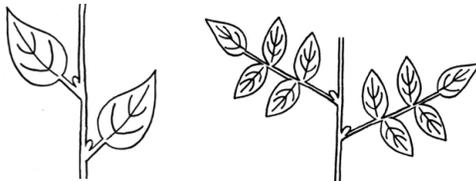
**LOW VASCULAR PLANTS: go to page 33**



**SPRAWLING OR TWINING FORBS: go to pages 34-35**



**ALTERNATE LEAVED FORBS: go to pages 36-39**



**OPPOSITE LEAVED FORBS: go to pages 40-45**



**BASAL LEAVED FORBS: go to pages 46-48**





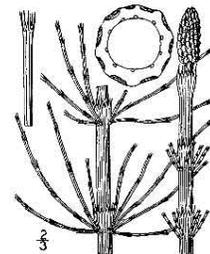
# LOW VASCULAR PLANTS

## Horsetails

### *EQUISETUM*

(Horsetail) #27

Stems can be easily pulled apart at the nodes, spores produced in terminal cone-like structures



## Ferns

### *ONOCLEA sensibilis*

(Sensitive Fern) #50

*Frond:* 12-30 inches long  
*Pinnae:* shallowly lobed  
*Sori:* early summer in structures along branch



### *THELYPTERIS palustris*

(Marsh-Fern) #81

*Frond:* 6-30 inches long, lanceolate shaped  
*Pinnae:* deeply lobed, smooth  
*Sori:* located on backside of pinnae



### *OSMUNDA*

(Cinnamon Fern, Interrupted Fern)

#51

*Frond:* up to 40 inches long, 10 inches across  
*Pinnae:* deeply lobed or compound  
*Sori:* emerging below pinnae or on a separate stalk





## Emergent Plants

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .

### SPRAWLING AND/OR TWINING FORBS

#### CAMPANULA

##### aparinoides

(Marsh-Bellflower) #14

**Leaves:** very thin leaves, alternate, widely-spaced toothed margins, little or no leaf stalk

**Flowers:** white stamens and petals, 5 petals on flower, June– August

**Stem:** weak, rough, hairy, 3-sided, with short, hooking bristles



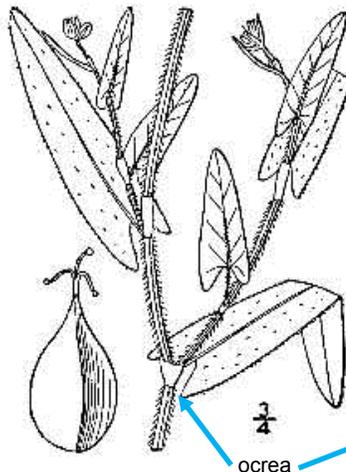
#### POLYGONUM

(Smartweed) #57

**Leaves:** lanceolate, alternate, smooth edges with short hairs, pointed tip, approx. 4-8" long and 1/2-2" wide, sometimes has a dark blotch on surface

**Stem:** light green to red, swollen nodes covered with a distinct sheath (ocrea), may zigzag between leaves

**Flowers:** small, five-parted pink or rose colored flowers on a short spike, July-September





**SPRAWLING AND/OR TWINING FORBS (continued)**

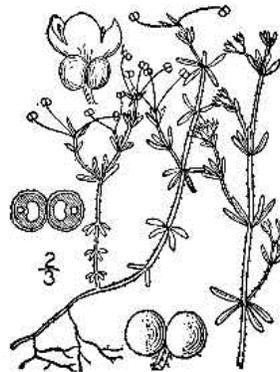
**GALIUM**

(Bedstraw) #32

**Leaves:** whorled leaves in groups of 4-6, blunt or rounded tips, stalkless

**Stem:** rough, hairy, smooth and square

**Flowers:** 3-4 white petals, in clusters of three flowers typically, blooms all summer



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**LATHYRUS**

(Wild Pea) #38

**Leaves:** alternate, pinnately compound with leaflets attached opposite, leaflets linear-lanceolate, 2 1/2" long and 1/2" wide

**Flowers:** pink/blue/purple flowers in clusters, blooms in summer

**Stem:** a twining tendril at the end of the leaf stem, leafy stipules attached at leaf joints



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**SOLANUM dulcamara**

(Nightshade) #74

**Leaves:** ovate, compound and/or deeply lobed, dark green to purplish, smooth edges, crushed leaves have an unpleasant smell

**Stem:** hairless to sparsely hairy, lack tendrils, lower stem is woody

**Flowers:** star-shaped, purple, 5 petals, stamens fused in a prominent yellow cone; grow in clusters along branches, blooms all summer



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## Emergent Plants

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .

### ALTERNATE LEAVED FORBS

*Simple leaves: go to pages 37-39*

### Compound leaves

(Pages 36-37)

#### CICUTA

(Water-Hemlock) #18

**Leaves:** twice compound, leaflets 1-35mm wide, 2-4 inches long, sharply toothed, leaf veins stop at the bottom of leaf serrations and not at the tips, which helps to identify this plant

**Flowers:** tiny white flowers with 5 petals that grow in clusters 2 -8" wide, spring, early summer

**Stem:** smooth, hollow and often with purplish-green striations.

**Caution:** this plant is poisonous.



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Leaf vein ends in notch

#### POTENTILLA (Comarum ) *palustre*

(Marsh-Cinquefoil) #61

**Leaves:** 5-7 toothed leaflets, leaves nearest to the flowers sometimes have just three leaflets., rounded at the tip

**Stem:** sprawling, bottom of stem is reddish-brown, woody, smooth, fine hairs below flowers

**Flowers:** reddish purple flower, five red sepals bigger than its five petals , summer



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**ALTERNATE LEAVED FORBS**

**Compound leaves (continued)**

**SIUM suave**

(Water-Parsnip) #73

**Leaves:** Leaves alternate, 1/4" - 1/2" wide, 2"-5" long, with fine sharply pointed teeth

**Flowers:** convex clusters of 1/8" flowers with 5 heart-shaped white petals, July-Sept

**Stem:** smooth, hollow and often with purplish-green striations.



**Simple Leaves**

(Pages 37-39)

**Note:** The following two plants (*Epilobium* and *Impatiens*) can sometimes appear opposite

**EPILOBIUM**

(Willow-Herb) #26

**Leaves:** alternate but can be so close together it appears opposite on bottom and top of stem, narrow, lanceolate, rounded base, pointed tip

**Stem:** round, often tinged with red, short hairs off the leaf stalks near the top of the plant

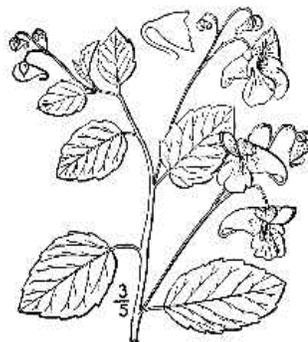


**IMPATIENS**

(Jewelweed, Spotted Touch-me-not) #35

**Leaves:** egg-shaped, poorly defined teeth, slender long stalks, alternate but often have some opposite leaves

**Stem:** round, almost transparent, and watery





# Emergent Plants

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .

## ALTERNATE LEAVED FORBS

## Simple leaves *(continued)*

### EUTHAMIA

(Grass-leaved Goldenrod) #29

**Leaves:** grass-like, narrow to linear, less than 10 mm wide, stalk-less, 2–4 inches long, leaves have three distinct parallel veins, may be scented when crushed

**Stem:** light green, smooth to slightly ridged and may have scattered hairs



### SOLIDAGO

(Goldenrod) #75

**Leaves:** typically about 4-6 inches long and 1/2 –1 inch wide, stalk-less, finely toothed margins, 3 parallel veins, hairy underside along veins, upper side has a rough texture

**Stem:** long, woody, smooth, sometimes deep red in color, may have small soft hairs in upper half below the flowers





ALTERNATE LEAVED FORBS

Simple leaves (continued)

ASTER

(Aster) #8

**Leaves:** typically 4-10 inches long and 1/2 - 1 1/4 inch wide, tapering to a sharp point at the tip, with fine widely spaced teeth and a prominent center vein, leaves clasping at the stem

**Stem:** may be red-purple in color, sparsely to densely covered in stiff white hairs.

**Flowers:** form in clusters at the top of the plant, 1 to 1 1/2 inches across with 12 -60 petals, white to pink or light purple, late summer



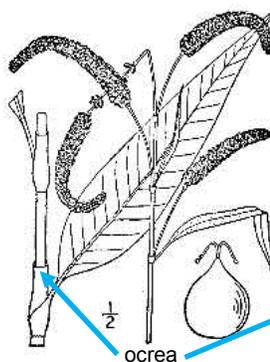
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POLYGONUM

(Smartweed) #57

**Leaves:** lanceolate, smooth edges with short hairs, pointed tip, approx. 4-8" long and 1/2-2" wide, sometimes has a dark blotch on surface

**Stem:** light green to red, swollen nodes covered with a distinct sheath (ocrea), may zigzag



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CIRSIUM

(Thistle) #19

**Leaves:** margins with very sharp spines (one species without), stalkless, immature leaves are basal

**Stem:** light green, slightly ridged and may have scattered hairs

**Flowers:** purple to pink, summer



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## Emergent Plants

Herbaceous, emergent plants with broad or linear leaves that are not grasslike and are growing on saturated soil or clearly growing above the water surface .

### OPPOSITE LEAVED FORBS

#### Compound leaves

##### **BIDENS**

(Beggar-Ticks) #9

**Leaves:** opposite, 3-5 leaflets, ovate to lanceolate, toothed, underside may have short hairs

**Stem:** green to red tinged to purple, smooth, may have fine hairs

**Flowers:** orange-yellow, small disk flowers surrounded by 5-9 green leafy bracts, blooms in late summer



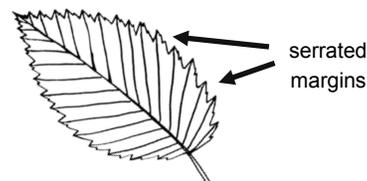
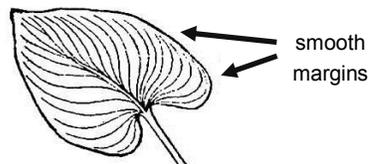
#### Simple leaves

(Pages 41-45)

**Square or angled stem: go to pages 41-42**

**Round stem, smooth margins: go to page 43**

**Round stem, serrated margins: go to pages 44-45**





**OPPOSITE LEAVED FORBS**

**Simple leaves (continued)**

**Square or angled stem**

(Pages 41-42)

**MENTHA arvensis**

(Field Mint) #45

**Leaves:** opposite, short-stalked, toothed, with a pointed tip, underside has fine hairs, strongly mint scented when crushed

**Stem:** square, green or red in color, hairy

**Flowers:** axillary, small, white-light pink, whorled clusters, blooms July—Sept



**SCUTELLARIA**

(Skullcap) #72

**Leaves:** cordate-ovate to broadly lanceolate, hairless, regularly toothed, top of leaf is strongly veined

**Stem:** light green to pale reddish-green, square, hairless or with fine hairs

**Flowers:** axillary, relatively large, blue-purple, trumpet shaped, less than 1/2" long, no noticeable floral scent, blooms July—Sept



**LYTHRUM salicaria**

(Purple Loosestrife) #43

**Leaves:** whorled or opposite, lance-shaped with smooth edges, up to 4" long, may have tiny, soft hairs, stalkless

**Stem:** woody, erect, square to at times multi-angled, covered with fine hairs

**Flowers:** purple to pink, small flowers in spikes off top of plant, 5-7 petals, July - Sept





# Emergent Plants

Plants with woody stems, such as shrubs, vines, and trees.

## OPPOSITE LEAVED FORBS

## Simple leaves (continued)

### Square or angled stem

(continued from page 41)

#### LYCOPUS

(Bugle-Weed) #41

**Leaves:** lance-shaped, largely toothed, upper surface often rough, underside is hairless

**Stem:** square, green, hollow, may have short spreading hairs along angles

**Flowers:** axillary, small, white, in clusters



#### STACHYS palustris

(Hedge-Nettle) #80

**Leaves:** regularly toothed, hairy, lanceolate or narrowly ovate, heart-shaped base, 1/8" leaf stalk or stalkless, strongly veined, bumpy top surface

**Stem:** square, hairy

**Flowers:** lavender-pink, whorled around stem, 4 dark purple stamens, blooms June-August



#### VERBENA hastata

(Blue Vervain) #87

**Leaves:** lanceolate, regularly toothed sometimes 3-lobed, up to 7" long & 1" wide, short stalk, upper surface rough, lower surface finely haired

**Stem:** green to reddish, may have small hairs

**Flowers:** blue to pink, in long narrow spikes, 5 petals forming a short tube, blooms June—Sept





**OPPOSITE LEAVED FORBS**

**Simple leaves (continued)**

**Round stem, smooth margins**

(Pages 43-45)

**ASCLEPIAS incarnata**

(Swamp Milkweed) #7

**Leaves:** contain milky juice, narrow, lanceolate with sharp tips, hairless, entire margins, approx. 6" long, 1 1/2" wide

**Stem:** contain milky juice, mostly hairless

**Flowers:** pink-purple red, clustered at the top of a branching stem, blooms all summer



**LYSIMACHIA**

(Loosestrife) #42

**Leaves:** lanceolate, entire margins, almost stalkless leaves in whorls, may be finely haired along margins, sometimes wavy, dots may appear on lower surface

**Stem:** hairless main stem, leaf stalks hairy, unbranched throughout

**Flowers:** yellow, cup-shaped, five petals, blooms all summer



**HYPERICUM**

(St. John's-Wort) #34

**Leaves:** lanceolate to ovate, entire margins, pointed tip, underside lighter in color, no leaf stalk, dots or streaks on upper surface

**Stem:** hairless, erect, often branched in the upper third of the plant

**Flowers:** yellow-cream colored, five petals, July—August





## Emergent Plants

Plants with woody stems, such as shrubs, vines, and trees.

