

2005 COASTAL PLANT IDENTIFICATION

With a focus on plants found on the wetland/upland interface in
Minnesota's Lake Superior Watershed



Ilex verticillata

This project was funded in part under the Coastal Zone Management Act, by the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management, in conjunction with Minnesota's Lake Superior Coastal Program.



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Summary of the 2003 and 2005 Coastal Plant Identification Courses

December 22, 2005

Gary B. Walton

The 2003 Coastal Plant Identification Course

The 2003 Coastal Plant Identification course was a web-based program combined with formal presentations and field trips to plant communities in the area. The goal was to teach 100 species of plants typically found in or near wetlands using web pages and field days touring places where these plants could be found. By season's end about 170 species were discussed.

Originally the web pages written for the 2003 Coastal Plant Identification course were envisaged to be phenological. The choice of name for these pages settled on "WHAT'S DEVELOPING" which seemed a good definition of "phenology". Because the first web pages were being written in March when plants are for the most part dormant the pages started off with winter twig identification using keys, species descriptions and close-up photographs of dormant twigs. Habitat and wetland indicator status were also included. In a sense these pages were more taxonomic than phenological. The purpose of these pages was to help people identify dormant plants and to get them interested in getting out into the field to look at plants at all times of the year. A few of these early season taxonomic pages also featured evergreen ferns. That some of our ferns are evergreen may have come as a surprise to a few people.

As warmer weather approached (right around April 13) the phenological or "WHAT'S DEVELOPING" segment of the pages was initiated. These pages stressed what species were coming into flower, leafing out, or fruiting and continued until the end of the course. The pages included photographs of some plants, the habitats where they occurred, and wetland indicator status.

In a short time, however, it became apparent that a taxonomic approach linked with seasonal changes might be more appropriate especially when dealing with closely related species that were leafing out, flowering or fruiting at about the same time. These pages stressed plant taxonomy with brief descriptions of common wetland and upland species of plants such as sedges (*Carex*), aster (*Aster*) goldenrods (*Solidago*) and various species of ferns (the pteridophytes). Each taxonomic page contained a description with one or more diagnostic photographs of the species being discussed.

For example, the description for *Aster ciliolatus* on the 2003 web pages is,

"...native rhizomatous perennial is distinguished by its cordate basal leaves and upper leaves with broadly winged petioles with a marginal fringe of hairs. The leaf margins are coarsely serrate and their lower surfaces hirsute."



With this description was included the photograph (to left) of an *Aster ciliolatus* leaf showing the winged petiole with its fringe of hairs and coarsely serrate leaf margins. Similar species were mentioned and contrasted in many cases. The wetland indicator status and habitat affinities were also given.

Every plant was identified to species before its photograph was used in the web pages. If species identification was in question specimens were run through dichotomous keys using standard floristic texts.

Photographs used on the web pages (with a few exceptions when I used some of my old film pictures) were taken using a very ordinary Nikon Cool Pix 995 3.34 mega pixel digital camera mounted on a tripod. Standard techniques of photography (lighting, composition) were employed.

Formal PowerPoint presentations were given to cover some large and difficult plant groups such as sedges and willows. Eight field tours between May and September provided an opportunity to discuss a larger number of species than was possible on the web pages alone. They also helped people to see some of the range of variation within a species and changes throughout the growing season.

The 2005 Coastal Plant Identification Course

The 2005 Coastal Plant Identification course was also a web-based program in combination with formal presentations and field trips to plant communities in the area. The 2005 Coastal Plant Identification course built upon the 2003 course and expanded it. The goals of the 2005 course were broadened to include wetland habitat identification. Three subject areas were outlined: phenology, taxonomy, and determining plant community types.

The course was "kicked-off" with PowerPoint presentations in April on how to use the Ecological Land Classification method and other ecological classification systems for wetlands along with presentations by staff from the DNR, BWSR, and ACE on wetlands. In December the course was wrapped up with another presentation summarizing what was covered in 2005 and comparing/contrasting it with what was done in 2003.

Phenology pages were called "WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR (followed by the date)". These were usually weekly and included information on rain or snowfall and temperatures. Usually there were two or more plants featured in photographs and often with a brief description. Habitat and wetland indicator status were given. Sometimes there was mention of a particular plants usefulness to wildlife, i.e., was it a food plant for songbirds or insect larva?



Taxonomic pages focused on families and genera as before with dichotomous keys preceding any discussion of species. Species in particular genera were described as specimens became available. Habitat affinities and wetland indicator status were included with descriptions.

Many new families and genera were discussed in 2005 and a number of those only partly discussed in 2003 received more extensive treatment. Among these are the sedges (*Carex*), bulrushes (*Scirpus*), meadow rues (*Thalictrum*), soft rushes (*Juncus*), and clubmosses (*Lycopodium*). The asters (*Aster*) and goldenrods (*Solidago* and *Euthamia*) were revisited with additional information and species added.

Numerous close-up digital photographs were used in conjunction with the text. Some of photographs included arrows pointing to important diagnostic features mentioned in the text. An example is shown at the left where the arrow points to the dark bordered leaf-like bracts of *Eriophorum angustifolium*. As in 2003, species were identified using dichotomous keys found in standard floristic texts before the photographs were used in the web pages.

A few web pages were posted on determining plant communities and types using the Native Plant Communities field guide developed by the MN-DNR and other ecological methods. These consisted of species checklists of actual native plant community sites in northern Minnesota. It was hoped people would try determining community types using the various classification methods to see how they work and to compare to one another. The instructions were straightforward:

"Using the Native Plant Communities (NPC) of Minnesota Field Guide determine the native plant community indicated by the species checklists and information about land and hydrology. Determine the type of wetland community using the keys and descriptions in Cowardin, Circular 39, and Eggers."

This was followed by a comprehensive species checklist (like the one shown below) along with information on the ecological province, section and subsection, a soils description, the landscape setting, and field characteristics (i.e., tree height and canopy density). Answers to these problems were provided with the final compilation of 2005 web page text.

<p>Site #1 Ecological Province: Laurentian Mixed Forest Ecological Section: Northern Superior Uplands Subsection: North Shore Highlands Soils: Scarce, where present is composed largely of decomposed plant materials in crevices of bedrock or a mixture of gritty sand and living moss. Landscape: Rock outcrop. Very little plant cover most of which is confined to the edges of shallow pools and rock crevices. Field characteristics: Rock out crop of amygdaloidal basalt, some calcite veins. Water from precipitation, waves, and from small trickles that seep out from rock fractures and from between forest soil and rock interface somewhat further back from lake.</p> <p style="text-align: center;"><u>Species Checklist for Site #1</u></p> <table><tr><td><i>Agrostis scabra</i></td><td><i>Drosera rotundifolia</i></td></tr><tr><td><i>Calamagrostis lacustris</i></td><td><i>Lobelia kalmii</i></td></tr><tr><td><i>Scirpus cespitosus</i></td><td><i>Primula mistassinica</i></td></tr><tr><td><i>Potentilla fruticosa</i></td><td><i>Euphrasia hudsoniana</i></td></tr><tr><td><i>Physocarpus opulifolius</i></td><td><i>Solidago ptarmicoides</i></td></tr><tr><td><i>Pinguicula vulgaris</i></td><td><i>Xanthoria</i> (a lichen)</td></tr></table>	<i>Agrostis scabra</i>	<i>Drosera rotundifolia</i>	<i>Calamagrostis lacustris</i>	<i>Lobelia kalmii</i>	<i>Scirpus cespitosus</i>	<i>Primula mistassinica</i>	<i>Potentilla fruticosa</i>	<i>Euphrasia hudsoniana</i>	<i>Physocarpus opulifolius</i>	<i>Solidago ptarmicoides</i>	<i>Pinguicula vulgaris</i>	<i>Xanthoria</i> (a lichen)
<i>Agrostis scabra</i>	<i>Drosera rotundifolia</i>											
<i>Calamagrostis lacustris</i>	<i>Lobelia kalmii</i>											
<i>Scirpus cespitosus</i>	<i>Primula mistassinica</i>											
<i>Potentilla fruticosa</i>	<i>Euphrasia hudsoniana</i>											
<i>Physocarpus opulifolius</i>	<i>Solidago ptarmicoides</i>											
<i>Pinguicula vulgaris</i>	<i>Xanthoria</i> (a lichen)											

It was intended that MN-RAM (Minnesota Routine Assessment Method), another method of evaluating and typing plant communities, would be covered during the course. Unfortunately, MN-RAM received only a cursory mention due to lack of time.

Five field tours were held between May and September in four counties. About 50 to 70 species of plants were tagged with numbered flags prior to the field tours. Varieties of habitats were included. People were able to go to these locations on their own and identify the species flagged. An answer key was made for each site so that people could gage their skills. They could also attend the scheduled field tours where species were identified and described. As in 2003, these field tours helped people to see some of the range of variation within a species and changes throughout the growing season.

Some important changes have been made to the 2003 and 2005 coastal plant books. Indexes, tables of contents, page numbering, and references are provided to make it easier to find subject matter and to help people expand their knowledge through independent research. In addition, many sections of the 2003 book were re-formatted and errors were corrected (to the best of my ability).

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Coastal Plant Identification Course – 2005 Field Season Supplement

Following is part II of a Plant Identification Guide started in the 2003 field season in northeastern Minnesota. The State of Minnesota has contracted with leading Minnesota botanist Gary Walton to produce this document. A companion piece entitled, “Coastal Plant Identification with a focus on plant found on the wetland/upland interface in Minnesota’s Lake Superior Watershed” was written for the state by Gary in 2003.

The main purpose of this document is to assist wetland delineators to accurately describe the dominant plants which are part of the information required in determining a wetland boundary. Other uses of this book include educating residents on the important native plants and plant communities found in Minnesota’s Lake Superior in order that we can conserve them. Land disturbance can eliminate important plants and allow non-native invasive plant a foothold in spreading. But that’s a topic for another book.

Pagination and an index are included in this document to aid the reader in researching plants. Timing of the plant photos is also documented to provide a view of the plant community continuum throughout our growing season (May-September).

This book narrows the species of plants you can expect to find in the field. Gary and I advise perusing the wealth of existing definitive plant guidebooks for complete plant descriptions.

The word “Coastal” in our title refers to both the geographic scope of this document (Lake Superior Watershed in Minnesota) and also acknowledges the financial support provided through our national “Coastal Program.” Besides the NOAA at the federal level, the direct Coastal support comes from our Minnesota DNR and Governor appointed Coastal Council.

This document is available in a digital format from the Board of Water & Soil Resources. The entire BWSR organization has supported this project to which Gary and myself are thankful. We hope these pages will help you find the “answer!”

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2005 Lake Superior Coastal Wetland Plants Final List

December 14, 2005

Gary B. Walton

This list gives the page number and/or field location of the new species discussed during this year's coastal plant course.

Plain numbers – mention on web pages

Bold face numbers – photograph on web pages

Number with asterisk (*) – discussion on web pages

CF– Cloquet Forestry Center

CC – Cook County

LC – Lake County

MT – Munger Trail

MS – Magney Snivley

H – Hibbing

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<i>Potamogeton illinoensis</i>	34	<i>Scutellaria galericulata</i>	31, 53, 143*
<i>Primula mistassinica</i>	17 , 22, 227	<i>S. lateriflora</i>	37, 53, 143*
		<i>Selaginella rupestris</i>	11 , 12, 96*
<i>Prunella vulgaris</i>	53, 140* , LC , CC	<i>Sisyrinchium montanum</i>	16 , 117, 118*
<i>Prunus pumila</i> var. <i>besseyi</i>	11	<i>Solidago canadensis</i> var. <i>altissima</i>	180*
<i>Ranunculus abortivus</i>	14, 19	<i>Solidago hispida</i>	178, 182*, LC
<i>R. rhomoideus</i>	8	<i>Solidago ptarmicoides</i>	178, 179*, 227
<i>Rhamnus alnifolia</i>	10 , 196, 197* , 226	<i>Solidago rigida</i>	169, 178, 179*
<i>Ribes americanum</i>	11, 75, 134*	<i>Sorghastrum nutans</i>	MT
<i>R. cynosbati</i>	75, 109*	<i>Sparganium chlorocarpum</i>	41*
<i>R. glandulosum</i>	7, 75, 84*	<i>Spiraea alba</i>	31, 148* , 170 184
<i>R. hirtellum</i>	75, 77* , MS , LC	<i>S. tomentosa</i>	148*
<i>R. hudsonianum</i>	7, 8 , 75, 85* , 134	<i>Stachys aspera</i>	142*
<i>R. odoratum</i>	8, 75, 82*	<i>S. hispida</i>	53, 142*
<i>R. oxycanthoides</i>	75, 76, 109	<i>S. palustris</i>	30, 53, 142*
<i>R. triste</i>	5, 6 , 83*	<i>Streptopus roseus</i>	CC
<i>Rubus allegheniensis</i>	28* , 30	<i>Symplocarpus foetidus</i>	10 , 52, 91, 92*
<i>Rumex verticillata</i>	41	<i>Syringia japonica</i>	CF
<i>Salix candida</i>	5, 7, 8 , 63, 70*	<i>Taxus canadensis</i>	LC
<i>S. eriocephala</i>	65*, MT	<i>Thalictrum dasycarpum</i>	5, 30, 35, 135, 136*, 137* , 138, 139
<i>S. humilis</i> var. <i>a keweensis</i>	70*	<i>T. dioicum</i>	5, 7, 14, 28, 102, 135, 136* , 137, 138, MT
<i>S. h.</i> var. <i>microphyll</i>	70*	<i>T. pubescens</i>	135, 137*
<i>S. pedicellaris</i>	63, 64*	<i>T. revolutum</i>	135, 138*
<i>Saxifraga pensylvancia</i>	5, 158, 159* , 192	<i>T. venulosum</i>	5, 135, 138* , 139
<i>S. virginensis</i>	7, 11 , 12, 158* , 192	<i>Typha angustifolia</i>	43*
<i>Scirpus acutus</i>	25 , 107, 161, 162	<i>T. latifolia</i>	43*, MT
<i>S. atrocinctus</i>	107, 161, 165*	<i>T. X glauca</i>	43*
<i>S. atrovirens</i>	25, 33 , 107, 161, 163*	<i>Utricularia macrorhiza</i>	34
<i>S. a.</i> forma <i>prolifera</i>	163*	<i>Vicia americana</i>	18 , 153, 155* , 156
<i>S. cyperinus</i>	3, 25, 31, 33, 107, 161, 170, 226	<i>V. cracca</i>	153, 156*
<i>S. fluviatilis</i>	55 , 164*	<i>V. villosa</i>	22, 153, 156*
<i>S. micropcarpus</i>	25, 31, 107, 161, 164* , 170	<i>Zizia aurea</i>	35, MT



WHAT'S DEVELOPING- PHENOLOGY PAGES

A BRIEF LOOK AT THE COURSE FOR 2005

April 21, 2005

Gary B. Walton

It has been just about two years since we the first began the first Coastal Plant Identification course. A lot of ground was covered, about 200 species on the web pages plus many more on our filed trips. It was a great experience for me and a pleasure to share with you.

So here we are again. This year we will review many of the species covered in 2003 and add other species left out in 2003. I will also add details to some groups of species covered in 2003.

There are a few new items to this year's course. We will be learning about the native plant communities in the coastal region of western Lake Superior. This will be done by field trips and by using the Field Guide to the Native Plant Communities of Minnesota, The Laurentian Mixed Floristic Province published by the Minnesota DNR. Using the hierarchical methodology outlined in the field guide we will be identifying and classifying native plant communities. Much of this will be done in the field but I will also explain how to use the book and its methodology in a future web page. There will also be discussion in future web pages about the Minnesota Routine Assessment Method (MnRAM) and its application in wetland habitat evaluation and wetland delineation.



**Above: A plant community in northern MN. Swamp, bog, or conifer plantation?
What about habitat quality and wetland functions and values?**

Identification of plant species will take place in the field rather than from photographs alone. Specimens will be tagged ahead of time at selected locations. Identification will depend in part in being able to use dichotomous keys. You will need a hand lens and a metric ruler to do this. Keys will be provided on future web pages. Also, you will be identifying and classifying habitat types using various methods.

In addition to the text Field Guide to the Native Plant Communities of Minnesota, The Laurentian Mixed Floristic Province the following references are highly recommended:

Manual of Vascular Plants of the Northeastern United States and Adjacent Canada. H. A. Gleason and A. Cronquist

Flora of Michigan, Vol. 1-3. E. Voss.

Spring Flora of Minnesota. T. Morley

Ferns of Minnesota. R. Tryon

Wetland Plants and Plant Communities of Minnesota and Wisconsin. S.Eggers.

Wetland Plants of Ontario. S. G. Newmaster, A. G. Harris, L. J. Kershaw.

Classification of Wetlands and Deepwater Habitats of the United States. L. M. Cowardin, V. Carter, F. C. Golet, E. T. LaRoe.



PLANT DEVELOPMENTS DURING THE LAST THIRTY DAYS

During the last two weeks of March I went snowshoeing in several wetlands in Carlton County. Besides the obvious such as conifers I was able to locate and identify species such as winterberry holly (*Ilex verticillata*), wild clematis (*Clematis virginiana*), tag alder (*Alnus rugosa*), red oak (*Quercus rubra*), red maple (*Acer rubrum*) mountain maple (*A. spicatum*), balsam poplar (*Populus balsamifera*), quaking aspen (*P. tremuloides*), highbush cranberry (*Viburnum opulus*), and bog birch (*Betula glandulifera*). Several willows were also identifiable including *Salix bebbiana*, *S. planifolia*, *S. discolor*, *S. pyrifolia*, and *S. serrisima*.

In addition to woody plants the remains of some herbaceous species which survived the winter were identifiable in late March. Among these were monkeyflower (*Mimulus ringens*), mullein (*Verbascum thapsus*), bugleweed (*Lycopus* spp.), skullcap (*Scutellaria* spp.), whorled waterdock (*Rumex verticillatus*), bog goldenrod (*Solidago uliginosa*), smooth goldenrod (*S. gigantea*), turtlehead (*Chelone glabra*), flat-top aster (*Aster umbellatus*), lake sedge (*Carex lacustris*), woolgrass (*Scirpus cyperinus*), Canada bluejoint (*Calamagrostis canadensis*), and fringed brome (*Bromus ciliolatus*). In actively flowing seeps patches of golden saxifrage (*Chrysopenium americanum*) survived unharmed by the winter cold.

April is at its mid-point now. It is surprising how quickly the snow melted. Low temperatures have been near 30° most of the time and highs in the low 50's with some very warm days in the 60's and even 70's. This has resulted in a flush of growth. Much of this growth and flowering activity is anywhere from a few days to two weeks ahead of previous years. Tag alder flowers opened on April 5, followed by *Salix planifolia* on the 8th and beaked hazel (*Corylus cornuta*) on the 12th. *S. discolor* flowers opened a few days later and flowers of *S. bebbiana* should be opening very soon. Catkins of *S. planifolia* are being visited by several kinds of solitary bees and bumblebees. This is not surprising actually given the fragrance (a mixture of freesia and jasmine) of the flowers.

Quaking aspen catkins have elongated and were open on April 15th. Also, leaf buds of *Viburnum lentago*, *Sambucus pubens*, *Prunus pensylvanica*, *Malus* spp., *Vaccinium angustifolium*, *Ribes* spp., *Larix laricina*, and *Betula papyrifera* are beginning to open giving these trees and shrubs a greenish cast.

In some warmer locations within hardwood forests spring ephemerals such as *Dicentra cucullaria*, *Sanguinaria canadense*, *Cardamine concatenata*, *Allium tricocum*, and *Luzula acuminata*, *Claytonia caroliniana*. Even some bog species have begun to flower (*Eriophorum spissum*). Several sedges (*Carex*) are sending up new shoots. *Carex pedunculata* is in flower from Carlton County to Cook County. *Equisetum arvense* fertile shoots are now above ground and should be shedding spores in about a week.



WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR APRIL 27, 2005

April 27, 2005

Gary B. Walton



Temperatures have fallen back into the 40's and upper 20's, the typical temperature range for this time of year. Even so plant growth is about two weeks ahead of normal and I doubt if the snow is much of a problem.

On warm hillsides quaking aspen (*Populus tremuloides*, FAC) is continuing to leaf out. Balsam poplar (*P. balsamifera*, FACW) buds are swelling and on some sites the trees have flowered. Leaf buds are swelling on other trees including ironwood (*Ostrya virginiana*, FACU-), sugar maple (*Acer saccharum*, FACU) and shrubs including various viburnums (*Viburnum rafinesquianum*, no rating, *V. lentago*, FAC+ , and *V. opulus*, FACW), honeysuckles (*Lonicera hirsuta*, FAC, *L. canadensis*, FACU , and *Diervilla lonicera*, no rating) and red swamp currant (*Ribes triste*, OBL). Folded leaves and

flower buds of running serviceberry (*Amelanchier stolonifera*, FAC) are showing.

Prairie willow (*Salix humilis*, FACU) and tea-leaf willow (*S. planifolia*, OBL) have finished flowering and are now maturing fruit. Bebb's willow (*S. bebbiana*, FACW+), pussy willow (*S. discolor*, FACW), narrow-leaf willow (*S. petiolaris*, FACW+), and sage willow (*S. candida*, OBL) are in flower.

On the ground are displays of hepatica (*Anemone americana*, no rating) and other spring ephemerals. *Anemone quinquefolia* (FAC*) is also blooming. Fertile stems of field horsetail (*Equisetum arvense*, FAC) have just surfaced. The meadow-rues (*Thalictrum dasycarpum*, FACW-, *T. dioicum*, FACU+, and *T. venulosum*, FAC*) are sending up leaves. Rough mountain ricegrass (*Oryzopsis asperifolia*, no rating) will probably be the first grass species to bloom. More sedges are in flower (*Carex umbellata*, no rating, *C. peckii*, no rating). *Viola blanda* (FACW-) was seen flowering in the snow.

Northern sweet coltsfoot (*Petasites palmatus*, FACW) has flowered and small leaves are also appearing. In seeps look for golden saxifrage (*Chrysosplenium americanum*, FACW) and swamp saxifrage (*Saxifraga pennsylvanica*, OBL) along with marsh marigold (*Caltha palustris*, OBL).



Some of the plants in flower this week

Top row from upper left to right: *Acer rubrum*, *Lonicera canadensis*.

Middle row from left to right: *Ribes triste*, *Corylus americana*, *Petasites palmatus*.

Bottom row from left to right: *Caltha palustris*, *Sanguinaria canadensis*, *Viola blanda*.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR MAY 15, 2005

May 15, 2005

Gary B. Walton

Temperatures remain cool especially close to Lake Superior. It is not unusual to find thin ice on the water of shallow pools and ditches many mornings. In spite of the cool temperatures plants continue to flower and expand their leaves.

Over much of the area quaking aspen (*Populus tremuloides*, FAC) is nearly completely leafed out. Leaves on sage leaf willow (*Salix candida*, OBL), tea-leaf willow (*S. planifolia*, OBL) and narrow-leaf willow (*S.*



petiolaris, FACW+) are more or less fully expanded but not yet hardened. Leaves of nannyberry or sheepberry (*Viburnum lentago*, FAC+) are now visible. Immature flower buds on all species of native viburnums and on mountain maple (*Acer spicatum*, FACU*) are showing. Green alder (*Alnus crispa*, FAC) is in flower. Tamarack (*Larix laricina*, FACW) is leafing out and strobili are fully developed.

Two more wild species of *Ribes* are in flower- Hudson Bay currant (*R. hudsonianum*, OBL), and skunk currant (*R. glandulosum*, FACW). Juneberries (*Amelanchier* spp.) are in flower and also leafing out. Two other rose family members, pin cherry (*Prunus pensylvanica*, FACU-) Canada plum (*P. nigra*, FACU-) are in flower from Moose Lake to Ely. Flower buds are noticeable on wild apples (*Malus* spp.). Rough mountain rice-grass (*Oryzopsis asperifolia*, no rating) is in bloom. Two blue violets of northern Minnesota, hooked-spur violet (*Viola adunca*, FAC-) and Selkirk's violet (*V. selkirkii*, no rating) are in flower. Hooked-spur violet can be found in native grass openings while Selkirk's violet is commonly found in moist, cool forests such as cedar forests especially in Cook County. Another blue violet, the woolly blue violet (*V. sororia*, FAC-) is also coming into flower in moist habitats near wooded edges in eastern Pine County.

In mesic hardwood forests yellow bellwort (*Uvularia grandiflora*, no rating), pale bellwort (*U. sessilifolia*, FAC-), toothwort (*Dentaria laciniata*, FACU), yellow violet (*Viola pensylvanica*, FACW-), nodding trillium (*Trillium cernuum*, FAC) and large white trillium (*T. grandiflorum*, no rating) are in flower. Flower buds of early meadowrue (*Thalictrum dioicum*, FACU+) and wild ginger (*Asarum canadense*, no rating) are visible but not yet open. Spring beauty (*Claytonia caroliniana*, FACU) is in flower in many parts of its range.

Crosiers of several fern species are emerging including ostrich fern (*Matteucia struthiopteris*, FACW), interrupted fern (*Osmunda claytoniana*, FAC+), lady's fern (*Athyrium filix-femina*, FAC), and maidenhair fern (*Adiantum pedatum*, FAC-).

In drier, open habitats such as rock outcrops look for *Carex houghtoniana* (no rating), early saxifrage (*Saxifraga virginiana*, FAC-), blueberry (*Vaccinium angustifolium*, FACU), dwarf bilberry (*V.*

caespitosum, FACU*), yellow fumitory (*Corydalis aurea*, no rating), and pussytoes (*Antennaria plantaginifolia*, no rating) which are flowering now. In Pine County and southern Carlton County look for sand violet (*Viola sagittata*, FACW-) and prairie buttercup (*Ranunculus rhomboideus*, no rating) in prairie-like habitats.

Around old home sites in lawns the mint creeping Charlie (*Glechoma hederacea*, FACU) is in flower in along with dandelion (*Taraxacum officinale*, FACU). Also clove currant (*Ribes odoratum*, FAC-), a native US species planted as an ornamental is in flower. Field cress (*Barbarea vulgaris*, FAC) a weed of pastures is flowering.



Above from top left going clockwise: *Dentaria laciniata*, *Antennaria plantaginifolia*, *Larix laricina*, *Ranunculus rhomboideus*, *Ribes hudsonianum*.

Below from top left going clockwise: *Salix planifolia* catkins, *S. candida* catkins, flowers of *Vaccinium angustifolium*, *S. petiolaris* catkins.



WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR MAY 22, 2005

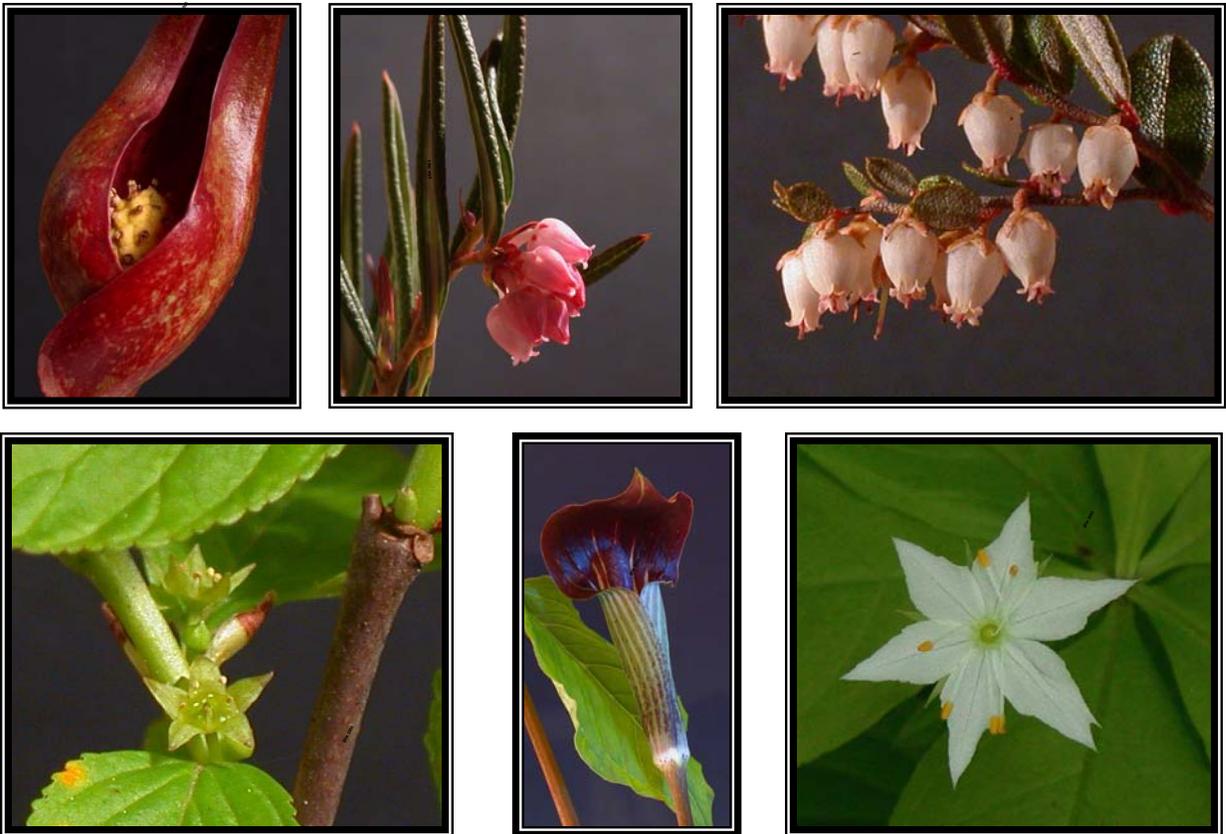
May 22, 2005

Gary B. Walton

This week has seen a steady rise in temperatures into the low 60's with some heavy rain and fog. The increased temperatures and moisture have helped to move plant development along. Among the species currently in flower are two species of Ericaceae found in peatlands leatherleaf (*Chamaedaphne calyculata*, OBL) and bog rosemary (*Andromeda glaucophylla*, OBL). A few other peatland species are also in flower at this time including *Eriophorum angustifolium* (OBL) and bog birch (*Betula glandulifera*, OBL). The strobili of white spruce (*Picea glauca*, FACU) and black spruce (*P. mariana*, FACW) are beginning to shed pollen.

In rich cedar swamps various *Ribes* continue to flower as the weather warms. Also, in some you might come across skunk cabbage (*Symplocarpus foetidus*, OBL) also in flower and with leaves beginning to uncurl. Another species in flower is alder-leaf buckthorn (*Rhamnus alnifolia*, OBL).

Mesic forest species continue to bloom this week and include starflower (*Trientalis borealis*, FAC+), woodland anemone (*Anemone quinquefolia*, FAC*) and jack-in-the-pulpit (*Arisaema triphyllum*, FACW-). Red maple and other deciduous trees are leafing out. Grasses such as sheep fescue (*Festuca ovina*, no rating) and meadow foxtail (*Alopecurus pratensis*, FACW) are in flower. In southern Carlton County and Pine County in jack pine/bracken fern barrens with prairie components look for bird's foot violet (*Viola pedata*, UPL) and *Carex umbellata* (no rating) both in flower now.



**Top row left to right: *Symplocarpus foetidus*, *Andromeda glaucophylla*, *Chamaedaphne calyculata*
Bottom row left to right: *Rhamnus alnifolia*, *Arisaema triphyllum*, *Trientalis borealis***

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR MAY 31, 2005

May 31, 2005

Gary B. Walton

Temperatures continue to remain in the 60's. Rainfall has been heavy (up to 2 inches in some locations) causing streams to flood. Ephemeral pools are staying full from the extra rain and this is benefiting many frogs and salamanders that use them. It is also keeping swamps extremely wet making channels and pools in these systems more easily noticed.

Tamarack is now fully leafed out. Balsam fir, black spruce, white spruce and the pines all have new growth showing. The pollen cones of jack pine are enlarged and ready to shed pollen.

In rich conifer swamps look for pink lady slipper orchid (*Cypripedium acaule*, FACW), water calla (*Calla palustris*, OBL), 3-leaf Solomon's seal (*Smilacina trifolia*, OBL), kidney-leaf violet (*Viola renifolia*, FACW), and sweet violet (*V. blanda*, FACW-). These two violets are also common in other wet forests and near edges of pools. Blue marsh violet (*V. cucullata*, OBL) is in bloom, too, in rich swamps and willow swamps. Goldthread (*Coptis groenlandica*, FACW) is flowering in moist conifer-hardwoods and conifer swamps. Leaves are just beginning to show on winterberry (*Ilex verticillata*, FACW+). This is our only species of holly (*Ilex*) native to Minnesota. It can be found in rich swamps and occasionally in wet forests. American black currant (*Ribes americanum*, FACW) is in flower in shrub carrs and wet forests.



Besides the orchid *Cypripedium acuale* another orchid is in bloom this week: *Corallorhiza trifida* FACW-, pictured on right), a non-photosynthetic flowering plant that derives its nutrients from a symbiotic relationship with fungi that grow on the roots of other photosynthesizing plants. *C. trifida* occurs in a variety of moist to wet forested habitats.

In sedge marshes and willow swamps several species are now in flower. Although most willows have already bloomed and many are now producing seeds both balsam willow (*Salix pyrifolia*, FACW) and shining willow (*S. lucida* (FACW+) are flowering. At least two large sedges, *Carex lacustris* (OBL) and *C. stricta* (OBL) are producing flowering culm.



Left to right: some species of dry rock outcrops *Saxifraga virginiensis*, *Antennaria plantaginifolia*, and *Selaginella rupestris*.

On rock outcrops and along the edges of wet forests New England violet (*V. novae-angliae*, OBL) from Carlton County to Cook County. Small tufted sedges such as *Carex backii* (no rating) and *C. umbellata* (no rating) are also in flower on drier parts of outcrops. A small tufted sedge similar to *C. umbellata* is *C. deflexa* (no rating) found in moist woods and is also in flower.) Other rock outcrop species in flower at this



time are various pussytoes (*Antennaria* spp.), *Arabis hirsuta* (FACU), *A. divaricata* (no rating), sand-cherry (*Prunus pumila* var. *besseyi*, no rating), *Saxifraga virginiensis* (FAC-) and *Heuchera americana* (FACU-). Also, look for a clubmoss relative, rock spikemoss (*Selaginella rupestris*, no rating) on these outcrops. Bearberry (*Arctostaphylos uva-ursi*, UPL) a species of dunes, pine barrens, and rock outcrops is blooming. Its flowers are similar to those of blueberry (*Vaccinium*) to which it is related.

Left: *Prunus pumila* var. *besseyi* a small member of the plum and cherry genus grows on dry outcrops in northeastern Minnesota. This individual was found near Ely in the Border Lakes region. A different variety of *Prunus pumila* (var. *pumila*, the "typical" variety) grows in the sand dunes on Minnesota Point and Wisconsin Point.

In upland forests look for mountain rice-grass (*Oryzopsis asperifolia*, no rating), wild ginger (*Asarum canadense*, no rating), yellow violet (*Viola pubescens*, FACU-), and Canada violet (*V. canadensis*, no rating) which are now up and in bloom. Most deciduous trees except oaks (*Quercus*), ashes (*Fraxinus*), and

big-tooth aspen (*Populus grandidentata*) have or are nearly leafed out. Along the edges of moist forests *Viola conspersa* (FACW-) is in bloom.



Viola canadensis (no rating)



Viola pubescens (FACU-)

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JUNE 7, 2005

June 7, 2005

Gary B. Walton

Heavy rains still pound some areas of northeastern Minnesota and have caused flooding of small streams to continue. Temperatures are still rising and here in the middle of Carlton County, at least, went just above 70° F. The warmer day and night temperatures are speeding plant development along.

Jack pine is shedding pollen and white and red pines are not far behind. Many grass species are about ready to flower or are in flower: *Festuca ovina* and several other *Festuca* species (I'll let you know what these are after I key out), *Alopecurus pratensis*, *Oryzopsis asperfolia*, *Danthonia spicata*, and *Schizachne purpurascens*.

Several upland and mesic forest sedge species are now maturing fruit. This is the best time to collect specimens and learn these species: *Carex pedunculata*, *C. arctata*, *C. blanda*, *C. deweyana*, *C. backii*, *C. umbellata*, *C. deflexa*, *C. peckii*, *C. communis*, and *C. pensylvanica*. Use a good floristic text such as the Flora of Michigan Vol. 1 (Voss) or Gleason and Cronquist.

Another wetland sedge, *C. castanea* (FACW+), is in full flower. Other wetland species in flower besides very obvious *C. stricta* and *C. lacustris* are *C. disperma* and *C. leptalea*.

Right: *Carex backii* inflorescence.
Far right: *C. umbellata* fruiting spikes.



In the rose family (Rosaceae) dewberry (*Rubus pubescens*, FACW+), chokecherry (*Prunus virginiana*, FAC-), mountain ash (*Sorbus* spp.), and hawthorns (*Crataegus* spp.) are in flower. Flower buds are showing on *Rosa acicularis* (FACU).

Left: Inflorescence of *Prunus virginiana*.

There are a few more members of the buttercup family (Ranunculaceae) in bloom now in woodlands and wooded edges. *Ranunculus abortivus* (FACW-), *Actaea rubra* (no rating), *Thalictrum dioicum* (FACU+), and *Aquilegia canadensis* (no rating) are flowering. *Ranunculus cymbalaria* (OBL), a species with a tolerance for salt and alkaline conditions can be seen flowering along Grand Avenue in Duluth near the old steel plant. *R. cymbalaria* is a listed rare species in Wisconsin and grows in several places in Superior, too.

Several ferns are completely uncoiled including *Dryopteris carthusiana* (FACW-), *Matteucia struthiopteris* (FACW), *Athyrium filix-femina* (FAC), *Onoclea sensibilis* (FACW), and *Gymnocarpium dryopteris* (FAC). *Mertensia paniculata* (FAC) is in full flower in cool woods along the shore of Lake Superior. Bunchberry (*Cornus canadensis*, FAC) has come into full bloom this week. Other woody *Cornus* species are leafed out and some have flower buds. Many *Viburnum* species have flower buds on them.



***Gymnocarpium dryopteris* found growing under tamarack and balsam fir near the edge of a rich conifer swamp.**



Upper Left: Inflorescence of *Cornus canadensis*.

Lower left: Leaves of *Cornus alternifolia* (no rating) a woody *Cornus* species found in rich mesic hardwoods. The curved parallel leaf venation of *Cornus* is known as "arcuate".



WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JUNE 12, 2005

June 12, 2005

Gary B. Walton

There are 9 more days until summer and a new set of plant species are beginning to flower. Many grasses of pastures and lawns are in full flower now or will be in a week. Although most grasses planted for forage crops and lawns are not native to North America they are nevertheless important naturalized components of our flora and occur in a variety of settings and habitats given the widespread use of some species in re-vegetation efforts. Most are rated as FACU species although one, meadow foxtail (*Alopecurus pratensis*) which is now in full flower, is given FACW indicator status. Another non-native grass in flower now is orchard grass (*Dactylus glomerata*, FACU) a species planted in many pastures and hayfields.