### OPPOSITE LEAVED FORBS

### Simple leaves (continued)

## Round stem, serrated margins

(continued from page 43)

### BIDENS

(Beggar-Ticks) #9

**Leaves:** lanceolate to oblong-lanceolate, serrated margins, sharp point at tip, short or missing stalk, mostly unlobed, leaf bracts below flower heads are smaller and elliptic or oblong in shape

**Stem:** light green to purple, hairless

**Flowers:** with distinct yellow rays, numerous disk florets, blooms August—October



### EUPATORIUM

(Joe-Pye Weed, Boneset) #28

**Leaves:** whorled or opposite, leaf pairs may form together and look like a single leaf surrounding the stem, broadly lanceolate to ovate, hairless

**Stem:** light green to purple, sometimes with purple spots, short leaf stalks

**Flowers:** compound flower, flat-dome shaped clusters, pink to purple, July—September





**OPPOSITE LEAVED FORBS**

**Simple leaves (continued)**

**Round stem, serrated margins** (continued from page 44)

**PILEA**

(Clearweed) #55

**Leaves:** translucent, ovate with pointed tip and wedge-shaped base, serrated, hairless, coarsely serrated, prominent central vein and two side veins, underside sometimes pale

**Stem:** translucent, smooth and shiny, leaf stalks are about half as long as the leaf itself

**Flowers:** no petals, 3-4 sepals, pale green, July- September



**URTICA dioica**

(Stinging Nettle) #84

**Leaves:** coarse with stinging hairs on underside, elliptic to lanceolate with tapered end, toothed, prominent veins

**Stem:** coarse with stinging hairs

**Flowers:** catkins of tiny, light green-pink flowers grow from the leaf axils., appear fuzzy, blooms all summer





## Emergent Plants

Plants with woody stems, such as shrubs, vines, and trees.

### BASAL LEAVED FORBS

**Linear, sword-like leaves: go to pages 48-49**

### Broad leaves

(Pages 46-48)

#### ANEMONE canadensis

(Canada Anemone) #6

**Leaves:** surfaces finely hairy, 3-5 deeply divided wedge-shaped lobes, serrated margins

**Flowers:** white, 5 petals, yellow-tipped stamens in center, blooms May-July

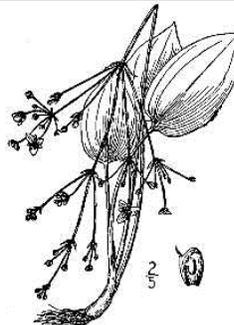


#### ALISIMA

(Water-Plantain) #5

**Leaves:** elliptic, never narrow, long leaf stalk, veins are parallel, entire margin, dark green, pointed tip, hairless

**Flowers:** in a panicle arrangement, white, 3 petals, blooms all summer



#### RUMEX

(Dock) #68

**Leaves:** lanceolate-ovate, large, 10-60cm long (up to 2 m tall), leaf edges may curl

**Stem:** green to reddish, sometimes ribbed

**Flowers:** distinct flowering stalk stout, 3 sepals, no petals, blooms early-mid summer





**BASAL LEAVED FORBS**

**Broad leaves (continued from page 46)**

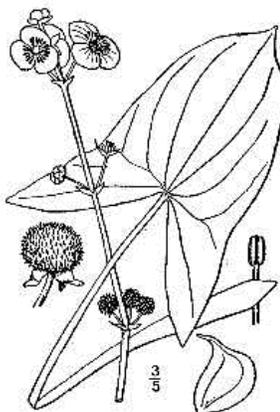
**SAGITTARIA**

(Arrowhead) #69

**Leaves:** often arrow shaped, sometimes elliptic, entire margins, hairless, basal lobes at least half as long as remainder of the leaf, can be broad or thin

**Stalk:** basal leaves surround the taller stalk, somewhat milky sap

**Flowers:** showy, white petals, whorled around stem, blooms July—September



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**CALLA palustris**

(Water-Arums, Wild Calla) #12

**Leaves:** cordate (heart-shaped) with entire margins, typically as wide as it is long, waxy, pointed tip, lateral veins are curved-ascending, margins sometimes curl inward toward the midrib

**Stem:** stout, sheathed at the base

**Flowers:** inflorescence creamy white, flowering stalk, blooms late spring to early summer



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**CALTHA palustris**

(Marsh Marigold) #13

**Leaves:** cordate-kidney shaped, scalloped (sometimes toothless) margins, glossy, palmate venation

**Stem:** thick, hollow, branching stem, hairless, limp, stipules surround stem like a sheath

**Flowers:** clusters of bright, shiny, buttercup-like yellow flowers with yellow stamens, blooms April—May



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## Emergent Plants

Plants with woody stems, such as shrubs, vines, and trees.

### BASAL LEAVED FORBS

#### Linear, sword-like leaves

(Pages 48-49)

#### SPARGANIUM

(Bur-Reed) #76

**Leaves:** triangular in cross-section or with a triangular raised midrib on one side

**Stalk:** stout, branched, flower stalk may zig-zag

**Flowers:** staminate (male) flowerheads are located above the pistillate (female) flowerheads on the same branch, staminate flowerheads are smaller, pale yellow when they bud and bright white when in bloom from May to August



Source: [www.bwsr.state.mn.us](http://www.bwsr.state.mn.us)

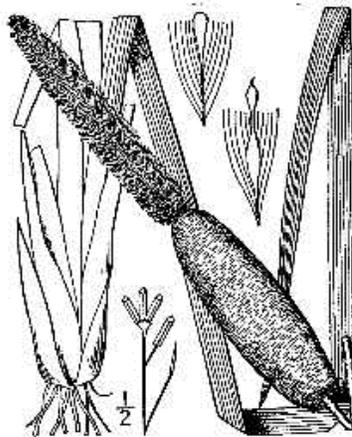
#### TYPHA

(Cattail) #82

**Leaves:** flat or crescent shaped in cross-section, narrowleaf 4-10mm wide and taller than flower spike, broadleaf 14-23mm wide and shorter than flower spike

**Base:** base of plant is round

**Flowers:** staminate (male) above pistillate (female) on flower spike



Source: [www.bwsr.state.mn.us](http://www.bwsr.state.mn.us)



**BASAL LEAVED FORBS**

**Linear, sword-like leaves (continued)**

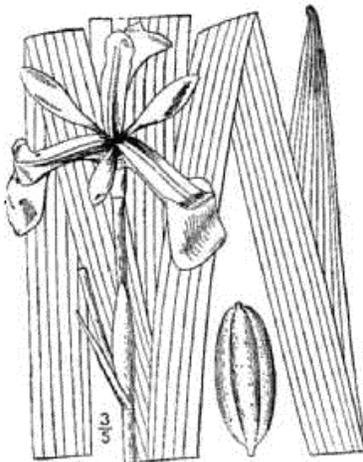
**IRIS**

(Iris, Flag) #36

**Leaves:** nearly flat in cross-section to tapered at edges, waxy, sword-like

**Base:** base of plant is flattened, giving the plant a fan-like appearance

**Flowers:** blue to violet, 3 petals, blooms June-July



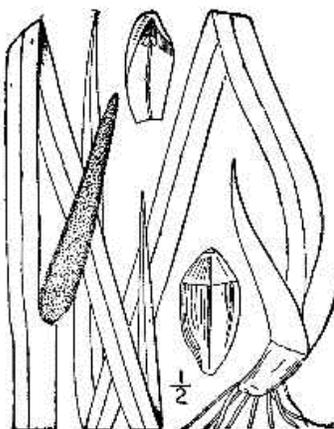
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**ACORUS**

(Sweet Flag) #3

**Leaves:** distinct raised midrib on both sides, sweetly aromatic when crushed, base of leaves may be white or reddish, parallel veins to midrib

**Flowers:** finger-like spike with yellow to brown flowers, blooms June-July



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**Cross-sections of leaves:**



Sparganium



Typha



Iris



Acorus





## Grasslike Plants

Plants with flat linear leaves arising from distinct stems or basal, or leaves round and like the stem in appearance.

### STEMS ROUND, leaves two-ranked

*Without obvious leaves: go to page 56*

*With leaves, hollow stems: go to pages 52-55*

### STEMS TRIANGULAR, leaves three-ranked

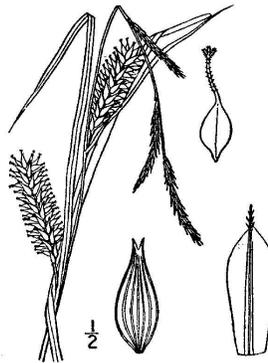
#### CAREX

(Sedge) #15

**Leaves:** blue-green, coarse, typically strongly m-shaped in cross-section

**Stem:** rough, triangular, may have a red base

**Flowers:** upper spikes male, lower spikes female, perigynium (bottle-shaped bract) surrounds each female flower, flowers may be stout or extend into a long throat or beak. which is divided at the tip into two teeth, male spikes are short-lived



Source:  
www.bwsr.state.mn.us





**STEMS TRIANGULAR, leaves three-ranked (continued)**

**CYPERUS**

(Flatsedge) #21

**Leaves:** light green to yellow-green in color, prominent midvein, somewhat folded, no sheath or collar

**Stem:** triangular, waxy

**Flowers:** behind scales, spikelets relatively long and flattened, straw colored or golden yellow, sticking out perpendicular to the stem



**SCIRPUS**

(also: *Schoenoplectus*)

(Bulrush) #71

**Leaves:** M-shaped in cross-section and leafy bracts below the inflorescence

**Stem:** leafy triangular stem

**Flowers:** flowers are behind brown scales, small spikelets crowded into dense, spherical heads, spikelets relatively ovoid, sometimes drooping



**DULICHIUM arundinaceum**

(Three-way Sedge) #22

**Leaves:** strongly 3-ranked

**Stem:** round, oval or slightly triangular in cross-section, hollow between leaf nodes

**Flower:** 7 -10 spikelets growing from the bases of the upper leaves, surrounded by greenish or brown scales





## Grasslike Plants

Plants with flat linear leaves arising from distinct stems or basal, or leaves round and like the stem in appearance.

### STEMS ROUND, leaves two-ranked

#### With leaves, hollow stems: GRASSES

*Ligules < 2mm -AND- leaves < 10mm wide: go to page 53*

*Ligules < 2mm -AND- leaves > 10mm wide: go to page 56*

#### Ligules > 2mm

(Pages 52-53)

#### PHALARIS arundinacea

(Reed-Canary Grass) #53

**Leaves:** leaf sheathes that enclose the stem and open near top, largest leaves > 10 mm wide, hairless, flat, come off stem at 45 degree angle, clear papery ligule

**Stem:** erect, smooth, up to 6 feet tall, tan coloring near the top

**Flowers:** dense flowerheads with hairless spikelets, panicle opens and widens during flowering, start off green-purplish in late spring/early summer and turn bleached tan color when mature later in summer



#### ZIZANIA palustris

(Wild Rice) #91

**Leaves:** 1-4.5 cm in width, strap-like, smooth, toothed margins

**Stem:** 2-3 meters tall, thick, spongy

**Flowers:** female (above) and male (below) flowers separate on same plant, open flower panicle





STEMS ROUND

GRASSES

Ligules > 2mm (continued)

GLYCERIA

(Manna-Grass) #33

**Leaves:** leaf sheaths completely closed, leaves strongly 2-ranked, hairless, slightly rough on upper surface, lower surface smooth, translucent 3-6mm long ligule

**Stem:** erect, flattened at base

**Flowers:** flowers in an open panicle, individual branches may lean to one side, purplish in early season



Source: www.bwsr.state.mn.us

CALAMAGROSTIS

(Reed Grass, Canada Bluejoint) #11

**Leaves:** leaf sheaths opening near top, 2 - 10 mm wide, papery ligule,

**Stem:** slender, unbranched, sometimes purplish towards base with purple joints

**Flowers:** spikelets on slender stalks with tufts of hair at base of flowers (unlike reed canary grass)



Source: www.bwsr.state.mn.us

Ligules < 2mm -AND- leaves < 10mm wide (Pages 53-54)

AGROSTIS

(Bent Grass, Redtop) #4

**Leaves:** delicate grasses usually growing in groups or tufts, can be rough to the touch, ligule occasionally > 2mm and bottom reddish purple

**Stem:** smooth and straight, up to 2 feet tall, may be curved at the base

**Flowers:** open panicle, seeds on thin branches with reddish purple tint, single seeded spikelet



Usually in moist to drier habitat that may be flooded short term due to precipitation



Source: www.bwsr.state.mn.us



## Grasslike Plants

Plants with flat linear leaves arising from distinct stems or basal, or leaves round and like the stem in appearance.

STEMS ROUND

GRASSES (continued)

Ligules < 2mm -AND- leaves < 10mm wide (continued)

### SPARTINA pectinata

(Prairie Cordgrass) #77

**Leaves:** stout tall grass with long wiry leaves, very finely toothed leaf margins (rough), ligule has short hairs

**Stem:** erect, up to 2 meters tall

**Flowers:** distinct one-sided flower head makes it easily distinguishable from other species



Source: www.bwsr.state.mn.us

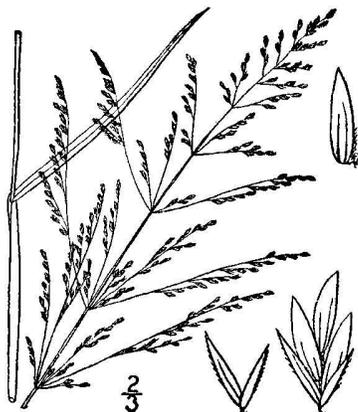
### POA

(Blue Grass) #56

**Leaves:** narrow and delicate ending with a boat keel shaped tip, truncate ligule

**Stem:** rounded or slightly flattened near the base, sometimes purplish at base

**Flowers:** flowers in an open panicle that is pyramidal, multiple flowers per spikelet, small hairs on lemma



Source: www.bwsr.state.mn.us



STEMS ROUND

GRASSES (continued)

**Ligules < 2mm -AND- leaves > 10mm wide**

**PHRAGMITES australis**

(Giant Reed) #54

**Leaves:** sheathed at base around stem, white fringed ligule approx. 1 mm long

**Stem:** Stems very stout, usually > 1 m tall, reddish near base, darkened distinct joints

**Flowers:** large panicles over a foot long, feathery with silky hairs at maturity



Source: www.bwsr.state.mn.us

**ECHINOCHLOA**

(Barn-yard Grass) #23

**Leaves:** 1-2 cm wide, smooth, slightly hairy margins, ligules absent

**Stem:** strong, up to 5 feet tall, sometimes purplish at base

**Flowers:** green or reddish purple spikelets with bristles on outer scales, densely flowered, spreading branches,



Source: www.bwsr.state.mn.us

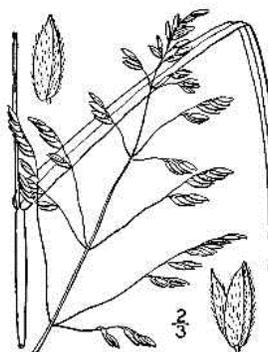
**LEERSIA**

(Cut Grass) #39

**Leaves:** ligule membranous, leaves very rough upper surface, finely toothed leaf margins

**Stem:** Stems weak and often sprawling, fuzzy ring around joints

**Flowers:** greenish-white, one per spikelet, spikelets on branch ends with stiff hairs, flower-head often drooping



Source: www.bwsr.state.mn.us



## Grasslike Plants

Plants with flat linear leaves arising from distinct stems or basal, or leaves round and like the stem in appearance.

### STEMS ROUND

### Without obvious leaves (or leaves round)

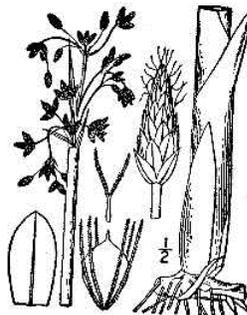
#### SCIRPUS

(Bulrush) #65

**Leaves:** 1-2 cm long near base or appearing leafless

**Stem:** strong, 1-4 feet tall, or rounded stem with air pockets that crushes easily

**Flowers:** spikelets 2-8mm long, 1-3mm



Source: www.bwsr.state.mn.us

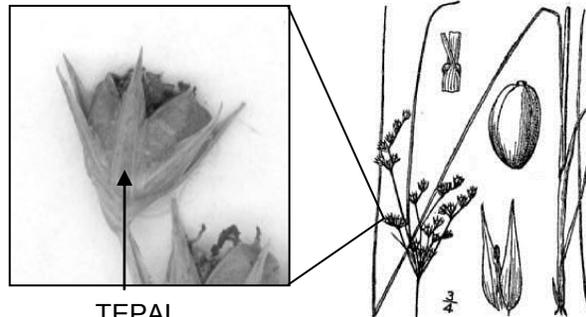
#### JUNCUS

(True Rush) #61

**Leaves:** With or without apparent leaves, but when present they are round in cross section

**Stem:** solid, round

**Flowers:** subtended by 6 scale-like tepals, flowers are bisexual, lateral or terminal



TEPAL

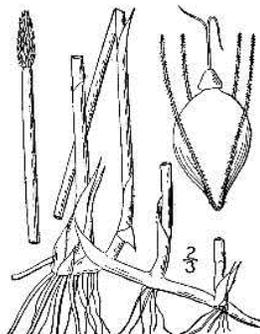
#### ELEOCHARIS

(Spike Rush) #60

**Leaves:** reduced to sheaths at the base of the stems.

**Stem:** soft stems, majority of stems tipped with a single spikelet

**Flowers:** single spikelet at tip of stem, 4-30mm long



Source: www.bwsr.state.mn.us



# Floating Rooted Plants

Aquatic plants that are rooted in the bottom of the wetland and have leaves that float on top of the water surface.

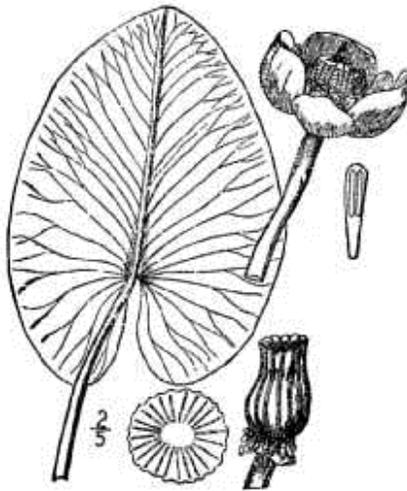
## NUPHAR

(Yellow Water Lily) #48

**Leaves:** oval to heart-shaped with a notch that is typically less than half as long as the midrib, rounded tip, in drought conditions, leaves may rise above water and margins may be wavy

**Stem:** flattened on one side and slightly winged

**Flowers:** yellow with reddish color inside, blooms June-August



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## NYMPHAEA odorata

(White Water Lily) #49

**Leaves:** light green above, reddish purple underneath, almost round, deeply notched almost to the center

**Stem:** attached at center, soft and spongy, smooth, sometimes have darkened stripes

**Flowers:** white or slightly pinkish, fragrant, open in the morning and close between mid-day and sunset



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## Floating Rooted Plants

*Aquatic plants that are rooted in the bottom of the wetland and have leaves that float on top of the water surface.*

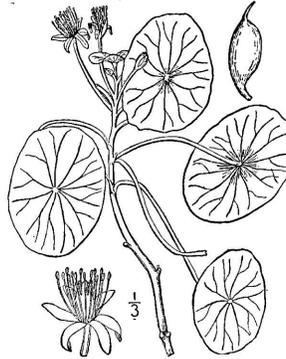
### BRASENIA schreberi

(Water Shield) #10

**Leaves:** oval without a notch, waxy, purplish on underside, petiole joins leaf in center

**Stem:** covered in mucus-like jelly

**Flowers:** red-purple, 3 or 4 petals that curve downwards, bloom June—August



### POLYGONUM amphibium

(Water Smartweed) #58

**Leaves:** ovate with distinct sheath surrounding leaf nodes, smooth margins, prominent mid-veins on underside, short leaf stalks or sometimes stalkless

**Stem:** stem nodes may be enlarged with purplish color and hair at leaf joints

**Flowers:** pink to red, 5-parted, cup-shaped petals, spiked terminal clusters, blooms all summer

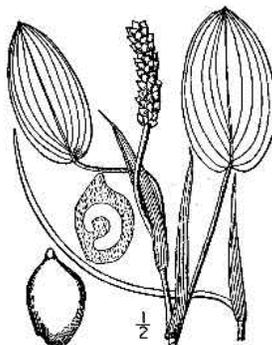


### POTAMOGETON

(Pondweed) #60

**Leaves:** surface leaves ovate-elliptic, underwater leaves otherwise, prominent mid-vein

**Flowers:** green-brown in a cylindrical spike above the water





# Submersed Plants

Aquatic plants that have stems and leaves that grow entirely underwater growing near shore to the deepest part of the littoral zone.

## OPPOSITE OR WHORLED LEAVES

**Compound leaves: go to page 61**



**Simple leaves: go to pages 62-63**



## ALTERNATE LEAVES (pages 59-60)

### POTAMOGETON

(Pondweed) #60

**Leaves:** simple, narrow linear to broad, a large genus with many species



Source: UW Stevens Point

Matthew L. Wagner



## Submersed Plants

Aquatic plants that have stems and leaves that grow entirely underwater growing near shore to the deepest part of the littoral zone.

### ALTERNATE LEAVES (continued)

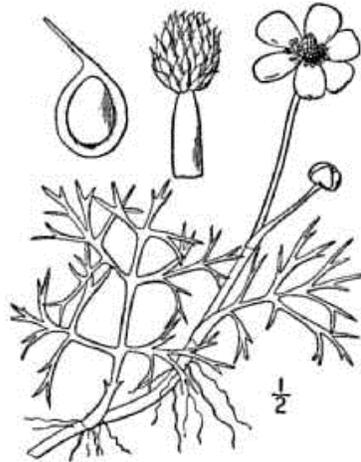
#### RANUNCULUS

(Water Crowfoot) #63

**Leaves:** branching, finely divided, typically fan-shaped, several times divided 2 or 3-parted, alternate off of main stem (not in whorls)

**Stem:** hollow, smooth

**Flowers:** white or yellow, typically 5 or 6 petals, yellow center, blooms June—August



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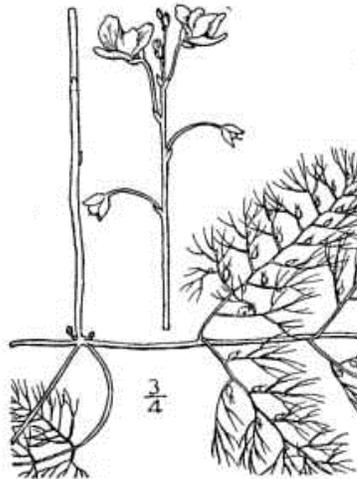
#### UTRICULARIA

(Bladderwort) #85

**Leaves:** alternate, two or more divisions from base, alternate branching with attached sac-like bladders

**Stem:** sometimes zig-zags between branches, no roots

**Flowers:** yellow, snapdragon-like flowers, blooms June—August



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# OPPOSITE OR WHORLED LEAVES

## Compound leaves

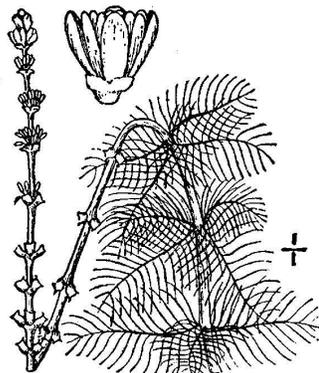
### MYRIOPHYLLUM

(Water Milfoil) #46

**Leaves:** in whorls of 3-5 around the stem, pinnately compound, 5-22 thread-like segments on each side of the midrib

**Stem:** multi-branched, sometimes reddish in color

**Flowers:** rise out of water, usually reddish



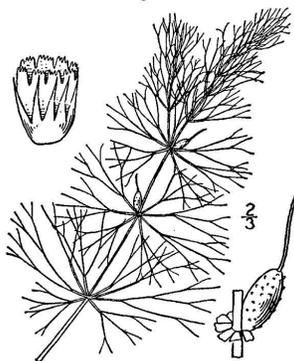
© Paul Skawinski  
Source: UW Stevens Point

### CERATOPHYLLUM

(Coontail) #16

**Leaves:** whorled and branching, whorls crowded at ends of stems, leaves relatively stiff, edges toothed with small spine at tip, spaced whorls closer at branch ends, leaves fork 1-2 times

**Stem:** long, trailing, no roots



© Dennis W. Woodland  
Source: UW Stevens Point

### MEGALODONTA beckii

(Water-Beggar-Ticks) #44

**Leaves:** opposite or whorled and branching, relatively weak, has broad above water leaves associated with flowers

**Stem:** limp, cannot support the plant out of water, rooted to lake bottom

**Flowers:** yellow, daisy-like flowers



© Linda W. Curtis  
Source: UW Stevens Point





## Submersed Plants

Aquatic plants that have stems and leaves that grow entirely underwater growing near shore to the deepest part of the littoral zone.