One native grass in flower now is June grass (*Koeleria pyramidata*, no rating). This is a species of jack pine barrens and similar prairie-like habitats in southern Carlton and Pine counties. Unlike most prairie grasses *Koeleria pyramidata* is a cool-season species. A few more grassland flowers are showing up, too. One in particular, blue-eyed grass (*Sisyrinchium montanum*, FAC+), is a member of the iris family (Iridaceae). Also, some native *Arabis* species (*Arabis hirsuta* and *A. divaricarpa*, both FACU) are flowering and fruiting now. *Sisyrinchium montanum*, *Arabis hirsuta*, and *A. divaricarpa* can also be found on rock outcrops throughout the region with other drought-tolerant species.



Arabis divaricarpa



Sisyrinchium montanum

On wet rock outcrops along Lake Superior look for bird's eye primula (*Primula mistassinica*, FACW) which is coming into flower. Its presence and that of several other species owes to a unique combination of cool climate, high humidity, and veins of the mineral calcite in the igneous rocks on which they grow.



Above: *Primula mistassinica* growing in a mossy crevice in a rock outcrop.



Vicia americana



Lathyrus ochroleucus

There are several non-native leguminous species, clovers (*Trifolium* and *Melilotus*), vetches (*Vicia*) and trefoils (*Lotus*) that have become naturalized but right now two natives, pale vetchling (*Lathyrus ochroleucus*, no rating) and American vetch (*Vicia americana*, NI) are flowering in woods and along woodland edges.

In moist woods and along wetland edges *Viburnum* species are now in flower. Two very prominent species because of their large and showy inflorescences of white flowers are high bush cranberry (*Viburnum opulus* or *V. trilobum* in some older books, FACW) and nannyberry (*V. lentago*, FAC). Both grow into large multi-stemmed shrubs 2 to 4 meters tall. *V. lentago* forms thickets as new shoots sprout from its far ranging roots. Red osier dogwood (*Cornus stolonifera*, FACW) is also in flower in the same habitats. The berries of these shrubs are important food for several species of birds.



Left: *Viburnum opulus* flowers. The larger outer flowers are sterile and serve to attract the attention of pollinators.

Herbaceous species such as such as *Ranunculus abortivus* (FACW-) and wild ginger (*Asarum canadense*, no rating) are in flower now and should continue to bloom for at least another week. The flowers of *Asarum* are difficult to see as they are held close to the ground and not brightly colored (principle pollinators are ground beetles). They are tubular and deeply three lobed. Petals are absent or merely vestigial. The calyx lobes are hairy outside and their tips are prolonged into a long tip. The calyx parts of *Asarum* are in 3's or multiples of 3 (trimerous) and suggest a relationship with monocots such as the lilies.



Asarum canadense flower



Ranunculus abortivus flower



In many forests the ground appears to be strewn with bunchberry (*Cornus canadensis*, FAC) which has come into full bloom this week. The berries of *C. canadensis* are eaten by ruffed grouse. Another low growing berry plant in flower this week is dewberry (*Rubus pubescens*, FACW+) and its fruit are also a food source for ruffed grouse.

Left: Flowering plant of *Rubus pubescens*.

Several *Crataegus* species are still in bloom. One species of interest in Lake and Cook counties is *Crataegus douglasii* (black hawthorn, FAC) a species on the Minnesota "threatened species" list. *C. douglasii* is a disjunct species with two widely separated populations across its range. The largest population center extends from southern Alaska and into British Columbia east to Saskatchewan and south to Idaho, Nevada, Wyoming, and barely into California. The Minnesota populations are part of the Great Lakes population which includes sites in the Apostle Islands in Wisconsin, northern Michigan, and southern Ontario. Most Great Lakes populations of *C. douglasii* are at or within a few miles of the lake shores.



***Crataegus* sp. flowers. Proper determination of species requires information on stamen number, cyme pubescence, leaf shape, fruit color, seed surface features, thorn length and several other characteristics. Once you know these it's easy to determine the species. This one has 20 stamens, soft, bright red fruit, very sparsely villous cymes, inner surfaces not pitted, elliptic to rhomboidal leaves with shiny +/- glabrous surfaces and glandular teeth, and stiff sharp thorns 2 to 3.5 cm long. Any guesses? For more on *Crataegus* see Voss's Flora of Michigan Vol. 2 and pages 264-268 in the Manual of Vascular Plants by Gleason and Cronquist. A very worthwhile and accessible read on the genus is Hawthorns and Medlars by J. B. Phillips, R. J. O'Kennon, and R. W. Lance.**

**SEDGES AND A FEW OTHER PLANTS FROM
THE HIBBING SOILS FIELD DAY ON JUNE 10, 2005**

June 21, 2005

Gary B. Walton

On June 10, 2005 a field trip study and learn about soils formed in the deposits of glacial Lake Upham was arranged by Julie Klejeski with Mike Walczynski. Three sites were chosen. The first was near the Hibbing Airport and the other two were a few miles out from downtown Hibbing. The site near the Hibbing Airport was an open field that was cultivated and apparently still mowed for hay. The other two sites were in more natural habitats with forest cover typical for the area.

At the site near the Hibbing Airport a number of sedge, rush, and grass species were present as well as forbs. Some sedge plants were readily identifiable in the field but a few were not identifiable at all owing to incomplete development of the perigynia.

Sedges (*Carex*) and rushes (*Eleocharis*, *Juncus*, and *Luzula*) identified are *Carex aurea*, *C. pellita*, *C. arctata*, *C. gracillima*, *C. conoidea*, *C. castanea*, *C. pallescens*, *Eleocharis nitida*, *Juncus balticus*, and *Luzula campestre*. Among the sedges are two specimens that belong to the group Ouales. These were incompletely developed and could not be sensibly identified. A few grasses were also identified on the site and include *Glyceria striata*, *Festuca ovina*, *Danthonia spicata*, and *Phleum pratense*. Other plants seen include *Salix petiolaris*, *S. bebbiana*, *Antennaria neglecta*, *Equisetum arvense*, and *Fragaria virginiana*.



Left to right: *Carex pellita*, *C. conoidea*, *C. castanea*. All collected from site near Hibbing Airport.



Upper left going clockwise: *Carex aurea*, *C. pallescens*, *Luzula campestris*.

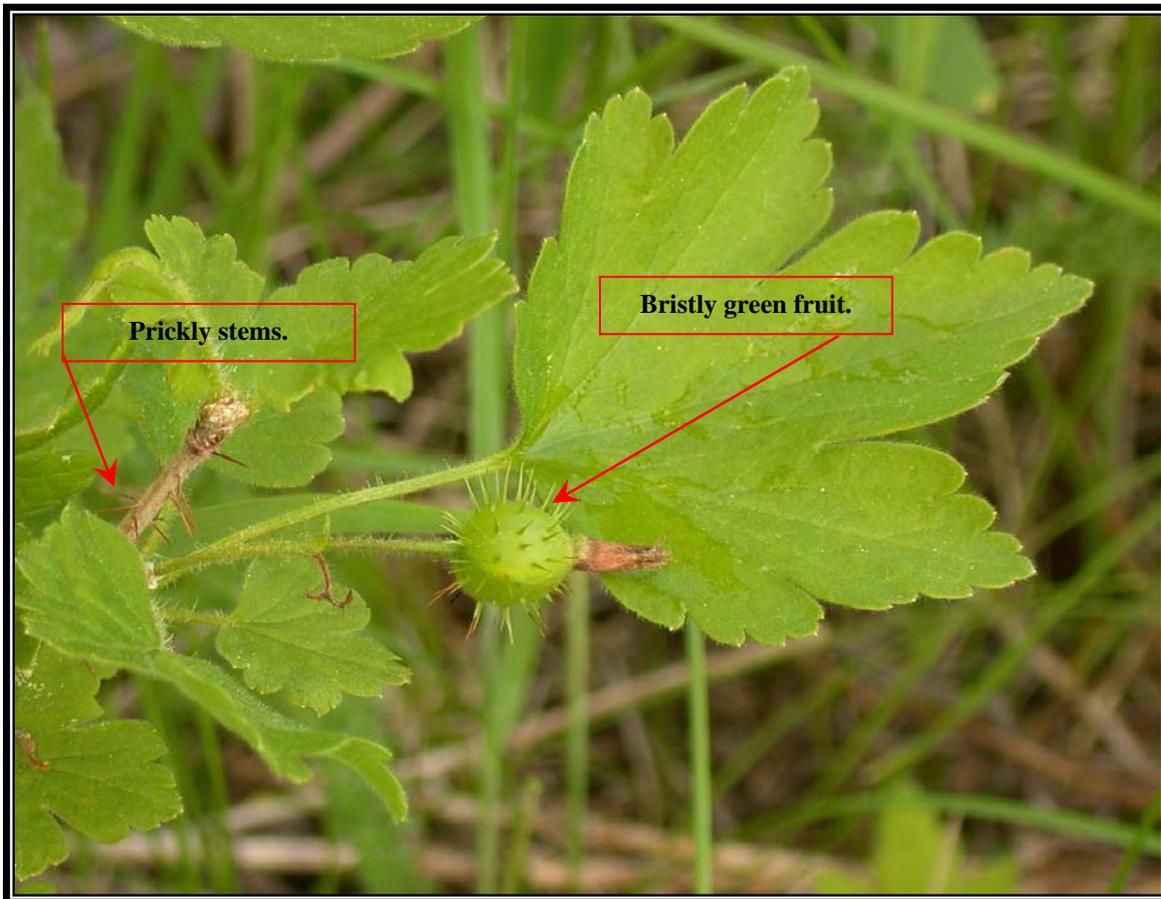
Plants at the other two sites were typical forest species and included black spruce (*Picea mariana*), tamarack (*Larix laricina*), Labrador tea (*Ledum groenlandicum*), bunchberry (*Cornus canadensis*), blueberry (*Vaccinium angustifolium*), wintergreen (*Gaultheria procumbens*), woodland horsetail (*Equisetum sylvaticum*), Mayflower (*Maianthemum canadense*), waterberry (*Lonicera villosa*), bluebead lily (*Clintonia borealis*), clubmosses (*Lycopodium obscurum* and *L. annotinum*), tag alder (*Alnus rugosa*), bracken fern (*Pteridium aquilinum*), cinnamon fern (*Osmunda cinnamomea*), *Carex disperma* and *C. trisperma*.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JUNE 21, 2005

June 21, 2005

Gary B. Walton

It is officially the first day of summer with very warm temperatures in the 70's to low 80's. Heavy rains continue to inundate low lying areas. A number of new plants are now in flower and many that were flowering last week and earlier are developing fruit. For many plant species having both flowering and fruiting material is essential to correct identification. This is especially true for sedges and grasses but also the case for *Galium*, *Rubus*, *Ranunculus*, *Ribes* and several other common genera in our area. Take the specimen pictured below. It is from the genus *Ribes* and from the fruit (shown by the red arrow) you should be able to determine the species.



A few more clues: the flowers of this *Ribes* are single or in small clusters of fewer than 4 and the stems of the plants are somewhat prickly. We have not discussed this species yet, either in the field or on a web page, but check the "Key to the Genus *Ribes*" posted on May 8, 2005. The answer will be given next week.

Here is a description of an *Eriophorium* species (family Cyperaceae which includes sedges) often found in intermediate to rich fens in our area. This species and at least four others in our area are in flower and/or maturing fruit now.

Spikelets 2 or more, nodding or spreading, subtended by 1 or more involucreal leaves. Cauline leaves flat, wide (to 6 mm wide), 2 or more involucreal leaves mostly longer than inflorescence. Scales thin, midvein conspicuous, drab to blackish color, spikes drooping or nodding. Summit of upper leaf sheaths without a dark border (its light brown), midvein of scales thick and extending to tip, bristles white to pale brown, achenes 3 to 3.4 mm long.

Using this description you should be able to determine the species pictured below using any standard floristic text or use the key posted on June 21, 2005 "Key to the genera of the Cyperaceae excluding *Carex*". The answer will be given next week.



On to less taxing matters. This week *Iris versicolor* and *I. shrevei* (wild iris, both OBL) are in bloom in many wetlands across northeastern Minnesota. There are also several sedges and rushes in flower with *I. versicolor* and *I. shrevei* including *Carex utricullata*, *C. lacustris*, *C. stricta*, *Eleocharis smallii*, *Scirpus rubrotinctus*, *S. cyperinus*, *S. acutus*, and *S. atrovirens* (all OBL). A number of grasses in wetlands are nearing flowering, too. In particular *Phalaris arundinacea* (canary grass, FACW) is in many areas just a few days from full bloom (and with that tons of pollen). At least one manna grass, *Glyceria striata* (OBL), is in flower now.



From top left going clockwise: *Scirpus acutus*, *Iris shrevei*, *Lemna minor*.

Many aquatics are also beginning to become evident especially species with emergent or floating leaves. In shallow ponds and along the banks of streams you should look for *Acorus calamus* (sweet flag, OBL) a plant resembling *Iris* but easily distinguished by the spicy fragrance of its leaves and rhizomes. *Ranunculus gmelinii* (small water crowfoot, OBL), *Callitriche verna* (water starwort, OBL), and *Lemna minor* (duckweed, OBL) can also be found along shores and in shallow waters. Several species of *Potamogeton* (pondweeds, all species are OBL) are now showing some floating leaves although a few species such as *P. obtusifolius* never have floating or aerial leaves.

Below: Emergent vegetation in shallow water of a stream channel. Species present are *Ranunculus gmelinii* and a grass, probably *Glyceria grandis*. Beneath the water are *Callitriche verna* and *Potamogeton alpinus*.



In sedge fens and other similar peatlands *Drosera rotundifolia* (sundew, OBL) is now often abundantly present along with several sedges such as *Carex paupercula* (OBL), *C. aurea* (FACW+), and *C. livida* (OBL) and shrub species such as *Potentilla fruticosa* (shrub cinquefoil, FACW). These same species are also present on wet rock outcrops on the shore of Lake Superior with several other species mentioned previously (June 12, 2005) such as bird's eye primula (*Primula mistassinica*, FACW). If you are feeling particularly lucky (or if you happen to be in the right place at the right time, that is, now in a rich fen with some calcium carbonate in the peat and water) you might find *Carex gynocrates* (OBL) a species of sedge that is rare in Wisconsin and somewhat uncommon in Minnesota.

Left: *Carex gynocrates*



From top left going clockwise some other species of intermediate to rich fens: *Drosera rotundifolia*, *Potentilla fruticosa*, *Carex aurea*, *C. livida*.

In upland forests most spring ephemerals are now dormant. Other species such as *Arisaema triphllya* (FACW-) are still flowering although some are developing fruit. Other spring flowers now developing fruit include *Anemone quinquefolia* (FAC*), *Thalictrum dioicum* (FACU+), *Hepatica americana*, *Caulophyllum thalictroides*, *Carex peckii*, *C. pedunculata*, *Oryzopsis asperfolia*, and both species of *Actaea* (these last seven species all "no rating"). Red maple (*Acer rubrum*, FAC) and American elm (*Ulmus americana*, FACW-) are shedding seeds. Along the edges of woodlands red raspberry (*Rubus strigosus*, FACW-) and blackberry (*R. allegheniensis*, FACU+) are flowering. In moist forests with some conifer components *Mitella nuda* (FACW), *Oxalis acetosella* (FACU*), and *Corallorhiza striata* (FACU-) are in flower.



Rubus allegheniensis flowers. Note that it like *R. strigosus* has gland-tipped hairs on the sepals, peduncles, young stems, stipules, and petioles. The robust stems with thick sharp thorns and leaves usually with five leaflets are good features to separate *R. allegheniensis* from *R. strigosus* when not in fruit.



Oxalis acetosella is frequently found growing in large colonies in moist coniferous forests often under balsam fir, white spruce, and white cedar. It is our only native *Oxalis* with pink-striped white flowers, all others have yellow flowers except *O. violacea*, a prairie species from scaly bulbs with rose-violet flowers.

O. acetosella is a perennial from a scaly rhizome with long petioled trifoliate hairy leaves. Besides the obvious flower in the picture *O. acetosella* also produces cleistogamous ("hidden") flowers underground.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JUNE 29, 2005

June 29, 2005

Gary B. Walton

The hot weather continues with temperatures reaching 90°. This is stressful weather especially for many of our native species which are better adapted to cool climates. Heavy rains persist in some parts of northeastern Minnesota and of course this keeps many low lying areas flooded.

In southern Carlton County and in Pine County a number of prairie species and other plants suited for dry soils have come into flower in the last two weeks. Among these are hoary puccoon (*Lithospermum canescens*, no rating), porcupine grass (*Stipa spartea*, no rating), purple prairie clover (*Petalastemon purpurea*, no rating), and thimble flower (*Anemone cylindrica*, no rating). Blazing star (*Liatris aspera*, no rating) is coming closer to flowering, too.



Upper left: *Lithospermum canescens*

Upper right: *Anemone cylindrica*

Lower left: *Calystegia sepium*

In dry grasslands, pine and bracken fern barrens, and northern upland meadows hedge bindweed (*Calystegia sepium*, no rating), is also in flower. *C. sepium* is a perennial morning glory native to our region with large white trumpet-shaped flowers. It is often found in dry habitats with such northern grasses as poverty oats (*Danthonia spicata*, no rating) and false melic (*Schizachne purpurascens*, FACU) both of which are also in flower.

Along wooded edges and similar partly shaded habitats a number of shrubby *Rubus* species are in flower including *R. allegheniensis*, *R. strigosus*, *R. setosus*, and *R. parviflorus*.



Left: Flower of *Rubus parviflorus* which resembles a white rose. Its large maple-shaped leaves easily distinguish it from roses. Also, the fruit is like a typical raspberry and composed of many small drupelets.



Several *Galium* species are in flower now. In upland woods *Galium triflorum* (FACU+) is flowering. It can be differentiated from other *Galium* species by its smooth stems and leaves with the midvein retrorsely scabrous below. Another *Galium* in flower now is *G. boreale* (FAC) which occurs in dry grasslands and dry

woods. Also, look for sweet cicely (*Osmorhiza longistylus* and *O. claytonii*, both FACU-), two members of the Apiaceae (carrot family) in rich upland hardwoods and mixed coniferous-hardwoods forests. Both are in flower and/or maturing fruit now. Another member of Apiaceae in flower now is *Sanicula canadensis* (black snakeroot, FACU+). It occurs in moist hardwoods and mixed coniferous forests.

Left: *Galium triflorum*

Pastures, fields and cultivated meadows are bright with species of *Hieracium* (hawkweeds), *Chrysanthemum* (daisy), *Crepis*, *Tragopogon* (goat's beard), *Trifolium* (clovers), *Vicia* (vetch), *Potentilla* (five-finger grass), *Stellaria* (stitchwort), and many species of grasses.

Besides several *Scirpus* and *Carex* species *Thalictrum dasycarpum*, *Heracleum lanatum*, *Stachys palustris* and *Acorus calamus* are in flower in many shrub swamps and wet meadows. *Acorus calamus* has long linear leaves with an equitant arrangement and might resemble a non-flowering *Iris*. However, the rhizome and crushed leaves have a distinct spicy fragrance. *A. calamus* often grows wherever *Iris versicolor* grows.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JULY 6, 2005

July 6, 2005

Gary B. Walton

Several sedges are maturing fruit and a few aquatic species are in flower this week. Among the sedges are *Carex arcta* (OBL), beaked sedge (*C. rostrata*, OBL), tussock sedge (*C. stricta*, OBL), and *C. intumescens* (OBL). *Carex arcta* is a member of the *Carex* group STELLULATAE which includes several very similar species. *C. arcta* is fairly easy to distinguish from other species in its group once you have keyed the specimen to the STELLULATAE (of course) by its cylindrical cluster of spikes and 20-40 perigynia per spike. *C. arcta* grows in wet meadows, shores, edges of woodland pools, and stream banks.

Several members of the *Carex* group OVALES are also maturing fruit and so are becoming less difficult to identify. Among the more common species in our area are *C. projecta*, *C. tenera*, *C. scoparia*, and *C. normalis*. The STELLULATAE and OVALES are difficult groups. While most are FACW or OBL it is important to correctly identify specimens as a few species are on the rare plant lists in both Minnesota and Wisconsin.

In marshes and wet meadows several native wetland grasses are also beginning to flower now including *Glyceria grandis* (OBL), *G. canadense* (OBL), and *Poa palustris* (FACW+). Also, in flower and becoming more identifiable are *Scirpus cyperinus* and *S. rubrotinctus* (both OBL). In these same habitats look for meadowsweet (*Spiraea alba*, FACW+), marsh bellflower (*Campanula aparinoides*, OBL), bugleweed (*Lycopus uniflorus*, OBL), wild mint (*Mentha arvensis*, FACW+), and skullcap (*Scutellaria galericulata*, OBL).

In shallow pools, along shores, and in channels through peat mats look for marsh cinquefoil (*Potentilla palustris*, OBL) which has red-purple fragrant flowers held above the water on slightly woody stems. Its leaves are pinnately compound with 3 to 5 leaflets and large ovate stipules. Other emergent aquatics in flower are yellow water lily (*Nuphar lutea*, OBL), and water plantain (*Alisma subcordatum*, OBL).





Above: *Potentilla palustris*, a semi-woody, coarse stemmed decumbent plant from a long rhizome normally found growing in the still water of ponds, pools, marshes, and channels.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JULY 12, 2005

July 12, 2005

Gary B. Walton

There has been little rain for the past two weeks and some ephemeral pools are beginning to dry up or have dried up completely. Wood frog tadpoles have gotten their legs just in time. Many small creeks are also low. Temperatures for the next 5 to 7 seven days are predicted to be in the 80's over much of the area.

This past week has seen many mid-summer species come into flower. *Asclepias syriaca* and *A. incarnata* are in bloom. Both are host plants for monarch butterfly larva which are growing rapidly in the warm weather. On nettles (*Urtica dioica*), white sage (*Artemisia ludoviciana*) and pussytoes (*Antennaria* spp.) a second brood of painted lady butterfly and Milbert's tortoise-shell butterfly larva have hatched out.

In marshes and along shores sedges and rushes continue to flower. This week *Scirpus atrovirens* and *S. cyperinus* (both Cyperaceae) are flowering. *Juncus effusus* and *J. vaseyi*, two of the soft rushes (Juncaceae) are also in flower as is toad rush (*Juncus bufonius*) on trails and logging roads. *Acorus calamus* (sweet flag) is in flower this week.

In ephemeral pools you should look for *Lycopus americanus*, *Alopecurus aequalis*, *Carex lupulina*, *Galium tinctorum*, and *Sium suave* which are beginning to flower now. Around the edges of these pools you might see winterberry (*Ilex verticillata*) in flower. Its flowers are small but very numerous along the twigs and so very noticeable.



Left to right: *Ilex verticillata*, *Scirpus atrovirens*, *Acorus calamus*

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR JULY 17, 2005

July 17, 2005

Gary B. Walton

We are entering our third week of low rainfall and high temperatures. Some plants on well drained soils are showing stress from the high temperatures and lack of water. Many larger wetlands although not necessarily flooded are remaining saturated. Most ephemeral or vernal forest pools are now mud holes and some look like small sedge meadows. Typical species in these dry pools include *Alopecurus aequalis*, *Carex lupulina*, *Lycopus americanus*, *Galium tinctorum*, *Callitriche verna*, *Veronica scutellata* and *Sium suave* all of which normally grow in very saturated soils. There may also be *Torreyochloa pallida*, *Ranunculus gmelinii*, and *Sparganium glomeratum*.

On muddy banks and shores of slow moving rivers, small creeks, and lakes several new species are in flower. Among these are *Eleocharis smallii*, *Glyceria borealis*, *Torreyochloa pallida*, *Sium suave*, *Campanula aparinoides*, *Mimulus ringens*, *Polygonum amphibium*, *Scutellaria galericulata*, *Callitriche verna*, *Galium obtusum*, and *Veronica scutellata*. Several aquatic species are also in flower including *Pontederia cordata* *Potamogeton* spp., *Utricularia macrorhiza* which are blooming in masses across shallow pools and ponds. All the above named species are either FACW or OBL.



Flowers from top left going clockwise:
Mimulus ringens, *Galium obtusum*, *Potamogeton illinoensis*, *Campanula aparinoides*, and *Utricularia macrorhiza*.

Some very showy flowers have become noticeable especially along roadsides where the ditches are seldom mowed. The most obvious is *Lilium michiganense* (Michigan lily). Gleason and Cronquist (1991) and Voss (1972) both recognize *L. michiganense*, *L. canadense*, and *L. superbum* as distinct species while the National List (Reed 1988) and some other wetland plant lists merge *L. michiganense* into *L. canadense* and seem confused about the nativeness of *L. superbum*.



Lilium michiganense (shown upper left) inhabits low wet woods, wet meadows, and the margins of swamps. The tepals are fully recurved so that the tips turn back beyond the base of the perianth, anthers are mostly around 9 mm long (measurements from 8 different specimens measured from 3 population sites in Carlton County), and leaves with finely scabrous margins. This fits well with the species delineations presented in Gleason and Cronquist and in Voss. The

habitat affinities of *L. michiganense* are described as wet meadows, borders of streams and woods and similar moist to wet habitats. Associated species at several sites included *Calamagrostis canadensis*, *Phalaris arundinacea*, *Spartina pectinata*, *Lysimachia ciliata*, *Eupatorium maculatum*, *Zizia aptera*, *Cicuta maculata*, and *Thalictrum dasycarpum*.



Other showy flowering plants are also blooming in wet ditches and wet meadows. Among these are fireweed (*Epilobium angustifolium*), joe-pye-weed (*Eupatorium maculatum*), fringed loosestrife (*Lysimachia ciliata*), tall sunflower (*Helianthus giganteus*), and wild cucumber (*Echinocystis lobata*). In drier open habitats early goldenrod (*Solidago juncea*) and gray goldenrod (*S. nemoralis*) are about ready to bloom. A native *Hieracium* species (*Hieracium kalmii*) is also now in flower.

In drier areas such as jack pine barrens some *Liatris* species and *Helianthus occidentalis* are near blooming. A plant in the clover family typical of prairies but with a few apparently native outlier populations in scattered along the bluffs in Duluth, *Petalastemon (Dalea) purpurea* is in flower as are two other dry grassland species, one from the rose family, *Potentilla pensylvanica*, the other from the mint family, *Monarda fistulosa*.



Hieracium kalmii

Hieracium kalmii (shown left) is a native hawkweed found in woods, gravelly or sandy beaches, thickets, and old fields. This species has cauline (stem) leaves barely clasping with acute tips, some coarse teeth, margins and surfaces with many stellate hairs (visible at 10X or greater), rarely any small conic hairs and then only a few so that the surface is not rough to the touch. The stems are also pubescent long hairs and stellate hairs and end in an umbelliform inflorescence. Bracts of individual flower heads are often glabrous but may have some small soft hairs or long hairs, sometimes a few stellate hairs. A similar species is *H. umbellatum* which is distinguished by copious small conic hairs on the leaf margins (making them feel rough) and on the leaf surfaces and stems. Both species are native perennials from rhizomes and occur in similar habitats. No species of *Hieracium* has a wetland rating.

A number of shrub species that were in flower in the early spring are now in fruit. *Sambucus pubens*, *Cornus sericea* (*Cornus stolonifera*), *Rubus strigosus*, *Prunus virginiana*, *Amelanchier* spp., and *Vaccinium angustifolium* are all ripening fruit.



Cornus sericea



Sambucus pubens

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR AUGUST 1, 2005

August 1, 2005

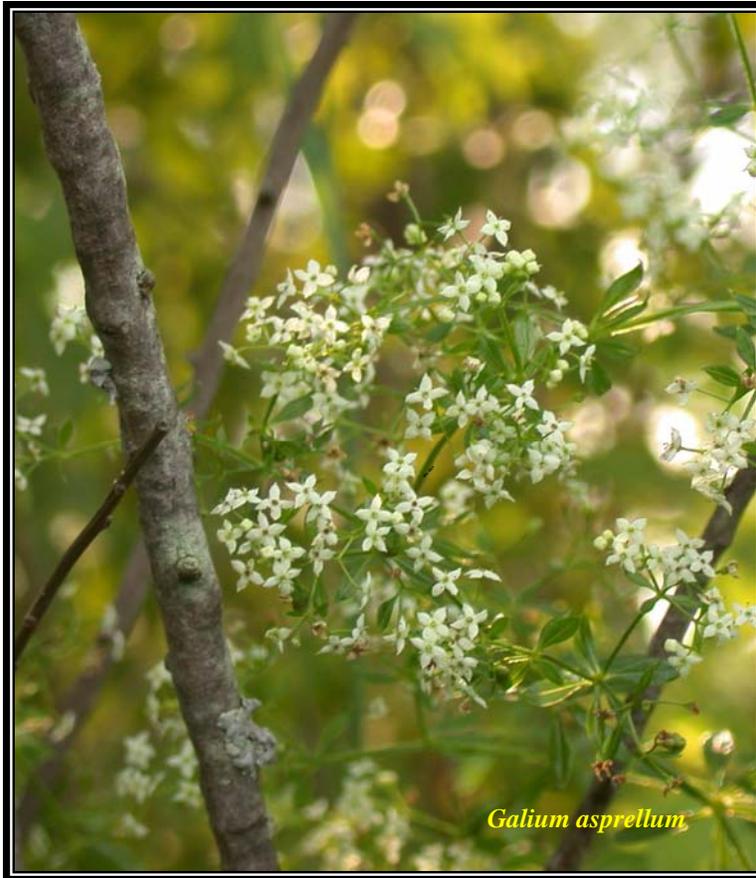
Gary B. Walton

Finally during the last week of July almost 2 inches of rain fell after nearly 20 days of high temperatures, drying winds and no precipitation. The rain came in time before many wild fruits which are valuable forage for various species of song birds were harmed by the lack of water.

Many vernal forest pools were drying out from the lack of rain although this is the normal state of affairs for these habitats. A number of species found in vernal forest pools are now in bloom or maturing fruit. Among them are *Sium suave* (water parsnip, OBL), *Scutellaria lateriflora* (skullcap, OBL), *Lycopus uniflorus* (bugleweed, OBL), *Galium tinctorum* (bedstraw, OBL), and *G. asprellum* (OBL). Two sedges, *Carex vesicaria* (sedge, OBL), *C. tuckermanii* (sedge, OBL), both members of the section VESICARIAE, are also with mature or nearly mature fruit. Other sedges are also maturing perigynia and achenes to the point where identification is practical. These include *Carex gynandra*, *C. comosa*, and *C. pseudocyperus*. Many of these same species also grow in marshes and swamps.

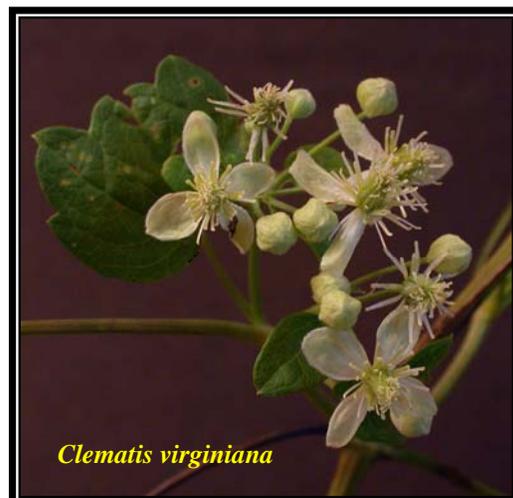


Above: Fruiting spikes of *Carex tuckermanii* (right) and *C. vesicaria* (left) two common sedges of woodland pools.



Left: *Galium asprellum* (OBL) or rough bedstraw has retrorse barbs along the stems, the leaf margins and on the underside of the mid-vein which support this straggling plant on other vegetation. The flowers are four-petals, white, and sweetly fragrant and borne in loose panicles at the top of the plant. The fruit is smooth surfaced.

Along streams and rivers look for *Clematis virginiana* (virgin's bower, FAC), *Echinocystis lobata* (wild cucumber, FACW-), *Smilax hispida* (greenbrier, FAC), and *Humulus lupulus* (wild hops, FACU*) all vining species that are in flower this month. *Fraxinus pennsylvanica* (green ash, FACW) is maturing fruit. Its samaras (winged fruit) differ from the related *F. nigra* (black ash, FACW+) in that the wings do not extend along the entire length of the fruit.





Fraxinus pennsylvanica samaras

Above: The winged fruit (samaras) of *Fraxinus pennsylvanica* differs from the related black ash (*F. nigra*) by its winged margins which extend only about three-fourths of the way along the fruit (all the way down in black ash). While both species are wetland species *F. pennsylvanica* is more likely to be found in wet woods and on floodplains while *F. nigra* is a species of swamps.



Lycopodium uniflorum plant



Lycopodium uniflorum tuber

Above: *Lycopodium uniflorum* (bugleweed) has somewhat sessile leaves with a few teeth. The plant is stoloniferous with each stolon ending in a tuber.

WHAT'S DEVELOPING- PHENOLOGICAL CHANGES FOR AUGUST 29, 2005

August 29, 2005

Gary B. Walton

These last four weeks have been extremely dry over much of the region but temperatures have been moderate much of the time and some rain fell on August 26. On August 23 a frost hit many low lying areas and in some places was damaging especially to plant species adventive from warmer climates such as *Amaranth* spp. (red root), *Mollugo verticillata* (carpet-weed), and *Portulaca oleracea* (purslane). Some of our native trees and shrubs are turning color somewhat early but this may be more a response to drought and heat stress than it is to the changing day length.



Fruiting plants from left to right: *Hieracium scabrum* (sticky hawkweed), *Agrimonia gryposepala* (agrimonia), *Elymus trachycaulis* (wheatgrass).



Both upland and wetland grasses and sedges are quickly maturing fruit and on many the seed heads are shattering. Most are still identifiable, though. In uplands many forbs are also setting seed including *Lathyrus ochrocleucus* and *L. venosus*, *Vicia americana*, *Hieracium scabrum*, *H. kalmii*, *Agrimonia gryposepala*, *Epilobium angustifolium*. Berry plants such as *Rubus setosus*, *Cornus canadensis*, *C. rugosa*, and *C. alternifolia* are ripening fruit which is being eaten by songbirds such as vireos, catbirds, robins. Ruffed grouse are eating fruit of *Rubus setosus* and *Cornus canadensis*.

Actaea spp. (baneberries) and *Arisaema triphyllum* are also in fruit in upland and moist woods.

Left: Fruit of *Rubus setosus* (a blackberry)



**Left: *Sparganium chlorocarpum* var. *acaule* (green-fruited bur-reed, OBL).
Right: *Rumex verticillatus* (whorled dock, OBL)**

In wetlands plants such as *Rumex verticillata*, *Calla palustris*, *Sagittaria* spp., *Potamogeton* spp., *Galium* spp., *Sium suave*, *Sparganium* spp., *Typha latifolia*, and *Acorus calamus* are setting fruit. Some such as *Sagittaria*, *Potamogeton*, *Rumex* and *Sparganium* are most easily identified to species by characteristics of the fruit.

In roadside ditches look for narrow-leaved cattail (*Typha angustifolia*) which can be distinguished from *T. latifolia*, the broad-leaved cattail, by its narrow 5 to 11mm wide leaves and by the distinct gap (from 1 to as much as 12 cm) between the staminate section and 1 to cm thick section of the inflorescence. *T. angustifolia* is more tolerant of alkaline conditions and has probably moved from the east and west to the midwest from coastal saline marshes along roadside ditches. *T. latifolia* and *T. angustifolia* hybridize to produce a vigorous hybrid known as *T. X glauca*.

Goldenrod (*Solidago*) and asters (*Aster*) are the most prominent flowering plants right now. Some early bloomers are setting seeds. Several species of wild sunflower (*Helianthus*) are also in bloom. Many of these are adventive to our region but one, *Helianthus giganteus* (tall sunflower, FACW), is native to our area and can be found in roadside ditches and along moist edges of woods, streams, and swamps. **From**



From upper left going clockwise:
Solidago nemoralis (gray goldenrod, no rating) found in open dry fields.
Solidago canadensis (Canada goldenrod, FACU) common in mesic to dry sites and often weedy on disturbed ground.
Aster ciliolatus (fringed aster, no rating) is common in dry to mesic woods and fields.

Helianthus giganteus (below) is a wild sunflower native to northeastern Minnesota (all others very likely recently introduced or adventive from the south and west). *H. giganteus* grows in moist soils along trails, woodland edges, wet meadows, and also along ditches. It is a tall plant often reaching 2 or even 3 meters in height. The leaves (8 to 20 cm long by 1 to 3.5 cm wide) are flat with three prominent veins starting from the base and taper to a short petiole. Leaf surfaces are rough with short stiff hairs above, softly hairy below, and the margins toothed to entire. The bracts are narrow, end in a sharp or attenuate tip, green often with a darkened spot near the base, and the margins hirsute-ciliate. The roots of *H. giganteus* are tuberous but are not true tubers like those of the Jerusalem artichoke (*H. tuberosus*) which are thickened subterranean stems.

The flower heads of *H. giganteus* produce numerous small seeds that are eaten by many songbirds such as goldfinches.



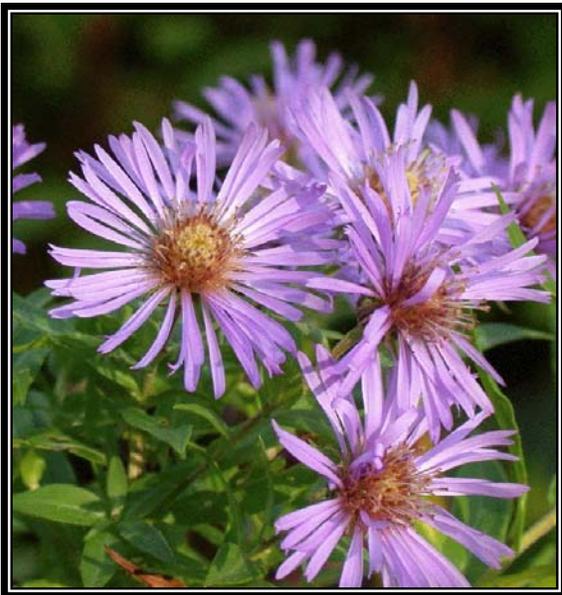
This is a very colorful time of the year and some flowers though seldom abundant are worth noting here for their intense color and beauty. Two gentians and two asters are pictured below.

Top left: *Gentiana andrewsii* which grows on non-calcareous moist soils in full to part sun throughout the area. The color of *G. andrewsii* flowers is normally blue. Wetland rating is FACW.

Top right: *G. rubricaulis* a species found on moist calcareous soils such as the clay plains of Superior, WI. Wetland rating is OBL.

Bottom left: *Aster modestus*, occasional to frequent in some wet meadows between Hibbing and Grand Portage, MN. Wetland rating is FAC+.

Bottom right: *A. novae-angliae*, very uncommon in our area but sometimes found in wet meadows near Pokegama, WI. Wetland rating is FACW.



WHAT'S DEVELOPING-PHENOLOGICAL CHANGES FOR SEPTEMBER 1-19, 2005

September 1-19, 2005

Gary B. Walton

Up until September 12 it looked as though we would have experienced almost two full months of below normal (or none at all) rainfall. As much as 3 inches fell in some places on September 12 and 13. The drought continues, though, as fall approaches with many areas of northeastern Minnesota 7 inches below normal rainfall. Woodland ponds, streams, marshes and other normally wet areas are dry or low. Uplands are also very dry and the stress of drought combined with above normal temperatures and constant winds is having an effect. Many fruiting shrubs have produced poorly. Other plants have not set seed at all. Some trees that normally change color in late September turned yellow and red in August. This was especially the case for trees and shrubs on shallow soils over bedrock and on well-drained sandy soils.