### OPPOSITE OR WHORLED LEAVES

#### Simple leaves

(Pages 62-63)

#### ELODEA

(Waterweed) #25

**Leaves:** opposite or whorled, 1-2 mm wide, more or less regularly spaced along the stem, typically only 3 leaves in the whorl, no leaf stalks

**Flowers:** 3 white petals with waxy coating

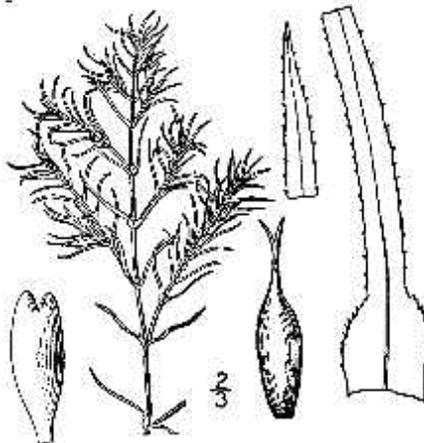


#### NAJAS

(Water Nymph) #47

**Leaves:** 0.2-2 mm wide, generally have narrow leaves that broaden at the base, leaves crowd towards the end of the stem

**Stem:** slender, branching





**OPPOSITE OR WHORLED**

**Simple leaves (continued)**

**ZANNICHELLIA**

**palustris**

**(Horned Pondweed) #90**

**Leaves:** long, thread-like, mostly opposite or arranged in whorls, leaf tips gradually taper to a point

**Stem:** slender, branching

**Seeds:** 2-4 horn-shaped seeds form in the leaf axils



(C) Paul Skawinski, 2009

Source: UW Stevens Point

**CHARA**

**(Muskgrass) #17**

**Leaves:** light green or gray-green, forked, gritty or crusty, strong musky odor when crushed

**Stem:** grows entirely underwater



Photo by Vic Ramey

**BASAL LEAVES**

**VALLISNERIA americana**

**(Water Celery) #86**

**Leaves:** long and ribbon like with a distinct light band down the middle, bluntly rounded tips, if you break it apart, it will sometimes create a snot-like string between the two segments

**Flowers:** small white-yellow flowers in late summer

Source: UW Stevens Point



(C) Paul Skawinski, 2009



Robert H. Read



## Free Floating Plants

Aquatic plants that have stems and leaves that grow entirely underwater growing near shore to the deepest part of the littoral zone.

### WITH ROOTS OR RHIZOIDS

#### RICCIOCARPUS natans

Non vascular

(Purple-Fringed Riccia) #66

**Leaves:** irregular shaped, dark brown to black color underneath, occasionally hints of purple underneath

**Roots:** More than 12 rhizoids per individual

**Size:** 6 – 15 mm



#### SPIRODELA polyrhiza

(Greater Duckweed) #79

**Leaves:** irregular round or oval shape, green above reddish purple below

**Roots:** 2 or more roots per frond, about as long as the thallus body

**Size:** 3 – 5 mm X 8 – 10 mm



Source: [www.bwsr.state.mn.us](http://www.bwsr.state.mn.us)

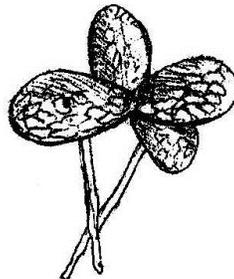
#### LEMNA

(Duckweed) #40

**Leaves:** green above and below

**Roots:** 1 root per frond, longer than the thallus body

**Size:** 2—6 mm





# NO ROOTS OR RHIZOIDS

## RICCIA fluitans

Non vascular

(Slender Riccia) #65

**Leaves:** light green, resembles reindeer antlers

**Roots:** none

**Size:** 0.1 – 0.3 mm X 5—30 mm



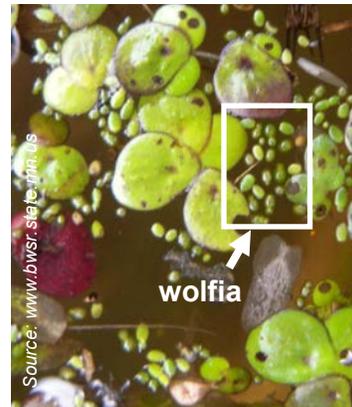
## WOLFIA

(Watermeal) #89

**Leaves:** light green, round to rod shaped, very small < 1.5 mm long

**Roots:** none

**Size:** 0.2 -1.4 mm X 0.3 –1.0 mm



## LEMNA

(Duckweed) #40

**Leaves:** light green

**Roots:** none

**Size:** 5—18 mm





## PLANT DESCRIPTIONS

**1. *Acer* (Maple)**..... p.27

-Small to large trees with opposite simple or compound leaves that have deeply cut margins. Seeds have a prominent wing. There are two common wetland species in this genus in our area: *Acer saccharinum* (Silver Maple) and *Acer negundo* (Box-Elder). Overall there are seven species of *Acer* in MN, one is introduced.

**2. *Acer negundo* (Box-Elder)**..... p. 26

-The only species in *Acer* with compound leaves. Has 3 or occasionally 5 leaflets. This tree is common in disturbed places throughout the state, particularly in lowland margins that periodically flood.

**3. *Acorus* (Sweet Flag)** ..... p.49

-A stout, emergent perennial forb reaching heights > 1 m. The erect sword-like leaves have a distinctly raised midrib (Figure 7) and are sweetly aromatic when crushed. The inflorescence emerges midway down the leaf and is a finger-like spike. Native Americans and early European settlers historically used the roots to make candy and for medicinal purposes. Two species occur in MN, one is introduced.

**4. *Agrostis* (Bent Grass)**..... p.53

-Delicate annual or perennial midsize grasses, often with a tufted growth form. Usually growing in moist soils and occasionally shallow water. Leaves short, 2-8 mm wide, usually flat, occasionally in-rolled. Inflorescence expanded to contracted, flrs/frt small and single per spikelet. Four species occur in MN, two are introduced.

**5. *Alisma* (Water-Plantain)**..... p.46

-Emergent perennial forbs with broad elliptical leaves, originating from a tufted base, with prominent parallel veins. Flrs with 3 small white petals, arranged in open panicles. Typically grows in shallow water. May be easily confused with some species of *Sagittaria*, particularly when the latter is immature. When leaves are similar, these two genera can be differentiated by the flr arrangement. Three species occur in MN.



6. *Anemone canadensis* (Anemone) ..... p.46

-Emergent perennial forb native to moist meadows, streambanks and shorelines, spreads rapidly by underground rhizomes. Deeply divided and toothed basal leaves, flowers have five white petals that bloom late spring to summer with a yellow center. Stems may be hairy. In the buttercup family.

7. *Asclepias incarnata* (Swamp-Milkweed) ..... p.43

-Emergent perennial forb with linear-lanceolate leaves and entire leaf margins. Leaves and stems with milky juice. Showy pink-purple-red flrs bloom in July. This is the only species of *Asclepias* commonly found in MN wetlands.

8. *Aster* (Aster) ..... p.39

-Emergent forbs with compound flrs (many small “florets” organized into a central head with surrounding petals, or rays, similar to a daisy). The conspicuous rays of the common wetland Asters in our area are usually white or blue-purple. Leaves alternate, the base of the leaves clasping to the stem or lanceolate shaped. This is a large and variable genus and the entire taxonomy is currently being reviewed and revised by botanists.

9. *Bidens* (Beggar-Ticks) ..... p.40, 44

-Emergent annual forbs (one species in the state is perennial) up to 0.5 m tall. Leaves opposite, variously serrated or lobed, simple or compound. Flrs yellow, with or without conspicuous rays, appearing mid-late summer. Typically grows on recently exposed saturated soils. Eight species occur in MN.

10. *Brasenia schreberi* (Water-Shield) ..... p.58

-Floating leaved aquatic perennial, leaves oval, 4-12 cm long and half as wide. Elongated petiole joins leaf at the center and is often coated with a clear mucilaginous gel. Flrs dull purple. Grows in quiet water up to 2 m deep.

11. *Calamagrostis* (Reed-Grass) ..... p.53

-Erect perennial grasses up to 1.5 m tall. Largest leaves about 1 cm wide and nearly flat, has prominent ligules. Nodes smooth and may have a bluish cast to them. The most common species, *Calamagrostis canadensis* (Bluejoint), was once the dominant grass of wet-meadow wetland types in our area but has now often been displaced by the aggressive Reed Canary-Grass (*Phalaris arundinacea*). Five species of *Calamagrostis* occur in MN, three are special concern species.

12. *Calla palustris* (Water-Arum) ..... p.47

-Emergent perennial forb with cordate shaped leaves. The inflorescence consists of a spike arrangement of flrs (spadix) and a modified cream colored leaf (spathe). Stems spreading in shallow water or along the soil surface, petioles and leaves erect.

13. *Caltha palustris* (Marsh-Marigold) ..... p.47

-Emergent perennial forb, leaves basal, cordate-kidney shaped with serrated margins. Flowers golden yellow with 5 waxy petals. One of the first wildflowers to bloom in the spring, large patches can often be found in Ash and Alder swamps before the trees have “leafed-out”. *Caltha palustris* can be an indicator of groundwater discharge. Another species of *Caltha* occurs in the state but it has only been found in Northeastern MN.

**PLANT DESCRIPTIONS** (continued)

**14. *Campanula aparinoides*** (Marsh-Bellflower) ..... p.34

-A thin stemmed perennial forb that typically sprawls amongst neighboring plants. Stems are rough hairy. Flrs bell-shaped and white. There are five *Campanula* species in MN but only *C. aparinoides* is typically found in wetlands.

**15. *Carex*** (Sedge) ..... p.50

- A very large and diverse genus. Many species have basal leaves or stems that are very short giving the appearance of basal leaves. Stems triangular (Figure 7) and leaves are three-ranked. The distinguishing feature of this genus is the sac-like structure called the perigynium that encloses the female (pistillate) flrs. *Carex* is the only genus with perigynia. Flrs are arranged in spikelets, often with the male (staminate) flrs in separate spikelets from the pistillate spikelets. The common rhyme “sedges have edges” refers to the triangular stem which can usually be felt when one rolls the stem in their fingers. There are species in other genera (*Cyperus*, *Dulichium*, and *Scirpus*) that are related to *Carex* and also have triangular stems, making this rhyme not entirely true. 143 *Carex* species occur in MN and 108 of these are typically found in wetlands.

**16. *Ceratophyllum*** (Coontail) ..... p.61

-Submergent aquatic forbs with finely branching leaves. Leaves are relatively stiff, whorled, and become crowded near the end of the stem to maximize light collection. Small white flowers bloom above water in late July. Two species occur in MN.

**17. *Chara*** (Muskgrass) ..... p.63

-A macroscopic algae. Can form uniform submergent “lime green” colored carpets in open water wetlands. Typically grows in hard waters (waters high in calcium and/or magnesium salts). The most common species in this genus, *Chara vulgaris*, gives off a strong “musky” odor when crushed.

**18. *Cicuta*** (Water-Hemlock) ..... p.36

-Emergent perennial forb up to 1.5 m tall. Leaves alternate and twice compound. Flrs white, arranged in an umbel. Two species occur in MN. One has narrow (< 5 mm, *C. bulbifera*, pictured in the guide) and the other wider (> 5 mm, *C. maculata*) leaflets. Plants in this genus are extremely poisonous.

**19. *Cirsium*** (Thistle) ..... p.39

-Emergent perennial or biennial forbs. All except one species in this genus have very sharp spines along leaf margins and stems. Flrs lavender-purple. First year leaves of the biennial species consist of a rosette of basal leaves growing close to the ground. Most often found in disturbed plant communities.

**20. *Cornus*** (Dogwood) ..... p.27

-Shrubs up to 3 m tall. Leaves opposite (one species in state has alternate leaves but does not commonly grow in wetlands); margins entire, the conspicuous veins run parallel from the midvein to leaf margin. Six species occur in MN.



**21. *Cyperus*** (Flatsedge) ..... p.51

-Annual or perennial grasslike plants. Stems triangular, leaves three-ranked. Differentiated from other related taxa (*Carex* and *Scirpus*) by the inflorescence. Flrs are arranged in relatively long and flattened spikelets. Often found on recently exposed soils. Thirteen species occur in MN, two are introduced.

**22. *Dulichium arundinaceum*** (Three-Way Sedge) ..... p.51

-Erect perennial up to 1 m tall. Stems are roughly triangular in cross section (the corners are rounded) and hollow. Leaves growing more or less perpendicular from the stem and are strongly three-ranked. Flrs arranged in spikelets emerging from leaf axils.