The growing season is quickly ending with many plants dying back and going dormant and others rapidly setting seed. In the last three weeks a number of annual species have flowered and are now setting seed. Many of these species are regarded weeds but they are common and abundant members of the flora especially on disturbed soils where they can be very abundant. Some well know examples include *Amaranthus* and *Chenopodium* two genera with species found over most of the northern and southern hemispheres.



Both *Amaranthus retroflexus* (FACU) and *Chenopodium gigantospermum* (no rating) are commonly called "pigweed" but are in separate families (Amaranthaceae and Chenopodiaceae). Principle differences are in the perianth, which is green and herbaceous in Chenopodiaceae, and dry, scarious, or membranous and green or variously colored in Amaranthaceae. In many other respects the two families are very similar.



Hawthorns (*Crataegus*) are one fruiting shrub that has done well this summer. One species, the fire-berry hawthorn (*Crataegus chrysocarpa*, no rating) with its large clusters of bright red fruit is very noticeable along streams and moist wooded edges. Roses (*Rosa acicularis* and *R. blanda*, both FACU) are also in fruit. Mountain ash (*Sorbus americana*, FAC+; and the introduced *S. aucuparia*, no rating) are also producing heavily in places where they find sufficient moisture.

In wetlands, some herbaceous plants besides *Aster puniceus* are still in flower. These include nodding beggar's ticks (*Bidens cernua*, OBL), tickseed (*B. frondosa*, FACW), bedstraw (*Galium tinctorum*, OBL), and tear-thumb (*Polygonum sagittatum*, OBL).

Upper left: *Crataegus chrysocarpa*

Lower left: *Bidens cernua*

Lower right: *Galium tinctorum*





Above: *Lycopodium annotinum* in *Sphagnum* moss dominated coniferous swamp.

Lycopodium annotinum (bristly clubmoss, FAC) is a common clubmoss (Lycophytes) occurring in a variety of moist to dry coniferous forests in acidic soil. The stiff leaves are 8-ranked, semi-whorled (4 leaves per whorl), with a sharp tip, and smooth to slightly toothed margins. The horizontal stems run across the soil or slightly below it, rooting and branching at intervals. The upright stems may be single or once or twice forked usually ending in a single spore cone. *L. annotinum* can form extensive colonies.

An extreme form of *L. annotinum* has stiff, tightly appressed, ascending, entire margined leaves and horizontal stems consistently underground. This form often grows in acidic poor forested fens with deep moss layers. It has been named *L. annotinum* var. *pungens* but the variety is no longer considered valid.

L. annotinum and other *Lycopodium* and *Diphasiastrum* species have mature spore cones now and are shedding spores. Like the *Botrychium* ferns discussed below spores of the Lycophytes germinate underground where they live for several years as achlorophyllous gametophytes in association with fungal hyphae for several years before the first above ground photosynthetic leaf is produced. Depending on the genus, the gametophyte may be fusiform or discoid.

While most ferns are dying back, their fronds changing color from green to various shade soft yellow, red, and brown, one genus, *Botrychium* (grapeferns) will remain green throughout the winter into next spring. Several species of the subgenus *Sceptridium*, can be found now although it may take some work to locate them. These are ferns with low growing fronds easily hidden among grasses and other plants. Two common species found in almost every county of Minnesota are *Botrychium multifidum* (grapefern, FACU) and *B. dissectum* (cut-leaf grapefern, FAC). Both occur in mesic, open habitats. *B. dissectum* is also common in hardwood forests especially in moist soil.

B. multifidum has a triangular, dark green, horizontally oriented usually flat-surfaced trophophore (photosynthetic, sterile leaf) 4 to 28 cm long and 3.5 to 20 cm wide on a stipe to 6 cm. Divisions of the pinnae are regular to the tip, slightly overlapping to remote. The pinnules are 4-8 mm wide, rounded to bluntly pointed with smooth to crenate to finely denticulate the margins. Venation is pinnate.

B. dissectum occurs in two well-marked forms, forma *dissectum* which has lacerate to coarsely dissected pinnules and forma *obliquum* which has finely to irregularly toothed pinnules. Both formas are connected by a series of intermediates (and an array of names). *B. dissectum* has a flat to slightly convex trophophore surface, 15 cm long by 10 cm wide. The pinnae, slightly approximate to remote, are ascending and undivided except in the proximal third. Venation is pinnate. The trophophore is semi-evergreen but turns bronze-purple in the fall as the temperatures cool.

Spores of *Botrychium* are produced on separate fronds with numerous branches in clusters of yellow to yellow-orange rounded sporangia. These are upright and wither once spores are shed in late summer and early autumn. The spores germinate underground and exist as achlorophyllous gametophytes for several years in association with fungal hyphae. The subterranean population of *Botrychium* can be immense compared to plants with aboveground leaves.

Botrychium do not produce scaly rhizomes like other ferns. The single (rarely two) annual frond arises from a series of preformed buds at the apex a short upright stem under the soil. This stem has several thick, fleshy roots with no root hairs but many fungal strands. The roots look segmented and are contractile, that is, they pull the short stem deeper into the ground each year as the stem grows upwards. This type of root is similar in function to the contractile roots of tuberous monocots like those in *Iris*.



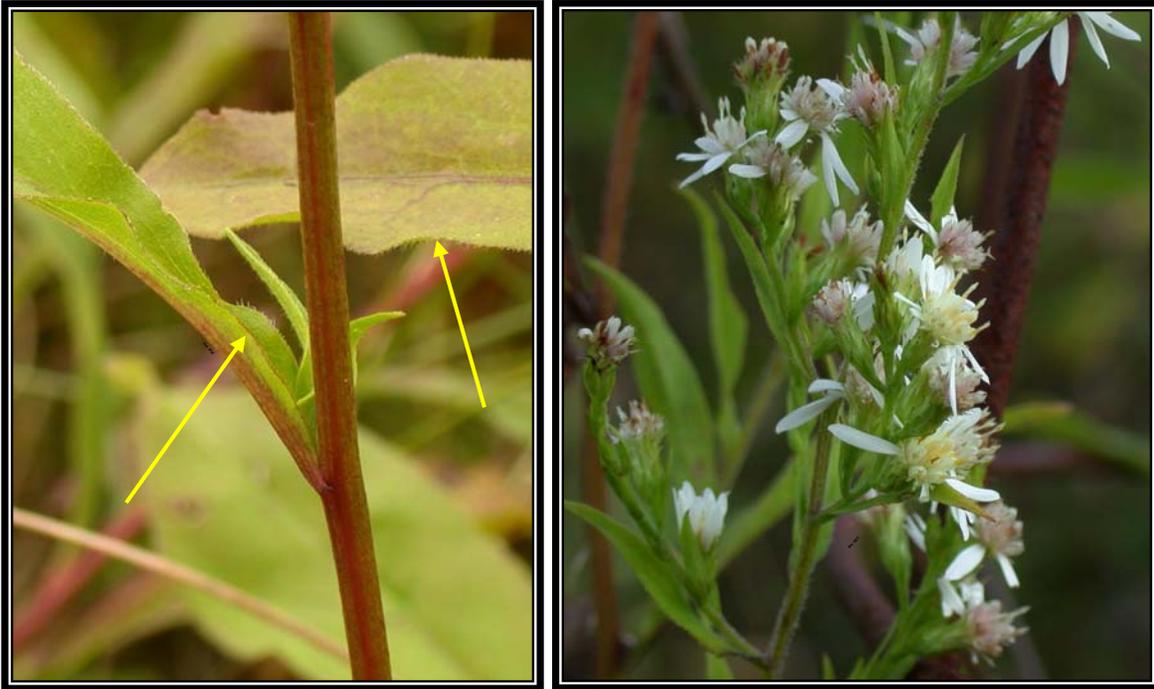
Left: *Botrychium multifidum*



Right: *Botrychium dissectum* forma *obliquum*

Two more asters: one upland species and one wetland species

Many species in the aster family such as *Aster*, *Solidago*, *Heliopsis*, *Helianthus*, *Eupatorium*, *Liatris*, *Senecio*, and *Cirsium* are maturing and shedding seeds. *Solidago gigantea* is still in bloom and some small patches of *S. canadensis* are still in flower but most are shedding seeds. Several species of *Aster* (*Aster ciliolatus*, *A. novae-angliae*, *A. puniceus*, *A. lanceolatus*, and *A. lateriflorus*) are still blooming. In addition, two other species, *Aster urophyllus* and *A. firmus*, are now coming into bloom. This is the ideal time of year to collect specimens of asters and goldenrods as many have both seeds and mature flowers on the same plant.



Left: *Aster urophyllus* stem with sessile leaf. Note winged petiole with scant ciliate hairs. Also, note the other leaf in the back that is ciliate margined but not serrate.

Right: A single inflorescence branch cluster of *Aster urophyllus*. It is dense with white flowers.

Aster urophyllus Lindley (syn. *Aster sagittifolius*, arrow-leaf aster, no rating) is an upland species that is now in full flower some three weeks after *A. ciliolatus* came into flower. Both are related and belong to the *Aster* subgenus *Symphotrichum* subsection *Heterophylli*. The ray flowers of *A. urophyllus* are 4.5 to 7 mm long, usually white to pale pink, in numerous (as many as 100) small heads on paniculiform ascending branches. The basal and lower stem leaves are shallowly cordate, petiolate, regularly serrate, and rarely entire. Those further up the stem are winged-petiolate to cuneate becoming almost sessile near the top. Leaves nearest the top have margins are ciliate-entire. The undersides of the leaves are softly pubescent.

A. urophyllus grows in mesic habitats such as streambanks and moist woods. It also grows in habitats that are more open.

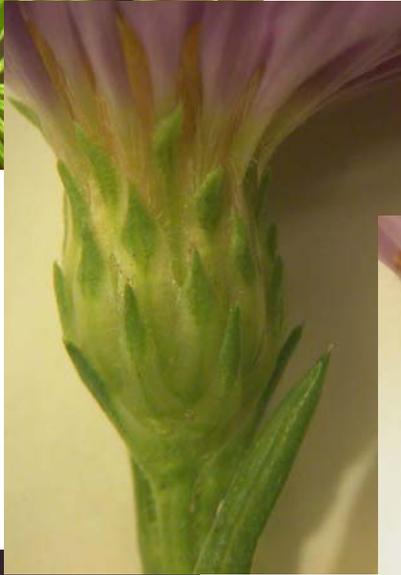


Above: Inflorescence and leaves of *Aster firmus*.

Aster firmus Nees (syn. *A. lucidulus* (Asa Gray) Wieg, the shining aster, FACW-) is an aster species very similar to and closely related to *A. puniceus*. It has been considered at times and by different botanists to be a variety or subspecies of *A. puniceus* (*A. puniceus* var. *firmus*, *A. puniceus* var. *lucidulus*). When seen *in situ* the differences between the two species are clearly apparent. *A. firmus* has narrow (around 1 cm wide) leaves that are entire margined to scarcely toothed with somewhat attenuate tips. The leaves are scarcely pubescent except along the lower midvein and leaf margins but never scabrous as in *A. puniceus*. Internodes are short giving the whole plant a very leafy appearance especially towards the inflorescence. *A. puniceus* grows from a thick caudex while *A. firmus* is colonial by long thin rhizomes. The stems of *A. firmus* are pubescent as in *A. puniceus* but mostly in lines along the stem angles. Flower color is paler than in *A. puniceus*.

Habitat preferences of *A. firmus* tend to be moist places rather than highly saturated soils, the usual habitat of *A. puniceus*.

TAXONOMY PAGES



**KEY TO SPECIES OF PONTEDERIA (PONTEDERIACEAE),
SAGITTARIA (ALISMATACEAE), AND ALISMA (ALISMATACEAE)**

April 21, 2005

Gary B. Walton

- 1A) Blades of aerial leaves cordate, leaves crowded at the base from a thick rootstock, flowers blue in a dense spike: *Pontederia cordata*
- 1B) Blades of aerial leaves rounded, linear, sagittate never cordate, leaves in a rosette, flowers white or pink on a scape: 2
 - 2A) Aerial leaves sagittate, narrowly spatulate to linear but never cordate, flowers white, the lowest flowers either all staminate or all carpellate (these in a globose head), the uppermost almost all staminate: 3 (*Sagittaria*)
 - 2B) Aerial leaves broad, flat, rounded or tapered at base, flowers white or pink, the lowest flowers with both stamens and carpels (these in a single ring on a flattened receptacle): 6 (*Alisma*)
- 3A) Filaments of stamens pubescent with flattened or scale-like hairs, leaves not sagittate (or with very small basal lobes): 4
- 3B) Filaments glabrous, aerial leaves usually sagittate: 5
 - 4A) Flowers nearly to completely sessile, flower stems bent just above lowest flowers, leaf blades scarcely as wide as petiole or rarely oval (and then with small basal lobes): *Sagittaria rigida*
 - 4B) Flowers on pedicels, flower stems not bent, leaf blades narrowly ovate, wider than petioles, never with basal lobes: *Sagittaria graminea*
- 5A) Mature achenes with a horizontal beak 0.5-2 mm long, achenes winged, leaves with all lobes equal, inflorescence bracts papery, 5-10 mm long: *Sagittaria latifolia*
- 5B) Mature achenes with erect beak to 0.5 mm long, margins of achenes appearing swollen or convex, leaves with terminal lobe longest, inflorescence bracts 10-30 mm long: *Sagittaria cuneata*
- 6A) Petals white, achenes with 2 ridges and dorsal groove: *Alisma plantago-aquatica*
- 6B) Petals pink, achenes with 3 ridges and 2 dorsal grooves: *Alisma gramineum*

NOTE:

The Alismataceae are species of shallow, usually permanent, water bodies such as ponds, lakes and rivers. Some species, though, of *Alisma* are weedy colonizers of disturbed wetland soils. While *Pontederia cordata* is easily recognized by its thick spike of blue flowers and cordate leaves with arcuate venation members of *Sagittaria* and *Alisma* have variable leaf forms especially in the case of submerged and partially emergent forms. Correct identification to species in *Sagittaria* and *Alisma* requires good fruiting material as well as in some cases intact mature flowers.

KEY TO GENERA AND SPECIES OF ACORACEAE, ARACEAE, AND LEMNACEAE

April 21, 2005

Gary B. Walton

- 1A) Plants without leaves, body of plant rounded or composed of floating globose or flattened jointed stems, flowers minute: 2
1B) Plants with true leaves, terrestrial or aquatic, flowers easily seen: 5
- 2A) Plants without roots, globose, minute: *Wolfia columbiana*
 2B) Plants with at least one root per joint: 3
- 3A) Plants reddish-purple below, with several roots per joint, usually 7 prominent nerves, joints 3-10 mm long: *Spirodela polyrhiza*
3B) Plants green above and below, one root per joint with 1-3 nerves: 4 (*Lemna*)
- 4A) Joints rounded, plants floating most of growing season: *Lemna minor*
 4B) Joints long, narrow, plants floating or often sinking: *Lemna trisulca*
- 5A) Leaves erect, linear from a thick rhizome, inflorescence not enclosed by spathe, whole with a spicy fragrance: *Acorus calamus*
5B) Leaves not grass-like, from a tuber, corm or stout rootstock, inflorescence enclosed by a leafy spathe, plants acrid: 6
- 6) Leaves compound with 3 leaflets, from a corm, spathe green to purple, the hood arching over the spadix, fruit a red berry : *Arisaema triphyllum*
 6B) Leaves simple, ovate: 7
- 7A) Leaf veins curved, parallel, not reticulate, along a floating or decumbent stem, spathe white, open, fruit a red berry: *Calla palustris*
 7B) Leaf veins reticulate, leaves all basal from a corm and broadly ovate, acrid smelling, spathe ovoid, reddish brown, fruit fleshy, globose: *Symplocarpus foetidus*



Left: Spadix of *Acorus calamus* and portion of elongate subtending leaf.

Right: Spadix of *Symplocarpus foetidus* enclosed by red spathe.

KEY TO THE GENERA AND SPECIES OF MINTS (LAMIACEAE)

April 21, 2005

Gary B. Walton

1A) Plants aromatic or at least faintly minty: 2

1B) Plants lacking scent: 5

2A) Stamens 2, exserted, plants aromatic, flowers bright but pale lavender, aggregated in globular clusters near and at top of plant, stamens two, corolla 1.5-3 cm long, leaves lanceolate to deltoid lanceolate, serrate, usually thinly pubescent: *Monarda fistulosa*

2A) Stamens 4, exserted: 3

3A) Plants scented like anise, flowers blue in crowded verticils forming a cylindrical cluster at top of plant, stamens 4, corolla to 1 cm, calyx clearly 2-lipped and regular, leaves rhombic- or deltoid-ovate, coarsely serrate, whitened below with a fine pubescence: *Agastache foeniculum*

3B) Flowers mostly in small axillary verticils subtended by leaves: 4

4A) Calyx more or less regular, the lobes similar in shape and size, corolla 2-lipped, upper lip concave forming a hood over stamens, flowers blue-violet with purple spots, leaves cordate reniform with crenate margins, plant creeping, pungent with faint minty aroma: *Glechoma*

4B) Calyx lobes dissimilar in size and shape, stamens extended beyond corolla throat, flowers white to blue, leaves ovate to elliptic, serrate, glabrous or hairy, menthol scent: *Mentha arvensis*

5A) Calyx with a distinct protuberance on the upper side: 6 (*Scutellaria*)

5B) Calyx lacking a distinct protuberance on the upper side: 7

6A) Flowers mostly in axillary racemes subtended by foliage leaves: *Scutellaria lateriflora*

6B) Flowers mostly solitary subtended by foliage leaves: *Scutellaria galericulata*

7A) Stamens 2, exserted, calyx more or less regular, the lobes similar in shape and size: 8 (*Lycopus*)

7B) Stamens 4: 10

8A) Calyx and corolla 5-lobed, calyx lobes broadly triangular, less than 1 mm, stoloniferous, stolons tuber-tipped, leaves lanceolate to oblong with sparse tootthing: *Lycopus uniflorus*

8B) Calyx and corolla 4-lobed, leaves glandular punctuate: 9

9A) Leaves sessile, margins coarsely but evenly serrate, stolons with tuberous tips:
Lycopus asper

9B) Leaves tapering to a short petiole, with irregular coarse tootthing, no tubers: *Lycopus americanus*

(*L. virginicus* with 4 calyx and corolla lobes, stoloniferous but no tubers. Its stems are densely appressed hairy and leaves are short petioled and long hairy on both surfaces and sometimes also felty hairy below. It is uncommon in MN)

10A) Stamens 4, flowers sessile in small cymes, calyx more or less regular, the lobes similar in shape and size, the lobes prolonged into sharp spines: *Galeopsis tetrahit*

10B) Stamens 4, flowers in terminal racemes or spikes: 11

11A) Calyx irregular, upper three lobes differing from lower, the bracts rounded and apiculate:
Prunella vulgaris

11B) Calyx regular, the bracts few, small, leaves linear: 12 (*Stachys*)

12A) Stems pubescent on and between angles: *Stachys palustris*

12B) Stems pubescent on angles with 1-2 mm long bristles: *Stachys hispida*

KEY SEPARATING GENERA OF CYPERACEAE

April 27, 2005

Gary B. Walton

- 1A) Achene enclosed by a membrane (perigynium), style protruding from apical opening, flowers either pistillate or staminate and usually on separate spikes: *Carex*
- 1B) Achene not enclosed by a perigynium, flowers perfect: 2
 - 2A) Floral scales in two vertical rows, spikelets appear flattened: 3
 - 2B) Floral scales spirally imbricate, spikelets appear rounded: 4
 - 3A) Inflorescence axillary, achene subtended by bristles, scales light brown, hyaline margined: *Dulichium arundinaceum*
 - 3B) Inflorescence terminal, achene not subtended by bristles, scales red-purple to deep brown: *Cyperus*
- 4A) Achenes tipped with a prolonged tubercle derived from style tip: 5
- 4B) Achenes blunt, style tip short, confluent with achene body: 6
 - 5A) Spikelet solitary, terminal, without subtending bracts: *Eleocharis*
 - 5B) Spikelets by few to many, subtended by foliaceous bracts: *Rhynchospora*
- 6A) Bristles subtending achene 10 or more: *Eriophorum*
- 6B) Bristles subtending achene more than 1-6: *Scirpus*

Terminology Used to Describe the Cyperaceae

The Cyperaceae with some 100 genera and 4500 species worldwide are a difficult group of plants to master. In northern Minnesota there are about 100 species of *Carex* alone. Many Cyperaceae are important components of wetland habitats and several are indicators of pH and nutrient regime. Many species provide food for songbirds and waterfowl.

Learning the specialized language used to describe plant organs is critical to their identification can add to the difficulty. Below is a list of frequently used terms.

- Achene**- An indehiscent (does not open by means of a suture, pores, lids) fruit with a single seed.
- Beak**- In some *Carex* an elongation of the mature perigynium. This may be variously ornamented with serrations.
- Blade**- The flattened portion of the leaf.
- Bristles**- Hair-like bracts of the inflorescence of *Scirpus* and other Cyperaceae.
- Bract**- A leaf subtending the inflorescence.
- Culm**- A stem of a monocot. Usually refers to the flowering stem.
- Perigynium**- A membranous sheath surrounding the pistillate flower (and later the fruit) of a *Carex*.
- Rachilla**- The axis of the spikelet.
- Rhizome**- A subterranean horizontal stem.
- Scale**- A small leaf subtending a flower (either the pistillate or staminate).
- Sheath**- The elongate tubular portion of the leaf that surrounds the culm or other leaves not yet fully developed.
- Spike**- An elongate, unbranched, indeterminate inflorescence with sessile flowers.
- Spikelet**- A small spike consisting of small reduced flowers inserted alternately along the rachilla.
- Style**- The pistil or its remnants on an achene.
- Tubercle**- The enlarged and distinctively formed style on the achene of many *Eleocharis* and other Cyperaceae.



Some representative Cyperaceae. From upper left going clockwise the orange-yellow achenes of *Eleocharis nitida* showing surface ornamentation and tubercles, spike of *Carex paupercula* showing scales subtending individual perigynia (a rich display for such a poor sedge), the filamentous bristles of *Eriophorum angustifolium*, and an achene of *Scirpus fluviatilis* with bristles and stigma.



**Left: *Eleocharis nitida* plants in their native habitat.
Right: Flattened spikes of *Cyperus schweinitzii*.**



Above: This isolated wetland in a northern forest is a sedge meadow. Dominant species are sedges (largely *Carex rostrata* and *C. retrorsa*).



Above: A wet meadow dominated by *Scirpus* species (the rusty areas which are largely *Scirpus cyperinus*, *S. rubrotinctus*, and *S. atrovirens*) along with several species of *Eleocharis* and *Carex*.

Below: Intermediate fen with an outer vegetation zone of *Carex rostrata*.



KEY TO THE GENUS *PETASITES* (COLTSFOOT, FAMILY ASTERACEAE)

April 27, 2005

Gary B. Walton



There are three species of *Petasites* in our region. Although differences can be detected in the flowers that are useful in separating the species these differences require some magnification. Leaf shapes are more useful. Pictured at the left are the flowering heads of *Petasites palmatus* (northern sweet coltsfoot, FACW), a species commonly found in moist woods and along upland-wetland edges. The other two species in our region are *P. sagittatus* (arrowhead coltsfoot, OBL) and *P. X vitifolius* a natural hybrid of *P. palmatus* and *P. sagittatus*. *P. sagittatus* is listed as a "Threatened" species in Wisconsin.

Leaf key to native *Petasites*

- 1A. Leaves cordate to sagittate with scalloped margins to dentate to nearly entire, densely tomentose
below: *P. sagittatus*
- 1B. Leaves lobed, cleft $\frac{1}{4}$ to more than $\frac{1}{2}$ into the leaf blade: 2
 - 2A. Leaves somewhat rounded in outline with very deep sinuses often more than half the width of the leaf blade: *P. palmatus*
 - 2B. Leaves somewhat triangular to somewhat rounded in outline, sinuses shallow to deep: *P. X vitifolius*

Petasites sagittatus (Banks) A. Gray (arrowhead sweet coltsfoot)



Above: *Petasites sagittatus* in a shallow pool of water in a rich conifer swamp.

Petasites sagittatus is a large leaved (to 30 cm long) herbaceous perennial from long rhizomes found in very wet mesotrophic habitats such as sedge meadows, shrub carrs, and cedar swamps. Colonies can be very extensive often covering up to an acre or more. The leaves are arrowhead-shaped to triangular in outline, with scalloped to merely denticulate margins. The upper leaf surface is sparsely tomentose to glabrous but below it is densely gray tomentose. Wetland rating for *P. sagittatus* is OBL. Fragrant flowers appear in the early spring before the leaves. Plants may be either staminate or pistillate and are insect pollinated.

P. sagittatus hybridizes with *P. palmatus* to produce the fertile hybrid *P. X vitifolius*.

Petasites palmatus (L.) Fries. (Northern Sweet Coltsfoot)



Above: *Petasites palmatus* in *Sphagnum* mat of rich conifer swamp.

Petasites palmatus is also an herbaceous colonial perennial from long rhizomes. It occurs in wet meadows, moist woods and forested wetlands on hummocks and similar better drained locations. The wetland rating of *P. palmatus* is FACW. The palmate leaves are distinctive to this species of *Petasites*. The leaves measure up to 40 cm across but are usually smaller, are loosely white tomentose below and glabrous above. This species is very common in northern Minnesota and Wisconsin.

As in *P. sagittatus* plants may be either staminate or pistillate and are insect pollinated.

***Petasites X vitifolius* Greene (hybrid species of coltsfoot)**



Petasites X vitifolius is a naturally occurring hybrid wherever *P. palmatus* and *P. sagittatus* occur. It is sometimes called *Petasites frigidus* but this name is properly applied to a northern species of *Petasites*. From the photograph it is obvious that the species combines some characteristics of each parent. Habitat requirements of *P. X vitifolius* are similar to those of *P. palmatus*. Some backcrosses with *P. sagittatus* may be confused with that species. Sparse tomentum on the leaf undersides identifies these as *P. X vitifolius*.

P. X vitifolius apparently has no wetland rating but it prefers moist habitats. Like its parent species it is an herbaceous colonial perennial from long rhizomes and plants are either staminate or pistillate.

Left: *Petasites X vitifolius* growing in marginal area along wetland/upland interface.

THE GENUS SALIX (WILLOWS, FAMILY SALICACEAE)

May 3, 2005

Gary B. Walton

Willows (*Salix*) are a conspicuous component of many wetland types-hardwood or conifer swamp, alder thicket, and especially, shrub carr. Most willow species in Minnesota are shrubs to small trees but a few do attain large sizes, notably the Black Willow (*Salix nigra*) and some introduced species (*S. petandra*, *S. fragilis*). Many species of willows occur along streams, rivers, and lakes where their fibrous root systems and dense interlocking branching patterns are important erosion controls.

Willows are among the earliest spring flowers some species blooming in April while the ground is still frozen. The flowers of willows produce pollen and nectar and are an early season food source for numerous small wasps and solitary bees. Warblers use shrubby willows as nesting sites and the many small insects that feed on willows are in turn fed upon by songbirds. Willows are forage for the larva of some species of *Cecropia* moths. Many mammals use them for food including moose, beaver, and snowshoe hares. All in all willows are important species in any wetland habitat.

All willows contain salicylic acid an anodyne and anti-inflammatory compound related to aspirin. Certain species have been used medicinally since ancient times to reduce fever and minor pain.

Willows may be difficult to identify owing to variability of leaf morphology. Occasional hybridization also presents some problems. In addition, some species are composed of two or more varieties or at least forms with some more or less consistent characteristics. While many keys depend upon flowering or fruiting material these become less useful by mid-summer. During the summer it is better to determine species by leaf characteristics. Spring Flora of Minnesota by Thomas Morley (1974) has keys for both staminate and pistillate flowering material with some leaf characteristics. The brief descriptions in Morley's text are also very helpful. Other good references are Manual of Vascular Plants of Northeastern United States and Adjacent Canada (Gleason and Cronquist 1991) and Michigan Flora Part II Dicots (Voss 1985).

Willow Terminology

Capsule - the two-valved fruit of *Salix*.

Catkins - flowering branches composed of several small apetalous unisexual flowers in a spike and maturing as a single unit. Also known as "aments".

Filaments - sterile hair-like growths surrounding stamens.

Glands - small rounded outgrowths on tooth tips and margins of stipules in some species of *Salix*.

Precocious - refers to species with flowers appearing before the leaves.

Scales - bracts subtending individual flowers within catkins.

Stipules - a pair of leaf-like projections at the junction of the petiole and stem that may be persistent or early deciduous.

Leaf Key to Shrub Willows of Northeastern Minnesota

- 1A) Leaves elliptic, oblanceolate, rhombic to oblanceolate, obovate: 2
1B) Leaves distinctly linear, lanceolate, rarely some lance oblong or oblanceolate: 10
- 2A) Leaves glaucous, occasionally with sparse pubescence, below: 3
2A) Leaves often densely pubescent especially early in the season: 8
- 3A) Leaves light green above, margins entire often revolute: *Salix pedicellaris*
3B) Leaves dark green above, margins sometimes sparingly undulate to crenulate,: 4
- 4A) Leaves with evidently toothed margins: 5
4B) Leaves with revolute margins, seldom toothed: 6
- 5A) Leaves dark green above, glaucous below, margins undulate: *S. discolor*
5B) Leaves dark green above, glaucous and reticulate below, margins often with glandular teeth: *Salix pyrifolia*
- 6A) Leaves dark green above, glaucous below, margins undulate: *Salix discolor*
6B) Leaves elliptic to rhombic, glaucous below, margins entire, sub-entire to crenate to serate: 7
- 7A) Leaves crowded on thick twigs, glabrous, glossy above, glaucous below: *Salix planifolia*
7B) Leaves on thin twigs, gray hairy above and below, glaucous and rugose-reticulate below: *Salix bebbiana*
- 8A) Leaves undulate margined, sometimes sparingly undulate-crenulate, dark green and rugose above, early with dense gray tomentum below: *Salix humilis*
8B) Most leaves linear with crenate margins, a few may be oblanceolate, dense gray or white tomentum below: 9
- 9A) Leaves dull green with sunken veins and thinly tomentose above, margins entire to glandular crenate, densely white tomentose below: *Salix candida*
9B) Leaves glabrate above with sub-impressed veins, silky white tomentum below, later somewhat glabrous: *Salix pellita* (rare species known from Grand Portage Creek)
- 10A) Leaves round-toothed or sharp-toothed glandular, glandular crenate to glandular serrate: 11
10B) Leaves remotely denticulate: *Salix exigua*
- 11A) Leaves dull green with sunken veins and thinly tomentose above, densely so below, margins entire to glandular crenate: *Salix candida*
11B) Leaves shiny above, without sunken veins, glandular serrate: 12
- 12A) Leaves glandular serrate, shining green above: 13
12B) Leaves mostly narrowly lanceolate, acute to acuminate, sub-entire to serrulate or remotely denticulate: 14
- 13A) Leaves finely glandular serrate, shining dark green above, subglaucous below, acute to short acuminate: *Salix serissima*
13B) Leaves glandular serrate, shining green above, duller below, abruptly acuminate to long attenuate: *Salix lucida*
- 14A) Leaves on short petioles mostly narrowly lanceolate, acute to acuminate, sub-entire to glandular serrulate, some coppery hairs: *Salix petiolaris*
14B) Leaves, sub-sessile, mostly narrowly lanceolate, acute to acuminate, remotely denticulate, often thinly silky: *Salix exigua*

Salix pedicellaris Pursh (Bog Willow)



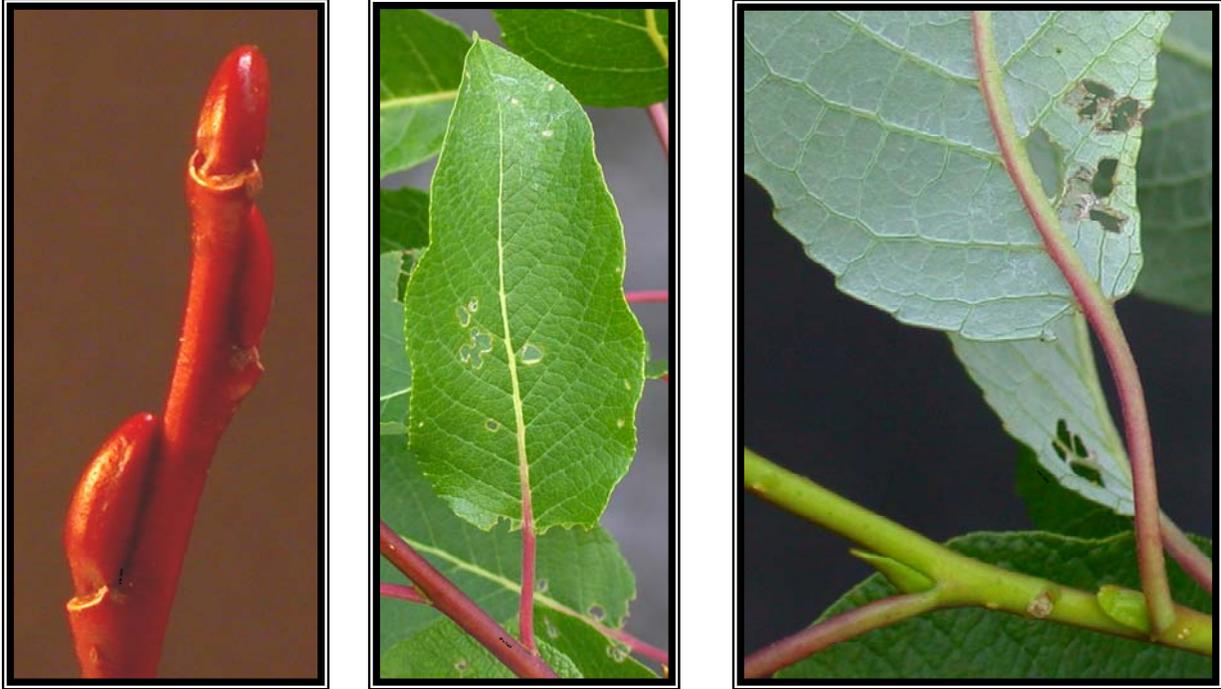
Left and right: Leaves of *Salix pedicellaris*.

This small willow is seldom seen unless one ventures into mesotrophic or intermediate fens especially those with floating or quaking sedge and *Sphagnum* moss mats where it often forms dense thickets. *Salix pedicellaris* is a fen indicator species. Its wetland indicator status is OBL.

S. pedicellaris is a low growing (< 1meter) shrub with reddish twigs bearing leathery 2 to 5 cm long by 0.5 to 3 cm wide leaves on short petioles (2 to 7 mm) and are subtended by stipules which are soon deciduous. Above the leaves are dark green with a prominent mid-vein that may be yellow or reddish. The upper and lower surfaces are ornamented by a fine network of small veins. Below the leaves are glaucous. Typically the leaves are elliptic but sometimes may trend towards an oblanceolate or lanceolate outline.

The flowering catkins appear with the foliar leaves and are on peduncles with 3 to 6 distinctly petioled leaves equal to or exceeding the length of the catkin. The yellow, 1 mm scales are fringed by hairs near the inside tip and surpass it. Rarely the entire inside surface of the scale is hairy. Staminate catkins may have red-tipped scales. There are usually 2 stamens with one basal nectar gland per staminate flower. The 4 to 7 mm fruit is narrowly lanceolate.

Salix pyrifolia Andersson (Balsam Willow)



From left to right: Twig with buds, upper surface of leaf, lower leaf surface and leaf base

Salix pyrifolia is a shrub to small tree (up to 5 meters) that grows in conifer swamps and some *Sphagnum* moss dominated wetlands with good ground water flow through. It is rated with a FACW+ wetland indicator status.

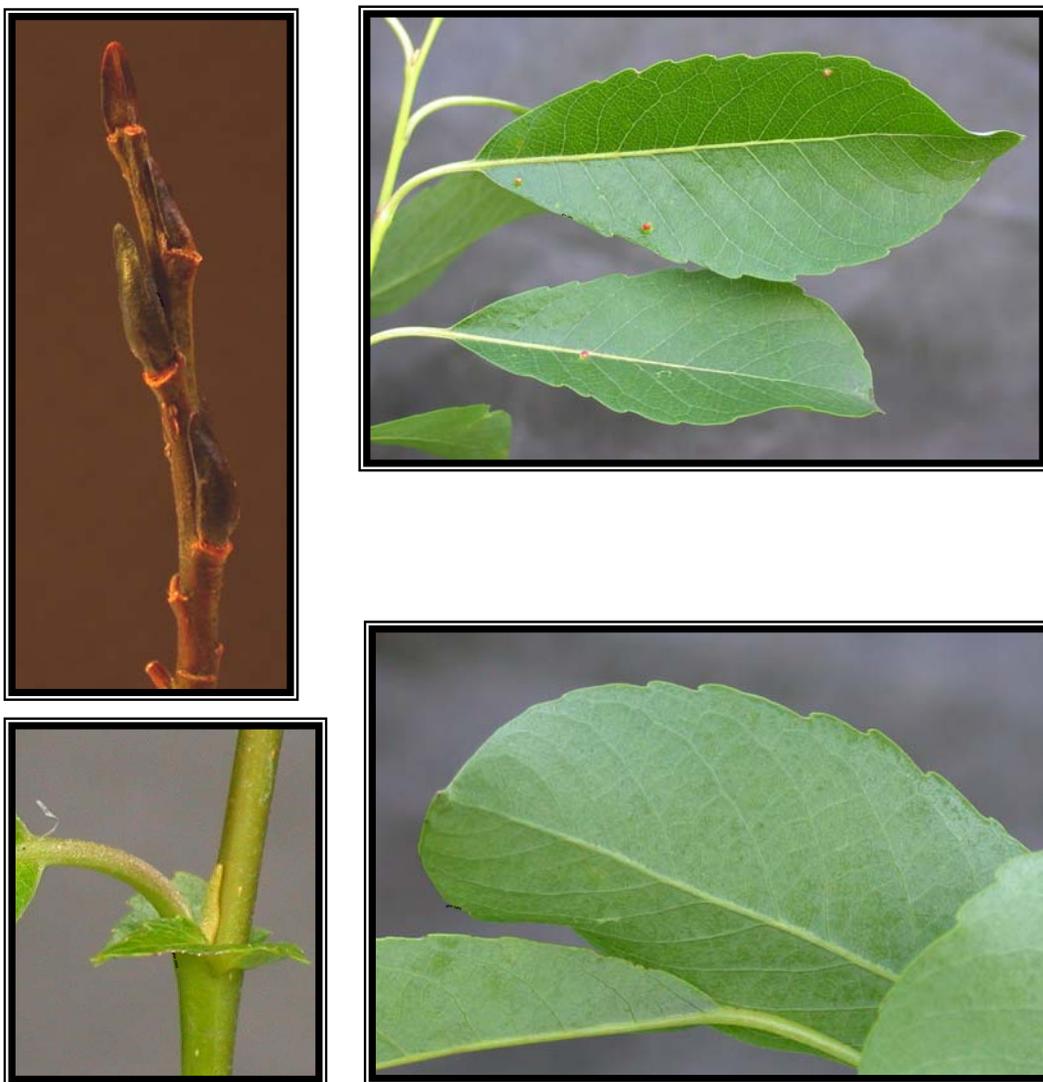
In late winter and early spring *S. pyrifolia* is easily recognized when its yellowish completely glabrous twigs become bright shiny red. The color is impressive. The large (2 to 8 mm) leaf buds are also bright red and shiny. Young growth has a spicy fragrance especially after drying.

Newly unfolding leaves are reddish and thin. These later become somewhat rigid with shiny green upper surfaces and glaucous nearly glabrous undersides. Shape varies from ovate-lanceolate to lance-oblong and measure 4 to 10 cm long and 2 to 6 cm wide. The margins are often glandular serrate or glandular crenate to serrate, the leaf bases rounded to rounded to cordate, the tips acute or abruptly acuminate. Stipules, when present, are small (1 to 2 mm) and rounded.

Catkins of *S. pyrifolia*, both pistillate and staminate, are borne on 1 to 3 cm and 2 to 8 mm long peduncles or stipes, respectively, and appear before or as the leaves begin to unfold. Pistillate catkin stipes are leafy, the staminate merely bracteate. The margins of these leafy growths are conspicuously glandular. Pistillate scales are 2 to 2.5 mm, reddish-brown and white-villous. Staminate flowers have 2 stamens. The fruit are 6 to 8 mm, lanceolate-rostrate, and glabrous.

A similar species is *S. eriocephala* Michaux which has serrulate, rigid, reticulate veined leaves that are also red when first unfolding. The reddish-brown to dark brown twigs and bud scales are puberulent to pubescent to long hairy not glabrous and shining as are those of *S. pyrifolia*. Some varieties of *S. eriocephala* are pubescent just above the leaf nodes only. Bracts of the catkin branches are not glandular margined. *S. eriocephala* grows along rivers and other watercourses across the much of northeastern North America from Virginia to Newfoundland, west from Quebec to British Columbia then south to California.

Salix discolor Muhl. (Pussy Willow)



From lower left going right: stipule, lower and upper leaf surfaces, and winter twig of *Salix discolor*.

Salix discolor or Pussy Willow is one of the most well known willow species at least by name as several others are often also called “Pussy Willow”. However, many willows produce conspicuous pistillate catkins in the spring but true Pussy Willow (*S. discolor*) is small multi-trunked tree or large shrub (2 to 7 meters) with thick twigs (pubescent when young) and large, dark brown leaf buds up to 1 cm long. It is found in swamps and other wet places. The wetland indicator status is FACW.

Leaves of *S. discolor* are elliptic to elliptic to lanceolate with sub-entire to undulate to crenate margins, 4 to 8 cm by 1.5 to 3.5 cm, dark green above and below glaucous and hairy when young later becoming glabrous. Occasionally, the reddish hairs on the undersides of the leaves are persistent. Stipules are large, rounded in outline, and persistent.

Catkins are precocious appearing well before the leaves and are more or less sessile on twigs typically with a close gray pubescence or remnants from the previous year. Pistillate catkins are from 3 to 15 cm long the floral styles from 1 to 1.8 mm long. Scales are dark brown, 1 to 2.5 mm and long to villous. Staminate catkins are from 15 to 20 cm long with flowers bearing 2 stamens, one basal nectar gland, and filaments hairy at the base. The stamens with their reddish anthers are very conspicuous when the flowers are in bloom. The fruit are beaked, 7 to 12 mm long, and gray hairy.

Salix planifolia (Tea to Leaf Willow or Diamond to Leaf Willow)

Salix planifolia is an upright shrub or multi-stemmed small tree to 3 meters found in a wide variety of wet habitats including lakeshores, fens, shrub swamps, and marshes. Its wetland indicator status is OBL.

The twigs of *S. planifolia* are thickened, chestnut to reddish-purple, glabrous and shining with large leaf buds. Leaves are glossy above, glaucous below. Its rhomboidal or obovate leaves with entire to rarely crenate to serrate margins are crowded on the twigs, acute at both ends or obtuse at the base, measure 3 to 6 cm by 1 to 2.5 cm on petioles from 4 to 10 mm. The primary lateral veins are evenly spaced. Stipules are small or absent.

The sessile catkins of *S. planifolia* appear before the leaves are fully unrolled and it is not unusual to find this species in full flower even while the ground is still frozen as early as the second week of April. Even more striking is the fact that this is an insect pollinated plant. The fragrant flowers attract several species of solitary wasps and flower flies. Pistillate catkins are 2.5 to 5 cm long with black long to villous 2 to 3 mm scales. Staminate catkins are a similar size with 1 nectar gland, 2 stamens (anthers brilliant red before dehiscence), and glabrous filaments. The 4 to 7 mm fruit is lanceolate, sub-sessile, and finely sericeous.

S. planifolia is listed as a "Special Concern" species in Wisconsin.



From left to right: Winter twig of *Salix planifolia* and views of upper and lower leaf surfaces.

Salix bebbiana Sarg. (Bebb's willow)



Left to right: Pubescent twig and upper and lower views of the leaves of *Salix bebbiana*.

Salix bebbiana is a large shrub to small tree with one or a few stems reaching 5 meters. *S. bebbiana* often grows in shrub carrs but does not seem to tolerate prolonged flooding as well as species such as *S. petiolaris* or *S. planifolia* do. It is more likely to occur near the less saturated edges of a wetland. *S. bebbiana* is rated FACW+.

The main trunk of larger *S. bebbiana* plants has a thick bark with diamond patterning. Often there are large diamond shaped depressions at the bases of branches. These are caused by a parasitic fungus. Young twigs are brownish and are glabrous to pubescent.

Leaves of *S. bebbiana* are elliptic to broadly rhombic with sub-entire to undulate to crenate margins, 4 to 8 cm by 1.5 to 3 cm. The upper surface of the leaves is dark green, lighter and somewhat hairy below with evident reticulate venation and raised veins. Stipules are small or not present.

Catkins appear as the leaves begin to appear. The staminate catkins are sub to sessile and small while the 2 to 7 cm pistillate ones are lax on 5 to 20 mm long bracteate peduncles. Scales are pillose, greenish to yellow with a red tip. The fruit is 7 to 10 mm long, lanceolate, beaked, and finely hairy.

Salix humilis Marshall (Prairie Willow)



From upper left going clockwise twigs, lower leaf surfaces and upper leaf surfaces of *Salix humilis*.

Salix humilis is a small multi-stemmed colonial shrub from 1 to 3 meters tall found in woodlands, dry barrens, and mesic or wet prairies. *S. humilis* is rated FACU and is our only upland species. It is seldom abundant as other willow species are but can be common in certain habitats.

The slender, flexible, yellowish brown twigs of *S. humilis* are covered by a soft velvety pubescence that may last a few years. The leaf buds are also yellowish, pubescent and measure around 5 mm in length.

Leaves of *S. humilis* are dark green above, sometimes pubescent, somewhat glaucous and rugulose, gray tomentose below, 3 to 15 cm long by 1 to 3 cm wide, oblanceolate to narrowly obovate, acute to abruptly short acuminate. *S. humilis* the leaf margins are undulate, revolute and usually without teeth. The tomentum on the leaf undersides is persistent throughout the growing season. Stipules are lanceolate and often soon deciduous.

The recurved catkins are precocious, sessile to sub to sessile, and borne on gray pubescent twigs. Pistillate catkins are 1.5 to 4 cm long with long villous, blackish 1 to 2 mm scales. Staminate catkins are shorter at 1 to 2 cm and have 2 stamens, the filaments basally hairy. Fruits are narrowly lanceolate, beaked and gray hairy, 20 to 50 mm long.

In addition to typical *S. humilis*, two variations, sometimes considered varieties, exist. The first is *S. humilis* var. *keweenawensis* which has leaves about 2 times as long as wide (broadly oblanceolate to elliptic to obovate), 1.5 to 5 cm wide, and densely pubescent so that the lateral veins are scarcely or not at all visible. The dense pubescence of the leaves persists most of the summer. This variation is somewhat rare.

The second variation, also considered rare, is *S. humilis* var. *microphylla* (*S. tristis*). This is a very low to growing shrub (less than 1 meter) with small leaves (under 7 cm) and small fruiting catkins (10 to 25 mm). Neither variation is well defined leading some authorities to not confer them varietal status.

Salix candida Fluegge (Sage Willow)



Salix candida is a low growing 1 to 1.5 meter shrub found in intermediate and rich fens especially calcareous fens. Its wetland indicator status is OBL. *S. candida* is a calcareous fen indicator species.

The short to petioled, linear to oblong to narrowly oblanceolate leaves are 4 to 10 cm long and 0.7 to 4 cm wide, acute at both ends, leathery above with impressed veins, densely white tomentose below. Leaf margins may be revolute, entire to crenulate, sometimes glandular. Stipules are lanceolate, glandular, and persistent. Old branches are glabrous but young twigs are densely white tomentose as are most other parts of the plant.

The 1 to 5 cm long catkins bloom as the foliar leaves are expanding, on leafy stalks (0.5 to 2 cm), and borne on gray pubescent twigs. Pistillate catkins are 1.5 to 4 cm long with long villous, blackish 1 to 2 mm scales. Staminate catkins are shorter at 1 to 2 cm and have 2 stamens, the filaments basally hairy. The 5 to 8 mm long sub to sessile fruits are lanceolate and white to tometose.



S. pellita, a rare species in MN known from Grand Portage Creek, has blackish long to villous floral scales, sessile to sub to sessile catkins, and glaucous not tomentose twigs. It is also larger growing to a small tree in size at 3 to 5 meters. *S. pellita* is a species of alluvial soils and shores rather than fens.

Top: lower leaf surfaces of *S. candida*.
Bottom: upper leaf surfaces of *S. candida*.

***Salix exigua* Nutt. (Sandbar or Coyote Willow)**



Salix exigua is a multi-stemmed colonial shrub willow from 1 to 5 meters often found near water on sandbars, mudflats, and riverbanks. Its wetland rating is OBL.

Twigs and young stems are thin, reddish, reddish-brown to brown with many leaves densely packed along them.

The linear to broadly linear leaves *S. exigua* measure 5 to 14 cm by 5 to 12 cm, often acute at both ends with a very short petiole (sub to sessile). The margins are toothed with irregularly spaced spinulose teeth. The underside of the leaf is a paler green than the upper side. Young leaves are pubescent to sericeous when young but become glabrous with age. Stipules are small and soon deciduous.

Many willows flower in April and May before or as their leaves emerge but *S. exigua* flowers in late June when in full leaf. Flowers are borne singly or in clusters of 2 or 3 on wood of the previous year. Pistillate catkins are drooping. Fruit is 5 to 8 mm and narrowly lanceolate.

Leaf and stem of *Salix exigua*.

***Salix serissima* (Bailey) Fernald (Autumn Willow)**

Salix serissima is small shrub to 4 meters or usually less with olive to brown branches and yellow to brown twigs that are conspicuous from a distance. It occurs in rich swamps and shrub carrs and has an OBL wetland rating.

The leaves (reddish when young) of *S. serissima* have glandular petioles, glandular finely serrate margins, dark green above and subglaucous below. They are acute to short acuminate tipped and measure 5 to 10 cm by 1 to 3 cm. Stipules of *S. serissima* are minute and frequently soon deciduous.

Catkins appear after the leaves on lateral leafy peduncles. Scales of the catkins are pale yellow and white pillose. Staminate flowers have 3 to 7 stamens. The fruiting catkins mature in the late summer and persist into the winter (hence "Autumn Willow"). The fruit is narrowly conic, glabrous, 7 to 10 mm.



Upper left going clockwise: winter twig, catkin with seeds, and views of leafy stems of *Salix serissima*.

***Salix lucida* Muhl. (Shining Willow)**

Salix lucida is shrub to small tree between 2 and 6 meters. It occurs in habitats similar to those of *S. serissima*. Its wetland rating is FACW+.

Branches of *S. lucida* are smooth and brown but young twigs are shining yellow-brown and may have some hairs. The buds are also shining.

Leaves of *S. lucida* have glandular petioles and somewhat coarse glandular serrate margins. The lanceolate to lance-ovate leaves are shiny green above and pale below with long acuminate tips. They measure 5 to 15 cm by 1.5 to 4 cm. Stipules of *S. lucida* are large (2 to 5 cm), reniform and persistent.

Catkins appear with the leaves on lateral leafy peduncles. The scales are yellow and sparsely hairy. Staminate flowers have 3 to 6 stamens. The fruit is lanceolate, glabrous, 4.5 to 7 mm.



Left to right: Winter twig and leaves of *Salix lucida*.

Salix petiolaris J. E. Smith (Meadow or Narrow to leaf Willow)



From left to right: Winter twig of *Salix petiolaris* and upper and lower sides of leaves.

Salix petiolaris (syn. *S. gracilis*) a common and variable species found in many shores, stream banks, wet meadows, shrub carrs and edges of forested wetlands in northern Minnesota. It is a multi-stemmed shrub from 1 to 7 meters (usually around 3 meters) that can form dense thickets. *S. petiolaris* is often a colonizer of disturbed wetlands. Its wetland indicator status is FACW+.

The stems of *S. petiolaris* are yellowish to dark brown although red and greenish-yellow are also seen. Young twigs are lightly puberulent.

S. petiolaris bears some resemblance to *S. exigua* but can be quickly distinguished from it by its longer petiole (5 to 15 mm), leaves 4 to 10 cm long by 0.8 to 3 cm and sub-entire to glandular serrate leaf margins. Young leaves are densely sericeous with a few coppery colored hairs mixed in but soon become glabrous. Very rarely the pubescence will persist. The leaves blacken when dried in the plant press. The lack of stipules even on young leaves distinguish this plant from young plants of *S. nigra*, a large tree at maturity (tree willows will be treated separately).

The 1 to 3.5 cm long catkins appear as the leaves are unfolding and are borne on bracteate pedicels or may be sessile. Scales are 1 to 2 mm, brown and thinly villous. The fruit is lanceolate and beaked, 4 to 8 mm.

**KEY TO THE GENUS *RIBES* (CURRANTS AND GOOSEBERRIES,
FAMILY GROSSULARIACEAE) PART 1**

May 8, 2005

Gary B. Walton

Ribes, the gooseberries and currants is a large genus of shrubby plants containing some 150 species found across the temperate northern hemisphere. Flowers may be either tubular or saucer-shaped. Some species have very showy flowers. The fruit is a many-seeded berry that may green, red, or black. All our species are edible but the appreciation of many is an acquired taste. At least two Eurasian species are cultivated here (*Ribes nigrum* and *R. sativum*) for their edible fruit. *R. nigrum* is often found around old farmsteads.

1A) Flowers single or in small clusters of 2 to 4 and plants at least somewhat prickly to very prickly: 2

1B) Flowers in racemes, plants smooth or prickly: 4

2A) Ovary bristly (fruit also bristly), fruit green: *R. cynobasti*

2B) Ovary not bristly but glabrous or with gland-tipped hairs or bristles: 3

3A) Stamens (2.5 to 5 mm long) shorter than the sepals but equal to the petals, hypanthium glabrous, fruit black, smooth to glandular-setose to bristly, stems very spiny, leaves with glands and hairs at least along veins below: *R. oxycanthoides*

3B) Stamens (2.5 to 5 mm long) about equal to the sepals, 1 to 2 times longer than the petals, hypanthium villous, fruit smooth and green, stems with few or no spines, leaves without glands: *R. hirtellum*

4A) Plants with bristles and very prickly, petioles glandular and hairy, ovary with glandular bristles, fruit purple to black: *R. lacustre*

4B) Plants smooth, never with bristles, thorns, or prickles, ovary smooth or with glandular bristles or resin glands: 5

5A) Flowers bright yellow, fragrant, the floral tube 9 to 15 mm long, erect shrub often in cultivation, fruit blackish: *R. odoratum*

5B) Flowers varying from white to greenish to purple, floral tube less than 4.5 mm long, leaf blades over 3.5 cm long, margins with many teeth, sprawling, straggling or erect plants: 6

6B) Leaves without resin glands, may have stalked glands on lower leaf surfaces, fruit red, plants sprawling to straggling: 7

6A) Leaves with small, sunken, yellow resin glands: 8

7A) Ovary and fruit smooth, leaves odorless when crushed: *R. triste*

7B) Ovary and fruit with gland-tipped hairs or bristles: *R. glandulodum*

8A) Bracts of inflorescence longer than pedicles, flowers yellow to cream, fruit smooth, black, without resin glands: *R. americanum*

8B) Bracts of inflorescence shorter than pedicles flowers white, greenish-white or purple, fruit black, with resin glands: 9

9A) Flowers white, flowers and fruit in ascending racemes: *R. hudsonianum*

9B) Flowers greenish-white to purple, flowers and fruit in more or less drooping Racemes: *R. nigrum*

Ribes oxycanthoides L. (Northern Gooseberry)



Above left: Flower and leaves of *Ribes oxycanthoides*.

Above right: Leaves, bristles, and thorns of *Ribes oxycanthoides*.



Glandular hairs on leaf underside of *R. oxycanthoides*

Like most of our native gooseberries *Ribes oxycanthoides* is a small shrub with stiff upright stems. *R. oxycanthoides* normally grows in upland habitats usually rocky sites in openings in moist woods, on rock outcrops along Lake Superior and scattered in the pine forests on Minnesota Point and Wisconsin Point. *R. oxycanthoides* is listed as a "Threatened" species in Wisconsin. The wetland for *R. oxycanthoides* rating is NI.

The stems of *R. oxycanthoides* are both prickly and spiny at the nodes (usually 3 spines around 5 mm

sometimes longer). The flowers of *R. oxycanthoides* are borne in small clusters of 1 to 4 on 2 to 6 mm long pedicels with finely glandular-ciliate bracts. The 2 to 4 mm sepals are oblong and blunt, the petals obovate, 2 to 3 mm and equal to or slightly smaller than the stamens. The glabrous ovary produces a greenish-purple fruit that may have a few short hairs or bristles. Leaves of *R. oxycanthoides* are glandular and hairy leaves on the lower side (visible at 10X and higher and shown above), 1.5 to 3 mm by 2 to 3.5 mm, broadly cuneate to truncate at the base.

Ribes hirtellum Michx. (Swamp Gooseberry)



Ribes hirtellum is a small shrub with stiff upright stems but with no prickles and no or only a few soft nodal spines. The wetland rating of *R. hirtellum* is FACW. Some authors report *R. hirtellum* from rocky woods and cliffs (Gleason and Cronquist) but Voss includes swamps and other wetlands in addition to rocky openings in mixed woods while Morley writes that *R. hirtellum* occurs in swamps and wet woods. Occasionally, *R. hirtellum* does grow in somewhat dry habitats.

Although *R. hirtellum* is sometimes confused with *R. oxyacanthoides* (compare the descriptions in Morley and in Gleason and Cronquist) the smooth stems and near to total absence of nodal spines serve to quickly distinguish the two species in the field. Other distinguishing features are leaves softly hairy to nearly glabrous but without glands, floral bracts sparsely glandular to glandless, stamens equal to or slightly exceeding the petals, and the fruit greenish and smooth (*R. oxyacanthoides* fruit may have a few short hairs or bristles and is greenish-purple).



Above left: leaves of *Ribes hirtellum*.

Below left: Flowers of *R. hirtellum*. Note nodal spine on this specimen. The glandular leaves help to distinguish it from *R. oxyacanthoides*.

KEY TO THE GENERA *DIERVILLA* AND *LONICERA*
(HONEYSUCKLES, FAMILY CAPRIFOLIACEAE)

May 15, 2005

Gary B. Walton



Lonicera canadensis flowers

Lonicera (honeysuckle) is a member of the Caprifoliaceae, which includes *Viburnum* (arrow-wood), *Sambucus* (elderberry), *Diervilla* (bush honeysuckle), *Triosteum* (horse gentian), and *Linnaea* (twinfleur). There are six native species in our area and at least one escaped non-native *Lonicera* in our area. Most are low bushes but two are woody vines. Worldwide there are 180 species of *Lonicera* all in the northern hemisphere.

Lonicera differs from other members of the family by its 5-lobed tubular to funnel-shaped flowers that are slightly irregular to strongly bilabate, the tube often with a short spur or pouch at the base on a terminal or axillary inflorescence. The fruit of *Lonicera* is a fleshy berry with a few seeds. The leaves are simple, entire in our species.

Most *Lonicera* are cultivated for ornamental purposes or as a food source for wildlife. These species are most likely to escape and invade native habitat especially in suburban and rural areas and in city parks. One, the Asian variety of *L. caerulea*, is cultivated to a small extent for its edible fruit.

Diervilla (bush honeysuckle) is similar to *Lonicera*. The principal differences are its serrate leaves and fruit that is a septical capsule rather than a fleshy berry. There are 3 species, all found in North America.

Key to *Diervilla* and *Lonicera*

- 1A) Plants vining, the uppermost leaves fused around the stem, inflorescence terminal: 2
- 1B) Plants shrubs, leaves never fused around stem, inflorescence pairs of flowers on axillary peduncles: 3
 - 2A) Leaves fringed with hairs, pubescent above: *L. hirsuta*
 - 2B) Leaves not fringed, glabrous: *L. dioica*
- 3A) Leaves serrate, corolla yellow, nearly regular, 5-lobed, fruit a dry capsule: *Diervilla lonicera*
- 3B) Leaves not serrate, corolla pink, yellowish, maroon, 5-lobed, often bilabiate, fruit a berry: 4 (*Lonicera*)
 - 4A) Branchlets of preceding year with hollow internodes and brown pith, flowers usually pink, style hairy, corolla scarcely bilabate: *L. tatarica*
 - 4B) Branchlets of preceding year with solid internodes and white pith, flowers yellowish, often blushed with reddish-purple, to maroon, style glabrous, corolla bilabate: 5
 - 5A) Corolla strongly bilabate, fruit red and wholly or partly fused: *L. oblongifolia*
 - 5B) Corolla not strongly bilabate, fruit not fused, red or blue: 6
 - 6A) Fruit obviously separate, red: *L. canadensis*
 - 6B) Fruit blue, fused, ripening fruit concealed within fused bracts: *L. caerulea*

Lonicera canadensis Marshall (fly honeysuckle)

Lonicera canadensis is, after *Diervilla lonicera*, probably the one native species of honeysuckle most frequently encountered in northern Minnesota forests. *L. canadensis* is rated as FACU species and is found in mesic to moist woods, occasionally on high spots in forested wetlands.

The leaves of *L. canadensis* are triangular-ovate to oblong, 3 to 12 cm long, with ciliate margins. Leaf tips are acute to blunt and the base is rounded-cuneate. The flowers are borne on 2 to 3 cm long axillary peduncles. There is an evident basal spur on one side of the flower. Flower color is yellowish with red streaking.



Upper and lower right: flowers and leaves of *Lonicera canadensis*. The red streaking is very evident.

Lonicera hirsuta Eaton (hairy honeysuckle)



Lonicera hirsuta is one of two native vining *Lonicera* species in our area. It occurs in mesic to moist woods and sometimes along wetland edges. The rating for *L. hirsuta* is FAC.

L. hirsuta is a twining vine to 2 meters with sessile to short-petioled leaves hairy above and below and rhombic in outline. The uppermost leaves are fused around the stem forming a roundish disk below the terminal inflorescence. Floral spikes with 1 to 4 whorls of yellow to orange 20 to 25 mm long flowers. The floral tube is pubescent and with a slight basal spur. The fruit is red.



Above left: Flowers of *Lonicera hirsuta*. Leaf disk can be seen behind the flowers.

Below left: Leaves showing cilia and hirsute surface and stem showing hairy glandular surface.

MORE SPECIES FROM THE GENUS *RIBES*
KEY TO THE GENUS *RIBES* (CURRANTS AND GOOSEBERRIES, FAMILY
GROSSULARIACEAE) PART 2

May 15, 2005

Gary B. Walton

***Ribes odoratum* H. H. Wendl. (golden currant)**



Left: Leaves of *Ribes odoratum*.

Right: Flowers of *R. odoratum*.

Ribes odoratum is native to the southwestern part of Minnesota but is widely cultivated as a garden ornamental for its large showy fragrant yellow flowers. It is unlikely to be found naturalized but does persist around old dwellings. The wetland rating for *R. odoratum* is NI but in the wild it occurs on cliffs and rocky hillsides.

R. odoratum is an upright shrub with smooth stems that may be downy when young. The leaves are usually 3-lobed, with a few blunt teeth on the upper lobe. Leaf margins are ciliate and the surface is glabrous above and finely glabrate below. Resinous glands are visible on both surfaces.

The flowers are very different from all our other *Ribes* species. They are extremely fragrant, showy and bright yellow with an 11 to 15 mm long tubular hypanthium. The ovaries are glabrous as are the fruit which are black.

Ribes triste Pall. (red swamp currant)



Ribes triste is a straggling shrub found in forested wetlands, wet forests, and rarely in moist forests. Its wetland rating is OBL.

R. triste is a currant with 3 to 14 purplish or greenish purple flowers in pendant racemes the stems and pedicels of which are clothed with small stipitate-glandular hairs. The flowers are flattened, saucer-shaped with 5 rhombic to ovate 2 mm sepals. Petals are much smaller, about 1 mm, and narrow. These are followed by shiny red smooth fruit.

Leaves of *R. triste* are deeply 5-lobed usually, truncate to shallowly cordate at the base, glabrous to softly hairy. The stems are smooth and there are no spines or bristles at the nodes.

Ribes glandulosum Grauer. (skunk currant)



Ribes glandulosum is a trailing or sprawling shrub of rich coniferous and hardwood swamps. It often grows in large patches with stems trailing over logs, rocks, and hummocks. *R. glandulosum* is rated as FACW.

R. glandulosum bears 10 to 15 small green to yellow-green flowers on ascending racemes that are glandular-hairy throughout or at least on the pedicels. The ovaries are covered with many reddish, translucent, small gland-tipped hairs. The fruit is red and retains the glandular bristles.

The stems of *R. glandulosum* are smooth unlike those of the similar *R. lacustre* which are prickly. The leaves are 5- to 7-lobed, glabrous or with small stalked glands. The crushed leaves emit a very distinctive skunky odor,

Above left: Leaf of *R. glandulosum*.

Below left: Flowering raceme of *R. glandulosum*. Glandular bristles are visible on ovaries and pedicels.

***Ribes hudsonianum* Richards (northern black currant)**



Upper left and right: Flowers, stems, leaves of *Ribes hudsonianum*.

Lower left: Close-up of *R. hudsonianum* leaf showing resin glands (arrows) and hairs.

Ribes hudsonianum is an erect shrub found in rich cool swamps especially cedar and black ash systems with an active groundwater flow. *R. hudsonianum* is rated OBL.

R. hudsonianum leaves are 5-lobed, cordate with many small yellow and pungently scented resin glands on the lower surface which is also minutely hairy. Stems are smooth with no bristles or spines. Sessile resin glands may be present on newer growth.

Flowers of *R. hudsonianum* are bright white on erect racemes. The sepals are densely hairy (unlike *R. americanum*) and 3.5 to 4.5 mm long. The ovaries of *R. hudsonianum*, dotted with some resin glands, later mature to dark black fruit.

KEY TO THE GENUS *POPULUS* (ASPENS AND COTTONWOODS, FAMILY SALICACEAE)

May 20, 2005

Gary B. Walton

There are at least six species of *Populus* in northeastern Minnesota but only three can actually be called native: quaking aspen (*P. tremuloides*), big-tooth aspen (*P. grandidentata*), and balsam poplar (*P. balsamifera*). These three species often form extensive stands by means of root sprouts. *P. tremuloides* is a major component of the forests in northeastern Minnesota. Some selected low lignin strains are being planted experimentally in the upper Midwest for wood fiber production a possibly imprudent action.

Cottonwood (*P. deltoides*) is native to western and southern Minnesota along rivers and streams. Certain seedless cultivars of cottonwood are planted as shelterbelt trees and sometimes (mistakenly) as yard trees. It does not appear to be naturalized in northeastern Minnesota although there are some saplings on the bayside of Minnesota Point in Duluth that may be naturalized.

White poplar (*P. alba*) and black poplar (*P. nigra*) are European species planted as a yard trees. White poplar may be naturalizing to some extent as it produces suckering roots and may form thickets where it has been planted. Rapidly growing hybrids involving cottonwood and strains of black poplar are being planted on biomass plantations. These could escape by root suckers and by pollen contributing genes to native cottonwoods and possibly to balsam poplar.

Populus is related to the willows (*Salix*) but unlike them has wind not insect pollinated flowers and broad not narrow leaves.

Twig Key to Native *Populus*

1A) Buds not viscid, gummy or resinous, silky or tomentose: *Populus grandidentata*

1B) Buds viscid, gummy or resinous: 2

2A) Buds extremely resinous, sticky and fragrant, with three exposed scales: *P. balsamifera*

2B) Buds viscid, gummy or resinous but not fragrant: 3

3A) Twigs thick, buds large (to 1 cm) with three exposed scales: *P. deltoides*

3B) Twigs thin, buds small (rarely over 0.5 cm), glabrous (rarely downy), more than three exposed scales: *P. tremuloides*

Leaf Key to Native *Populus*

1A) Petioles terete in cross section, leaf blades ovate to lance-ovate, finely serrate to subentire, resinous especially below: *P. balsamifera*

1B) Petioles flattened in cross section, leaf blades deltoid to reniform, tothing fine to coarse: 2

2A) Petioles without basal glands, leaf blades reniform to rotund-ovate, margins finely toothed: *P. tremuloides*

2B) Petioles with basal glands (usually), leaf blades with coarse tothing: 3

3A) Leaves coarsely and remotely toothed, tomentose when young, often with a pair of basal glands on petiole: *P. grandidentata*

3B) Leaves broadly deltoid, glabrous, coarsely toothed the teeth incurved with a callous tip, at least 2 basal glands on petiole: *P. deltoides*

Populus balsamifera L. (balsam poplar)



Left: Terminal and lateral buds of *Populus balsamifera*
Right: Leaves of *P. balsamifera*

Populus balsamifera is so named for its fragrant resinous buds and leaves. *P. balsamifera* is medium to large tree reaching height of 30 meters with a diameter of 1 meter. Most trees are usually smaller. *P. balsamifera* grows on wet soils along creeks and rivers, at the edges of conifer swamps and in wet forests including those with black ash (*Fraxinus nigra*, FACW+). The wetland rating of *P. balsamifera* is FACW.

Leaves of *P. balsamifera* are ovate to lance-ovate with fine serrations. The entire leaf is coated with a bronzy resinous deposit. On a warm day the fragrance of the resin can be heavy in the air. The bark is dark gray, deeply furrowed and can be very thick.

A similar species is *P. candicans* known from cultivation only and probably a selection of *P. balsamifera* or a hybrid with *P. deltoides* (*P. x jackii*). It has broadly ovate to cordate leaves that are pubescent on the petioles and veins of the lower side. Also, the young twigs are pubescent. All *P. candicans* plants are pistillate.

The resinous buds of *P. balsamifera* were used medicinally by Native Americans, who called it zaudee, for respiratory ailments and in salves.

Populus tremuloides Michx. (quaking aspen)



Clockwise from upper left: Staminate catkins, terminal bud, and leaves of *Populus tremuloides*.



Populus tremuloides is probably the most common deciduous hardwood in northeastern Minnesota often sprouting vigorously from root suckers after fire or logging. *P. tremuloides* can occur in nearly pure stands or be mixed with paper birch (*Betula papyrifera*, FAC), balsam fir (*Abies balsamea*, FACW), and white spruce (*Picea glauca*, FACU). It may also occur with sugar maple (*Acer saccharum*) and other FACU species. While abundant on well-drained sites of moderate to good fertility *P. tremuloides* also occurs on wet soils where it may become dominant. According to the North Central Region (Region 3) list of wetland plants *P. tremuloides* is not rated. Another species, *P. tremula*, is rated as FAC. *P. tremula* is not native to North America and is not an important component of forested land

here, either, occurring as an occasional escape or persisting after cultivation. It is a Eurasian tree with similar ecological affinities as *P. tremuloides*. Use of the name *P. tremula* for our native *P. tremuloides* is erroneous. Leaves of *P. tremuloides* are reniform to rotund-ovate, finely toothed (16 to 45 teeth per side) are completely glabrous and lack resinous coatings and glandular projections on leaf margins and petioles. *P. alba* has leaves that are densely tomentose and appear silvery beneath and in some forms lobed leaves. On young trees, bark of *P. tremuloides* is smooth and gray-green although some clones have very white smooth bark. Older trees develop deeply furrowed bark.

P. tremuloides is an important food plant for many kinds of insects (and the birds that feed on them). Hares, moose, and deer feed on young twigs and foliage, grouse feed extensively on the buds in the winter. *P. tremuloides* is probably the best food source for beaver when compared to *Salix*, *Betula* and *Acer* species. The soft wood of large dead trees is easily excavated by small songbirds for nest sites.

Populus grandidentata Michx. (big-tooth aspen)



Left: Leaves of *Populus grandidentata*.

Right: Terminal and lateral buds of *P. grandidentata*.

Populus grandidentata prefers drier soils than *P. tremuloides* although the two may grow together. It is rated as a FACU species and often grows with red oak (*Quercus rubra*, FACU) and sugar maple (*Acer saccharum*, FACU) and other FACU species such as American hazelnut (*Corylus americana*), hop hornbeam (*Ostrya virginiana*), basswood (*Tilia americana*), and bracken fern (*Pteridium aquilinum*).

Leaves of *P. grandidentata* are somewhat ovate to cordate with 5 to 15 teeth per side. Leaves on new stems are somewhat lanceolate and wooly or tomentose. The leaves produced on mature branches have deep serrations. There is usually a pair of glands at the leaf base. The bark of *P. grandidentata* is smooth and greenish when young but becomes brown and furrowed on mature individuals.

P. grandidentata is of similar value to wildlife as *P. tremuloides*.

ARISAEMA TRIPHYLLUM (JACK-IN-THE-PULPIT, FAMILY ARACEAE)

May 22, 2005

Gary B. Walton



Arisaema triphyllum is a perennial herbaceous plant from a corm. There are usually two compound leaves on 3-6 dm petioles with three leaflets. As the leaves and flowers mature the petiole often doubles in length. The middle leaflet is elliptic to rhomboidal while the outer two are asymmetrical. The leaf veins are parallel from (not with) the mid-vein to the marginal vein and connected by many smaller veins. *A. triphyllum* wetland rating is FACW-.

The inflorescence of *A. triphyllum*, which to someone resembled the pulpit of a Puritan preacher, is a convolute 3 to 7 cm long spathe with the top part arched over the spadix (spike of small flowers). The color of the spathe may be green or purplish and its surface smooth or fluted these ending in broad flanges.

Characters of the spathe have sometimes been used to distinguish varieties. Two are recognized in our area by some authors. Plants found in rich woods with asymmetrical lateral leaflets and spathes not obviously fluted are called *A. triphyllum* var. *triphyllum* (or var. *atrorubens*). Plants in wetter situations with leaflets only somewhat asymmetrical and spathes prominently fluted with white ridges and green to purple stripes are called *A. triphyllum* var. *stewardsonii*.



Above left: Inflorescence of *Arisaema triphyllum*.

Lower left: Venation pattern on leaf of *Arisaema triphyllum*.

CALLA PALUSTRIS (WATER CALLA OR WILD CALLA-LILY, FAMILY ARACEAE)

May 23, 2005

Gary B. Walton



Calla palustris

Calla palustris is an emergent aquatic plant found in still water of swamps and marshes in full sun to part shade. *C. palustris* is closely related to *Arisaema triphyllum* (FACW-) and *Symplocarpus foetidus* (OBL) although not necessarily found in association with them. It is rated as an OBL wetland species.

Leaves of *C. palustris* are simple and ovate veins curved, parallel veins. The stem is horizontal and grows on or just beneath the water surface or decumbent on muddy soil. Flowers of *C. palustris* are on a spike (spadix) enclosed by a leafy, white bract called the "spathe". The fruit is a berry, red in color and borne in a cluster. The whole plant is acrid and irritant because of oxalic acid crystals in the tissue.

SYMPLOCARPUS FOETIDUS (SKUNK CABBAGE, FAMILY ARACEAE)

May, 23, 2005

Gary B. Walton



Symplocarpus foetidus, the skunk cabbage, is known best for its acrid smelling juice. It is the only member of its genus and occurs as two disjunct populations, one in eastern North America and the other eastern Asia. *S. foetidus* grows in rich swamps with an active ground water flow. Its wetland rating is OBL.

As in all Araceae the inflorescence of *S. foetidus* is a spike (spadix) composed of a fleshy axis with numerous small flowers and enclosed by a leafy bract (spathe). The spathe of *S. foetidus* is reddish and resembles raw partially decomposed meat. The flowers also smell fetid and attract flies.

Leaves *S. foetidus* are all basal, simple, broadly ovate with reticulate veins and come from thick rhizome (or corm according to some authors).

Above and lower left: Inflorescence of *S. foetidus*.



gbw
May 23, 2005

KEY TO THE GENUS GALIUM
(BEDSTRAW, FAMILY RUBIACEAE) PART 1

June 1, 2005

Gary B. Walton

Galium is a genus of annual and perennial herbs with 4-angled slender stems and whorled leaves. The flowers are usually white or greenish-white (yellow in some introduced species), small with 3 to 4 petals in cymes. The fruit of our species is a pair of dry indehiscent 1-seeded nutlets. These may be smooth, roughened, or bristly depending on species. In our area there are 10 species.

Galium is not an easy genus to figure out and mistaken impressions about "important" characteristics can lead to false conclusions. Most of the characteristics that are important cannot be seen without some magnification, good lighting, and a metric ruler (in millimeters). The most difficult members of the genus are also among the smallest plants of the genus. Look carefully at the surface of the ovary and fruit (smooth, bristly, roughened with tubercles), the arrangement of barbs on the stems and leaves (retorse, antrorse), nodal pubescence, pedicel length, flower number, corolla form and number of petals. It is best to take the various characteristics as a whole rather than rely on just one "key" characteristic (but this, of course, is true when attempting to correctly identify and learn any plant species).