**23. *Echinochloa*** (Barnyard-Grass)..... p.55

-Coarse annual grasses having shallow fibrous roots. Up to 1 m tall. Leaves are ribbon-like, typically 1 x 20 cm. Flrs/frts arranged in panicles, appearing as many short spikes off a central stem. Flrs/frts and base of stems are often red-purple tinged. Stems, particularly in young plants, are somewhat flattened at the base. Overall plant is without hairs, though the ligule may be a tuft of hairs and the ends of individual flrs may be tipped with a single coarse hair-like structure called an awn. Three species occur in MN, one is introduced.

**24. *Eleocharis*** (Spike-Rush)..... p.56

-Fine (< 10 cm tall, hair-like) to robust (0.5 m tall) perennial grasslikes appearing as a leafless stem (leaves reduced to clasping bracts around the base of the stem) tipped with a cone-like spikelet. Often grows as many distinct single stems. Typically grows in shallow water or as part of a floating mat.

**25. *Elodea*** (Waterweed)..... p.62

- Submergent perennials with short leaves up to 4 mm wide and < 30 mm long, arranged in whorls of 3-4 from an often branched stem. The simple leaves have entire margins. White flrs reach the surface via long thin filaments. Two species occur in MN.

**26. *Epilobium*** (Willow-Herb)..... p.37

-Emergent perennial forbs. Leaves linear to lanceolate, may be opposite and alternate on the same individual. Flrs regular with four white-pink petals. Frts consist of elongated capsules containing many seeds. Seven species occur in MN.

**27. *Equisetum*** (Horsetail) ..... p.33

-Low vascular plants with distinct round, hollow, and vertically grooved stems that are regularly jointed. Stems can easily be pulled apart at the joints. Some species have whorls of scale-like leaves. Spores borne in terminal brown cones. Nine species occur in MN.

**28. *Eupatorium*** (Joe-Pye Weed, Boneset)..... p.44

-There are two distinct species that are commonly found in wetlands in our area. *E. maculatum* (Joe-Pye Weed) is a tall (up to 1.5 m) emergent forb that has whorled leaves and pale-pink flrs (pictured in the guide). *E. perfoliatum* (Boneset) is also a tall emergent forb but has opposite leaves with the pairs of leaves joined together and completely surrounding the stem and white flrs. Both bloom in late July and August and grow on saturated soils.

**PLANT DESCRIPTIONS**     *(continued)*

**29. *Euthamia*** (Grass-Leaved Goldenrod)..... p.38

-Emergent forbs with alternate leaves. Leaves have three distinct veins that run parallel up the length of the leaf. Leaves of some *Solidago* also have this pattern; however, leaves of *Euthamia* are not as wide (2-4 mm). Flrs golden-yellow. Grows on saturated soils. Two species occur in MN.

**30. *Frangula alnus*** (Alder-Buckthorn) ..... p.28

-Medium to large shrub. Leaves alternate, margins entire, oval shaped and tapered to a tip. Flrs/frts axillary. Frt a purple-black berry. An aggressive invasive species of shrub swamps.

**31. *Fraxinus*** (Ash) ..... p.26

-Medium to large trees with compound opposite leaves with 7-11 leaflets. Leaf edges are serrated, at least above the middle. Seeds have a prominent wing. Bark is dark gray with shallow ridge-like furrows. Three species occur in MN.

**32. *Galium*** (Bedstraw) ..... p.35

-Sprawling or twining emergent forbs. Leaves whorled, linear-narrowly oval, usually with a prominent midvein. Stems, and sometimes the leaves, are often rough-hairy. Flrs are small and white. Twelve species occur in MN, two are introduced.

**33. *Glyceria*** (Manna-Grass)..... p.53

-Erect perennial grasses with prominent ligules. Leaf sheath is closed up to the point where the leaf diverges from the stem. The distinct feature of these grasses is the strongly two-ranked leaves. Inflorescence large open panicles. Four species occur in MN.

**34. *Hypericum*** (St. John's-Wort) ..... p.43

-Emergent forbs, 10 cm to 1.5 m tall, with opposite entire leaves. Leaves of some species covered with brown glands (use hand-lens). Flrs regular, with 4-5 yellow-cream colored petals. Most often found on saturated soils in our area. Six species occur in MN, one is introduced.

**35. *Impatiens*** (Jewelweed)..... p.37

-Emergent annual forbs with round, almost transparent, watery stems. Individuals will often have both alternate and opposite leaves. Flrs irregular, orange-yellow usually with reddish-brown spots. Juice of stem found to sooth minor skin irritants (such as the sting from *Urtica*, Stinging Nettle). Grows on saturated soil. Two species occur in MN.

**36. *Iris*** (Iris, Flag)..... p.49

-Emergent perennial forbs reaching 50-80 cm. Leaves more or less flat in cross section (Figure 7), growing in clumps with the clumps flattened at the base giving the plant a fan-like appearance. Flrs regular, showy, either blue or yellow. Typically grows on saturated soils. Three species occur in MN, one (the yellow flowered *I. pseudacorus*) is introduced.



37. *Juncus* (True Rush) ..... p.56

-Grasslike perennials with round stems. Leaves are either reduced to sheaths along the stem (giving the appearance that the plant lacks leaves, similar to some members of *Scirpus*), or strongly inrolled, or completely round in cross section. The distinctive feature of *Juncus* is the regular 6 scale-like tepals that subtend the flr/frt (use hand-lens), as opposed to flrs/frts being located behind scales such as in *Scirpus* or *Cyperus*. Often grows on recently exposed soils. Twenty two species occur in MN.

38. *Lathyrus* (Wild Pea) ..... p.35

-Sprawling or twining emergent forbs. Leaves are pinnately compound with linear-lanceolate leaflets with entire margins. Flrs irregular, white-purple. Six species occur in MN.

39. *Leersia* (Cut Grass)..... p.55

-Sprawling perennial grasses. Leaves are extremely rough hairy, nodes are ringed with short stiff hairs. Ligule is short and membranous. Flrs emerge late in the season. Typically grows in shallow water or recently exposed soils. Three species occur in MN, *L. lenticularis* is on the State Special Concern list.

40. *Lemna* (Duckweed) ..... p.64,65

-Small (plants up to 3 cm wide) free-floating aquatic forbs. Individual fronds usually have a single root (*L. trisulca*, Star-Duckweed, often lacks roots). May form a continuous “green carpet” on the water surface of wetlands. Two species occur in MN.

41. *Lycopus* (Bugle-Weed)..... p.42

-Emergent forbs up to 0.5 m tall with square stems. Leaves are opposite and have relatively coarse teeth. Small white bugle-like flrs are clustered tightly in the leaf axils. Four species occur in MN.

42. *Lysimachia* (Loosestrife) ..... p.43

-Emergent forbs up to 0.5 m tall with round stems. Leaves opposite or sometimes whorled, margins entire. In the two common wetland species the flrs are regular with 5 yellow petals and are either terminal or axillary (pictured in guide). Seven species occur in MN, one is introduced.

43. *Lythrum salicaria* (Purple Loosestrife)..... p.41

-Emergent forbs up to 1.5 m tall. The stem is winged or sharp angled. Leaves opposite or whorled and may become alternate as the leaves spiral towards the tops of stem. Leaves lanceolate and often clasping the stem. Flrs regular, pink-purple, showy. This genus includes the invasive Purple Loosestrife (*L. salicaria*) which is an exotic aggressive plant that can outcompete and crowd-out native plants.

44. *Megalodonta beckii* (Water-Beggar-Ticks)..... p.61

-Submergent aquatic forb with opposite or whorled branching leaves. Has an above water inflorescence that includes broad opposite leaves. Flrs compound with 6-10 gold-yellow rays.

**PLANT DESCRIPTIONS**     *(continued)*

**45. *Mentha arvensis*** (Field-Mint)..... p.41

-Emergent forb with a square stem and opposite leaves. Leaves and stems are noticeable hairy with white or pink irregular flrs grouped in bunches either in the leaf axils or terminal. Stems and leaves are strongly mint scented when crushed. Three other *Mentha* species occur in MN; however, they are introduced species that do not commonly grow in wetlands.

**46. *Myriophyllum*** (Water-Milfoil) ..... p.61

-Submergent aquatic forbs with whorled pinnately compound leaves and often a reddish stem. Inflorescences often emergent with small axillary flrs. This genus includes the invasive Eurasian Water-Milfoil (*M. spicatum*) which can be identified by having more than 12 leaflets on one side of a leaf (check several leaves). Six species occur in MN; one has alternate leaves but does not occur in our area.

**47. *Najas*** (Water-Nymph)..... p.62

-Submergent aquatic forbs with opposite ribbon-like leaves. The leaves becoming crowded near the end of stems. Leaves enlarged or “winged” near the base. Four species occur in MN.

**48. *Nuphar*** (Yellow Water-Lily) ..... p.57

-Floating leaved aquatic perennials. Leaves large, 10-25 cm long, two-thirds as wide, oval in outline with a deep notch or cleft. Flrs yellow, showy.

**49. *Nymphaea*** (White Water-Lily)..... p.57

-Floating leaved aquatic perennials. Leaves large, 10-30 cm long, round in outline with a notch or cleft. Flrs white, showy, many petaled, fragrant.

**50. *Onoclea sensibilis*** (Sensitive Fern)..... p.33

-Fern with shallowly cut pinnae. Reproductive frond growing from a separate stalk that is unlike the green photosynthetic frond.

**51. *Osmunda*** (Osmunda) ..... p.33

-Ferns with deeply cut or compound (in one species, *O. regalis*) pinnae. Fronds are large when mature, up to 1 m tall. Sori borne on modified pinnae located below photosynthetic pinnae or on a separate stalk. The early spring immature fronds, or “fiddleheads”, of *O. claytoniana* (Interrupted Fern) are sought after as a wild vegetable similar to Asparagus. Three species occur in MN.

**52. *Parthenocissus*** (Virginia Creeper)..... p.24

-Sprawling vine appearing to be mostly herbaceous but has a woody base. Compound leaves have five coarsely toothed leaflets. Flrs/frts axillary. Frt a blue-black berry. Two species occur in MN.



**53. *Phalaris arundinacea*** (Reed Canary-Grass)..... p.52

-A stout erect perennial grass. Leaves are often wider than 1 cm. Ligule is prominent. Inflorescence is a closed to loosely open panicle that appears somewhat like a spike when flrs are immature and after the grass has dropped its seed. Usually grows on saturated soil but can grow in standing water up to 0.5 m. *P. arundinacea* is a very aggressive plant that often forms dense stands crowding out other native plants.

**54. *Phragmites australis*** (Giant Reed)..... p.55

-A stout perennial grass that can grow to be 2-4 m tall. The leaves are flat, 1-4 cm wide. Ligule consists of a tuft of short hairs. The inflorescence is somewhat feather-like. This is our tallest wetland grass and often grows in dense colonies. This grass is also potentially invasive. There is a native strain and a strain introduced from Europe which is aggressive and can outcompete native plants.

**55. *Pilea*** (Clearweed) ..... p.45

-Annual emergent forbs, up to 50 cm tall. Leaves opposite, coarsely serrated. Similar in general appearance to *Urtica dioica* but is usually smaller, lacks stinging hairs, and has a clear or translucent stem (similar to *Impatiens*). Often found growing on woody debris in marshes. Two species occur in MN.

**56. *Poa*** (Blue Grass) ..... p.54

-Perennial or annual grasses. Leaves are narrow, < 3 mm wide, ending with a boat keel shaped tip (meaning that when looking at the tip of the leaf blade, head on, it looks like the bow of a boat). Ligule short and membranous. Inflorescence an open panicle, 2-several individual flrs per spikelet, each spikelet fringed at the base with short cob-web-like hairs (use hand-lens). Seventeen species occur in MN, six are introduced, one (*P. wolfii*) is on the state Special Concern List.

**57. *Polygonum*** (Smartweed)..... p.34, 39

-A very diverse genus. Erect emergent forbs, or sprawling and twining emergent forbs, or floating leaved aquatic forbs (see *Polygonum amphibium*). Leaves lanceolate-cordate. The distinguishing feature of this genus is a sheath that surrounds the stem at each leaf node (ocrea). Flrs white-pink. Thirty species occur in MN, nine are introduced.

**58. *Polygonum amphibium*** (Water-Smartweed)..... p.58

-The only species of *Polygonum* that is a floating leaved aquatic forb. Can be differentiated from floating leaved *Potamogeton* species by the ocrea and the veins on the leaves branch out from a central midvein as opposed to all of the veins running parallel up and down the leaf. Flrs red-bright pink, arranged in terminal spikes. Two forms of this species occur, a true aquatic form and an erect emergent form.

**59. *Populus*** (Aspen, Cottonwood)..... p.29

-Medium to large trees. Leaves alternate, roughly triangular in shape. Petioles are flattened which can be felt when you try to roll the petiole in your fingers. Newer bark is smooth white-green-light brown. Older bark becomes furrowed and grey. Five species occur in MN, one is introduced.