Key to the species of *Galium*

1A) Ovaries and fruit bristly: 2

1B) Ovaries and fruit glabrous or roughened or papillate: 3

2A) Leaves lanceolate (4 to 14 times as long as broad), upper leaves with 3 main veins, in whorls of 4, fruit bristles not hooked or at most merely curved (fruit is glabrous in var. *hyssopifolium*), plant stiffly upright: *Galium boreale*

2B) Leaves with one main vein, elliptic-lanceolate, retrorse-scabrous barbs below on leaf vein, leaves in whorls of 6, plant reclining, bristles of fruit hooked: *Galium triflorum*

3A) Leaves cuspidate or awned, stems retrorse-scabrous, leaves narrowly elliptic, 6 in a whorl, the margins and midvein below retrorse-scabrous, fruit smooth on thin straight pedicels: *Galium asprellum*

3B) Leaves not cuspidate or awned but acute to rounded, 4 to 6 in a whorl: 4

4A) Corolla 4-lobed on cymes once or twice branched and with 2 to 4 flowers: 5

4B) Corolla 3-lobed: 6

5A) Leaves 1 to 8 mm wide, in whorls of 5 or 6, ascending or spreading, with bristles on midvein below: *Galium obtusum*

5B) Leaves 1 to 3 mm wide, in whorls of 4, pointing downwards, generally glabrous or with a very few with bristles on midvein below: *Galium labradoricum*

6A) Leaves usually 4 in a whorl, flowers solitary on 1 cm or longer bent peduncles, in groups of 3 per node, pedicels minutely but densely retrorse-scabrous: *Galium trifidum*

6B) Leaves usually 4 to 6 in a whorl, at least some in whorls of 5, flowers 2 to 3 per peduncle, pedicels and peduncles straight and less than 1 cm, pedicels glabrous but peduncles sometimes scabrous: *Galium tinctorum*



Above: A species of *Galium* (*G. trifidum*) showing whorled leaves and the spherical fruit typical of the genus. *G. trifidum* is often found in wetlands on the edges of hummocks, fallen logs, and temporarily inundated vernal pools. Its wetland rating is FACW+.

THE LYCOPHYTES (QUILLWORTS, SPIKEMOSSES AND CLUBMOSSES) PART 1

June 1, 2005

Gary B. Walton

This group includes *Isoetes*, *Selaginella*, and the lycopods (*Lycopodium* and several other genera), plants once grouped as "fern allies" but now shown to be not related to ferns at all. Morphology of the leaves and sporophylls and recent analysis of chloroplast DNA suggest the lycophytes do not share a recent common ancestor with ferns (which also includes *Equisetum* and *Psilotum*) and seed plants (gymnosperms and angiosperms). The seed plants are the true fern allies.

KEY TO THE LYCOPHYTES

- 1A) Rosettes from a corm with grass-like leaves, sporangia at base of leaves on inside face: *Isoetes*
- 1B) Plants not rosettes, rooting along stem nodes either above or below ground, leaves small, needle-like or flattened: 2
 - 2A) Spores of two sizes borne in sporangia in leafy strobili at the tips of branches, plants moss-like: *Selaginella*
 - 2B) Spores of one size in sporangia either terminal strobili or in the axils of unmodified leaves, plants resembling small trees or creeping vines: Key to Lycopods

Isoetes (Quillworts)

There are three species in our area, *Isoetes lacustris*, *I. melanopoda*, and *I. echinospora*. *Isoetes* species are superficially similar and best distinguished by features of the megaspores. *Isoetes* are tufted plants with long narrow leaves growing from a thickened fleshy corm-like base. In this respect they resemble sterile *Eleocharis* or some grasses. Spores (both the megaspores and microspores) located at the bases of the leaves differentiate them from flowering plants. Megaspores are produced by the outer layer leaves and the microspores are produced by the inner layers of leaves in sporangia enclosed partially to entirely by a flap of leaf tissue (velum). The gametophyte develops within the megaspore after fertilization from microspores.

Isoetes are aquatic or amphibious plants found in shallow water of streams, lakes, and ponds. They also occur in temporary pools. *Isoetes* occur in oligotrophic waters with some sand or gravel in the substrate. Interestingly, *Isoetes* absorbs much of its carbon through its roots from CO₂ in the mud rather than from CO₂ dissolved in the water as most aquatic plants do. The CO₂ concentration in the mud is 5 to 100 times greater than it is in the water. The CO₂ is then passed from the roots through hollow chambers in the leaves where photosynthesis converts it carbohydrates. This allows *Isoetes* to utilize a rich carbon source and so thrive in nutrient poor systems.

Isoetes may be difficult to find owing to its rather nondescript form. It can be found in several lakes in the Border Lakes Region. In Cook County it occurs in several easily accessible rivers and in many small isolated ponds with gravelly substrates.

Key to *Isoetes*

- 1A) Leaves 5-20 cm long 0.7-2mm wide, dark green, usually without stomata, megaspores 0.5-0.8 mm, the surface with jagged crests, sporangia pale with few or no dots: *Isoetes lacustris*
- 1B) Leaves with many stomata, sporangia with many brown dots: 2
 - 2A) Megaspores slightly ridged or with tubercles, not spiny, 0.35 mm diameter: *Isoetes melanopoda*
 - 2B) Megaspores densely short-spiny, spines usually sharp, 0.5 mm diameter: *Isoetes echinospora*

Selaginella (Spikemosses, Family Selaginaceae)

Like *Isoetes*, *Selaginella* also produces megspores and microspores. These are found in sporangia on strobili at the tips of the branches. Our species of *Selaginella* may resemble mosses but the two spore type (megaspores and microspores) borne in the leafy strobili as opposed to the mosses' one spore type in capsules easily separate them. The two spore types also serve to distinguish *Selaginella* from members of Lycopodiaceae.

There are two species of *Selaginella* in our area, *Selaginella selaginoides* (FACW+) and *S. rupestris* (no rating). A third species, *S. apoda* (no rating) is found in moist calcareous clay soils in Michigan's Upper Peninsula and in some parts of Wisconsin and may occur in Minnesota. All three species are small, moss-like plants easily distinguished from one another by features of the leaves and plant form.

Key to Selaginella

1A) Leaves 4-ranked, dimorphic: *Selaginella apoda*

1B) Leaves spirally arranged and all alike: 2

2A) Leaves thin with evidently toothed margins: *Selaginella selaginoides*

2B) Leaves thick with ciliate margins: *Selaginella rupestris*

Selaginella selaginoides is a rare species in Minnesota that prefers very moist often mossy habitat along the North Shore of Lake Superior. The toothed leaf margins easily separate it from *S. rupestris*. Also, the megaspores of *S. selaginoides* are pale yellow with low tubercles on commissural faces.

Megaspores of *S. rupestris* are yellowish with faint reticulate or rugose sculpting on all faces. *S. rupestris* grows on dries substrates including sand and sunny rock outcrops.

S. apoda may occur in Minnesota. It prefers moist calcareous clay soils with low vegetation. In Michigan it can be found along utility right-of-ways.



Left: *Selaginella rupestris* a very common species of spikemoss found on rock outcrops and dry sands.

The Lycopodiaceae (lycopods or clubmosses)

The Lycopodiaceae are characterized by small, needle-like leaves, dichotomous or monopodal branching, and reniform sporangia that dehisce by a longitudinal slit. Growth is generally upright from horizontal stems that are either above or below the ground surface. Generally lycopods are terrestrial occurring in forests and or open areas such as blueberry fields but some species grow in rock crevices and a few subtropical and tropical species are epiphytes. None are aquatic but *Lycopodiella* contains members that occur mostly on highly saturated soils and may occasionally be submerged after heavy rain.

There are 4 genera and about 14 species of lycopods in our area. A few are extremely rare and are not covered here in extensive detail. Hybrids are also passed over.

Key to the Lycopods

1A) Sporophylls borne in the axils of green leaves, in alternating zones of sterile and fertile on the stem, not in cones, gemmae often present: 2

1B) Sporophylls borne in terminal strobili ("cones"): 3 (*Huperzia*)

2A) Leaves with stomata on upper surface only, leaves in zones alternating large and small, leaves widest above the middle and also toothed: *Huperzia lucidula*

2B) Leaves with stomata on both surfaces, more or less equal in size, minutely papillate to scarcely toothed: *Huperzia selago*

3A) Mature sporophylls green and similar in size and shape to vegetative leaves: *Lycopodellia inundata*

3B) Mature sporophylls yellow and wider than vegetative leaves and differing in shape from them: 4

4A) Leaves needle-like, in 6-10 ranks, similar in size and shape: 5 (genus *Lycopodium*)

4B) Leaves flat, in 4 or 5 ranks, dissimilar in size and shape, the branches tending to be fan-like: 10 (genus *Diphasiastrum*)

5A) Horizontal stems always deep below the surface, aerial stems upright, their form and tree-like and with numerous branches: 6

5B) Horizontal stems on surface of soil or slightly below duff layer, aerial stems upright, with few branches plants creeping: 8

6A) Leaves arranged so that branches appear flattened in cross section and leaves of main stem appressed, annual bud constrictions inconspicuous: *Lycopodium obscurum*

6B) Leaves arranged so that branches appear rounded in cross section, leaves of stem appressed or not: 7

7A) Leaves of main stem spreading, prickly, annual bud constrictions inconspicuous, branch leaves spreading, in 6 ranks, 2 upperside, 2 lateral, and 2 underside, equal in size: *Lycopodium dendroideum*

7B) Leaves of main stem below tightly appressed, annual bud constrictions absent, the leaves ascending, in 6 ranks, 1 on upperside, 4 lateral, and 1 on underside, equal in size, linear, widest in middle: *Lycopodium hickeyii*

8A) Leaves 8-ranked, semi-whorled, stiff with a sharp tip, smooth margins to slightly toothed: *Lycopodium annotinum*

8B) Leaves 10-ranked, narrow, ending in a hair-like tip, margins slightly toothed: 9

9A) Strobili (1)2-4 (-6) on branching stems, leaves spreading: *Lycopodium clavatum*

9B) Strobili single on non-branching stems, leaves ascending to appressed: *Lycopodium lagopus*

- 10A) Aerial branches from deep seated subterranean stems, upright shoots clustered, branching near base, leaves bluish to whitish green, ventral leaves 1-1.5 mm: *Diphasiatrum tristachyum*
 10B) Aerial branches upright from stems on soil surface or just below, branches flat, leaves green or greenish yellow, ventral leaves to 1 mm: 11

11A) Branching pattern irregular and with annual constrictions, strobili without sterile tips: *Diphasiatrum complanatum*

11B) Branching pattern fan-shaped and without annual constrictions, strobili often with sterile tips: *Diphasiastrum digitatum*

THE LYCOPOD SPECIES DESCRIBED

Huperzia selago (Linnaeus) Bernhardt ex Schrank & Martius (fir clubmoss)



Left and right: Branch tips of *Huperzia selago* showing sporangia and smooth margined leaves. These are shade form specimens. Plants in full sun have leaves more tightly appressed to the stems.

Huperzia selago is a plant with short shoots (8-12 cm) erect at first but later decumbent. It is often found in cool, moist woods, on hummocks in conifer swamps, and sometimes in open areas such as rock outcrops or even in old gravel pits where some water seeps to the surface. The wetland rating of *H. selago* is FACU-.

Leaves of *H. selago* are triangular to lanceolate, widest at the base, 3 to 7.5 mm, green in the shade but yellow-green in sunny locations, the margins nearly entire or with a few small papillae. Stomates are found on both surfaces, but are more numerous on the adaxial surface (30 to 90 per 1/2 leaf, a key characteristic for separating *H. selago* from rare species of *Huperzia*). In shade forms the leaves are spreading but tend to be appressed in sun forms.

Gemmae (4 to 5 by 3 to 4.5 mm) are produced on small branches at stems tips towards the end of the growing season.

Huperzia lucidula (Michaux) Trevisan



Left: Branch tip of *Huperzia lucidula* showing leaves with papillate/toothed margins and some sporophylls visible.
Right: Branch tip of *H. lucidula* with gemmae (red arrow points to one of these).

Huperzia lucidula also grows in habitats similar to those of *H. selago* but is often found in mesic hardwoods as well and less often in exposed places. The wetland rating of *H. lucidula* is FAC+.

H. lucidula is similar to *H. selago* in that it has erect indeterminate shoots that soon become decumbent. It differs by the very strong annual constriction between old growth and new growth and by the stomates which are on the lower leaf surface only. The leaves of *H. lucidula* are 3-11 mm long, narrowly obovate broadest at or above the middle with papillate margins and several small teeth at the distal end. The leaves are also reflexed and shining ("*lucidula*").

Gemmae (4-6 by 3-6 mm) are produced on small branches at stems tips towards the end of the growing season.

Hybrids between *H. selago* and *H. lucidula* exist. They are intermediate in appearance to the parent species.

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub

Diphasiastrum digitatum was at one time considered a variety of *D. complanatum* (obsolete syn. *Lycopodium complanatum*) known as variety *flabelliforme*. However, significant morphological differences separate *D. digitatum* from *D. complanatum* and the two are now regarded as separate species. *D. digitatum* occurs in both coniferous and deciduous forests and also in open areas. No wetland rating is available for this species.

Both *D. digitatum* from *D. complanatum* have upright stems that grow from long horizontal stems at the soil surface or just beneath the duff layer. In *D. digitatum* branchlets are consistently fan-shape and without obvious annual bud constrictions. The peduncles of *D. digitatum* fork suddenly from the base and give the impression of being whorled ("pseudo-whorl"). The strobili, which measure 20 to 35 mm long, have a sterile tip. The upright stems of *D. digitatum* bear branches that are consistently fan-shape. Branching is regular and sequential up to three times. The 2 to 4 mm wide branches are flat with dull or pale green below and shiny green above. Leaves are 4-ranked and appressed. The top leaves are linear-lanceolate with barely 1 mm of the tip free. The free portions of the lateral leaves are a bit longer at 2 to 3 mm. leaves on the underside are also appressed, pointed at the tip, and poorly developed.



Above: colony of *Diphasiastrum digitatum*

ARISTOLOCHIACEAE- ASARUM AND ARISTOLOCHIA

June 12, 2005

Gary B. Walton

There is only one genus and species of Aristolochiaceae native to Minnesota and that is *Asarum canadense*. Some species of *Aristolochia* (snakeroot, pipewort, and birthroot) are cultivated but these are hardy in northern Minnesota only with protection and probably never naturalize. All Aristolochiaceae are herbaceous perennials characterized by trimerous flowers. *Asarum* is a creeping perennial herb from thick rhizomes just beneath the duff with regular, 12-stamened flowers. *Aristolochia* is a perennial herbaceous vine with irregularly lobed flowers resembling a bent tube.

All Aristolochiaceae contain potent alkaloids some of which act upon smooth muscles. Even so, the rhizomes of *Asarum* contain a spicy, fragrant chemical that has been consumed by some people when the rhizome is chopped into pieces and brewed into a tea. This may not be a safe practice.

Asarum canadense L. (wild ginger)

Asarum canadense (no rating) is a perennial herbaceous colonial plant with hairy stems, leaves and flowers. The kidney-shaped 8 to 12 cm wide leaves on 5 to 10 cm long petioles arise from thick rhizomes with a spicy fragrance (hence the name "wild ginger"). At ground level from between pairs of leaves are 1 to 2 flowers produced in the early spring. These are 2 to 4 cm long, urn-shaped with three deeply parted lobes. The lobes which are actually sepals not petals (these are obscure to not present) are thick with hairy outer surfaces and maroon in color. The spreading reflexed sepals end in long attenuate tips. Stamens number 12 and are united basally; the 6-lobed stigma is capitate.



Mass of leaves of *Asarum canadense*.

A. canadense is a colonial species that can cover large areas in suitable habitat. It is typically found in rich mesic forests such as sugar maple-basswood forests. It also occurs in aspen stands if the soil is rich and moist. It is not unusual to find it with bloodroot (*Sanguinaria canadensis*, FACU-*), Dutchman's breeches (*Dicentra cucullaria*, no rating), spring beauty (*Claytonia caroliniana*, FACU) early meadow-rue (*Thalictrum dioicum*, FACU+), doll's eye (*Actaea pachypoda*, no rating), blue cohosh (*Caulophyllum thalictroides*, no rating), wild leek (*Allium tricoccum*, FACU+), and maidenhair fern (*Adiantum pedatum*, FAC-).



Flower of *Asarum canadense* (much enlarged). Note the trimerous floral parts visible (3 sepals, the 12 fused stigmas). The flowers of *Asarum* lie on the soil and are pollinated by small beetles that wander in.

KEY SEPARATING GENERA AND SPECIES OF CYPERACEAE EXCLUDING CAREX

June 21, 2005

Gary B. Walton

These keys only include species that will be covered in this course. For a fuller discussion of the Cyperaceae you should consult appropriate technical floristic texts. The sedges (*Carex*) are excluded from this key because the large number of species and complexity of descriptions require it. A series of write-ups on some *Carex* sections will be forthcoming in the next few weeks.

Main Key

1A) Achene enclosed by a membrane (perigynium), style protruding from apical opening, flowers either pistillate or staminate and usually on separate spikes: *Carex*

1B) Achene not enclosed by a perigynium, flowers perfect: 2

2A) Floral scales in two vertical rows, spikelets appear flattened: 3

2B) Floral scales spirally imbricate, spikelets appear rounded: 4

3A) Inflorescence axillary, achene subtended by bristles, scales light brown, hyaline margined: *Dulichium arundinaceum* (a monotypic genus)

3B) Inflorescence terminal, achene not subtended by bristles, scales red-purple to deep brown: *Cyperus*

4A) Achenes tipped with a prolonged tubercle derived from style tip: 5

4B) Achenes blunt, style tip short, confluent with achene body: 6

5A) Spikelet solitary, terminal, without subtending bracts: *Eleocharis*

5B) Spikelets by few to many, subtended by foliaceous bracts: *Rhynchospora*

6A) Bristles subtending achene 1-6: *Eriophorum*

6B) Bristles subtending achene more than 6: *Scirpus*

Key to the genus *Cyperus*

- 1A) Plants perennial from short, knotty rhizomes, in dry sandy soil: *Cyperus schweinitzii*
- 1B) Plants annuals, in wet ground, shores: 2
 - 2A) Cleft of style to base, scale more pigmented distally: *Cyperus diandrus*
 - 2B) Cleft of style two-thirds to base, scale more pigmented proximally: *Cyperus rivularis*

Key to the genus *Eleocharis*

- 1A) Achene tubercle elongate (0.3-0.7 mm) and confluent with achene, plant found on peaty shores, rare: *Eleocharis pauciflora*
- 1B) Achene tubercle forming a distinct cap: 2
 - 2A) Stem nearly as thick as spikelet: 3
 - 2B) Stem more slender than spikelet: 5
 - 3A) Stems jointed (septate-nodulose), rhizomatous: *Eleocharis equisetoides*
 - 3B) Stems not jointed but angular, cespitose and rhizomatous: 4
 - 4A) Stem 1.5-5 mm thick, sharply 4-angled, often with tuber bearing rhizomes: *Eleocharis quadrangulata*
 - 4B) Stem 1-2 mm thick, bluntly 3-angled, no tubers: *Eleocharis robbinsii*
- 5A) Achene trigonous to terete, style trifid: 6
- 5B) Achene lenticular, style bifid, rarely trifid: 9
 - 6A) Achene twice as long as wide, gray, with longitudinal ridges and fine cross lines, rhizomatous forming a sod: *Eleocharis acicularis*
 - 6B) Achene two-thirds to as wide as long, surface smooth or pitted: 7
 - 7A) Achene pale olive to yellowish, surface smooth, plant cespitose: *Eleocharis intermedia*
 - 7B) Achene yellow to orange (sometimes brown) with distinct pits on surface: 8
 - 8A) Stems 4-8 angled, achenes yellow to orange: *Eleocharis nitida*
 - 8B) Stems flattened often twisted, achenes golden yellow to brown: *Eleocharis compressa*
- 9A) Rhizomatous perennial, achene yellow-brown with finely roughened surface, tubercle sharply constricted at base: *Eleocharis smallii* (*E. palustris*)
- 9B) Cespitose annual (rarely a short-lived perennial), achenes shining, olive to dark brown with a broad flat appressed tubercle about 2/5 length of achene body: *Eleocharis obtusa* (in *E. ovata* the tubercle obviously narrower than achene body and about 2/5 length of achene; *E. engelmannii* tubercle as broad as achene but about 1/5 length)

Key to the genus *Rhynchospora*

1A) Perianth bristles antrorsely barbellate, one to three spikelets in dense dark brown glomerules, achenes not narrowed to a stipe-like base, surface smooth, plant rhizomatous: *Rhynchospora fusca*

1B) Perianth bristles retrorsely barbellate, one to several spikelets in dense glomerules, achenes narrowed to a stipe-like base: 2

2A) Perianth bristles 8-14, minutely hairy at the base, glomerules white to pale brown, achenes brownish-green with faint transverse lines, stems in loose clusters: *R. alba*

2B) Perianth bristles 6-9, not hairy at base, plants cespitose: 3

3A) Achenes half or more as wide as long, dark brown, smooth, tubercle widened at base, glomerules castaneous, fan-shaped, with several spikelets, leaves flat: *R. capitellata*

3B) Achenes half or less than half as wide as long, pale in center with darker margins, glomerules ellipsoid with 1-10 spikelets, leaves involute: *R. capillacea*

Key to the genus *Scirpus*

- 1A) Spikelet single, erect, not exceeded by involucre leaf: 2
- 1B) Spikelets 2 or many, often exceeded by involucre leaf: 3
 - 2A) Culms terete or several-angled, smooth, densely tufted: *Scirpus cespitosus*
 - 2B) Culms 3-angled, scabrous, perianth bristles white and cottony: *S. hudsonianus*
- 3A) Inflorescence apparently lateral with a terete involucre leaf continuing from end of culm: 4
- 3B) Inflorescence terminal, subtended by flat leaves: 6
 - 4A) Stems sharply triangular in cross-section, two sides concave, one flat, the scales red-brown scale margins with small bristles near tip, achenes ending abruptly with a short point: *S. americanus*
 - 4B) Stems stout, rounded in cross-section, scale margins with pronounced short fringe: 5
 - 5A) Stems soft, pale green, spikelets ovoid, more or less open inflorescence, scales shiny orange-brown, mid-rib prominent greenish, red dots limited to mid-rib, scales becoming dark gray at maturity: *S. validus*
 - 5B) Culms firm, dark green, spikelets ovoid to cylindrical in a somewhat dense inflorescence, scales dull, pale or whitish-brown, mid-rib not contrasting, the backs with numerous shiny red dots: *S. acutus*
- 6A) Perianth bristles more or less straight or with a few kinks, mostly as long as achene, minutely retrorsely barbed, spikelets in hemispheric or globose heads, plants from rhizomes: 8
- 6B) Perianth bristles crinkled at maturity, exceeding achene, smooth not barbed, spikelets ovoid solitary or in groups on pedicels, involucre darkened at base, plants in dense clumps: 7
 - 7A) Scales black: *S. atrovinctus*
 - 7B) Scales with numerous fine red lines: *S. cyperinus*
- 8A) At least the lower leaf sheaths red, bristle retrorsely barbed to base, achene pale and usually lenticular: *Scirpus rubrovinctus* (*S. microcarpus*)
- 8B) All leaf sheaths green, bristles retrorsely barbed from above the middle, achenes pale to white, compressed trigonous: 9 (*S. atrovirens* complex)
 - 9A) Glomerules few and large, scales 1.8-2.8 mm, greenish-black, the mid-rib prolonged into a 0.4-0.7 mm awn: *S. pallidus* (*S. atrovirens* var. *pallidus*), more common west of the Mississippi River.
 - 9B) Glomerules numerous, bristles 0-6, equal to or shorter than achene, scales 1.4-2.1 mm, black, the mid-rib prolonged into a 0.4 mm or shorter awn, leaf sheaths pitted: 10
 - 10A) Bristles mostly 6, equal to achene, leaf sheaths deeply pitted: *S. atrovirens* var. *atrovirens*, common mostly east of the Mississippi River.
 - 10B) Bristles 0-3, shorter than achene, leaf sheaths not deeply pitted: *S. georgianus* (*S. a.* var. *georgianus*), scattered east of the Mississippi River.

Key to the genus *Eriophorum*

- 1A) Spikelet solitary: 2
- 1B) Spikelets 2 or more, nodding or spreading, subtended by 1 or more involucre leaves: 3
 - 2A) Stems numerous, in dense tufts, 10 to 15 empty bracts at base of spikelet, bristles normally white: *Eriophorum spissum*
 - 2B) Stems solitary or a few in loose clumps, 7 or less empty bracts at base of spikelet, bristles reddish-brown: *E. chamissonis*
- 3A) Cauline leaves slender (2 or 3 mm wide), 3-angled or channeled entire length, 1 (or rarely 2) involucre leaf shorter than inflorescence: 4
- 3B) Cauline leaves flat, wide (to 6 mm), 2 or more involucre leaves mostly longer than inflorescence: 5
 - 4A) Scales greenish-brown to reddish-brown, culms scabrous above: *E. tennelum*
 - 4B) Scales with a blackish or leaden color, culms smooth: *E. gracile*
- 5A) Scales thick, the lower usually conspicuously 3 to 7 nerved, the rest inconspicuously nerved, brownish to reddish sometimes with a central green band, achenes 3 to 3.5 mm long, bristles tawny or coppery, spikes of inflorescence erect or spreading, not drooping: *E. virginicum*
- 5B) Scales thin, midvein conspicuous, drab to blackish color, spikes drooping or nodding: 6
 - 6A) Summit of upper leaf sheaths with a dark border, midvein of scales thin and does not extend to tip, bristles white, achenes 2 to 2.3 (rarely 3) mm long: *E. angustifolium*
 - 6B) Summit of upper leaf sheaths without a dark border, midvein of scales thick and extending to tip bristles white to pale brown, achenes 3 to 3.4 mm long: *E. viridi-carinatum*

ANOTHER SPECIES FROM THE GENUS RIBES
KEY TO THE GENUS RIBES (CURRANTS, FAMILY GROSSULARIACEAE) PART 3

June 22, 2005

Gary B. Walton

***Ribes cynosbati* L. (Dogberry)**

Ribes cynosbati is a small (to 1 m) shrub with smooth or prickly stiff upright stems and 1 or 2 (sometimes 3) spines (5-15 mm) per node occurring in upland mesic hardwood forests. It is not rated as to wetland indicator status.

The flowers of *R. cynosbati* are borne in small clusters of 1-3 rarely 4 on 5-16 mm long pedicels with glandular-ciliate bracts (pedicels of *R. oxycanthoides* are much shorter and the bracts finely glandular-ciliate). The 2.4-5 mm oblong sepals are reflexed, petals obovate and 1-2.5 mm and about equal to the stamens. The ovary is beset with stalked glands that later become stiff prickles when the fruit is ripe. The green to reddish fruit is edible but the numerous prickles and tough skin make eating them difficult.

Leaves of *R. cynosbati* are 2-5 cm long, truncate to cordate at the base, pubescent but normally not glandular. *R. oxycanthoides* has obviously glandular and hairy leaves on the lower side.



***Ribes cynosbati* fruit, leaves, and stem (note prickles on fruit and stem).**

CAREX SPECIES PART 1: VULPINAЕ and ATRATAE

June 29, 2005

Gary B. Walton

There are at least 100 *Carex* species from northeastern Minnesota. The genus *Carex* itself contains some 1500 or more species worldwide. A genus this large very obviously contains many divergent evolutionary lines and attempts have been made to separate the genus into sub-genera or groups of closely related species. These groups are sometimes referred to as "sections" but many of these sections are not formally recognized and their use here is merely a matter of convenience.

Correct identification of any *Carex* requires mature perigynia along with the culm, associated leaves, and underground parts (roots and rhizomes). Often measurements of the perigynia include length to width ratios and for this it is essential that a good metric ruler (in millimeters) be used. A dissecting microscope with 10X to 25X magnification is also important to look for details on the perigynia surface, leaf textures, and other small details. Merely staring at a specimen until an idea comes to mind simply will not work when identifying *Carex*.

Two *Carex* sections and two common species are described here this week. They are:

VULPINAЕ: *Carex stipata*

ATRATAE: *C. buxbaumii*

No key to *Carex* will be presented here. The number of species is too large and there are better keys available in numerous standard floristic texts such as:

Manual of Vascular Plants of the Northeastern United States and Adjacent Canada. H. A. Gleason and A. Cronquist.

Flora of Michigan, Vol. 1. E. Voss.

Spring Flora of Minnesota. T. Morley.

VULPINAE: *Carex stipata* Willd.



The *Carex* group VULPINAE are distinguished by spikes 2 or more; styles 2-cleft; achenes 2-sided; lateral spikelets crowded, sessile and short, the terminal spikelet often pistillate; staminate flowers at the apex of at least some spikelets; perigynia on short slender stipes, their bases spongy-thickened; pistillate scales usually awnless; and stout and sharply 3-angled, cespitose culms with no or short rhizomes, and wide leaves with loose sheaths.

Carex stipata is the most common species in this group found in our area. It occurs in many types of moist and wet habitats except the most acidic of bogs. The wetland rating of *C. stipata* is OBL.

Key features of *C. stipata* are the thin leaf sheaths with evident horizontal wrinkles and 4 to 5 mm long obtuse, stramineous perigynia tapered into an beak about as long as the body with several nerves dorsally and at least a few ventrally.

Overall *C. stipata* is a tall plant with densely clustered stems about 30 or so cm tall, sometimes shorter, and coarse leaves. The leaf sheaths are described as "cross-corrugated" or "horizontally wrinkled". This is a distinguishing field characteristic. Similar species with cross-corrugated or otherwise wrinkled leaf sheaths also have red or purple dots on the sheaths.

The inflorescence of *C. stipata* appears prickly because of the widely spreading perigynia.

Left: *Carex stipata* fertile culm.

ATRATAE: *Carex buxbaumii* Wahl.



The ATRATAE are distinguished by spikes 2 or more; styles 3-cleft; achenes 3-sided; lateral spikelets sessile to short pedunculate, the terminal spikelet partly pistillate; the pistillate spikelets erect and short cylindrical; glabrous to papillose perigynia rounded at the summit and longer than wide; scales obviously longer than the perigynia; and leaves and sheaths glabrous.

Carex buxbaumii is the most common species of the ATRATEA in northeastern Minnesota. A similar species, *C. media*, is quite rare and restricted to a few sites along the shore of Lake Superior. *C. buxbaumii* occurs in peaty habitats often somewhat circumneutral. Its wetland rating is OBL.

C. buxbaumii is a rhizomatous plant with tall (30 to 100 cm) culms arising singly or in sparse clusters with few or no leaves (these all basal, 2 to 4 mm wide). Spikes are somewhat remote to barely touching, mostly erect, sessile although the lowest may be peduncled. The uppermost spike is gynaecandrous (staminate below, pistillate above).

The pistillate scales are longer than the perigynia, brown to purplish with a paler mid-rib that ends in a tapered awn 0.5 to 3 mm long.

Left: *Carex buxbaumii* fertile culm. Arrow points to staminate portion of gynaecandrous terminal spike.

THE GENUS *ERIOPHORUM* (CYPERACEAE)

June 29, 2005

Gary B. Walton

Eriophorum is a genus of, in our area, 7 species. All are perennials of boggy sites, i.e., peatlands with some species also occasionally found in other wetland types such as marshes and along shores. In many ways *Eriophorum* is similar to *Scirpus* but differs in having 10 or more (as opposed to 1 to 6 in *Scirpus*) perianth bristles that become elongate as the fruit matures.

There are 20 species worldwide all in the northern hemisphere of which 7 are found in Minnesota.

Key to the genus *Eriophorum*

- 1A) Spikelet solitary: 2
- 1B) Spikelets 2 or more, nodding or spreading, subtended by 1 or more involucre leaves: 3
 - 2A) Stems numerous, in dense tufts, 10 to 15 empty bracts at base of spikelet, bristles normally white: *Eriophorum spissum*
 - 2B) Stems solitary or a few in loose clumps, 7 or less empty bracts at base of spikelet, bristles reddish-brown: *E. chamissonis*
- 3A) Cauline leaves slender (2 or 3 mm wide), 3-angled or channeled entire length, 1 (or rarely 2) involucre leaf shorter than inflorescence: 4
- 3B) Cauline leaves flat, wide (to 6 mm wide), 2 or more involucre leaves most longer than inflorescence: 5
 - 4A) Scales greenish-brown to reddish-brown, culms scabrous above: *E. tenellum*
 - 4B) Scales with a blackish or leaden color, culms smooth: *E. gracile*
- 5A) Scales thick, the lower usually conspicuously 3 to 7 nerved, the rest inconspicuously nerved, brownish to reddish sometimes with a central green band, achenes 3 to 3.5 mm long, bristles tawny or coppery, spikes of inflorescence erect or spreading, not drooping: *E. virginicum*
- 5B) Scales thin, midvein conspicuous, drab to blackish color, spikes drooping or nodding: 6
 - 6A) Summit of upper leaf sheaths with a dark border, midvein of scales thin and does not extend to tip, bristles white, achenes 2 to 2.3 (rarely 3) mm long: *E. angustifolium*
 - 6B) Summit of upper leaf sheaths without a dark border, midvein of scales thick and extending to tip, bristles white to pale brown, achenes 3 to 3.4 mm long: *E. viridi-carinatum*

***Eriophorum spissum* Fernald (syn. *E. vaginatum* L., tussock cotton-grass)**



Eriophorum spissum is a densely tufted plant of poor fens and raised *Sphagnum* moss bogs usually in full sun to part shade. It is rated OBL.

The plant forms large tussocks with stems mostly under 30 cm tall and filiform leaves clustered at the base. *E. spissum* is most notable for its white cottony solitary spike formed at the end of each culm. Each spike has from 10 to 15 black sterile basal scales, lance-ovate in shape with white margins.

**Upper left: Spike of *Eriophorum spissum*.
Bottom: *E. spissum* (white puffs) in raised *Sphagnum* bog with black spruce and leatherleaf.**



***Eriophorum angustifolium* Honck. (syn. *E. polystachion* L., cottongrass)**



Eriophorum angustifolium is a common species found in rich fens, marshes, and along the edges of bogs where nutrient levels are higher. Its wetland rating is OBL.

E. angustifolium is a colonial species with creeping rhizomes from which 20 to 60 cm tall stems arise. These have several flat 2 to 8 mm wide leaves and are topped by a 3 to 7 spikelets on minutely scabrous pedicels as long as 5 cm. The spikelets are subtended by 2 to 3 leaf-like bracts the sheaths of which are dark bordered. Scales of the spikelets may be tawny to blackish-green with a narrow mid-rib that extends only part of the length of the scale and the bristles white.

Left: *Eriophorum angustifolium*. Arrow points to dark bordered leaf sheath.

***Eriophorum viridi-carinatum* (Engelm.) Fernald (bog cotton)**



Eriophorum viridi-carinatum resembles *E. angutifolium* but differs by its blackish green scales with a pale mid-rib that extends to the tip and is larger at the top than bottom. The upper leaf sheaths do not have a dark border which is in *E. viridi-carinatum* small and brownish.

E. viridi-carinatum occurs in rich fens, swamps, bog edges, and marshes. Its wetland rating is OBL.

Left: *Eriophorum viridi-carinatum*. Note brownish border of upper leaf sheath indicated by arrow.



Above: Clump of *Eriophorum viridi-carinatum*

KEY TO THE GENERA AND SPECIES OF THE IRIDACEAE (IRIS FAMILY)

June 29, 2005

Gary B. Walton

There are only two native genera of Iridaceae, *Sisyrinchium* and *Iris*, in our area of northeastern Minnesota and only 4 native species (that's not to say other *Sisyrinchium* species won't be found here in the future). The two most common species encountered are *Sisyrinchium montanum* (blue-eyed grass, FAC+) and *Iris versicolor* (blue-flag, OBL). Two other species, *S. angustifolium* (FACW-) and *I. shrevei*, are found occasionally especially as one goes further south from Duluth. The occurrence of another *Sisyrinchium*, *S. mucronatum*, is debatable.

All of our Iridaceae have 6 colored tepals that resemble petals, three stamens opposite the outer tepals, and a 3-lobed style. The leaves are simple, linear and arranged in an equitant manner. The subterranean portion may be a corm or rhizome. In *Iris* the style branches are expanded so as to cover the stamens and appear to be petals. In *Sisyrinchium* the style branches are not petal-like and the stamens are clearly visible. Also, the perianth of *Sisyrinchium* is more rotate in form and the tepals are all similar in shape and size.

There is one non-native *Iris* in our area that is naturalized. It is *I. pseudacorus* which has yellow instead of blue flowers like our native species. It is commonly found in the St. Louis River harbor. One might also find *I. sibirica* around old homes and in yard waste dump piles on the edges of woods. *I. sibirica* has purple to deep purple flowers (cultivars and hybrids may vary) with gold markings and very narrow leaves (1 cm or less). *I. sibirica* is not established as *I. pseudacorus* is. Other *Iris* species (*I. pumila* and *I. germanica* hybrids) also tend to persist around old home sites but spread slowly into "wild" areas if at all.

The key

1A) Style branches not petal-like, the stamens clearly visible, perianth rotate: *Sisyrinchium*

1B) Style branches petal-like, the stamens hidden by these, outer tepals spreading or reflexed: 2 (*Iris*)

2A) Outer tepals bearded: *Iris germanica* hybrids and *I. pumila*

2B) Outer tepals not bearded: 3

3A) Flowers yellow: *I. pseudacorus*

3B) Flowers blue or violet, rarely white, with variegations of yellow: 4

4A) Outer tepals erect, leaf blades usually 1 cm wide: *I. sibirica*

4B) Outer tepals reflexed, leaf blades usually over 1 cm wide:

5A) Sepal blade oblong-ovate, basal yellow spot hairy: *I. shrevei*

5B) Sepal blade ovate to reniform, basal yellow spot glabrous: *I. versicolor*

***Sisyrinchium montanum* Greene (blue-eyed grass)**



Sisyrinchium montanum (FAC+) is grass-like perennial plant found in moist to dry open areas such as fields, meadows, and shores. Under certain conditions it can become very abundant.

In flower it is hard to confuse this with any other species. However, when in fruit the plant may be less noticeable. *S. montanum* (and all other *Sisyrinchium*) produces globular three-valved fruit on wiry peduncles. The equitant leaf arrangement is another key feature that should serve to separate it from plants such as sedges and grasses.



From top left going clockwise: Flower, equitant leaves, and globular fruit capsules (arrow) of *Sisyrinchium montanum*.

***Iris versicolor* L. and *Iris shrevei* Small (blue-flag or wild iris)**



These two irises are very similar and grow in similar habitats. *Iris shrevei* is more southern than *I. versicolor* but does occur sporadically in northeastern Minnesota. Both are rated OBL species.

Although the photographs show differing colors for both *I. shrevei* and *I. versicolor* this is not reliable as color intensity is controlled by a variety of interacting environmental and genetic factors. The chief differences are in the flowers. At the base of the largest sepals is a yellow spot. In *I. shrevei* this spot is finely pubescent with hairs roughly as long as the sepal is thick. In *I. versicolor* the yellow spot is more greenish and the hairs (or papillae) are shorter than the thickness of the sepal.

All other differences (color of leaf bases, length of cauline leaves, and size of ovaries during flowering) are too subject to variation.



Owing to the overlapping traits of these two species they have sometimes been included together as varieties of the species *I. versicolor*. In that case *I. versicolor* var. *shrevei* is considered the typical form found in the southern part of the species range and *I. versicolor* var. *versicolor* being the northern form.

Other irises in our area are persistent after cultivation or waifs except *Iris pseudacorus* which appears to be naturalized in many places around the Great Lakes.