**PLANT DESCRIPTIONS** (continued)

**60. *Potamogeton*** (Pondweed)..... p.58, 59

-A very large and variable genus. There are two general types in this genus: submergent aquatic forbs and floating leaved aquatic forbs. The difference between the two types is that the floating leaved forbs have dissimilar floating and below water leaves and the submergent type leaves are all the same. All species have alternate leaves. Below water leaves range from narrowly linear-lanceolate-ovate, floating leaves are ovate-elliptic with parallel venation (leaf veins run parallel to each other from the base to the tip of the leaf). Twenty four species occur in MN, one of these is an aggressive introduced species (*P. crispus*, Curly Pondweed).

**61. *Potentilla (Comarum) palustris*** (Marsh-Cinquefoil)..... p.36

-Emergent perennial forb. Stems creep along the soil or in shallow water often rooting at the nodes. Petioles and leaves erect. Leaves alternate, compound with 5-7 leaflets. Flrs dark red.

**62. *Quercus*** (Oak) ..... p.29

-Large trees up to 50 m. Leaves simple, alternate, and have large coarse teeth. "White" oaks have rounded teeth and "Red" oaks have sharply pointed teeth. Bark becomes deeply furrowed in older trees. Usually found in uplands, one species found in wetlands in our area (*Q. bicolor*, Swamp-White Oak).

**63. *Ranunculus*** (Water-Crowfoot)..... p.60

-Perennial submergent aquatic forbs. Leaves alternate and finely branching. Flrs above the water surface, consisting of regular yellow or white petals. Eighteen species of *Ranunculus* occur in MN, only the submergent aquatics are covered in this guide.

**64. *Rhamnus cathartica*** (Common Buckthorn) ..... p.27

-Medium sized-tall shrubs often with alternate and opposite leaves. Leaves margins serrated. Twigs often end with stout thorns. An aggressive invasive species of forests and some wetlands.

**65. *Riccia fluitans*** (Slender Riccia)..... p.65

-A free-floating thallose liverwort. Main body is a slender branched frond somewhat resembling reindeer antlers. Length is usually < 3 cm. Often found in tangled masses on or just below the water surface.

**66. *Ricciocarpus natans*** (Purple-Fringed Riccia)..... p.64

-A free-floating thallose liverwort, usually about 1 cm wide. Main body is flat with a central furrow and is lobed at one end. Upper surface is green and lower surface purple with numerous rhizoids (roots).

**67. *Rubus*** (Raspberry, Dewberry, Blackberry) ..... p.28

-A large genus of low lying to medium sized shrubs (some species herbaceous). Leaves alternate and compound with 3-5 leaflets. Stems often thorny. Twenty one species occur in MN.



68. *Rumex* (Dock) ..... p.46

-Emergent perennial forbs. The common wetland species have large (10-60 cm long) basal leaves that are arching from the base, lanceolate-ovate, often with wrinkled or wavy margins. Flowering stalks are distinctly taller (up to 2 m) than the basal leaves.

69. *Sagittaria* (Arrowhead)..... p.47

-Emergent perennial forbs with arrow shaped (sometimes elliptic like *Alisma*) basal leaves. Floating leaved forms do occur. Leaves originate from the base of the plant in a tufted clump. Flrs regular with three white petals, whorled around the flowering stem on short stalks (as opposed to *Alisma* which has a panicle flr arrangement). Typically grows in shallow water. Six species occur in MN.

70. *Salix* (Willow)..... p.30

-A large and variable genus. Willows range from small shrubs to medium sized (20 m) trees. Most Willow species grow in wetlands, preferring wet soils. Leaves alternate, margins serrated or entire, range in shape from linear-ovate but most often are lanceolate. Flrs arranged in catkins, blooming May-June. Nineteen species occur in MN, three are introduced.

71. *Scirpus* (*Schoenplectus*) (Bulrush)..... p.51, 56

-A large and variable genus. All *Scirpus* species have flrs arranged in ovoid spikelets. There are two general forms in this genus: *Scirpus* without leaves and *Scirpus* with grasslike leaves. Some of the without leaf species have round stems and some have triangular stems. All with leaf species have triangular stems. Twenty one species occur in MN.

72. *Scutellaria* (Skullcap)..... 41

-Emergent perennial forbs with square stems. Leaves opposite. Flrs irregular with an arched lip extending over the other petals, blue-purple. Five species occur in MN.

73. *Sium suave* (Water-Parsnip) ..... p.37

-Emergent perennial forb. Stems hollow, low and trailing when not in bloom, stout and erect (up to 1 m tall) when in bloom. Leaves pinnately compound, may be finely dissected if under water. Flrs small, white.

74. *Solanum dulcamara* (Nightshade)..... 35

-A sprawling or twining forb. May be somewhat woody at the base of the plant but is generally considered herbaceous. Leaves compound and/or lobed at the base. Leaflets ovate. Flrs purple with petals bent back exposing yellow anthers in the center.

75. *Solidago* (Goldenrod)..... p.38

-Emergent perennial forbs with alternate leaves. The common wetland species in this genus have three distinct parallel veins that run the length of the leaf. This is similar to *Euthamia*; however, leaves are wider in *Solidago* (1-4 cm). Flrs yellow. Fifteen species occur in MN.

**PLANT DESCRIPTIONS**     *(continued)*

**76. *Sparganium*** (Bur-Reed) ..... p.48

-Emergent perennial forbs. Leaves long and linear, distinctly triangular in cross section or at least with a triangular raised midrib on one side (Figure 7). Floating ribbon-like aquatic leaves may be present when immature. Also some *Sparganium* species have mature ribbon-like aquatic leaves, but they are not common in our area. Flrs/frts occur as dense heads along zigzagging branches. The female flr/frt heads appearing as a spike covered ball. Usually grows in shallow water. Eight species occur in MN.

**77. *Spartina pectinata*** (Prairie Cord-Grass) ..... p.54

-Stout perennial grass with thin wiry leaves, 10 mm wide and up to 80 cm long. Ligule is short and membranous often fringed with short hairs. Flrs are arranged into one sided spikelets.

**78. *Spiraea alba*** (Meadowsweet) ..... p.30

-A medium sized shrub up to 2 m tall. Leaves alternate, finely serrated. Flrs arranged in terminal panicles. Flrs have five regular white petals, blooming July-August.

**79. *Spirodela polyrhiza*** (Greater Duckweed) ..... p.64

-A small free-floating forb. Fronds with two or more roots, green on upper surface and reddish purple below. Often mixed in with floating carpets of *Lemna*.

**80. *Stachys palustris*** (Hedge-Nettle) ..... p.42

-Emergent forb, up to 1 m tall, with square stems and opposite leaves. Leaves and stems are hairy. Flrs irregular, occurring in clusters in the axils of the upper leaves, lavender-pink. Leaves and stems not aromatic when crushed.

**81. *Thelypteris palustris*** (Marsh-Fern)..... 33

-Fern with deeply cut pinnae. Sori located on the backside or underside of pinnae. Similar in general appearance to members of *Osmunda* but much smaller (< 60 cm tall). Commonly found on floating mats and saturated soils.

**82. *Typha*** (Cattail) ..... p.48

-Emergent perennial forbs with linear basal leaves up to 2.5 m tall. Leaves are flat or crescent shaped in cross section (Figure 7), 0.5-3 cm wide. Inflorescence a dense spike with male flowers above female. Two species occur in MN, one is considered native (*T. latifolia*) and the other (*T. angustifolia*) introduced. *T. latifolia* has wide (1-3 cm) leaves and no gap between the male and female flrs and *T. angustifolia* has narrow (0.5-1 cm) leaves and a gap (usually > 2 cm) between male and female flrs. These two species readily hybridize to produce a Cattail with characteristics in between (*T. x glauca*). Both *T. angustifolia* and *T. x glauca* are invasive species.

**83. *Ulmus*** (Elm)..... p.29

-Medium to large trees. Leaves alternate, coarsely serrated, and the upper surface is often rough hairy. Grows in floodplains, moist woods, and uplands. Four species occur in MN, one is exotic.



84. *Urtica dioica* (Stinging Nettle) ..... 45

-Emergent forb with opposite leaves. Leaves and stems are covered with stinging hairs which can leave irritating welts. Flrs in the upper leaf axils. Can grow up to 2 m tall. *U. dioica* is an introduced species.

85. *Utricularia* (Bladderwort) ..... p.60

-Submergent aquatic forbs with finely branching alternate leaves. The characteristic feature of this genus is the sac-like bladders attached to the leaves (or in some species on a separate stem that lacks leaves). These bladders trap zooplankton (very small free swimming animals) and then slowly digest their prey with enzymes to acquire a portion of their nutrients, making these plants carnivorous. Flrs irregular, emerging out of the water, yellow or purple. Six species occur in MN.

86. *Vallisneria americana* (Water-Celery) ..... p.63

-Submergent aquatic forb with long ribbon-like leaves. Leaves basal and have a distinct light shaded band running down the middle. Immature specimens of *Sagittaria* and *Sparganium* have similar leaves; however, they lack the vertical banding.

87. *Verbena hastata* (Blue Vervain) ..... p.42

-Emergent forb with opposite leaves. Leaves sometimes 3-lobed. Flrs small, blue, arranged in long narrow spikes at the top of stems. Five species occur in MN, but only *V. hastata* is found in wetlands.

88. *Vitis riparia* (Grape) ..... p.24

-Woody vines typically climbing into trees or shrubs. Leaves alternate and simple with sharp teeth mostly forward pointing. Tendrils opposite of most leaves. Grows along margins of wetlands and other water bodies.

89. *Wolfia* (Water Meal) ..... p.65

-Very small (not more than 1.5 mm long) tear-drop shaped free-floating aquatic forbs. Often flat on one side and domed on the other. Lacks roots. Often found with other Duckweeds. Three species occur in MN.

90. *Zannichellia palustris* (Horned Pondweed) ..... p.63

-Submergent aquatic forb with simple opposite leaves. Stem is many branched like *Najas* but the leaves do not crowd near the tip. Leaves are very slender and thread-like (0.5 mm wide). Flrs/frts axillary, 2-3 mm long, appearing like small bean pods with hooks at the ends.

91. *Zizania palustris* (Wild Rice) ..... p.52

-A stout annual grass that can reach heights of 3 m. Almost always found in shallow water. Leaves are broad (1-4 cm) and flat with a long membranous ligule. The female or grain-producing flrs (above) and male (below) flrs separate on the same plant. Wild Rice was a traditional food source of Native Americans and is still widely harvested today. Wild Rice is also an important food for migrating water fowl.

## GLOSSARY OF PLANT TERMS

**Alternate leaf arrangement.** Leaves emerge from alternating sides of the stem (Figure 6).

**Aquatic.** Plants growing entirely in the water either submersed or with leaves floating on the surface (may be above surface during low water periods).

**Axil.** The angle where the petiole emerges from the stem.

**Axillary.** Originating from the leaf axil.

**Basal leaf arrangement.** Leaves apparently emerging from the soil surface, plants without above ground stems or stems very short (Figure 6).

**Branching leaf shape.** Compound leaves with fine thread-like leaflets that repeatedly fork, not originating from a central axis (Figure 8).

**Catkin.** Lax or erect spike-like inflorescence of some trees and shrubs bearing small, usually unisexual flowers.

**Compound leaf.** Leaf with two or more distinct leaflets growing beyond the bud (Figure 5).

**Cordate leaf shape.** Base of the leaf is distinctly lobed (Figure 8).

**Double serrate margin.** Leaf margin with smaller teeth imbedded in larger teeth.

**Elliptic leaf shape.** Leaf oval in outline (Figure 8).

**Emergent.** Plants growing above the water surface.

**Entire leaf margin.** Leaf margin without teeth.

**Flr.** Abbreviation for flower.

**Forb.** An herbaceous vascular plant (generally with broad leaves) that is not a Grass, Rush, or Sedge.

**Fron.** The leaf of a fern or duckweed where leaves and stems are not differentiated.

**Fr.** Abbreviation for fruit.

**Genus.** The second finest taxonomic classification division for biological organisms.

**Herbaceous.** A plant without a persistent woody stem.

**Inflorescence.** The flower arrangement of a plant.

**Irregular flower.** A flower with dissimilar petals that can be cut into two equal parts in only one plane (bilaterally symmetrical).

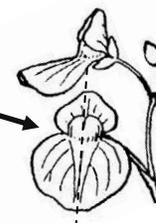
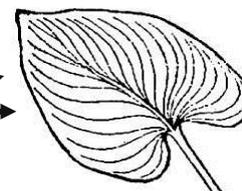
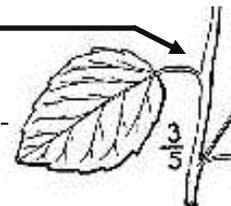
**Lanceolate leaf shape.** Lance or spear-head shaped, much longer than wide (Figure 8).