Top left: *Iris shrevei*
Lower left: *I. versicolor*

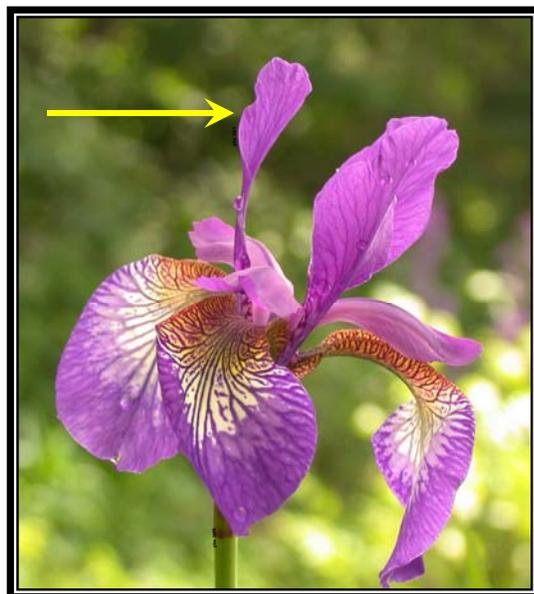


Left: equitant leaves of *Iris shrevei*. Equitant or two-ranked overlapping leaves are characteristic of the Iridaceae.

Two Non-native *Iris* species somewhat naturalized in Duluth

Below left: *Iris pumila* found spreading from cultivation near a very old abandoned garden site in Duluth, MN. Note white "beard" (arrow) on inner tepals and the large erect outer tepals.

Below right: Flower of *Iris sibirica* found at a dumpsite (illegal) in a wooded area in Duluth, MN. Note the narrow erect outer tepals (arrow) and beardless inner tepals.



THE LYCOPHYTES (QUILLWORTS, SPIKEMOSSES AND CLUBMOSES) PART 2:
DIPHASIASTRUM COMPLETED

June 29, 2005

Gary B. Walton

***Diphasiastrum complanatum* (Linnaeus) Holub**



Diphasiastrum complanatum is similar to *D. digitatum* with its horizontal stems from long horizontal stems at the soil surface or just beneath the duff layer. Unlike *D. digitatum* it has branches with an irregular branching pattern giving the plant a somewhat scraggly appearance. Also, annual bud constrictions which

are rather obscure on *D. digitatum* are abrupt and conspicuous on *D. complanatum*. The strobili of *D. complanatum* end in a blunt tip and are entirely fertile.

D. complanatum occurs in similar but usually drier coniferous and deciduous forests habitats as *D. digitatum* but is more northerly in its range and circumboreal in distribution. The wet land rating of *D. complanatum* is FACU+.

***Diphasiastrum tristachyum* (Pursh) Holub (blue ground-cedar)**



Diphasiastrum tristachyum is another northern species with a circumboreal distribution. Of the three *Diphasiastrum* species it is most likely to occur in dry soils often with jack pine and oak. *D. tristachyum* has no wetland rating.

Although at first glance *D. tristachyum* may seem the same as *D. digitatum* and *D. complanatum* there are significant differences. First, the rhizome of *D. tristachyum* is deeply seated underground. The upright shoots do not radiate in either a regular or irregular fan-like pattern. Instead they are clustered along the stem and upright. The branchlets are square with rounded angles in cross section (they are flat in *D. digitatum* and *D. complanatum*) with abrupt and conspicuous annual bud constrictions. As the leaves mature during the summer they take on a glaucous to bluish tint.

KEY TO THE OSMUNDA FERNS (FAMILY OSMUNDACEAE)

June 29, 2005

Gary B. Walton

There are only three species of *Osmunda* in our area: *Osmunda cinnamomea*, *O. claytoniana*, and *O. regalis*. Of these three *O. claytoniana* is probably the *Osmunda* fern species most frequently seen along the interface of uplands and wetlands.

The *Osmunda* can be recognized by their thick, scaleless rhizomes covered in persistent leaf bases and roots. The fronds are erect, coarsely divided sometimes with coarse lobing on the pinnules. The spores are not borne in sori on the edges or undersides of the leaves but in clusters on leaf segments. These segments may be part of the photosynthetic frond or all on a separate frond depending on species.

The Osmundales to which *Osmunda* belongs is ancient with a fossil record dating back to the Triassic Period some 210 million years ago. *Osmunda claytoniana* has a fossil record stretching back 200 million years in Antarctic rocks. Today *O. claytoniana* is restricted to portions of eastern North America and eastern Asia.

The key:

1A) Fronds bi-pinnate, spore bearing leaflets at top of frond: *Osmunda regalis*

1B) Fronds pinnate: 2

2A) Fertile fronds distinct from photosynthetic fronds: *Osmunda cinnamomea*

2B) Set of fertile leaflets about midway up photosynthetic frond: *Osmunda claytoniana*



Above: Stand of *Osmunda cinnamomea* in a rich tamarack swamp.

Osmunda cinnamomea L. (cinnamon fern)



Left: *Osmunda cinnamomea* spore frond.



Right: Plant of *Osmunda cinnamomea*.

Osmunda cinnamomea is fern typically found in swamps more often than merely wet woods. It is usually found in rich swamp systems such as black ash swamps and rich conifer swamps and is rated FACW.

O. cinnamomea is a large fern with fronds to 1.5 meters or slightly larger that grow in a radiating pattern from thick dark black rhizomes covered with old leaf bases and fibrous roots. The emerging fronds are covered with a dense pale brown wooly pubescence that is later shed. *O. cinnamomea* has dimorphic fronds. The fertile fronds are achlorophyllous (no chlorophyll), rusty brown and emerge in the early spring from the center of the crown. These soon wither after the spores are shed. Its leaves have 15 to 20 sub-opposite, sessile, oblong-lanceolate pinnae with alternating obtuse to subacute pinnules.

Two other wetland fern species with dimorphic fronds occur in our area. These are *Matteucia struthiopteris* (ostrich fern, FACW) and *Onoclea sensibilis* (sensitive fern, FACW). Good field characteristics that can be used to distinguish them from *Osmunda cinnamomea* are their woody spore fronds that can persist more or less intact for about a year.

Osmunda claytoniana L. (interrupted fern)



Above: Fertile leaflets on *Osmunda claytoniana* fronds.

Osmunda claytoniana is similar to *O. cinnamomea* but bears spores on a set leaflets near the middle of the frond instead of on a separate fertile frond. *O. claytoniana* is also large ferns to 1.5 meters or slightly larger with a similar growth habit as that of *O. cinnamomea*. Plants that are not fertile may resemble *O. cinnamomea* but the chief differences in the sterile fronds are rounded pinnules in *O. claytoniana* and pinnae that are remote rather than nearly completely overlapping at least in specimens which receive a fair amount of sunlight.

O. claytoniana occurs in drier habitats than *O. cinnamomea* such as mesic forests but also in wetlands particularly along the edges and on root hummocks. The wetland of *O. claytoniana* rating is FAC+.



Above: Growth form of *Osmunda claytoniana*.



Frond portions for comparison.
From upper left going clockwise: *Osmunda cinnamomea*, *O. claytoniana*, *Matteucia struthiopteris*. All three are tall species (*M. struthiopteris* to 2 meters) that occur in mesic forests and wetlands. The frond stems of *Osmunda* are rounded with barely perceptible winged margins while those of *Matteucia* have prominently winged margins and grooves.

Osmunda regalis L. (royal fern)



Above: Portion of *Osmunda regalis* frond.

Osmunda regalis is very different looking from the two *Osmunda* species already described. The frond is bi-pinnate and the margins of the pinnae are serrulate (they are entire in *O. cinnamomea* and *O. claytoniana*) and the veins of the leaflets are clearly visible. Finally, *O. regalis* has fertile leaflets at the top of the frond.

O. regalis is a large fern to 2 meters in height often found along lake shores, streams and other highly saturated rich wetlands. Its wetland rating is OBL. *O. regalis* is found in many places across the northern hemisphere with several marked varieties (or more likely separate species) in eastern Asia.

SANGUINARIA CANADENSIS L. (BLOODROOT, FAMILY PAPAVERACEAE)

July 2, 2005

Gary B. Walton



Above: Colony of *Sanguinaria canadensis*

Sanguinaria canadensis is a colonial perennial species with large leaves and showy white flowers growing from a thick reddish rhizome. It is best known for its red latex giving it the name "bloodroot". *S. canadensis* grows in rich moist woods particularly mesic hardwoods. It can also be found in some mixed aspen-birch-fir-spruce forests if the soil is good. The wetland rating of *S. canadensis* is FACU-*

Leaves of *S. canadensis* are orbicular with 3 to 9 lobes and coarsely toothed. The flowers are white with 8 (rarely more) petals, four of which are longer than the others, numerous stamens, and a two-lobed stigma. Flowers are borne singly on scapes up to 15 cm tall and appear before the leaves are fully unfolded. The fruit is a narrow capsule with several seeds. The seeds have an appendage or aril known as an "eliasome", an oily body attractive to woodland species of ants. They collect the seeds for the eliasome and help to distribute them.

S. canadensis blooms in the early spring and its leaves tend to die down by late July. Colonies can be very extensive covering several hundred square feet.

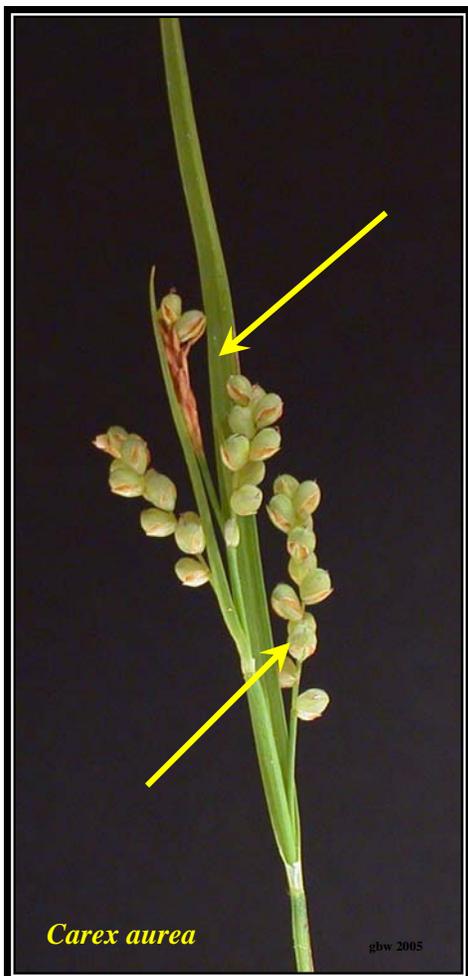


Above: Flowers of *Sanguinaria canadensis*

CAREX PART 2: BICOLORES

July 5, 2005

Gary B. Walton



The BICOLORES are characterized by 2 or more spikelets per culm with bracts protruding and small segments of the rachis (flower stem) visible; 2-cleft styles; 2-sided achenes; lateral spikelets peduncled; slender culms; all spikes erect or ascending; terminal spike staminate but often with some pistillate flowers at the top; pistillate spikes loosely flowered and the lowermost almost always long peduncled; and perigynia white-pulverulent when immature and golden at maturity. We have two species, *Carex aurea* which is very common and *C. garberi*, which is rare.

Carex aurea Nutt.

Carex aurea is a short (4 to 25 cm) loosely tufted plant of moist habitats such as wet meadows with low growing sedges and grasses, calcareous shores, and cedar swamps. The perigynia are ovoid to globose, elliptic in cross section, beakless, 1.7 to 3 mm long with 12 to 20 ribs to almost nerveless and mostly well separated on the rachis from one another. When immature the perigynia are whitish-papillate to green but become golden yellow when mature. *C. garberi* has perigynia that are much more closely arranged on the rachis, usually touching, and the mature perigynia are whitish-papillate. Both species grow in moist circum-neutral to calcareous habitats. *C. aurea* is rated as FACW+ and *C. garberi* is rated FACW.

LONICERA AND DIERVILLA (HONEYSUCKLES, FAMILY CAPRIFOLIACEAE) PART 2

July 6, 2005

Gary B. Walton

Lonicera dioica L. (wild honeysuckle)



Lonicera dioica is a vining honeysuckle similar to *L. hirsuta* (May 15, 2005) but differs by its glabrous leaves and that are glaucous and sometimes sparsely villous or glandular hairy below. The flowers of *L. dioica* are distinctly gibbous at the base and may be pale yellow to purplish in color and hairy inside. In some varieties the corolla tube is also hairy outside. The non-native (in our part of the country but often cultivated outside of its range) *L. sempervirens* has flowers that may be red or yellow outside but always yellow inside. Other non-native vining *Lonicera* species have yellow flowers.

L. dioica grows in woods and thickets in moist soil and sometimes in swamps. Its wetland rating is FACU.

Diervilla lonicera Miller (yellow bush-honeysuckle)

Diervilla lonicera is very similar to *Lonicera*. It differs chiefly by regular as opposed to bilabate flowers (starting out yellow and then turning red), fruit a septicidal capsule rather than a berry, and leaves with serrate (see photo) and ciliate margins rather than entire and usually ciliate margins. *D. lonicera* grows in dry woods, rock outcrops, and only very seldom in wetlands and then just barely. It is not given a wetland rating.



RIBES AMERICANUM MILLER (AMERICAN BLACK CURRANT)

July 6, 2005

Gary B. Walton

Ribes americanum is an erect shrub with unarmed stems found in wet forests, willow thickets, and occasionally ash swamps. *R. americanum* is rated FACW.

R. americanum leaves are 3- to 5-lobed, cordate at the base with many small yellow scarcely scented resin glands on the lower surface which may also minutely hairy along the veins. Resin dots are present on the upper surface as well. Stems are smooth with no bristles, spines, or resin dots.

Flowers of *R. americanum* are greenish-white to yellow on drooping racemes. The sepals are glabrous (unlike *R. hudsonianum* which are densely hairy) and 3.5 to 4.5 mm long. The ovaries are glabrous and later mature to dark black fruit.



Left: Leaves of *Ribes americanum*.

Right: Lower leaf surface showing numerous yellow resin dots and some hairs along veins.

KEY TO THE GENUS *THALICTRUM* (MEADOW-RUE, FAMILY RANUNCULACEAE)

July 7, 2005

Gary B. Walton

There are five native species of *Thalictrum* (meadow-rues) in northeastern Minnesota. The most common species is *Thalictrum dasycarpum* and the similar *T. pubescens*, are species of wet meadows, shores, and other moist places. *T. dioicum* is also very common but over much of our area is less so than *T. dasycarpum*. Rich upland hardwood forests are typical habitat for *T. dioicum*. Two other species, *T. venulosum* and *T. revolutum*, are occasionally found in our area. *T. venulosum* often grows near rocky or gravelly shores while *T. revolutum* is more likely to be found in dry woods.

The key

- 1A) Undersides of leaves at least somewhat pubescent with either soft hairs or glandular stalked capitate trichomes: 2
- 1B) Undersides of leaves glabrous, leaflets rounded, plants from fibrous roots: *Thalictrum dioicum*
 - 2A) Pubescence of soft hairs on undersides of leaves: 3
 - 2B) Pubescence of glandular stalked capitate trichomes on undersides of leaves: 4
 - 3A) Underside of leaflets distinctly pubescent, stigmas straight, filaments not wider than anthers and not constricted at attachment: *T. dasycarpum*
 - 3B) Underside of leaflets minutely pubescent, stigmas curved, filaments dilated wider than anthers and constricted at attachment: *T. pubescens*
 - 4A) Underside of leaves sparsely beset with glandular stalked capitate trichomes, rhizomes yellow: *T. venulosum*
 - 4B) Underside of leaves heavily beset with glandular stalked capitate trichomes, rhizomes not yellow: *T. revolutum*

Thalictrum dioicum L. (early meadow-rue)



Thalictrum dioicum is a species of rich deciduous hardwood forests growing to about 70 cm (when in full flower) from a fibrous rooted crown. Its wetland rating is FACU.

Leaves of *Thalictrum* species are very similar in shape as they are ternately decomposed with leaflets that are lobed and frequently with each lobe bearing 1 or more teeth. This is often a source of confusion as is the case with *T. dioicum* and *T. dasycarpum*. Leaflets of *T. dioicum* are orbicular to lunate in outline, three-lobed with each lobe bearing 2 or 3 teeth (seldom 1). Also, the undersides of the leaves are completely glabrous and without pubescence of any kind. The leaflets of *T. dasycarpum* are for the most part three-lobed and each lobe may have from 1 to 3 teeth. The base of the leaflet of *T. dasycarpum* is somewhat cuneate. The undersides of the leaves of *T. dasycarpum* are distinctly pubescent with many soft hairs.

T. dioicum grows to almost 1 meter including the flowering stem. It comes into flower early with or just before leaves on maples and basswoods appear. The filaments and anthers are greenish to yellow. Its achenes are about 4 mm sessile with strong ribbing, straight and symmetrical.

Thalictrum dasycarpum Fischre & Avé-Lall. (purple meadow-rue)
and *Thalictrum pubescens* Pursh. (tall meadow-rue)



Upper left going clockwise: leaves, node (note fine pubescence on stem), pistillate flowers and staminate flowers of *Thalictrum dasycarpum*.

Thalictrum dasycarpum is a tall plant (1 to 2 meters) from fibrous rooted crown found in moist meadows and along stream banks and shores. Its wetland rating of *T. dasycarpum* is FACW. *T. pubescens* occurs in moist woods and wet meadows and is rated FAC.

Young plants of *T. dasycarpum* may be mistaken for *T. dioicum*. The most obvious difference is the presence of soft hairs along veins on the underside of the leaf of *T. dasycarpum*. In addition, *T. dasycarpum* blooms much later in the season (late June to early July) and grows in considerably wetter habitats than *T. dioicum*. Filaments of *T. dasycarpum* are white, capillary to slightly dilated before the anther (always dilated in the case of *T. pubescens*). The achenes are obtuse and in a hemispherical head.

Thalictrum venulosum Trelease (northern meadow-rue) and
Thalictrum revolutum DC (skunk meadowrue)



Pistillate flowers of *Thalictrum venulosum*.

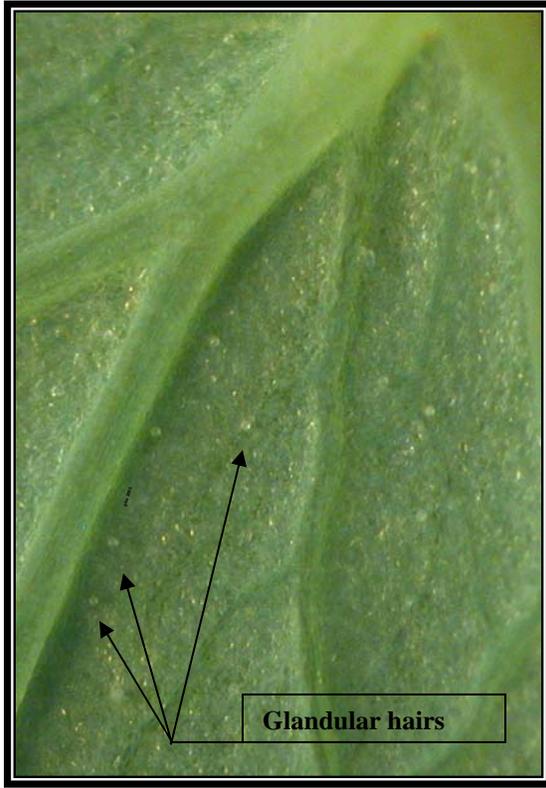
Thalictrum venulosum is medium sized plant (to 1 meter but usually smaller) from yellow rhizomes (in *T. revolutum*) found in moist rocky to gravelly soil near shores, streams, and pools. The wetland rating of *T. venulosum* is FAC*. *T. revolutum* grows in dry woods, fields, and along streams and is rated FAC.

T. venulosum differs from the previous two species by its distinctly rhizomatous growth, glabrous stems (compare to *T. dasycarpum*), and the lower leaf surfaces sparsely glandular (glabrous in *T. dioicum*, softly pubescent in *T. dasycarpum*). The similar *T. revolutum* is densely glandular below. The flowers are borne in a panicle of ascending branches. Pistillate flowers are pinkish. The achenes are 4 to 6 mm and convex on one margin.



Leaflets of *Thalictrum venulosum*.

Undersides of leaflets of *T. venulosum* and *T. dasycarpum* compared



Thalictrium venulosum



Thalictrium dasycarpum

LAMIACEAE (MINT FAMILY) PART 1

July 7, 2005

Gary B. Walton



Prunella vulgaris L. (self-heal)

Prunella vulgaris is prostrate to nearly erect perennial herb of moist grassy meadows, untended gardens, and also wet woods and swamps. Its wetland rating is FAC.

P. vulgaris grows to about 50 cm but is usually smaller. It has petiolate, elliptic to lanceolate to broadly ovate leaves 2 to 9 cm by 0.7 to 4 cm with entire to somewhat toothed margins. These may be glabrous to sparsely pubescent at least along the mid-vein. The flower spike *P. vulgaris* is distinctive. It is ovate-cylindric in shape with ciliate acuminate green bracts subtending flowers with green or purple sepals with spinulose teeth and rose-pink, purple or white petals. The fruit, as in all Lamiaceae, is a nutlet.

P. vulgaris is probably native at least in part but the species now has a nearly cosmopolitan distribution. Plants believed to be native are the variety *lanceolata* with narrower leaves, the middle leaves one third as wide as long and with a tapering base. The plant in the photo has leaves about half as wide as long and so is probably the European variety *vulgaris*.

Although in the mint family *P. vulgaris* is not scented or aromatic.

Mentha arvensis L. (field mint)



Mentha arvensis is a common native perennial mint found in moist habitats such as wet meadows, shrub swamps, and shores. Its wetland rating is FACW.

M. arvensis is often first detected by its strong mint fragrance that is very unlike that of spearmint and peppermint. It is an upright plant to almost 1 meter with slightly to heavily pubescent stems coated with short retrorse hairs or long spreading hairs along the angles (seldom also between). The leaves are short petiolate to nearly sessile in the inflorescence, 2 to 8 cm long by 6 to 20 mm (rarely larger) wide, glabrous or hairy, serrate, and narrowly ovate to rhombic-elliptic. The verticils (flower whorls) are compact, axillary, and separated by long internodes. Flower color is light purple, sometimes pink or white. Fruit is a nutlet.



Upper left: Portion of *Mentha arvensis* plant showing leaf and flower arrangement.

Lower left: Close-up of *Mentha arvensis* verticil. Some retrorse hairs visible on stem.

LAMIACEAE (MINT FAMILY) PART 2

July 12, 2005

Gary B. Walton

***Stachys hispida* Pursh (hispid hedge nettle)**



Upper left going clockwise: Verticil and stem (note retrorse hairs on angles), inflorescence, and leaf (note hairs on teeth of leaf) of *Stachys hispida*.

Stachys hispida is a common species of wet meadows, sedge meadows, thickets, and wet woods. Its wetland rating is FACW+.

S. hispida is a tall (to 1 meter) perennial plant with erect stems that are prominently hirsute with retrorse bristles (to 2 mm) on the angles. The leaves are oblong or lanceolate, acuminate, serrate, hirsute above including the margins. The

flowers are borne in a terminal spike with long internodes between each verticil, flowers are pink-purple, the throat white with spotting, and the calyx and corolla are hirsute.

Similar species include *S. palustris* (OBL) which has stems pubescent on the angles and in between angles, *S. tenuifolia* (OBL) which has calyx lobes smooth, glabrous, linear oblong, nearly entire leaves with petioles 8 to 25 mm long, and *S. aspera* (FACW+) which calyx lobes smooth, glabrous, sessile, oblong, serrate leaves.

Scutellaria galericulata L. and Scutellaria laterifolia L. (mad dog skullcap)



Scutellaria galericulata is a rhizomatous perennial with weak somewhat declining stems found in marshes, forested swamps, vernal pools, and shores. Its wetland rating is OBL.

S. galericulata has ovate to oblong, sessile to barely petiolate leaves with coarse teeth along the margins, glabrous above and pubescent below. The stems are pubescent with retrorse strigose hairs.

Violets to blue flowers with white markings in the throat are borne singly in the axils of leaves.

S. lateriflora (OBL) is also a perennial from rhizomes and occurs in similar wet habitats as *S. galericulata*. The stems of *S. lateriflora* are erect, pubescent in lines with ascending hairs. Its leaves are long petiolate, ovate to lance-ovate with a broad base. Flowers are borne on bracteate axillary racemes and may be blue or white.



Above left: Flower and leaves of *Scutellaria galericulata*.

Lower left: Leaves of *Scutellaria lateriflora*. Note slightly cordate bases and long petioles.

POTENTILLA (CINQUEFOIL), GEUM (AVENS) AND AGRIMONIA (AGRIMONY)
(FAMILY ROSACEAE) PART 1

July 12, 2005

Gary B. Walton

Potentilla is a genus in the rose family (Rosaceae) with about 200 species worldwide distributed mostly in the northern hemisphere. There are about 20 species of *Potentilla* found in Minnesota. Most occur in mesic to dry soils in full sun or partial shade. A few are non-native species and these may be found in a variety of open situations from railroad yards to old fields. Of the 20 or so *Potentilla* species in our state only a few are true inhabitants of wetlands. They are *Potentilla rivalis* (OBL) which grows near streams, *P. palustris* (OBL) commonly growing in shallow water, *P. anserina* (FACW-) which grows in wet meadows, and *P. fruticosa* (FACW) a species of calcareous fens and other calcareous wetlands. *P. norvegica* (FAC) is a weedy species that grows in a variety of wet or dry habitats. It is sometimes found on beaver lodges, muddy banks, even on sedge tussocks.

A few upland *Potentilla* species commonly seen in northern Minnesota are *P. simplex* (FACU), *P. arguta* (FACU-), *P. recta* (no rating), *P. pennsylvanica* (no rating), and *P. argentea* (FACU). *P. arguta* and *P. pennsylvanica* are species of open dry grasslands and bedrock outcrops. *P. simplex* grows in meadows and fields and *P. recta* and *P. argentea* are non-native species occurring as weeds in fields and other human perturbed upland habitats.

Some *Potentilla* species resemble strawberry (*Fragaria*) and *Waldsteinia* which are also in the rose family. The fruit of all three genera is an achene and in some species of *Potentilla* at least some the leaves are 3-lobed and toothed like those of *Fragaria* and *Waldsteinia*. Two other similar rose family genera are *Geum* and *Agrimonia* and it is with these that some confusion also arises. Principle differences are:

Genus	Receptacle	Ovaries	Style	Bractlets	Flower color
<i>Potentilla</i>	Dry	Numerous	Straight	Present, diverse shapes	Yellow, white, or red
<i>Fragaria</i>	Fleshy	Numerous	Straight	Present, triangular	White
<i>Waldsteinia</i>	Dry	2 to 10	Straight	Usually absent	Yellow
<i>Geum</i>	Dry, elongate	Numerous	Filiform, elongate, plumose or hooked	Present, linear	Yellow, white, or red
<i>Agrimonia</i>	Concealed by indurate barbed hypanthium	2	Straight	Pair of 3-lobed bracts	Yellow

Fragaria may occur in some wetlands and *Waldsteinia* is too uncommon in Minnesota and it is typically found in mesic upland forests. *Geum* and *Agrimonia* are two other rose family genera with species that occur in moist or dry woodlands and sometimes in wetlands. Most *Agrimonia* species are typically found in upland forests but may grow as weeds along trails. The barbed fruit aids in the dispersal of seeds and so the presence of *Agrimonia* along trails is expected. Three species of *Agrimonia* occur in Minnesota (15 worldwide, distributed in the northern hemisphere). They are *Agrimonia gryposepala* (FACU+), *A. rostellata* (FACU), and *A. striata* (FAC-).

Six species of *Geum* are found in Minnesota (50 worldwide, distributed in the northern hemisphere) but only four are common in wetlands: *Geum allepicum* (FAC+), *G. lacinatum* (FACW), *G. macrophyllum* (FACW+), and *G. rivale* (OBL).

Potentilla norvegica L. (strawberry weed)



Flower of *Potentilla norvegica*



Three-lobed leaf of *Potentilla*

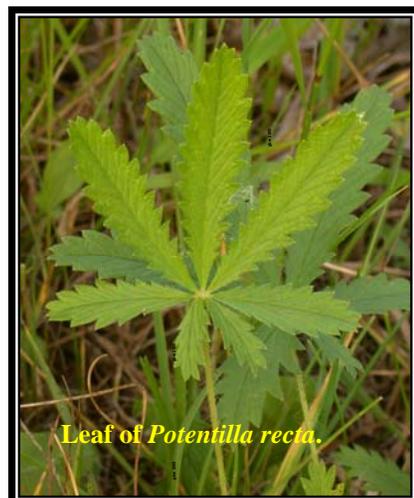
Potentilla norvegica is a short (to 0.5 meter) well branched annual or perennial with many small yellow flowers. It is commonly found as a weed along roads, trails, moist fields but also grows in undisturbed habitat such as rock ledges, beaver lodges, and tussock mounds in marshes. The wetland rating of *P. norvegica* is FAC. *P. norvegica* is more or less circumboreal in distribution with both native American varieties and European varieties of the species but differences are slight.

P. norvegica leaves are three-lobed, coarsely toothed, hirsute above, and subtomentose below. The flowers are yellow, up to 1 cm across with petals to 15 mm long or about equal to the sepals. The achenes are 1 mm, flat with curved longitudinal ridges.

Potentilla recta (sulfur flowered cinquefoil)



Flower of *Potentilla recta*.

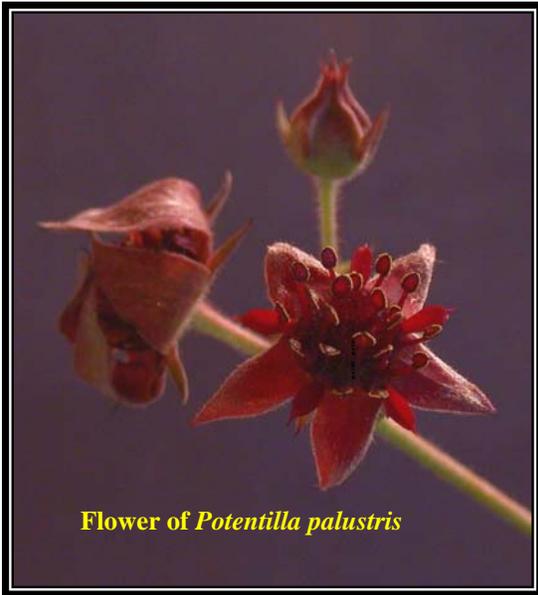


Leaf of *Potentilla recta*.

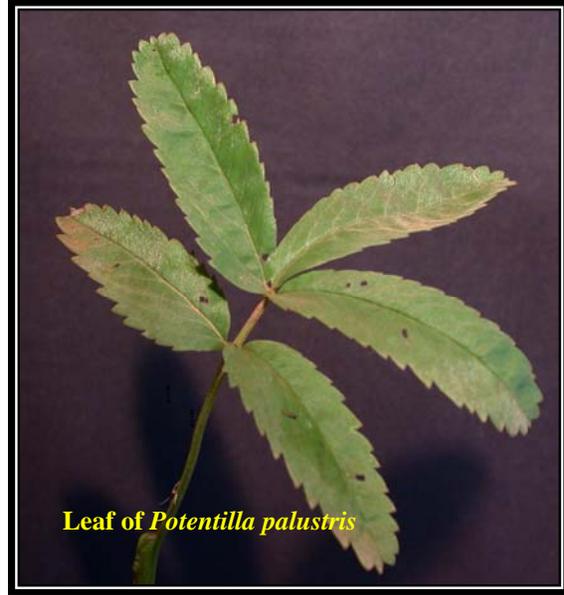
Potentilla recta is a common weedy perennial plant with erect pubescent stems from a stout taproot growing old fields, roadsides and similar disturbed habitats. It is a Eurasian species that has naturalized over much of North America. *P. recta* has no wetland rating.

P. recta has 1 cm wide sulfur yellow flowers in an inflorescence of many flowers. The bractlets are lance ovate and somewhat smaller than the sepals. The achene is striate with low curved ridges. Leaves of *P. recta* are palmately compound with 5 to 7 deeply toothed, narrowly oblanceolate leaflets. Leaflet number and petiole length decrease up the stem towards the inflorescence.

Potentilla palustris (L.) Scop. (marsh potentilla)



Flower of *Potentilla palustris*



Leaf of *Potentilla palustris*

Potentilla palustris is a semi-woody, coarse stemmed decumbent plant from a long rhizome typically found growing in the still water of ponds, pools, marshes, and channels. Its wetland rating is OBL.

P. palustris is our only *Potentilla* with red-purple flowers (the sepals are large and brightly colored and appear to be petals). The flowers are borne in a leafy inflorescence and measure 2 cm wide. The flowers are fragrant. The bractlets are narrowly lanceolate and much shorter than the sepals. The petals are half the length of the sepals. The achenes are smooth and on a spongy but dry receptacle. Leaves of *P. palustris* are long petioled, pinnately compound with 3 to 7 narrowly oblong to elliptic, sharply toothed leaflets, glaucous beneath. The stipules are rounded and clasping.

***Geum aleppicum* Jacq. (yellow avens) and *Geum macrophyllum* Willd. (large leaf avens)**



***Geum aleppicum* flower**



***Geum aleppicum* achenes**

Geum aleppicum is a large perennial plant to 1 meter with very hirsute stems. *Geum aleppicum* is rated as FAC+ species and grows in wet meadows, swamps, and moist woods. The similarly sized *G. macrophyllum* grows in moist woods and thickets and is rated as FACW+.

The leaves of *G. aleppicum* are variable but the lobes of the leaves are always cuneate at the base and

oblong to ovate. *G. macrophyllum*, which resembles *G. alippecum*, has basal leaves with a rounded to reniform often three-lobed terminal segment and the lobes are never cuneate based. The flowers of both species are yellow, the petals barely exceeding the sepals in both species.

The achenes of *G. alippecum* are hispid at the summit but otherwise glabrous or with appressed not spreading hairs. Achenes of *G. macrophyllum* are minutely pubescent, hirsute at the summit, and the style is minutely glandular. The terminal segment of the achene is also minutely pubescent.

The leaves of *G. aleppicum* are variable but the lobes of the leaves are always cuneate at the base and oblong to ovate. *G. macrophyllum*, which resembles *G. alippecum*, has basal leaves with a rounded to reniform often three-lobed terminal segment and the lobes are never cuneate based. The flowers of both species are yellow, the petals barely exceeding the sepals in both species.

The achenes of *G. alippecum* are hispid at the summit but otherwise glabrous or with appressed not spreading hairs. Achenes of *G. macrophyllum* are minutely pubescent, hirsute at the summit, and the style is minutely glandular. The terminal segment of the achene is also minutely pubescent.

SPIRAEA ALBA DUROI AND SPIRAEA TOMENTOSA L.
(MEADOWSWEET, FAMILY ROSACEAE)

July 12, 2005

Gary B. Walton

We have two native species of *Spiraea*: *S. alba* and *S. tomentosa*. Both are soft woody shrubs of moist soils with alternate, exstipulate, simple, somewhat ovate to lanceolate leaves. The inflorescence is elongate, paniculiform with numerous white or pink flowers and the fruit is follicle. *S. alba* differs by its finely toothed, glabrous or nearly glabrous leaves, usually white flowers, and glabrous fruit. *S. tomentosa* has leaves with more or less entire margins, a dense tomentum below, prominent veins above, usually pink flowers, and pubescent fruit.

S. alba occurs in wet meadows, swamps, and along river banks and lake shores. Its wetland rating is FACW+. *S. tomentosa* also occurs in similar habitats as well as on peat soils. It is rated FACW.

A variety of *S. alba* known as var. *latifolia* is often found in drier habitats than the typical variety of *S. alba* var. *alba*. Its leaves are coarsely toothed (finely toothed in var. *alba*), the sepals acute (obtuse in var. *alba*), and the inflorescence is glabrous (puberulent in var. *alba*). *S. alba* var. *latifolia* is rated FACW-.



Left: *Spiraea alba* var. *alba* flowers.

Right: *Spiraea alba* var. *alba* leaves

CAREX PART 3: BRACTEOSAE

July 17, 2005

Gary B. Walton

The BRACTEOSAE are a group of largely upland sedge species with perigynia superficially resembling those of the STELLULATAEA (to be covered soon in a future web page). The spikes are all alike, sessile, short, often crowded or with at least some separated by long internodes; 10 or fewer perigynia per spike; lateral spikes with a few staminate flowers at the tips; perigynia green at maturity; culms clustered with no or short rhizomes or culms from elongate rhizomes.

Three species of the BRACTEOSAE occur in our area: *Carex radiata*, *C. rosea*, and *C. muhlenbergia*. A fourth, *C. gravida*, is probably uncommon in northeastern Minnesota. It occurs on dry soils such as grasslands. *C. muhlenbergia* also grows in dry often sterile soils in full sun. *C. radiata* and *C. rosea* are species of mesic to dry woods although *C. radiata* grows in moister soils such as near the margins of wetlands and in wet woods.

Carex radiata (Wahlemb.) Small



Carex radiata is a cespitose sedge found near woodland ponds and in moist to wet woods. It has no wetland rating.

Culms of *C. radiata* are 20 to 80 cm tall, slender, erect with narrow (0.8 to 1.5 mm), flat leaves that are mostly near the base. There are 4 to 7 spikes per culm that are sessile closely grouped, the lower one often separated. Bracts are setaceous (bristle-like) and often longer than the inflorescence.

Perigynia are light green, spreading to reflexed at maturity, 2.6 to 3.8 mm long, 1.0 to 1.5 mm wide, the body 2 times as long as the beak, plano-convex to lance-ovate, spongy with a swollen subtruncate to broadly rounded base and acuminate tip. It is nerveless or very obscurely nerved near the base. The beak is serrulate and deeply bidentate. The stigmas are straight to slightly arched, never coiled.

Carex rosea Willd.



Carex rosea is robust, cespitose sedge with wider leaves (1.8 to 2.6), spikes separated by long internodes and perigynia radiating. *C. rosea* grows in drier habitats than *C. radiata*.

C. rosea is sometimes considered a variety of *C. radiata* but the perigynia which radiate in all directions, once or twice coiled stigma, and spikes separated by long internodes are key characteristics for differentiating the two species. Like *C. radiata* the setaceous bracts of *C. rosea* often are longer than the inflorescence.

Surface textures of *C. rosea* perigynia are similar to those of *C. radiata* but the base is cuneate to rounded.

CAREX PART 4: SYLVATICAE

July 17, 2005

Gary B. Walton

The SYLVATICAE are a sedge group characterized by 2 ribbed nerveless or faintly nerved, beaked, minutely toothed perigynia and spreading or drooping spikes on slender peduncles. Three species occur in our area: *Carex assiniboinensis*, *C. castanea*, and *C. arctata*. *C. assiniboinensis* (no rating) and *C. arctata* (no rating) occur in moist woods and *C. castanea* (FACW+) is found in wet meadows, swamps, and boggy sites.

Carex castanea Wahl.



Carex castanea is a tufted plant to 90 cm with purplish at the base and soft hairy stems and leaves. It occurs in wet meadows, swamps, and along the edges of boggy sites. The wetland rating for *C. castanea* is FACW+. It is named for its chestnut-colored ("*castanea* ") pistillate scales.

Fertile culms of *C. castanea* are taller than leafy sterile shoots. Both leaves and stems are soft hairy which is unusual given that many sedges are often barbed with sharp teeth along stem and leaf edges.