**Leaflet.** The leaf-like division of a compound leaf (Figure 5).

**Ligule.** A small projection or tuft of hairs at the juncture of the leaf blade and stem present in some grasses.

**Linear leaf shape.** Leaf that is very long and narrow (Figure 8).

**Margin.** The edge of the leaf.





**Mid-rib.** The main or central vein of a leaf.

**Node.** The point on a stem where a leaf originates.

**Ocrea.** A sheath that surrounds the leaf node in the genus Polygonum.

**Opposite leaf arrangement.** Leaves emerge from stems in pairs that are arranged side by side (Figure 6).

**Ovate leaf shape.** Wider than lanceolate (Figure 8).

**Ovoid.** Shaped like an egg.

**Panicle.** A flower arrangement which is branched more than once beyond the main flowering axis.

**Perignium.** A sac-like structure that encloses the female flower in the genus Carex.

**Petiole.** The stalk of a leaf (Figure 5).

**Pinnae.** The leaflets from the main axis of a fern.

**Pinnately compound leaves.** Leaflets are arranged along both sides of an elongate leaf axis (Figure 5).

**Ray.** Flower petals in the family Asteraceae (Asters, Sunflowers, Daisies, etc).

**Regular flower.** A flower with petals that are all similar in size, shape, and orientation and can be cut into equal parts along more than one plane (radially symmetrical).

**Rhizoid.** A simple root-like structure that lacks true vascular tissue.

**Serrate leaf margin.** Leaf margin with teeth.

**Sheath.** A collar-like part of a leaf that wraps around the stem.

**Simple leaf.** A leaf with the blade all in one piece (Figure 5).

**Sori.** Reproductive (spore bearing) structures of ferns.

**Spike.** An elongated unbranched inflorescence with many small flowers.

**Spikelet.** A small spike, found in many Grasses, Sedges, Rushes, etc.

**Submergent.** Plants growing below the water surface, or if floating, submerged and floating leaves all alike.

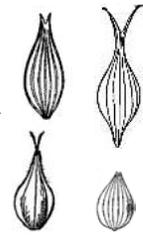
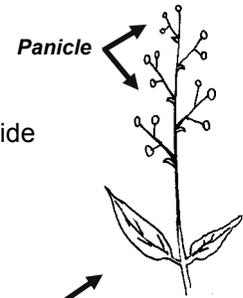
**Tepal.** Sepals and petals of flowers that cannot be differentiated.

**Terrestrial.** Growing on land, not aquatic

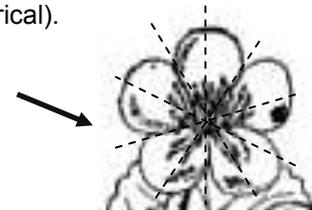
**Three-ranked.** Leaves emerge from stems in three distinct directions when looking straight down from the top of the plant.

**Two-ranked.** Leaves emerge from stems in two distinct directions when looking straight down from the top of the plant.

**Whorled leaf arrangement.** Leaves emerge from stems in groups of three or more per node (Figure 6).



Perignium



Regular Flower



Three-ranked



Two-ranked

PLANT DIAGRAMS

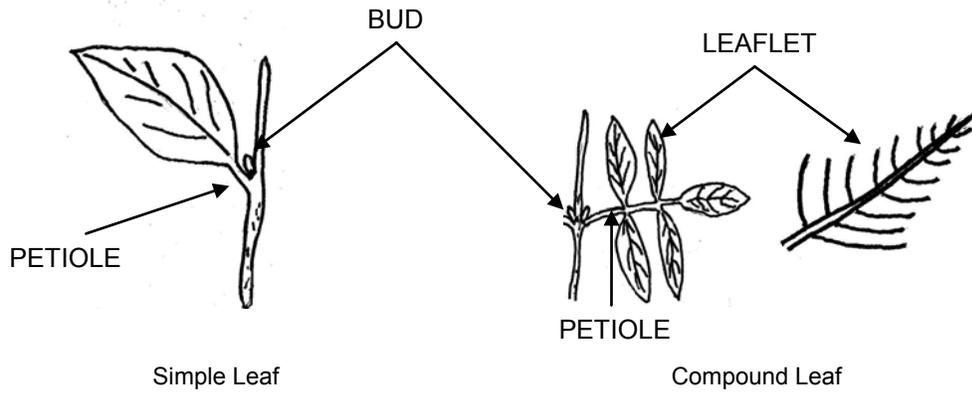


Figure 5. Leaf morphology.

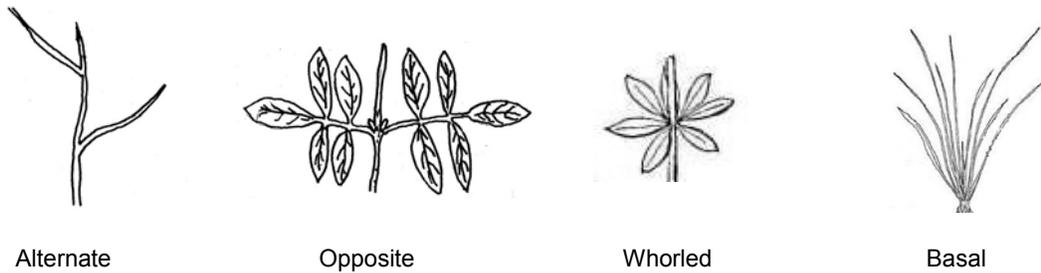


Figure 6. Leaf arrangement.



*Typha* leaf



*Iris* leaf



*Sparganium*  
leaf



*Acorus*



Grass



*Carex*,  
*Scirpus*

Figure 7. Cross sections of selected leaves and stems (Adapted from Eggers and Reed 1997).



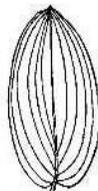
Linear



Lanceolate



Ovate



Elliptic



Cordate



Branching

Figure 8. Leaf shape.



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# APPENDICES

## APPENDIX 1: EQUIPMENT LIST

- Clipboard
- Site information data sheet
- Releve data sheet
- GPS unit (if available)
- Compass
- Pencils
- 50 m tape measure
- 4 tall garden stakes/dowels
- Hand-lens or magnifying glass
- Additional plant identification guides (if available)
- Gallon size plastic bags for collecting unknown plants
- Permanent marker for labeling bags

### Recommended Resources:

- \* Wetland Plants and Plant Communities of Minnesota and Wisconsin (Eggers and Reed)
- \* A Great Lakes Wetland Flora (Chadde)
- \* Through the Looking Glass-A Field Guide to Aquatic Plants (Borman et. al)
- \* A Guide to Aquatic Plants-Identification and Management (Fink)
- \* Additional plant identification guides (if available)

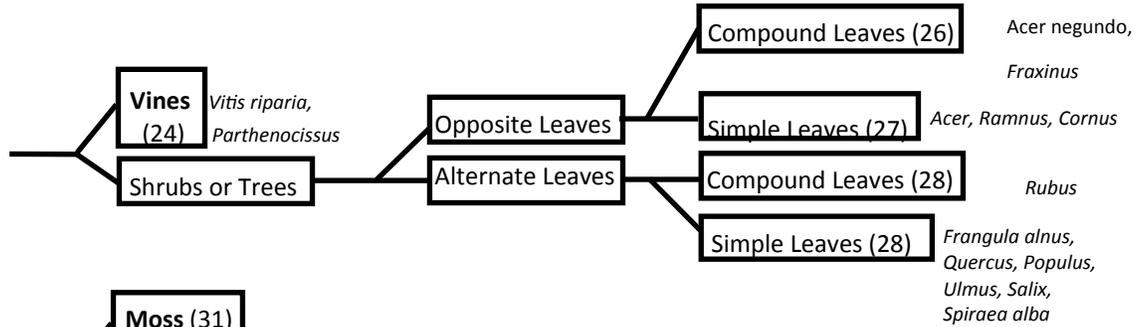




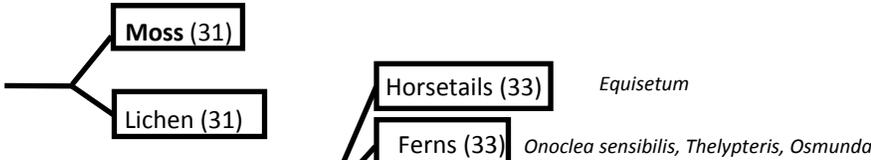
# APPENDIX 2: PLANT KEY AT A GLANCE



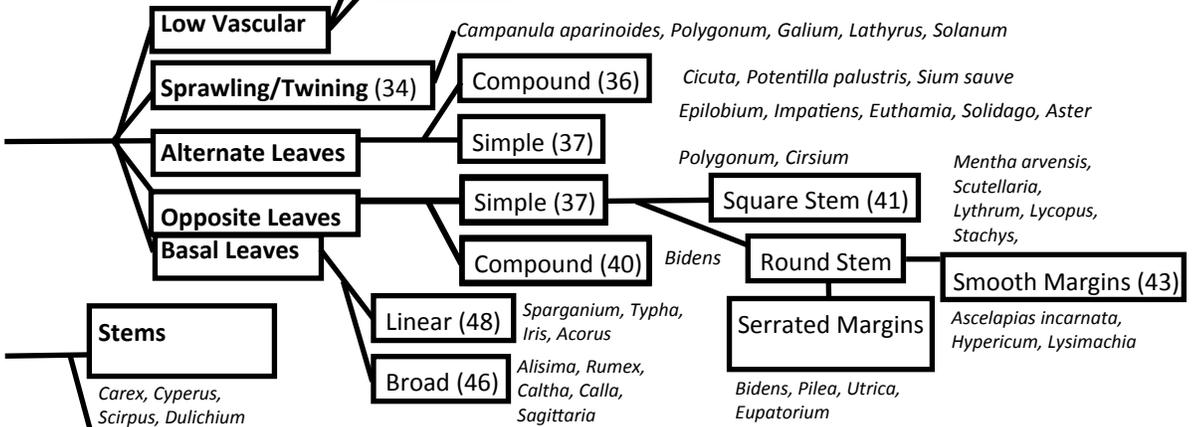
## WOODY PLANTS



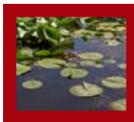
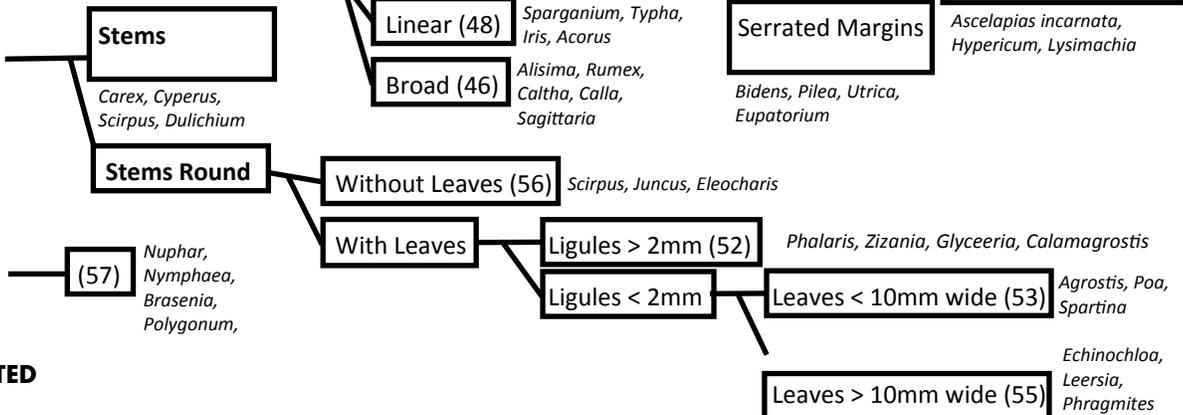
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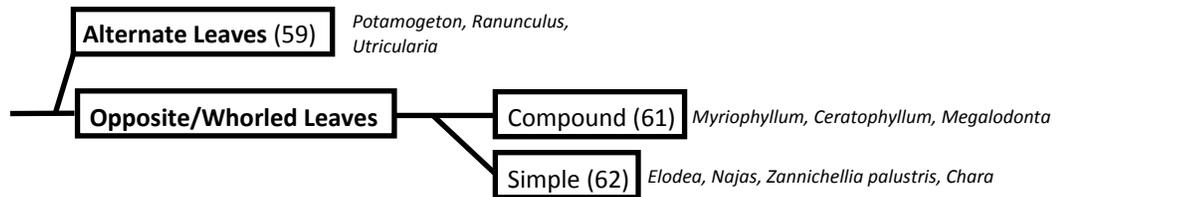
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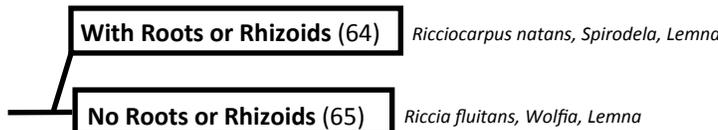
## GRASSLIKE PLANTS