The pistillate spikes (usually 3) of *C. castanea* are pendulous on thin peduncles, subtended by leafy sheathing bracts, usually well separated from each other, with 10 to 40 perigynia loosely arranged. The uppermost spike is staminate, bladeless, and erect. Scales are about equal in width to the perigynia, chestnut colored, acute to cuspidate at the tip. The perigynia are 3.5 to 5.8 mm long, conspicuously 2-ribbed, lanceolate, trigonous, on a short stipe, and tapered to a slender bidentate beak.

Carex arctata W. Boott.



Carex arctata is a densely tufted plant to 80 cm, purplish at the base found in rich mesic forests. It has no wetland rating.

The pistillate spikes of *C. arctata* are slender and on slender drooping peduncles. The perigynia are narrowly ovoid, trigonous, 3.2-4.8 mm long, abruptly narrowed to a short stipe, distinctly 2-ribbed, finely but obscurely several nerved and narrowed above to a short beak.

The staminate spike is terminal, somewhat erect, and rarely contains a few perigynia.

Scales of the perigynia are ovate to oblong, about three-fourths the length of the perigynium, usually tipped with a short cusp.

LATHYRUS AND VICIA
FABACEAE (LEGUME FAMILY)-

July 17, 2005

Gary B. Walton

Fabaceae or the Legume Family is well represented in Minnesota by native and introduced species. All Fabaceae produce a fruit called the "legume" which is a fruit derived from a single carpel (the ovule bearing structure of a flower) that splits along both sutures. Flowers are zygomorphic (symmetrical through only one plain), the calyx formed from five fused sepals, and the corolla of five unequal petals with the two basal petals fused.

Worldwide there are some 440 genera and 12,000 species in the Fabaceae. In Minnesota there are 20 genera of both native and non-native origins. Many of the native genera and their species are prairie plants but a few (*Lathyrus*, *Vicia*, and *Amphicarpa*) are frequent to common ground layer components of rich mesic forests. Other commonly seen genera (*Trifolia*, *Lotus*) are introductions cultivated as forage and hay crops or planted to restore soil and control erosion. A few introduced species of *Vicia* are common roadside weeds or plants of old pastures and hayfields. Lupine (*Lupinus polyphyllus*) which is a common sight along Highway 61 north of Duluth and elsewhere is native to the western United States but not to Minnesota.

Lathyrus (vetchling), *Vicia* (vetch), and *Amphicarpa* (hog peanut) are native species of Fabaceae most likely to be seen in northeastern Minnesota. Others, like *Astragalus*, *Baptisia*, *Dalea*, or *Desmodium* which are prairie species likely to turn up in "native plant" restorations where a so-called native seed mix is used in the northern forested regions of Minnesota. Naturally occurring populations of these prairie components do exist in northern Minnesota but they are not growing in isolated prairie remnants. The origins of these populations are obscure.

In northeastern Minnesota there are four species of *Lathyrus* (*L. palustris*, *L. maritimus*, *L. ochroleucus*, *L. venosus*), four species of *Vicia* (*V. americana*, *V. villosa*, *V. cracca*, *V. hirsuta*) and one of *Amphicarpa* (*A. bracteata* which will be treated later if time permits). Major differences are shown in the table below.

Genus	Leaves	Tendrils	Stems	Calyx
<i>Lathyrus</i>	Pinnately compound	From terminal leaflet	Usually winged	5 lobes
<i>Vicia</i>	Pinnately compound	From terminal leaflet	Not winged	5 lobes
<i>Amphicarpa</i>	Trifoliolate	None	Not winged	4 lobes (upper 2 fused into 1)

Lathyrus ochroleucus Hook (white vetchling) and other native Lathyrus species



Lathyrus ochroleucus is a perennial herbaceous rhizomatous plant found in mesic forests and clearings. It has no wetland rating.

L. ochroleucus has 5 to 10 white flowers (these become yellow after pollination) in racemes, pinnately compound leaves with 3 to 5 elliptic to obovate leaflets oppositely arranged, and semicordate stipules with irregularly toothed bases making them asymmetrical.



L. venosus Muhl. (forest pea vine, FAC) is a perennial herbaceous rhizomatous plant with wingless stems, 10 to 20 purple flowers in a dense raceme and narrow, semi-sagittate stipules. The elliptic leaflets (8 to 12) are alternately arranged on the leaf

L. palustris L. (marsh pea vine, FACW) is a perennial herbaceous rhizomatous plant with winged stems, reddish-purple flowers.

L. maritimus L. (Bigelow) (beach pea, FACU-) is a perennial herbaceous rhizomatous plant with 5 to 10 purple (rarely white) flowers in a raceme, 6 to 12 oblong to ovate leaflets, and symmetrical ovate stipules. It grows mainly on the shore of Lake Superior in sand and gravel.



From top left down: *Lathyrus ochroleucus* flowers, *L. ochroleucus* stipules and leaves (note elliptic shape of leaflets), and flowers and leaves (note ovate shape of leaflets) of *L. maritimus*.



Vicia americana Muhl. (American vetch)

Vicia americana is our only native vetch species and is a climbing perennial herb from deep spreading roots. *V. americana* typically occurs in both coniferous and hardwood mesic forests and woodland edges. The wetland rating of *V. americana* is NI or non-indicator.

Other vetch species, none native, grow in Minnesota and at least two are established: *V. cracca* and *V. villosa*. These two species have 10 or more flowers per raceme compared to *V. americana* which usually has 9 or more usually 5 or fewer. These species are frequent in old fields and along roadsides. Very rarely they may occur in openings in forests.

V. americana has sharply serrate stipules, 4 to 8 pairs of elliptic to oblong leaflets at 1.5 to 3 cm long per leaf often with a mucronate summit. The flowers are borne in axillary racemes and have from 2 to 9 purple flowers.

From top left down: Flowers, leaves, and stipule of *Vicia americana*.



Vicia villosa Roth (hairy vetch)

Vicia villosa is an annual or biennial non-native vetch to 1 meter or more that climbs by means of tendrils. It is often found on roadsides, old fields, and similar places and is often planted to control erosion, enrich soil, and as forage crop. *V. villosa* has no wetland rating status.

V. villosa differs from *V. americana* by its dense racemes of 10 to 40 purple flowers, stems with spreading villous hairs (some cultivars of *V. villosa* are less hairy), 5 to 10 pairs of narrowly oblong to lance-linear leaflets, leaflet-like stipules. The calyx tube is gibbous making the flower pedicel appear to be ventral



V. cracca L. (bird vetch) is also present in our area. It is a tendril climbing perennial to 1 meter or more with 5 to 11 pairs of 1 to 3 cm long linear to narrowly oblong leaflets. There are as many as 50 blue (sometimes white) flowers per densely crowded raceme. The calyx tube is oblique in *V. cracca* unlike that of *V. villosa* which is gibbous thus the flower pedicel appears to be basal.

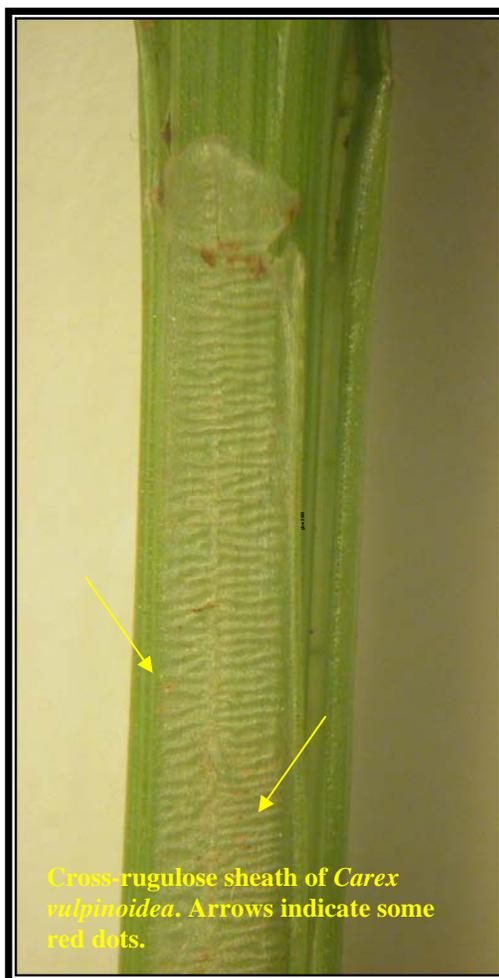
From top left down: Leaf and tendrils of *Vicia villosa* and flowering raceme of *V. villosa*.

CAREX PART 5: MULTIFLORAE

July 28, 2005

Gary B. Walton

MULTIFLORAE: *Carex vulpinoidea* Michaux (fox sedge)



The *Carex* group MULTIFLORAE is distinguished by spikes 2 or more, these all alike; styles 2-cleft; achenes 2-sided; lateral spikelets crowded, sessile and short, the terminal spikelet often pistillate; staminate flowers at the apex of at least some spikelets; perigynia rounded toward a slightly or not at all spongy-thickened base; pistillate scales with a 1 to 5 mm long awn; and stout and sharply 3-angled, cespitose culms with no or short rhizomes, and wide leaves with loose sheaths. Many of these characters are shared with the VULPINAE

(which includes *Carex stipata* discussed June 29, 2005 in *Carex* Part 1). The VULPINAE differ by the usually awnless pistillate scales and broad subtruncate perigynia bases that are definitely spongy-thickened.

There is only one species of the group MULTIFLORAE in eastern North America, *Carex vulpinoidea* (fox sedge). This species is a frequent component of many wet meadow seed mixtures but it also occurs naturally in marshes, wet meadows, and wet ditches. It is somewhat weedy and may appear in disturbed wet soils. Its wetland rating is OBL.

Carex vulpinoidea is a clustered plant to 1 meter with mostly flat 2 to 5 mm wide leaves scattered along the lower two thirds of the stout stems. The ventral sides of the leaf sheaths are cross-rugulose and with a few reddish dots. The spikes are sessile, androgynous and small with few flowers, aggregated into a dense 5 to 10 cm long inflorescence with small setaceous (bristle-like) bracts. The perigynia are subtended by slender scales with a green mid-rib sometimes prolonged into a 1 to 5 mm long awn. Perigynia are flattened to plano-convex, straw-colored to brown to partly light green when mature, 2 to 3.5 mm, narrowly ovate to round ovate, with no or a few inconspicuous nerves, the distal portion of the margin serrulate.

KEY TO THE GENUS SAXIFRAGA (FAMILY SAXIFRAGACEAE)

July 28, 2005

Gary B. Walton

There are four species in our region but two, *Saxifraga cernua* and *S. aizoon*, are very rare and not likely to be encountered. *S. cernua* is rhizomatous with small bulblets in the axils of the upper leaves. It is known from some locations on the North Shore of Lake Superior and the Border Lakes. *S. aizoon* occurs along the shore of Lake Superior. Its growth form is as a rosette of stiff leaves with small calcium crystals secreted from pores along the leaf margins. The other two species (*S. pennsylvanica* and *S. virginiana*) are quite common and more likely to be encountered.

Our species are all herbaceous with basal leaves in rosettes. The flowers are regular, perfect (staminate and pistillate) and borne on branched panicles. The hypanthium (a structure formed when the basal parts of the calyx, corolla, and stamens fuse around the ovary) is joined to the base of the carpels (only 2 in *Saxifraga*).

Key to *Saxifraga*

- 1A) Margins of basal leaves with numerous sharp teeth ending in a lime-encrusted po, petlas of flowers dotted red, the flowering stem with at least some leaves: *Saxifraga aizoon*
- 1B) Margins of basal leaves entire to minutely crenulate or with blunt teeth, flower petals not dotted with red, the flower stem with a few bracts and no leaves: 2
 - 2A) Basal leaves large (10 to 35 cm long), the margins entire to obscurely toothed, the leaf apex entire and rounded, flower stem 20 to 40 cm tall, in moist habitats: *S. pennsylvanica*
 - 2B) Basal leaves small (3 to 7 cm long), the margins clearly toothed to the leaf apex, flower stem less than 15 cm tall, in rocky habitats: *S. virginiana*

***Saxifraga virginiana* Michx. (early saxifrage)**

Saxifraga virginiana is not a wetland species although it may occur in habitats that sometimes become very wet after heavy rains. It is usually found on rock outcrops and open woods in dry to moist soil. Its wetland status is FAC-.

S. virginiana is a small plant with consisting of a rosette of stiff 3 to 7 cm long serrate margined or entire leaves and a short (often no more than 10 cm rarely taller), branching flower stem with small white flowers.



Basal leaves of *Saxifraga virginiana*.



Flowers of *Saxifraga virginiana*.

Saxifraga pensylvanica L. (swamp saxifrage)



Saxifraga pensylvanica is a species of wetland habitats (indicator status OBL) particularly those with some ground water flow. It often occurs in sedge meadows and black ash swamps.

S. pensylvanica is a distinctive plant with a basal rosette of large (to 20 cm long), sparsely hairy and sometimes glandular-denticulate strap-like leaves. The flower stalk is also large up to 100 cm tall with many smaller branches bearing numerous clusters of greenish-white to vaguely purple flowers. The petals are 2 to 3 mm long and narrowly lanceolate to lance-ovate and without pigmented dots. The fruit is a follicle.

Left: Cluster of flowers from flower stem of *Saxifraga pensylvanica*

Below: Basal rosette of *Saxifraga pensylvanica*



CAREX PART 6: LUPULINAE

August 1, 2005

Gary B. Walton

The *Carex* section or group LUPULINAE is characterized by 2 or more spikelets per culm with bracts protruding and small segments of the rachis (flower stem) visible; 3-cleft styles; 3-sided achenes; leaf sheaths and blades glabrous (sometimes scabrous); leaves flat; terminal spike solitary and normally staminate; perigynia glabrous and numbering 11 to 18 per spike, 15 to 20 nerved in cylindrical short oblong or subglobose spikes; style persistent and basal portion continuous with achene; the bract of the lowest pistillate spike definitely sheathing.

We have four species in our area but only two, *Carex intumescens* and *C. lupulina*, are very common.

Carex intumescens Rudge (bladder sedge)



Carex intumescens is a very common sedge species found in wet forests, swamps, and in vernal pools and similar moist depressions in upland forests. Its wetland rating is FACW+.

C. intumescens may be distinguished by 1 to 4 globose pistillate spikes about as long as wide with from 2 to 12 perigynia per spike. These are spreading to ascending with rounded bases, glabrous, shiny to satiny, the beak shorter than the perigynium body, and measure 10 to 16 mm long by 2.5 to 6.5 mm wide.

The plant is loosely tufted in small clusters or the stems may be solitary, and it does not form rhizomes. The basal sheaths of *C. intumescens* are purplish-red.

SCIRPUS (FAMILY CYPERACEAE)

August 1, 2005

Gary B. Walton

The *Scirpus* may be divided conveniently into species with a single erect spikelet equal to or exceeding the involucre leaf and those with 2 or more spikelets with involucre leaves of various sizes and forms. All species found in northeastern Minnesota occur in wet habitats such as marshes, rivers, and along shores except one, *Scirpus clintonii*, an extremely rare species which grows in dry upland habitats. In our area (northeastern Minnesota) it is known from a single location in Cook County, MN. Except for *S. clintonii* which is FACU- all of our other native *Scirpus* species are OBL.

Key to the genus *Scirpus*

- 1A) Spikelet single, erect, not exceeded by involucre leaf: 2
- 1B) Spikelets 2 or many, often exceeded by involucre leaf: 3
 - 2A) Culms terete or several-angled, smooth, densely tufted: *Scirpus cespitosus*
 - 2B) Culms 3-angled, scabrous, perianth bristles white and cottony: *S. hudsonianus*
- 3A) Inflorescence apparently lateral with a terete involucre leaf continuing from end of culm: 4
- 3B) Inflorescence terminal, subtended by flat leaves: 6
 - 4A) Culms sharply triangular in cross-section, two sides concave, one flat, the scales red-brown scale margins with small bristles near tip, achenes ending abruptly with a short point: *S. americanus*
 - 4B) Culms stout, rounded in cross-section, scale margins with pronounced short fringe: 5
 - 5A) Culms soft, pale green, spikelets ovoid, more or less open inflorescence, scales shiny orange-brown, mid-rib prominent greenish, red dots limited to mid-rib, scales becoming dark gray at maturity: *S. validus*
 - 5B) Culms firm, dark green, spikelets ovoid to cylindrical in a somewhat dense inflorescence, scales dull, pale or whitish-brown, mid-rib not contrasting, the backs with numerous shiny red dots: *S. acutus*
- 6A) Perianth bristles more or less straight or with a few kinks, mostly as long as achene, minutely retrorsely barbed, spikelets in hemispheric or globose heads, plants from rhizomes: 8
- 6B) Perianth bristles crinkled at maturity, exceeding achene, smooth not barbed, spikelets ovoid solitary or in groups on pedicels, involucre darkened at base, plants in dense clumps: 7
 - 7A) Scales black: *S. atrocinctus*
 - 7B) Scales with numerous fine red lines: *S. cyperinus*
- 8A) At least the lower leaf sheaths red, bristle retrorsely barbed to base, achene pale and usually lenticular: *Scirpus rubrotinctus* (*S. microcarpus*)
- 8B) All leaf sheaths green, bristles retrorsely barbed from above the middle, achenes pale to white, compressed trigonous: 9 (*S. atrovirens* complex)
 - 9A) Glomerules few and large, scales 1.8-2.8 mm, greenish-black, the mid-rib prolonged into a 0.4-0.7 mm awn: *S. pallidus* (*S. atrovirens* var. *pallidus*), more common west of the Mississippi River.
 - 9B) Glomerules numerous, bristles 0-6, equal to or shorter than achene, scales 1.4-2.1 mm, black, the mid-rib prolonged into a 0.4 mm or shorter awn, leaf sheaths pitted: 10
 - 10A) Bristles mostly 6, equal to achene, leaf sheaths deeply pitted: *S. atrovirens* var. *atrovirens*, common mostly east of the Mississippi River.
 - 10B) Bristles 0-3, shorter than achene, leaf sheaths not deeply pitted: *S. georgianus* (*S. a.* var. *georgianus*), scattered east of the Mississippi River.

Scirpus validus Vahl. (soft-stem bulrush)



Scirpus validus is a species of shores in shallow water to around 1.5 meters deep often forming extensive colonies. Dense stands of *S. validus* and other emergent aquatics help to reduce wave action and are habitat for many kinds of fish. The similar *S. acutus* Muhl. (hard-stem rush) has thicker, harder stems that are not easily crushed when squeezed.

S. validus is a light green, spongy plant with sheathing leaves at the base (0.8 to 2.5 cm diameter) and round stems. It can grow from 1 to 2 meters tall.

The inflorescence of *S. validus* is loose and open and often drooping as the flowers open. The spikes are reddish-brown with brown or tawny scales 2.5 to 3 mm long. The color of the scales masks the striolae (markings) so that they are not prominent as in the similar *S. acutus*. Scales are tipped with a small (0.5 mm) straight awn (contorted and 1 mm long in *S. acutus*). The achenes of *S. validus* measure 1.8 to 2.3 mm long and are only partially concealed by the scales.

Scirpus atrovirens Willd. (black bulrush) and closely related species



Scirpus atrovirens is a caespitose perennial plant from 0.5 to 1.5 meters tall found in swamps, marshes, and very often in disturbed wetlands and ditches.

S. atrovirens is likely to be mistaken for *S. microcarpus* but has much more slender stems and leaf sheaths that are green or merely light brown instead of reddish-brown to red.

Perianth bristles (usually 6) of *S. atrovirens* are straight, very short () and barbed only along the upper third to half. The scales are 1.4 to 2.1 mm long, brown to black with a pale midrib that is prolonged into a small point (0.4 mm). These cover the achenes which are pale to white, compressed trigonous and 0.8 to 1.2 mm long.

The inflorescence is once or twice branched on a smooth stem and subtended by leafy bracts about as long as the flowering branches. Most of the other leaves of *S. atrovirens* are basal or along the lower half of the culm, septate-nodulose, and up to 18 mm wide. A form of *S. atrovirens* (forma *prolifera*) has leafy buds mixed in with the inflorescence.



A species (or variety according to some) similar to *S. atrovirens* and occurring in our area is *S. pallidus* (Britt.) Fern. *S. atrovirens* may be distinguished from it by short-cylindric spikelets clustered in small sub-globose heads (to 1 cm thick) on branches once or twice branched. The scales of *S. atrovirens* end in a very tiny point. *S. pallidus* differs by having fewer and larger heads clustered at the tips of single branches. Also the scales are blacker (under magnification the darker color is from a higher number of small black streaks) and end in a prolonged awn from 0.4 to 0.7 mm long. Our *S. atrovirens* is considered by some authorities to be the eastern form of the species (*S. atrovirens* var. *atrovirens*) while *S. pallidus* (*S. a.* var. *pallidus*) is the western form.

A third species in the complex is *S. georgianus* Harper (*S. a.* var. *georgianus*) with from 0 to 3 bristles per achene and leaf sheaths not deeply pitted may also occur at least as far north in our area as Duluth, MN.

Scirpus microcarpus Presl (*Scirpus microcarpus* Presl. var. *rubrotinctus* (Fern.) M. E. Jones)



Red leaf sheath of
Scirpus microcarpus



Inflorescence of *Scirpus microcarpus*

Scirpus microcarpus is a coarse plant with wide (to 15 mm), flat, sharp edged leaves found in marshes, along shores, and in wet ditches.

S. microcarpus is easily distinguished from other similar coarse *Scirpus* species by the red or reddish-brown leaf sheaths at the nodes of the stem. The inflorescence is twice to three times branched into a compound umbelliform terminal cyme subtended by several large leafy bracts. The numerous sessile spikelets measure 4 to 8 mm. The top of the culm is smooth (except in some rare cases). Scales are 1 to 2 mm long, black to greenish-black with a green mid-rib. The pale 1 to 2.1 mm achenes are two sided with a two cleft style and are subtended by 4 to 6 slender, retrorsely barbed bristles.



Left: Leaf sheath mouth of *S. fluviatilis*

Right: Leaf sheath mouth of *S. microcarpus*

S. fluviatilis (Torr.) Gray, which occurs in marshes, particularly alkaline ones, may resemble *S. microcarpus*. However, the spikes are 0.5 to 1.5 cm long, with scales that are light brown, pubescent, scarious-margined, and end in an awn (to 2 mm) from a notched tip. The stems are also very evidently triangular with convex leaf sheath mouths (concave in *S. microcarpus*). Both species are rhizomatous but *S. fluviatilis* also produces small tubers at the tips of the rhizomes.

Scirpus cyperinus (L.) Kunth (wool grass)



Scirpus cyperinus is a very common species of wet meadows, marshes, and shores. It also occurs in disturbed wetlands such as clear cut black spruce swamps and in bogs with altered hydrology.

S. cyperinus is a cespitose and somewhat rhizomatous perennial that develops into large, dense tussocks. The tussocks are very leafy and produce numerous flowering culms to 2 meters. These are more or less round in cross section and topped by leafy bracts subtending the drooping inflorescence.

Spikes (mm) of *S. cyperinus* are ovoid to cylindrical on drooping stems that are once or twice branched. The pistillate scales (1 to 2mm) are elliptic to oval and pigmented with very fine red lines. The scale tip is blunt to broadly obtuse.

Bristles of *S. cyperinus* number six; these are contorted several times, and extend beyond the scales giving the whole inflorescence a woolly appearance. The achenes are pale yellowish gray to white, trigonous, and measure 0.7 to 1 mm long with a short beak.

Two other similar species (or varieties according to some) occasionally found in our area are *S. atrocinctus* Fern. (black scales, pedicellate spikelets) and *S. pedicellatus* Fern. (brown scales, pedicellate spikelets).

ASTERS (GENUS ASTER, FAMILY ASTERACEAE) REVISITED:
UPLAND SPECIES

August 29, 2005

Gary B. Walton



Above: Inflorescence of *Aster macrophyllus*.

Many of the aster (*Aster*) species that occur in northeastern Minnesota are wetland species but a few, *Aster macrophyllus*, *A. ciliolatus*, and *A. ericoides* are upland species. *A. macrophyllus* typically occurs in mesic forests often in the shade but *A. ciliolatus* is common more open, sunny areas. *A. ericoides* prefers very dry, sunny habitats such as rock outcrops. It also seems to have found a niche between sidewalks and pavement in Duluth.

The photograph above shows a flowering plant of *Aster macrophyllus* from a woodland edge in northern Minnesota.

Aster macrophyllus L. (big-leaf aster)



Above: Leaf of *Aster macrophyllus*.

Aster macrophyllus is probably the commonest aster species in our forests, both deciduous and coniferous, often covering many acres under good conditions. Rarely does it flower unless there is a break in the forest canopy. *A. macrophyllus* is a species of mesic forests on good soil but sometimes a few plants will occur near the edges of wetlands. It has no wetland rating.

A. macrophyllus is a native rhizomatous perennial is known for its large (4 to 30 by 3 to 20 cm) cordate basal leaves with coarse serrations and scabrous hairy upper and lower surfaces. Often, the leaves are glandular with a fragrance like walnut husks.

Under typical forest conditions *A. macrophyllus* seldom produces flowers. The corymbiform inflorescence consists of a few to many heads with blue or white ray flowers (9 to 15 per head and 8 to 13 mm long) in a corymbiform inflorescence. The imbricate bracts are glandular with a short pubescence, appressed, and rounded to sharply acute.

Aster ciliolatus Lindley (northern heart-leaved or fringed aster)



Aster ciliolatus a rhizomatous perennial to 1 meter found in mesic forests, clearings, and fields. It has no wetland rating.

A. ciliolatus is easily differentiated from other blue flowered aster species by its cordate basal and cauline leaves with broadly winged petioles. The wings of the petiole are fringed in a single line along their margins. Also, the petiole is fringed below in a single line by short hairs. *A. macrophyllus* has petioles that are also hairy and may be winged in the inflorescence. However, all surfaces of the petiole are pubescent in *A. macrophyllus*.



The leaf blades of *A. ciliolatus* are sagittate or ovate to cuneate with coarsely serrate margins and hirsute below.

The inflorescence of *A. ciliolatus* is a terminal panicle of hirsute to hirsute-puberulent branches with numerous (around 50 but sometimes more) blue-rayed flower heads. The ray flowers (8 to 15 mm long) number around 12 to 25 per flower head. The involucre are somewhat imbricate, acuminate to acute, glabrous but sometimes with ciliate margins and end in a narrow green tip.

Above left: Flowers of *Aster ciliolatus*.

Below left: Winged petiole of *Aster ciliolatus* showing fringe of hairs.

Some similar species are *A. cordifolius* (distinctly heart-shaped basal leaves), *A.*

sagittifolius (ascending branches of small white flowers, syn. *A. urophyllus*), *A. laevis* (glabrous, narrow cauline leaves, azure flowers), and *A. oolentangiensis* (scabrous, narrow cauline leaves, azure flowers).

Aster ericoides (L.) Reveal & Keener (heath aster or white prairie aster)



Above left: Flowering branch of *Aster ericoides*.

Above right: Closer view of flowers of *Aster ericoides*.

Aster ericoides is a prairie species and the native status of the species in some areas is debatable. It does seem to occur sporadically on rock outcrops with other prairie species such as *Solidago rigida*, *Monarda fistulosa*, and *Artemisia ludoviciana* in Duluth and part way up the North Shore. Also, plants may be seen growing in railroad yards and in cracks in sidewalks in West Duluth near the ore docks. In its natural habitat and range *A. ericoides* grows in dry soil or on rocky soil in full sun. Its wetland rating is FACU-

A. ericoides is a low-growing (under 1 meter) perennial from a corm-like rootstock or rhizome. The lower leaves are oblanceolate, sessile, and deciduous by flowering. The leaves of the inflorescence and upper stem are linear to oblanceolate, seldom 10 mm long by 4 mm wide, with a spine tip and moderately to densely strigose. The flowering branches are panicle-like to pyramidal in outline with numerous small white flowering heads. The involucre bracts, like the leaves, are spine-tipped.

**ASTERS (GENUS ASTER, FAMILY ASTERACEAE) REVISITED:
WETLAND SPECIES**

August 29, 2005

Gary B. Walton



Above: Sedge meadow/shrub carr with *Aster umbellatus*.

Many of the aster (*Aster*) species that occur in northeastern Minnesota are wetland species. *Aster umbellatus*, *A. lanceolatus*, *A. lateriflorus*, *A. borealis*, *A. puniceus*, *A. firmus*, *A. modestus*, and *A. novae-angliae* are wetland species. Most of these species typically occur on moist to saturated soils in full sun but some such as *A. umbellatus*, *A. lanceolatus* and *A. lateriflorus* grow in moist soils along trails and in clearings. *A. lanceolatus* also tends to become weedy on disturbed moist soils such as roadside ditches and on fill soils.

The photograph above shows a natural sedge meadow/shrub carr in northeastern Minnesota. *Aster umbellatus* is the most prominent *Aster* species in the picture but *A. lanceolatus* and *A. puniceus* are also present. Other important species in this wetland are *Carex rostrata*, *C. lacustris*, *Scirpus cyperinus*, *S. microcarpus*, *Caltha palustris*, *Calamagrostis canadensis*, *Solidago uliginosa*, *S. gigantea*, *Alnus rugosa*, *Larix laricina*, *Salix petiolaris*, *S. pyrifolia*, and *Spiraea alba*.

Aster umbellatus Miller (flat-top white aster)



Aster umbellatus is a 0.5 to 1.5 meter tall perennial plant from creeping rhizomes found in a variety of settings but most common in rich sedge meadows and in rich swamps. Its wetland rating is FACW+.

The stems of *A. umbellatus* are slightly pubescent in the inflorescence but otherwise are glabrous. The 4 to 16 cm long by 7 to 35 mm wide leaves are cauline and sessile to short-petiolate. These taper to both ends to form a lance-elliptic or narrowly elliptic shape. Leaf margins of *A. umbellatus* are ciliate, entire to rarely sparsely toothed.

Inflorescence of *A. umbellatus* corymbiform and densely flowered with 30 to 300 or more flower heads with 16 to 40 flowers per head. Rays of the flower head number 6 to 14 and are white. The involucre bracts are glabrous, greenish, imbricate, slender and acute or obtuse.

A similar species is *A. pubentior* Cronq. (or variety *A. umbellatus* var. *pubens*) which has puberulent stems, lower leaf surfaces, and involucre bracts. Also, the involucre bracts are long-triangular and acute and there are 17 to 22 flowers per flower head.



Above left: Inflorescence of *Aster umbellatus*.

Lower left: Stem and leaves of *Aster umbellatus*.

Aster lanceolatus Willd. (eastern lined aster or white paniced aster)



Top left: White flowered form of *Aster lanceolatus*.
Bottom left: Pale blue flowered form of *Aster lanceolatus*.

White panicle aster (a misnomer already since the flowers may also be pale blue) is *Aster lanceolatus*. It is not *Aster simplex* a name given to a species of hybrid origin involving *A. laevis* and a variety of *A. lanceolatus* (see page 582 in Gleason and Cronquist 1991). Voss (1996) and Semple, Heard, and Xiang (1996) regard *A. simplex* as an obsolete synonym for *Aster lanceolatus*. Use of *Aster simplex* instead of *Aster lanceolatus* is erroneous. None of these authors mention or otherwise recognize *Aster X lanceolatus* which must be a "synonym" used in the National List for *A. simplex* now recognized as correctly applying to a garden hybrid between *A. laevis* and *A. lanceolatus*.

According to National List (1988) of wetland plants for Region 3 a plant called *Aster X lanceolatus* is a non-indicator (NI) species. The Minnesota List (no date but post-1994) repeats this error. However, Gleason and Cronquist (1991), Voss (1996), and Semple, et al. (1996) describe habitat for *Aster lanceolatus* as "moist low places", "damp open ground", "riverbanks, edges of woods and swamps", "roadsides", and "mucky soils".

The *Aster lanceolatus* variety most likely to be encountered in our area is *A. lanceolatus* subspecies *lanceolatus* var. *lanceolatus*. Use of this unwieldy name is necessary only when discussing two or more subspecies or varieties of *A. lanceolatus*. The blue flowered *A. lanceolatus* subspecies *lanceolatus* var. *hesperius* (*A. hesperius*) is sometimes found in Minnesota. However, other varieties of *A. lanceolatus* may have blue or lavender colored flowers, too.

Aster lanceolatus is a tall 0.6 to 1.5 meter rhizomatous colonial perennial plant with lance-linear cauline leaves. These are usually glabrous to slightly scabrous, serrate to entire, sessile or with a petiole-like base and scarcely clasping. The stem is pubescent in lines. The strongly imbricate bracts of the involucre are sharply acute, narrow and glabrous or occasionally ciliate margined and end in an appressed green tip. Ray flowers number from 20 to 40 and are white in most varieties. The inflorescence is many headed and leafy.

Chromosome numbers are extremely variable in var. *lanceolatus* ($2n = 48, 56,$ or 64 and with aneuploid variants), which may account for many morphological variations. Other factors include possible hybridization with related aster species (with *A. ciliolatus*, *A. lateriflorus*, and *A. borealis* among the possible species) and environmental conditions.

Similar species include *A. borealis* (northern bog aster, OBL) has involucre bracts imbricate with purple tips or margins, flowers white or blue, and *A. lateriflorus* (calico aster, FACW-) with bracts imbricate in few series, obtuse to acute with an evident broad green tip, and often suffused with purple. *A. ericoides* (heath aster, FACU-) is another white flowered aster that may superficially resemble *A. lanceolatus* but it has involucre bracts ending with spinulose tips, not sharp or acute, numerous small flower heads densely arranged on secund branches, and occurs in very dry, sunny habitats.



Above: Another form of *Aster lanceolatus*

Aster lateriflorus (L.) Britton (calico aster)



Aster lateriflorus is a widely branched plant with numerous flower heads arranged in a sub-raciform pattern on arching to somewhat ascending lateral branches. It is often found along trails and moist thickets, but also in dry woods and the edges of dry woods. Its wetland rating is FACW-.



Superficially similar to *A. lanceolatus* (many-petaled small white flowers, linear leaves) it can be told apart by curly-villous hairs on the mid-rib on the underside of the leaf and involucre bracts with an evident broad, green tip that are often suffused with purple.

Top left and bottom left: Flowering branches of *Aster lateriflorus*.

Aster puniceus L. (bristly aster)



**Top left: Flowers of *Aster puniceus*.
Bottom left: Clasp of leaf base and
spreading hispid stem of *A. puniceus*.**

Aster puniceus is non-rhizomatous or short-rhizomatous plant with 1 to a few stems (0.5 to 3 meters) rising from a thickened caudex or short rhizome. It occurs in sedge meadows, wet meadows, shrub carrs, and forested swamps on wet to saturated soils the wetland rating of *A. puniceus* is OBL.

The stems of *A. puniceus* are spreading hispid becoming uniformly hairy in the inflorescence. The lanceolate to elliptic-oblong leaves (7 to 16 cm by 12 to 40 mm) are mostly cauline, sessile, the auricles clasping, and may be serrate towards tips to entire. Their surface is scabrous above and glabrous below to spreading-hairy on the midvein.

The inflorescence consists of few to many flower heads on a leafy inflorescence. The slender involucre measure 6 to 12 mm, scarcely imbricate, inner series, at least, long-acuminate to attenuate, and are not glandular. Rays of the flower heads number 30 to 60 and are usually blue or sometimes rose or white, 7 to 18 mm. The achenes are glabrous, sometimes sparsely hairy.

Three species that may be confused with *A. puniceus* are *A. modestus* (FAC), *A. novae-angliae* (FACW), and *A. firmus* (FACW+). All three occur sporadically in our area in wet meadows and swamps.

A. modestus and *A. novae-angliae* have glandular hairs in the inflorescence and can be confused with each other. *A. novae-angliae* has 45 to 100 bright red-purple to rose ray flowers while *A. modestus* has 20 to 40 dark purple rays. *A. modestus* is found in northern Minnesota from Hibbing to Grand Portage. *A. novae-angliae* is less common in northern Minnesota but does occur near Superior, Wisconsin in the Pokegama wetlands.

A. firmus (also known as *A. lucidulus* and sometimes considered to merely be a variety of *A. puniceus* is colonial by long rhizomes; the stem is glabrous or sparingly hispid below the inflorescence, the rays blue or lavender, the leaves crowded on the stem and shiny on the upper surface. Plants assignable to *A. firmus* can be

found near Ashland, Wisconsin and sporadically in northern Minnesota wherever *A. puniceus* occurs.

CAREX PART 7: GRISEAE

August 29, 2005

Gary B. Walton

The *Carex* section or group GRISEAE is characterized by 2 or more spikelets per culm (except in depauperate plants); 3-cleft styles; 3-sided achenes; leaf sheaths and blades glabrous; leaves flat and wider than 0.5 mm; terminal spike solitary and staminate; perigynia glabrous, convex-rounded to fusiform at the base, ellipsoid cylindrical to globose with numerous nerves, the beak very short (0.5 mm or less) and often bent.

GRISEAE is sometimes subsumed under the group OLOIGOCARPAE (no species in Minnesota but two are found in Michigan) on the basis of ovoid perigynia with fusiform bases and numerous impressed nerves, a surface with the appearance of longitudinal wrinkles, and awns of the pistillate scales roughened. The two groups are separated by some on the basis of the perigynia beak which in GRISEAE is absent or less than 0.5 mm long, and bent or curved and in OLOIGOCARPAE slender, over 0.5 mm long and with definite teeth.

We have two species of GRISEAE in our area: *Carex conoidea* and *C. katahdinensis*.

Carex conoidea Willd.



Carex conoidea is a densely caespitose sedge with fruiting culms (to 70 cm) longer than the main leaves. *C. conoidea* occurs in moist grassy meadows and other moist open places. Its wetland rating is FACW+.

The staminate spike measures 1 to 2 cm and often well above the uppermost pistillate spike. Pistillate spikes number from 2 to 4 and have scabrous peduncles and a scabrous axis. The ovate pistillate scale, shorter than the perigynia, have a green midvein which is often prolonged into a rough margined awned and. Perigynia measure 2.5 to 3.8 mm, are spirally imbricate, ellipsoid in shape and with 17 to 25 nerves that are not raised above the surface.

According to the Flora of North America Vol. 23:

"*Carex conoidea* is an uncommon plant throughout most of its wide range and is most frequent in New England. The species has been collected once in Arizona, where it is likely an introduction and does not appear to be persisting. *Carex conoidea* is unusual in Carex sect. Griseae in inhabiting open sites; it is the only species of the section regularly found in sunny habitats. *Carex conoidea* often grows with *C. buxbaumii*, *C. tetanica*, and *C. pallescens*."

Left: *Carex conoidea*

Carex katahdinensis Fern.



Carex katahdinensis is a small, tufted sedge with fruiting culms shorter than the leaves and spikes sessile. The related *C. connoidea* has fruiting culms about twice as long as the leaves. In most other respects the two species are similar and many authorities take the position that *C. katahdinensis* is an ecotype of *C. connoidea* (see Flora of North America Vol. 23). *C. katahdinensis* is listed by the Minnesota DNR as a "Threatened Species". The number of documented occurrences of *C. katahdinensis* in the state is very low.

C. katahdinensis grows in moist sandy or gravelly soil and among boulders or in rock crevices along lake shores and ponds. The species is not generally accepted and so has no wetland rating. However, if it is an ecotype of *C. connoidea* then it is FACW+. Its preferred habitat (fluctuating shorelines) certainly warrants this designation.