## FLOATING, ROOTED PLANTS



## SUBMERSED PLANTS



## FREE FLOATING PLANTS

**APPENDIX 3: DATA SHEETS**

**1) SURVEY FIELD SHEET: SITE INFORMATION..... 87**

**2) SURVEY FIELD SHEET: RELEVÉ DATA ..... 88**

**3) METRIC SCORING SHEET ..... 90**



**MN WHEP VEGETATION SURVEY FIELD SHEET: SITE INFORMATION**

Site Name: _____	Date/Time: _____
Team Leader/Observer: _____	Team Name: _____
Local Sponsor: _____	County: _____

**Location Information** (UTM coordinates from GPS unit, Township Range Section coordinates, or street directions):

**Site Description** (Include vegetation, water pathway, and immediate land use descriptions. Note any unique plants or plant communities within the wetland but occurring outside of the releve. Did you observe any wildlife while at this site?):

**Site Sketch** (Include vegetation zones, water inlets and outlets, point source pollution inputs such as stormwater pipes, immediate land use practices, any landmarks, and the location of the releve in the wetland):



# A CITIZEN'S GUIDE TO THE BIOLOGICAL ASSESSMENT OF WETLANDS

## MN WHEP VEGETATION SURVEY FIELD SHEET: RELIEVE DATA

Site Name: _____	Date/Time: _____
Team Leader/Observer: _____	Team Name: _____
Local Sponsor: _____	County: _____

Releve Dimensions (circle one): <b>10 m x 10 m</b> or <b>5 m x 20 m</b> = 100 m <sup>2</sup> Is the releve typical of the wetland plant community? (circle one): <b>Yes</b> or <b>No</b> (explain below) Water depth in the plot (meters): Shallowest: _____ m Deepest: _____ m Substrate/bottom description: _____ _____ _____ Comments: _____ _____ _____
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**DIRECTIONS:** If present in your releve, mark an "X" by the appropriate plant in the Pres column. Write in the known scientific name of any plants that are not already included in this table. If the plant cannot be identified, describe the plant as best as possible on page 2 under "Additional Unknown Plants". Next, use the box in the lower right corner of this page to determine the cover class (CC column) for the plant and write in the appropriate number by each plant.

Pres	CC	WOODY PLANTS
		Acer ( <i>maple, box elder</i> )
		Cornus ( <i>dogwood</i> )
		Frangula alnus ( <i>alder-buckthorn</i> )
		Fraxinus ( <i>ash</i> )
		Parthenocisis ( <i>Virginia creeper</i> )
		Populus ( <i>aspen, cottonwood</i> )
		Quercus ( <i>oak</i> )
		Rhamnus cathartica ( <i>common buckthorn</i> )
		Rubus ( <i>raspberry, blackberry</i> )
		Salix ( <i>willow</i> )
		Spiraea alba ( <i>meadowsweet</i> )
		Ulmus ( <i>elm</i> )
		Vitis riparia ( <i>wild grape</i> )

Pres	CC	EMERGENT PLANTS (continued)
		Eupatorium ( <i>joe pye-weed</i> )
		Euthamia ( <i>grass-leaved goldenrod</i> )
		Galium ( <i>bedstraw</i> )
		Hypericum ( <i>St. John's wort</i> )
		Impatiens ( <i>jewelweed</i> )
		Iris ( <i>iris</i> )
		Lathyrus ( <i>wild pea</i> )
		Lycopus ( <i>bugle weed</i> )
		Lysimachia ( <i>loosestrife</i> )
		<b>Lythrum</b> ( <i>loosestrife</i> )
		Mentha ( <i>field mint</i> )
		Oncoclea sensibilis ( <i>sensitive fern</i> )
		Osmunda ( <i>osmunda</i> )
		Pilea ( <i>clearweed</i> )
		<b>Polygonum</b> ( <i>smartweed</i> ) - duplicate in Floating Rooted Plants
		Rumex ( <i>dock</i> )
		Sagittaria ( <i>arrowhead</i> )
		Scutellaria ( <i>skullcap</i> )
		Sium ( <i>water parsnip</i> )
		Solanum dulcamara ( <i>nightshade</i> )
		Solidago ( <i>goldenrod</i> )

(Emergent Plants continued on next page)

Pres	CC	EMERGENT PLANTS
		Acorus ( <i>sweet flag</i> )
		Alisima ( <i>water-plantain</i> )
		Anemone Canadensis ( <i>anemone</i> )
		Asclepias incarnata ( <i>swamp milkweed</i> )
		Aster ( <i>aster</i> )
		Bidens ( <i>beggar-ticks</i> )
		Calla palustris ( <i>water arum</i> )
		Caltha palustris ( <i>marsh marigold</i> )
		Campanula aparinoides ( <i>marsh bellflower</i> )
		Cicuta ( <i>water hemlock</i> )
		Cirsium ( <i>thistle</i> )
		Comarum (Potentilla) palustre ( <i>marsh cinquefoil</i> )
		Epilobium ( <i>willow herb</i> )
		Equisetum ( <i>horsetail</i> )

Cover Class (CC)	Percent Cover Range
5	50-75%
4	25-50%
3	5-25%
2	1-5%
1	0-1%



Pres CC Emergent - continued

		Sparganium ( <i>bur-reed</i> )
		Stachys palustris ( <i>hedge nettle</i> )
		Thelypteris ( <i>marsh fern</i> )
		Typha ( <i>cattail</i> )
		Urtica ( <i>stinging nettle</i> )
		Verbena hastata ( <i>blue vervain</i> )

Pres CC GRASSLIKE PLANTS

		Agrostis ( <i>bent grass</i> )
		Calamagrostis ( <i>reed grass</i> )
		Carex ( <i>sedge</i> )
		Dulichium ( <i>three-way sedge</i> )
		Echinochloa ( <i>barnyard grass</i> )
		Glyceria ( <i>manna grass</i> )
		Juncus ( <i>rush</i> )
		Leersia ( <i>cut grass</i> )
		Phalaris arundinacea ( <i>reed canary grass</i> )
		Phragmites australis ( <i>giant reed</i> )
		Poa ( <i>blue grass</i> )
		Scirpus ( <i>bulrush</i> )
		Spartina pectinate ( <i>prairie cordgrass</i> )
		Zizania palustris ( <i>wild rice</i> )

Pres CC FLOATING ROOTED PLANTS

		Brasenia ( <i>water shield</i> )
		Nuphar ( <i>yellow water lily</i> )
		Nymphaea ( <i>white water lily</i> )
		<b>Polygonum</b> ( <i>smartweed</i> ) - duplicate in Emergent Plants
		Potamogeton ( <i>pondweed</i> ) - duplicate in Submersed Plants

Pres CC Additional and/or Unknown Plants (*describe*)


Pres CC MOSS AND LICHEN

		Moss— <b>NON VASCULAR</b>
		Lichen— <b>NON VASCULAR</b>

Pres CC SUBMERSED PLANTS

		Ceratophyllum ( <i>coontail</i> )
		Chara ( <i>muskgrass</i> )
		Elodea ( <i>waterweed</i> )
		Najas ( <i>water nymph</i> )
		Megalodontia beckii ( <i>water beggar-ticks</i> )
		Myriophyllum ( <i>water milfoil</i> )
		Potamogeton ( <i>pondweed</i> ) - duplicate in Floating Rooted Plants
		Ranunculus ( <i>water crowfoot</i> )
		<b>Utricularia</b> ( <i>bladderwort</i> )
		Vallisneria ( <i>water celery</i> )
		Zannichellia palustris ( <i>horned pondweed</i> )

Pres CC FREE FLOATING PLANTS

		Lemna ( <i>duckweed</i> )
		Riccia fluitans ( <i>slender riccia</i> ) - <b>NON VASCULAR</b>
		Ricciocarpus natans ( <i>purple-fringed riccia</i> ) - <b>NON VASCULAR</b>
		Spirodela polyrhiza ( <i>greater duckweed</i> )
		Wolffia ( <i>watermeal</i> )

Cover Class (CC)	Percent Cover Range
6	75-100%
5	50-75%
4	25-50%
3	5-25%
2	1-5%
1	0-1%

Additional Comments:

## MN WHEP VEGETATION SURVEY METRIC SCORING SHEET

Site Name: _____	Date Sampled: _____
Team Leader/Observer: _____	Date Scored: _____
Team Name: _____	County: _____
Local Sponsor: _____	

### 1) Vascular Genera

Count the number of different genera of low vascular plants (Ferns & Horsetails), woody plants, grasslikes, & all forbs observed within the sample plot. Be careful not to count the same genus twice.

**a. Total Number of All Species:** \_\_\_\_\_

**b. Number of Nonvasculars:** \_\_\_\_\_

- Nonvasculars = *Chara*  
*Lichens & Moss*  
*Riccia fluitans*  
*Ricciocarpus natans*

Scoring criteria for Vascular Genera	
Plot Tally	Score
≥ 20	5
9 - 19	3
0 - 8	1

**c. Total # of Vascular Plants (a - b):** \_\_\_\_\_

**d. Metric #1 Score:** \_\_\_\_\_

Comments:

### 2) Nonvascular Taxa

-Count the number of different kinds of nonvascular taxa observed within the sample plot (*Chara*, Lichens, Moss, *Riccia fluitans*, & *Ricciocarpus natans*). Do not count slimy filamentous algae, but note in the comments section.

**a. Plot Tally:** \_\_\_\_\_

**b. Metric #2 Score:** \_\_\_\_\_

Scoring criteria for Nonvascular Taxa	
Plot Tally	Score
≥ 2	5
1	3
0	1

Comments:



**MN WHEP VEGETATION SURVEY METRIC SCORING SHEET**

Site Name: \_\_\_\_\_ Team Name: \_\_\_\_\_ Date Sampled: \_\_\_\_\_

**3) Grasslike Genera**

-Count the number of different kinds of grasslike genera observed within the sample plot (refer to metric #1, part c).

a. Plot Tally: \_\_\_\_\_

b. Metric #3 Score: \_\_\_\_\_

Comments:

**Scoring criteria for Grasslike Genera**

Plot Tally	Score
≥ 5	5
2 - 4	3
0 - 1	1

**4) Carex Cover**

-Estimate the percent cover of *Carex* within the sample plot.

a. Carex Cover Class Value: \_\_\_\_\_

b. Metric #4 Score: \_\_\_\_\_

Comments:

**Scoring criteria for Carex Cover**

CC Value	Percent	Score
3 - 6	≥ 5%	5
2	1 - 5%	3
0 - 1	0 - 1%	1

**5) Utricularia Presence**

a. Was *Utricularia* present in the plot? Yes No

b. Metric #5 Score: \_\_\_\_\_

Comments:

**Scoring criteria for Utricularia Presence**

Presence/Absence	Score
Present	5
Absent	1

**6) Aquatic Guild**

-Count the number of different Aquatic Guild genera. This includes the submergent aquatic forbs and floating leaved aquatic forbs listed on the releve data sheet.

a. Plot Tally: \_\_\_\_\_

b. Metric #6 Score: \_\_\_\_\_

Comments:

**Scoring criteria for Aquatic Guild**

Plot Tally	Score
≥ 6	5
3 - 5	3
0 - 2	1

**MN WHEP VEGETATION SURVEY METRIC SCORING SHEET**

Site Name: \_\_\_\_\_ Team Name: \_\_\_\_\_ Date Sampled: \_\_\_\_\_

**7) Persistent Litter**

-Record the cover class (CC) of each plant taxa listed below that was found in your plot. Determine the midpoint % cover and sum all of the values to score this metric. The midpoint % cover is the middle percentage of the range that a CC represents. Da

**a. Sum of midpoint percent cover:**

Plant	CC	Midpoint %	CC	Percent Cover Range	Midpoint %
<i>Typha</i> (Cat Tail)	_____	_____			
<i>Sparganium</i> (Bur-Reed)	_____	_____	6	75-100	87
<i>Lythrum</i> (Loosestrife)	_____	_____	5	50-74	63
<i>Phragmites australis</i> (Giant Reed)	_____	_____	4	25-49	38
<i>Scirpus</i> (Bulrush)	_____	_____	3	5-24	15
<i>Polygonum</i> (Smartweed)	_____	_____	2	2-5	3
			1	0-1	0.5

Total Midpoint %: \_\_\_\_\_ (%)

**b. Metric #7 Score:** \_\_\_\_\_

**Scoring criteria for Persistent Litter**

Total Midpoint %	Score
≤ 27%	5
28 - 54%	3
> 54%	1

Comments:

**IBI Summary**

-Tally your results from the seven metrics and add them together to arrive at a wetland vegetation IBI score and condition assessment for the site.

<u>Metric</u>	<u>Score</u>
1) Vascular Genera	_____
2) Nonvascular Taxa	_____
3) Grasslike Genera	_____
4) <i>Carex</i> Cover	_____
5) <i>Utricularia</i> Presence	_____
6) Aquatic Guild	_____
7) Persistent Litter	_____

**Site Score Interpretation**

IBI Score	Wetland assessment
26 - 35	Excellent
16 -25	Moderate
7 - 15	Poor

**Total:** \_\_\_\_\_

**Wetland Condition Assessment:** \_\_\_\_\_