Left: *Carex katahdinensis*

GOLDENRODS (GENUS *SOLIDAGO*, FAMILY ASTERACEA) REVISITED:
UPLAND SPECIES

August 29, 2005

Gary B. Walton



Above: Upland field with three species of goldenrod: *Solidago juncea*, *S. nemoralis*, and *S. canadensis*

Of the 10 species of goldenrod (*Solidago* and *Euthamia*) that occur in northeastern Minnesota, 7 are upland species. These upland goldenrod species are *Solidago rigida*, *S. canadensis*, *S. juncea*, *S. nemoralis*, *S. hispida*, *S. flexicaulis*, and *S. ptarmicoides*.

Except for *S. canadensis* and *S. flexicaulis* most are found in dry habitats such as sandy well-drained soils or on bedrock exposures and frequently in full sun. *S. canadensis* has more ecological latitude and occurs on dry to moist soils in full sun to partial shade while *S. flexicaulis* is typical found in mesic northern hardwood forests. *S. ptarmicoides* is found in rock crevices near Lake Superior and is our only *Solidago* with white flowers.

As can be seen in the photograph above the upland species of *Solidago* can form a significant portion of a plant community. Other upland species with a major presence here include *Danthonia spicata*, *Phleum pratense*, *Aster ciliolatus*, and *Lycopodium clavatum*.

Solidago rigida L. (stiff goldenrod)



This species is occasionally seen in "native" plant restorations and plantings although the seed source is undoubtedly from places far removed from northeastern Minnesota. Native populations do exist in our area, though, and may be found infrequently along sunny dry rock outcrops and in dry soil.

Solidago rigida is a tall plant (to 1 meter) distinguished by its densely pubescent stems and leaves from a thick caudex. The basal leaves and cauline leaves of *S. rigida* below the

inflorescence are petiolate and ovate to elliptic. Leaves of the inflorescence are sessile. Leaf margins are entire to slightly toothed and are densely pubescent above and below especially along the margins and midveins.

The inflorescence of *S. rigida* is dense, broadly corymbiform (flat or round topped form) with many large (5 to 10 mm wide) heads. The involucre bracts are striate and may be glabrous or pubescent. The achenes are 10 to 20 nerved, stiff or angular. *S. rigida* plants with glabrous achenes are *S. rigida* var. *rigida* and those with short hairs near the tip are *S. rigida* var. *humilis* Porter.

S. ptarmicoides is closely related to *S. rigida* and part of a subgenus (*Oligoneuron*) distinguished from other parts of *Solidago* by persistent fibrous leaf bases, flat-topped corymbiform inflorescences, and involucre bracts with many fine striations. *S. ptarmicoides* is distinctive in *Solidago* by its white to pale yellow flowers and linear leaves. *S. ptarmicoides* occurs in our area principally in rock outcrops near Lake Superior and sometimes in sandy soil, too. It has no wetland rating.

Solidago canadensis L. (common or Canada goldenrod)



Solidago canadensis is one of the commonest goldenrod species found and grows in both dry and moist habitats. It is colonial by rhizomes and can form dense stands and even become weedy in some situations. Its wetland rating is FACU.

S. canadensis is a widespread species with several named varieties. One commonly seen variety is *S. canadensis* var. *canadensis* which has sharply serrate leaves that are glabrous beneath or rarely with some very short hairs on the main veins and stems glabrous on the lower half. Another common variety is *S. canadensis* var. *altissima* (FACU) which has involucre distinctly larger than those of var. *canadensis* measuring 3 to 5 mm long. The involucre of var. *canadensis* are seldom larger than 2 mm some rarely reaching 3 mm. Also, the stems of var. *altissima* are pubescent throughout and the leaves are entire to serrate with finely pubescent lower surfaces. The plants pictured here are var. *altissima*.

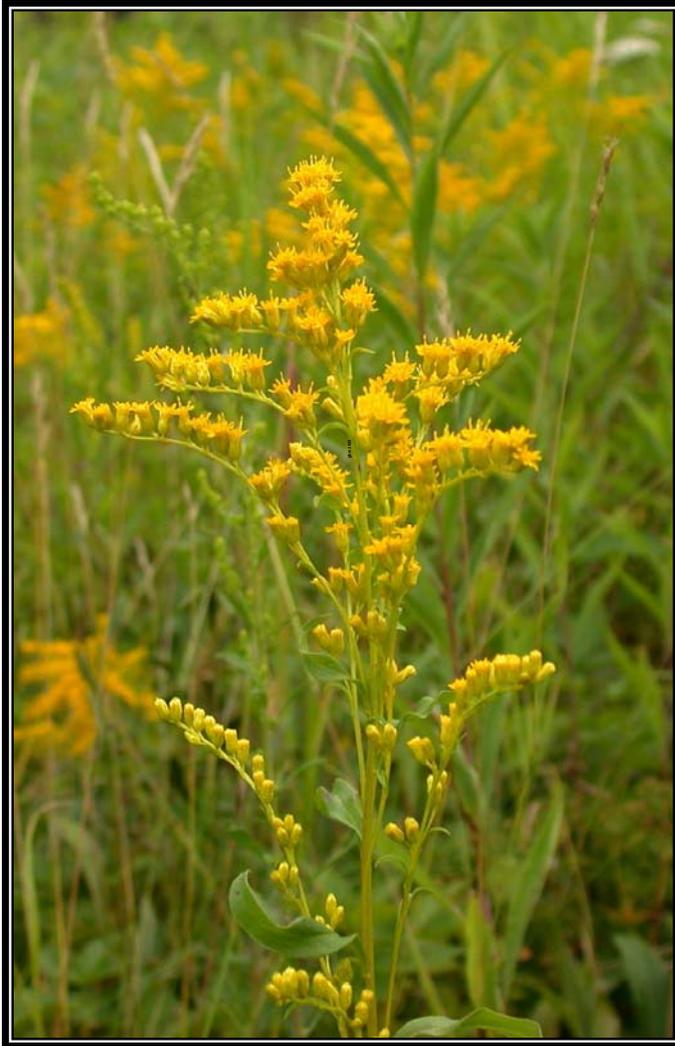
S. gigantea (smooth goldenrod, FACW), a wetland species, may resemble *S. canadensis* but its stem is glabrous except in the inflorescence where it is distinctly pubescent. In *S. canadensis* (both varieties) pubescence of the stem begins at least from the middle or even from the base and continues into the inflorescence.

Top left: Inflorescence of *Solidago canadensis* var. *altissima*.

Bottom left: Close-up view of *Solidago canadensis* var. *altissima* stem showing pubescence.



Solidago juncea Aiton (early goldenrod)



Solidago juncea is our earliest goldenrod to flower usually beginning by the second week of July. This species and the next are commonly found in dry to mesic upland fields and thin woods or even rock outcrops. No wetland rating.

S. juncea short, glabrous to very sparsely hirsute plant to 1.5 meters from a thick caudex or rhizome. The large narrowly elliptic leaves are largely basely except for a few small leaves along the stem and are short-petiolate. *S. juncea* can form extensive colonies by means of deep rhizomes.

Flower heads of *S. juncea* are on secund-recurved branches in a paniculate inflorescence. Flower heads measure about 3 to 5 mm with 7 to 12 very minute ray flowers often with some chaffy bracts in between the disk flowers which number 9 to 14.

Left: *Solidago juncea*

Solidago nemoralis Aiton (gray goldenrod or dyer's weed)



Left: Inflorescence of *Solidago nemoralis*. Note nodding tip and dense structure.
Right: Middle portion of *S. nemoralis* stem showing fine, dense pubescence.

Solidago nemoralis is a species of dry to mesic soils found in fields, open woods and rock outcrops. Like *S. juncea* it has no wetland rating.

Superficially it resembles *S. juncea* but differs by the fine, dense pubescence of spreading hairs on the stems and leaves, fewer disk flowers (3 to 6), denser inflorescence often with a nodding tip. The involucre bracts are imbricate, glabrous except for the ciliate margins.

S. hispida Muhl. (hairy goldenrod) also grows in dry habitats and is densely pubescent differs from *S. nemoralis* by its elliptic to obovate basal leaves and glabrous achenes. Also, the inflorescence of *S. hispida* is composed of branches that are stiffly ascending rather than secund. *S. hispida* also has no wetland rating.

Solidago flexicaulis L. (zig-zag goldenrod)



Above: Inflorescence of *Solidago flexicaulis*.

This species is very distinctive with its stem that grows in a zig-zag. *Solidago flexicaulis* is a goldenrod species of dry to mesic hardwoods and has no wetland rating.

S. flexicaulis is a rhizomatous perennial to 1.2 meters zig-zagging stems especially towards the top. Leaves are cauline, sharply toothed, hirsute below on main veins and mid-vein, blade ovate-elliptic and contracted to a winged petiole, becoming smaller towards top of stem.

The inflorescence of *S. flexicaulis* is a series of short axillary clusters with 3 to 4 ray flowers per head.

GOLDENRODS (GENERA *SOLIDAGO* AND *EUTHAMIA*, FAMILY ASTERACEAE)
REVISITED: WETLAND SPECIES

August 29, 2005

Gary B. Walton



Above: Sedge meadow/shrub carr with smooth goldenrod (*Solidago gigantea*).

The majority of the goldenrod (*Solidago* and *Euthamia*) species that occur in northeastern Minnesota are upland species. Only three, *Solidago uliginosa*, *S. gigantea*, and *Euthamia graminifolia*, are wetland species. Typically, these species occur on moist to saturated soils in full sun although *S. gigantea* will grow in partial shade and also tends to colonize disturbed sites often with the FACU species *S. canadensis*.

The photograph above shows a natural sedge meadow/shrub carr in northeastern Minnesota. *S. gigantea* is the most prominent *Solidago* species in the picture but *S. uliginosa* and *Euthamia graminifolia* are also present. *S. uliginosa* was noted growing in areas where sphagnum moss is moving out from a conifer swamp and *E. graminifolia* occurs along the upland and wetland interface. Other important species in this wetland are *Carex stricta*, *C. lacustris*, *C. arcta*, *C. rostrata*, *Calamagrostis canadensis*, *Aster lanceolatus*, *A. umbellatus*, *Salix petiolaris*, *S. pyrifolia*, and *Spiraea alba*.

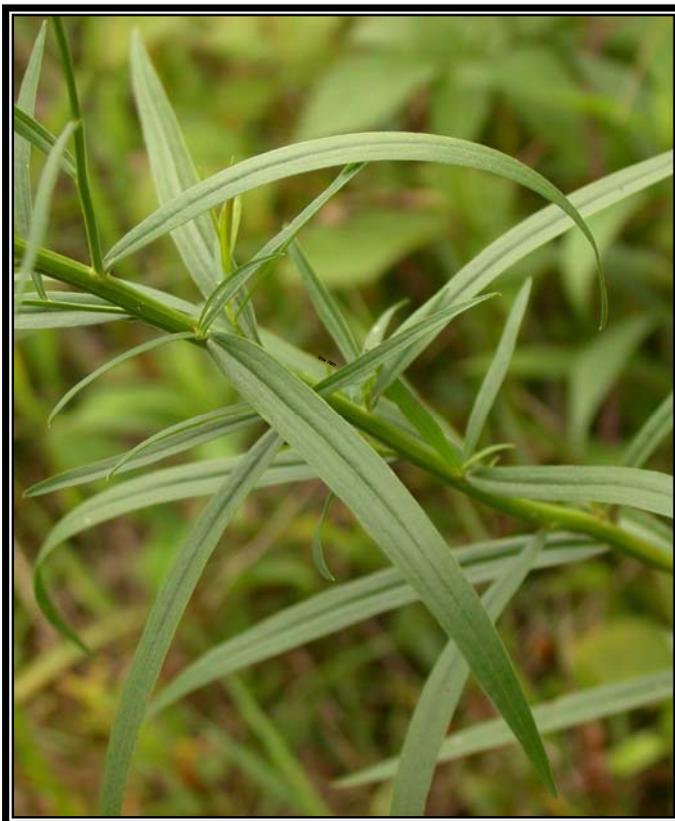
***Euthamia graminifolia* (L.) Nuttall (grass-leaved goldenrod)**



Euthamia graminifolia is an erect plant to 1.5 meters from creeping rhizomes. It occurs in a variety of moist to wet open areas and along moist wooded edges. Its wetland rating is FACW-.

Stems of *E. graminifolia* are striate, glabrous to pubescent. All leaves are cauline, linear-lanceolate, 5 to 7 cm by 0.4 to 1.2 cm, acuminate, with 3 to 5 prominent nearly parallel veins, and short petioled to nearly sessile. The surface is marked by numerous punctate glands that in some plants emit a faint anise scent when bruised. Leaf surfaces may be glabrous to pubescent and leaf margins are very finely toothed.

The inflorescence of *E. graminifolia* is corymbiform to rounded and composed of several smaller clusters ("glomerules") of flower heads of unequal height. Branches of the inflorescence like the main stems may be glabrous to pubescent. Bracts of flower heads number 14 to 16 in an unequal series and are ovate, obtuse or acute, and resinous. The ray flowers are yellow, 17 to 25, 0.1 mm wide, 1 to 1.1 mm long.



Above left: Clusters of small flower heads of *Euthamia graminifolia*.

Below left: Stem and leaves of *Euthamia graminifolia*.

Solidago uliginosa Nuttall (bog goldenrod)



Solidago uliginosa is a tall (to 1.5 meters) perennial plant from a long branched caudex with glabrous stems and leaves except for the occasionally puberulent stems and branches of the inflorescence. It grows in bogs and similar wet areas often in circumneutral to calcareous soils and is rated OBL wetland status.

Most of the leaves of *S. uliginosa* are basal but do not form a well-defined rosette, 10 to 35 cm by 0.5 to 6 cm, oblanceolate acute, sub-entire to serrate, and taper to a short petiole that sheaths the stem. Cauline leaves are similar in shape but much reduced in size.

The inflorescence is paniculiform varying from elongate, narrow, and few-headed with secund branches to elongate, broad, many-headed and ascending branches. The branches may be pubescent. Rays number 1 to 8.

Left: Flowering panicle of *Solidago uliginosa*.

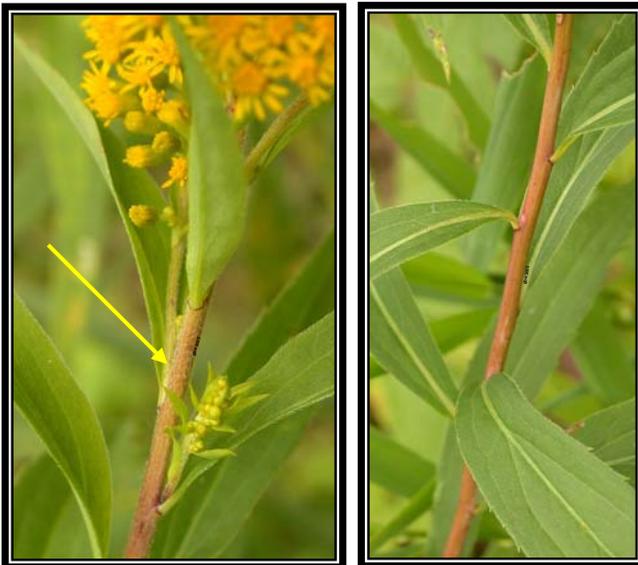
Solidago gigantea Aiton (smooth goldenrod)



Solidago gigantea is a 0.5 to 1 meter tall perennial from long creeping rhizomes, with glabrous, often glaucous, stems immediately below the inflorescence. It grows in wet meadows, sedge meadows, shrub swamps, and on fill soils in wetlands. The wetland rating for *S. gigantea* is FACW.

As stated above the stems of *S. gigantea* are glabrous immediately below the inflorescence. The only stem pubescence present is on the main inflorescence axis and its branches which are puberulent to densely pubescent. The leaves are all cauline, glabrous, rarely with a line of fine hairs along the three main veins below, the margins entire to serrate.

The inflorescence of *S. gigantea* is paniculiform, the branches recurved-secund which are puberulent to densely pubescent. Involucres measure 2.5 to 4 mm. Ray flowers number from 10 to 17.



Above left: Inflorescence of *Solidago gigantea*.

Lower left: Portion of stem at base of inflorescence of *Solidago gigantea* showing pubescence (increase page size to 300% or greater to see).

Lower right: Glabrous stem just below inflorescence of *Solidago gigantea*.

CAREX PART 8: VESICARIAE

September 3, 2005

Gary B. Walton

The *Carex* section or group VESICARIAE is characterized by 2 or more spikelets per culm with bracts protruding and small segments of the rachis (flower stem) visible; 3-cleft styles; 3-sided achenes; leaf sheaths and blades glabrous (sometimes scabrous); leaves flat; terminal spike solitary and normally staminate; perigynia glabrous, thin walled and inflated, 15 to 20 nerved, numbering 11 to 18 per spike; the spikes cylindrical short oblong or subglobose; style persistent and basal portion continuous with achene; the bract of the lowest pistillate spike scarcely or not at all sheathing.

We have seven species of the VESICARIAE in our area all of which are rated OBL: *Carex oligosperma*, *C. vesicaria*, *C. tuckermanii*, *C. utricullata*, *C. rostrata*, *C. lurida*, *C. schweinitzii*, *C. lupulina*. *C. schweinitzii* is somewhat uncommon. It grows in cool moist ravines along streams.

Section VESICARIAE is very closely related to the LUPULINAE (in LUPULINAE the bract of the lowest pistillate spike is definitely sheathing).

Carex oligosperma Michx.



Carex oligosperma is species characteristic of intermediate to poor sedge fens and bogs. It is a rhizomatous species that often forms dense stands in peaty soils.

C. oligosperma has slender stems to 1 meter with a purplish base and narrow (1 to 3 mm) pale green leaves. The staminate spikes are terminal and usually solitary. The 1 to 2 cm long pistillate spikes of *C. oligosperma* number from 1 to 2, sometimes three, are remote, short-cylindric, and more or less sessile. The lowest spike is subtended by a short leafy bract.

The scales are shorter than the perigynia. The perigynia are compressed-inflated, 4 to 7 mm long and about half as thick as long. They are conspicuously several nerved and narrow quickly to a 1 to 2 mm long emarginate beak. The achene style is persistent and straight to slightly curved near the top.

Left: *Carex oligosperma*

Carex vesicaria L.



Carex vesicaria is another sedge species common to bogs and fens but also may be found in swamps, marshes, and along shores.

Stems (to 1 meter) of *C. vesicaria* are loosely to densely clustered on stout branching rhizomes, trigonous, smooth but become sharply scabrous near the top. The leaves are elongate, flat, 1 to 3 mm wide and mostly along the stems. A prominent characteristic of the leaves are the septate-nodulose markings.

The staminate spikes of *C. vesicaria* are terminal, number from 1 to 2, with the lowest sometimes androgynous. Pistillate spikes are more or less sessile, elongate (2 to 7 cm), erect and remote.

The pistillate scales of *C. vesicaria* are shorter than the perigynia and barely awned. The ascending perigynia are crowded on the spike in 6 to 8 vertical rows. They are inflated near the base, strongly 10 to 20 nerved, and lanceolate to lance ovate in outline. These taper to a small often poorly defined beak with noticeable teeth.

The achenes are yellow, trigonous with a persistent and contorted style.

Top left: *Carex vesicaria*

Carex tuckermanii F. Boott.



Carex tuckermanii is a tufted plant on short rhizomes found in swamps, woodland vernal pools, ponds, and wet meadows.

C. tuckermanii is similar to *C. vesicaria* with numerous imbricate perigynia ascending in about 6 rows on 2 to 4 pistillate spikes measuring 2 to 5 cm long. Often the two species grow together.

The principle differences are in the perigynia and achenes. In *C. tuckermanii* the inflated, thin walled perigynia are broadly ovoid tapering at the summit into a slender 2 mm long beak with teeth 0.5 to 1 mm long. The achenes of *C. tuckermanii* are trigonous to ovoid and with a conspicuous dent in the middle of one of the angles.

Bottom left: *Carex tuckermanii*

Carex rostrata Stokes



Carex rostrata is a robust rhizomatous sedge that forms dense colonies in sedge meadows, shallow water, and isolated forest pools. It often occurs with *C. rostrata* and *C. lacustris* in isolated forest pools.

The leaves of *C. rostrata* are flat, yellowish-green, septate-nodulose, about 5 to 12 mm wide and 10 to 20 cm long or longer. The base of the culm is spongy.

There are several pistillate spikes per culm with densely crowded perigynia in 8 (sometimes more) rows. There is usually 1 staminate spike at top of the culm.

The perigynium are 4-7 mm long, glabrous, shining, inflated, strongly 8-17 nerved, broadly ellipsoid to subglobose, and abruptly contracted to a 1-2 mm smooth beak. Pistillate scales are shorter and narrower than the perigynium, and acute to short-awned.

Left: *Carex rostrata*. Arrow points to septate-nodulose leaf.

Carex retrorsa Schweinitz



Carex retrorsa is a densely clumping species to 1 meter on short rhizomes. It occurs in sedge meadows, shallow water, along streams, and isolated forest pools.

C. retrorsa has several crowded sessile pistillate spikes, the lowest on a slender pedicle and 2-4 distal staminate spikes. Often one of the staminate spikes is mixed with some perigynia.

The perigynium of *C. retrorsa* are 7 to 10 mm long, glabrous, shining, inflated, strongly 6-13 nerved, broadly ellipsoid to subglobose and somewhat oblique. These are densely crowded in 8 rows, and abruptly contracted to a 2 to 4 mm long smooth beak. The lowermost perigynium at least point downward (retrorse). The achene is dark brownish and trigonous with a persistent hard style.

Pistillate scales are conspicuous but shorter and narrower than the perigynia.

The leaves are flat, yellow-green, slightly septate-nodulose especially on the leaf sheaths, are 4-10 mm wide and most overtop the inflorescence.

KEY TO THE SAXIFRAGACEAE (SAXIFRAGE FAMILY)

September 3, 2005

Gary B. Walton

There are just a few species of Saxifragaceae native to northeastern Minnesota and of these only three, *Chrysosplenium americanum*, *Mitella nuda*, and *Saxifraga pensylvanica*, are commonly seen. These three are also common in wetlands and two, *C. americanum* and *S. pensylvanica*, are indicators of rich wetland systems with groundwater interaction. *M. nuda* is found in many cool moist forests and many types of forested and shrub wetlands. *Heuchera richardsonii* and the other two species of *Saxifraga* (*S. aizoon* and *S. virginensis*) are frequently found on rock outcrops.

The key:

- 1A) Plants trailing, leaves opposite along stem, alternate near top, flowers apetalous with 4 sepals:
Chrysosplenium americanum
- 1B) Plants upright, the leaves in basal rosettes, flowers with petals, sepals 5: 2
 - 2A) Flower regular, 10 stamens: 3
 - 2B) Flowers zygomorphic, 5 stamens: *Heuchera richardsonii*
- 3A) Petals fringed, leaves ovate with lobed margins: *Mitella nuda*
- 3B) Petals entire, leaves ovate to lanceolate, the margins sharply toothed or with blunt teeth or at least minutely crenulate, in a basal rosette: 4 (*Saxifraga*)
- 4A) Margins of basal leaves with numerous sharp teeth ending in a lime-encrusted po, petals of flowers dotted red, the flowering stem with at least some leaves: *Saxifraga aizoon*
- 4B) Margins of basal leaves entire to minutely crenulate or with blunt teeth, flower petals not dotted with red, the flower stem with a few bracts and no leaves: 2
 - 5A) Basal leaves large (10 to 35 cm long), the margins entire to obscurely toothed, the leaf apex entire and rounded, flower stem 20 to 40 cm tall, in moist habitats: *S. pensylvanica*
 - 5B) Basal leaves small (3 to 7 cm long), the margins clearly toothed to the leaf apex, flower stem less than 15 cm tall, in rocky habitats: *S. virginiana*

Chrysosplenium americanum Schewin. (golden saxifrage)



Chrysosplenium americanum is a prostrate herb with ascending branch tips with numerous short-petioled ovate to rounded leaves with entire margins or sometimes with irregular tooting. The lowermost leaves are opposite but the uppermost associated with the flowers are alternate.

Solitary flowers greenish-yellow or greenish-red purple spotted sepals and red, brown-purple or green centers are produced at the ends of branches.

C. americanum grows in seeps, springy soils, and other similar permanently wet habitats with nutrient rich soil in partial to full shade. Rich black ash swamps and rich cedar swamps are typical habitat and mats of *C. americanum* can be extensive. Its wetland rating is OBL.

Mitella nuda L. (naked miterwort)



Mitella nuda is a low growing herbaceous plant of moist woods and swamp forests often in mossy soil. Its wetland rating is FACW.

M. nuda is usually best recognized by its leaves that are rotund to reniform with a cordate base, crenate, and sparsely hairy. The flowers are produced in early spring on leafless or nearly leafless 5 to 20 cm tall glandular stems. Flower petals are white to yellowish-green and deeply divided so as to resemble feathers.

LEMNA MINOR L., L. TRISULCA L., AND SPIRODELA POLYRHIZA (L.) SCHLEIDEN.
(DUCKWEEDS, FAMILY LEMNACEAE)

September 3, 2005

Gary B. Walton

Lemna minor, *L. trisulca*, and *Spirodela polyrhiza* are vascular flowering plants with bodies reduced to thallus-like stems with a few roots (*Wolffia* has no roots and resembles a green speck). The inflorescence is also very small consisting of either staminate (usually 1 or 2) or pistillate (usually solitary) flowers subtended by a membranous spathe in a pouch on the thallus.

Lemna, *Wolffia*, and *Spirodela* are true aquatics either floating on the surface of the water or submerged just below it. The wetland rating of all species in these genera is OBL.

Key:

1A) Plants without roots, globose, minute: *Wolffia columbiana*

1B) Plants with at least one root per joint: 2

2A) Plants reddish-purple below, with several roots per joint, usually 7 prominent nerves, joints 3-10 mm long: *Spirodela polyrhiza*

2B) Plants green above and below, one root per joint with 1-3 nerves: 3 (*Lemna*)

3A) Joints rounded, plants floating most of growing season: *Lemna minor*

3B) Joints long, narrow, plants floating or more often sinking: *Lemna trisulca*



Lemna minor

A FEW MISCELLANEOUS SHRUBS

September 12, 2005

Gary B. Walton

This is a collection of woody shrubs from various families often seen in northeastern Minnesota. It includes *Ilex verticillata*, *Rhamnus alnifolia*, *Dirca palustris*, *Myrica gale*, and *Physocarpus opulus*.

Ilex verticillata (L.) Asa Gray (winterberry, Aquifoliaceae)



Ilex verticillata a tall shrub to 4 meters with numerous dark gray slender branches found in wet woods, conifer and hardwood swamps, the edges of bogs, and in shrub thickets. Its wetland rating is FACW+.

The leaves are alternate, obovate to lanceolate, glabrous to pubescent on the veins below (var. *verticillata*) to distinctly pubescent on the lower surface (var. *padifolia*), simple with sharply serrate margins and the teeth often bristle-tipped.

I. verticillata is usually dioecious and is insect pollinated. The flowers are five-petaled, white to greenish- or yellowish-white in groups of three to five on short crowded pedicels. These bloom in the spring when the leaves are fully open and later followed by clusters of bright red (occasionally yellow) soft berries. These berries are a late winter food for several bird species.

Several named cultivars of *Ilex verticillata* selected for larger and more brightly colored fruit are sold in the horticultural trade.

Above left: Flowering branch of *Ilex verticillata*.

Lower left: Branch with mature fruit.



Rhamnus alnifolia L' Héritier (alder-leaf buckthorn, Rhamnaceae)



Above: Flowering branch of *Rhamnus alnifolia*.

Rhamnus alnifolia is a buckthorn and our only native species. It is a low growing upright spreading shrub found in rich conifer and hardwood swamps and sometimes in moist forests or rarely in bogs. Its wetland rating is OBL.

Unlike the two non-native species, *R. alnifolia* leaves are alternate rather than alternate to sub-opposite to opposite serrate rather than crenate-serrate, and pubescent below instead of glabrous. In addition, the venation of the leaves in *R. alnifolia* is pinnate not parallel-arcuate as in *R. cathartica* and *R. frangula*. These two non-natives also may grow into large shrubs or even small trees up to 20 meters with trunk diameters of 36 cm.

R. alnifolia flowers in the early spring. The flowers are greenish-yellow, borne in the axils of the lower leaves and followed in late summer by black subglobose berries.

Dirca palustris L. (leatherwood, Thymelaeaceae)



Above: Leafy branch of *Dirca palustris*

Dirca palustris is a shade tolerant, slow growing, low shrub (to 2 meters) of rich, moist upland forests with sugar maple, red oak, and basswood. Its wetland rating is FAC. The species epithet "palustris" means "of the water" but *D. palustris* is not a wetland species like the other three shrub species discussed here. If it occurs in any wetlands at all these would be small vernal wet depressions in hardwood forests.

D. palustris has simple, entire, ovate to oblong alternate leaves on short petioles that cover the buds. The leaves are pubescent at first but later are glabrous. Flowering is in the early spring before the leaves are open. These are insect pollinated and later followed by a 1 to 1.2 cm green, oval berry.

The bark of *D. palustris* is very flexible allowing the stems to be bent without breaking. Species in the family Thymelaeaceae are well known for being extremely poisonous plants.

Myrica gale L. (sweet gale, Myricaceae)



Above: Leafy branch of *Myrica gale* with pistillate catkins formed for next year.

Myrica gale is a low shrub (to 3.5 meters) with ascending branches and very aromatic leaves and twigs. It occurs in fens, along lakes, streamsides, and peaty shores. Its wetland rating is OBL.

M. gale has alternate simple, leathery resin gland dotted leaves that are oblanceolate with toothed tips and wedge shaped at the base. In addition to the resin glands the undersides of the leaves have small white hairs. The plants are monoecious with staminate and pistillate catkins on separate plants. Pollination is by the wind when the flowers bloom in the early spring. The fruit is a resin dotted nut borne in 10 to 12 mm long compact catkins that are also resin dotted.

Root nodules on *M. gale* contain bacteria that live in a symbiotic relationship with the plant and fix atmospheric nitrogen. *Comptonia peregrina* (no rating) is a related species occurring on dry soils and has pinnately lobed leaves. It also has root nodules with nitrogen fixing bacteria.

***Physocarpus opulus* (L.) Maximowicz (ninebark, Rosaceae)**



Above left: Fruit branch of *Physocarpus opulus*.

Above right: Leafy branch of *Physocarpus opulus*.

Physocarpus opulus is a many-branched upright spreading shrub with a tangle of branches growing to 3 meters. It grows principally on moist sandy to rocky shores and stream banks and on moist rock outcrops. It is especially common on rocky shores along Lake Superior. Its wetland rating is FACW-.

The leaves of *P. opulus* are alternate, simple, 3 to 8 cm long and wide, three-lobed or five-lobed, irregularly serrate, with a cuneate to truncate base and superficially like a maple leaf. Leaves on flowering branches may be smaller and unlobed. Flowers are borne in dense cymes in late spring and early summer on umbel-like cymes. Flowers are five-petaled with numerous stamens, white to pinkish and insect pollinated. The fruit of *P. opulus* is an aggregate of up to five follicles. These are lustrous, glabrous or with stellate pubescence (var. *intermedius*), pointed at the tips and measure about 5 to 10 mm long.

Some forms of *P. opulus* with variegated leaves and larger flowers have been introduced into the horticultural trade.

POTENTILLA (CINQUEFOIL), GEUM (AVENS) AND AGRIMONIA (AGRIMONY)
(FAMILY ROSACEAE) PART 2

September 12, 2005

Gary B. Walton

***Agrimonia gryposepala* Wallr. (common agrimony), *A. rostellata* Wallr. (woodland agrimony),
and *A. striata* Michx. (roadside agrimony)**



Above left and right: flowers and fruit of *Agrimonia gryposepala*.

Agrimonia may resemble *Geum* species when in flower. However, the fruit of *Agrimonia* is an obconic to hemispheric grooved hypanthium with hooked bristles that becomes hardened at maturity. *Agrimonia gryposepala* is a common member of this genus found in moist or dry open woods and along trails. Its wetland rating is FACU+.

A. gryposepala has fibrous roots (another native species, *A. rostellata*, FACU, has tuberous thickened roots) and glandular and long hirsute herbage especially the stems. The leaves are compound with coarsely toothed margins, glabrous above but glandular below and hairy on the veins. The inflorescence axis is also glandular and hirsute. The flowers are five-petaled, yellow with 5 to 15 stamens. The hypanthium (3 to 5 mm) is on hirsute pedicles and is itself glandular (or sometimes with a few short hairs) and with bristles in several rows. *A. rostellata* differs chiefly by its smaller hypanthium (2 to 2.5 mm) which is almost always only glandular. The similar *A. striata* (FAC-) has a hypanthium (4 to 5 mm) that is minutely strigose in the grooves only, is not glandular, the 3-cleft bractlets exceeding the hypanthium, and on a pubescent inflorescence axis.

CAREX PART 9: EXTENSAE

Carex flava L., C. cryptolepis Mackenzie and C. viridula Michx.

The *Carex* section EXTENSAE is characterized by 2 or more spikes per culm (except depauperate plants); spikes sessile or nearly so, short-cylindric to subglobose, and densely flowered; perigynia spreading or abruptly recurved above the base; perigynia glabrous, beaked, 2 ribbed and also conspicuously nerved (10 or more) these extending the length of the perigynium; perigynia yellow to yellow brown at maturity; 3-cleft style, the styles withering; 3-sided to rounded achenes; terminal spike staminate rarely mixed; bracts of pistillate spikes sheathless or nearly so; leaf sheaths and blades glabrous; leaves flat and wider than 0.5 mm.

There are three species of the EXTENSAE found in our area: *Carex flava*, *C. cryptolepis* and *C. viridula*. *C. flava* is especially abundant in limestone regions but finds conditions adequate in northern Minnesota near greenstone belts, the Rove formation, and some glacial lake clay deposits. *C. cryptolepis* and *C. viridula* are less exacting in their pH requirements and occur on sandy or organic acidic soils (they will also grow in weakly calcareous soils) in emergent habitats such as along shores and shallow pools. All three species are rated OBL wetland plants. *C. flava* is listed as a "Special Concern" rare species in Minnesota.

Of the three species *C. cryptolepis* and *C. flava* are most similar. Both are caespitose plants with leaves usually shorter than the flowering culms which are usually 10 to 50 cm (or as much as to 75 cm in *C. flava*) tall; ligules on distal cauline leaves truncate or rounded; proximal pistillate spikes 2 to 5 (rarely just 1), contiguous or approximate, globose to elliptic. These are similar in size. For *C. flava* pistillate spikes are, and 9 to 19 to 22 mm long by 7.5 to 12.7 mm wide and in *C. cryptolepis* 12 to 21 long by 1.3 to 2.7 mm wide. *C. flava* and *C. cryptolepis* differ from each other in three very distinct ways.

Species	Perigynia	Pistillate Scales	Perigynia Beak
<i>C. flava</i>	Reflexed, bright yellow at maturity, the beak angle 26° to 72°.	Coppery colored, margins narrowly whitish hyaline, conspicuous.	Rough margined, sharply bidentate, apex gradually narrowed.
<i>C. cryptolepis</i>	Reflexed, yellowish green at maturity, the beak angle 13° to 48°.	Yellowish green, inconspicuous.	Smooth, abruptly contracted.

C. viridula is also a caespitose plant but with leaves equaling or surpassing the flowering culms. The pistillate spikes number 2 to 4 and measure 5 to 15 mm long with similar dimensions for the width. The pistillate scales are brown with a green midrib and shorter than the smooth beaked perigynia.



LUZULA (WOOD RUSH) AND JUNCUS (SOFT RUSH) (FAMILY JUNCACEAE) PART 1

September 12, 2005

Gary B. Walton

Juncus and *Luzula* are two common components of wet meadows and woodlands, respectively. There are about 17 species of *Juncus* and 3 species of *Luzula* in our area. *Juncus* may be confused with sedges (Cyperaceae) and both *Juncus* and *Luzula* may be confused with grasses (Poaceae). In many ways, the floral pattern of Juncaceae is like that of Liliaceae (lilies). The differences are set forth in the table below.

Family or genus	Leaves	Stems	Flowers	Fruit
Cyperaceae (sedges such as <i>Carex</i> , <i>Scirpus</i>)	Flat to terete, hairy, glabrous or scabrous	Usually triangular and usually solid	Perfect or often unisexual, stamens 1 to 3, stigmas 2 or 3, single ovule	Achene (single seeded, indehiscent fruit)
Poaceae (grasses such as <i>Poa</i> , <i>Festuca</i>)	Flat to terete, hairy, glabrous or scabrous	Round and usually hollow (solid in <i>Zea</i> , <i>Tripsacum</i> , <i>Andropogon</i>)	Perfect or sometimes unisexual, stamens 3 or 6, stigmas 2 or 3, ovule solitary	Grain (composed of layers adnate to the single seed, indehiscent)
<i>Luzula</i>	Flat and hairy	Round and solid	Trimerous, perianth regular, stamens 3 or 6, stigmas 3, ovary 3-parted	3-valved capsule with many seeds
<i>Juncus</i>	Terete or flat, glabrous or scabrous	Round and solid	Trimerous, perianth regular, stamens 3 or 6, stigmas 3, ovary 3-parted	3-valved capsule with many seeds

All our species of *Luzula* are plants of upland forests and meadows although they may be sometimes found in swamps growing on root hummocks. *L. acuminata*, (woodrush, FAC-) is the most common species and an important part of the forest herbaceous layer. *L. multiflora* (woodrush, FACU) is more often found in upland meadows. *L. parviflora* (small-flowered woodrush, FAC) is a rare species of moist northern forests usually near the edges of coniferous wetlands or in coniferous wetlands on root hummocks.

Juncus species are typically found in wet meadows, sedge meadows, and along shores. A few are disturbance dependent such as *Juncus bufonius* (toad rush, FACW+) and *J. tenuis* (path rush, FAC). Other *Juncus* species also colonize disturbed sites as well as forming extensive colonies in natural habitat.

Juncus is separated into species by taking into account the presence or absence of small bracts (prophylls) subtending the individual flowers, inflorescence structure, whether basal leaf sheaths have a leaf blade or not, if the leaves are septate in longitudinal cross section or not, if the leaves are flat or terete or channeled or nodulose, shape or the seed capsules, length and shape of the tepals, features of the seeds (surface ornamentation, arils, shape, color, and size). *Luzula* is separated into species using characteristics of the inflorescence structure, perianth color, shape of floral bracts, and plant form (cespitose, loose). No key to *Juncus* or *Luzula* is presented here as better ones are available.

Luzula acuminata Raf. (woodrush)



Luzula acuminata is a densely cespitose grass-like plant with short rhizomes found in of mesic forests and sometimes upland meadows, rarely in swamps. Its wetland rating is FAC-.

L. acuminata has flat leaves with long, blunt calloused tipped hairs along the margins. The flowers are in terminal sub-umbellate clusters on slender branches each with 1 to several brownish flowers.

The seed capsules of *L. acuminata* are ovoid and contain one seed per locule. The seeds are subglobose, purple-brown in color with a whitish aril.

A rare species of woodrush, *Luzula parviflora* var. *melanocarpa* is known in Minnesota from Lake and

Cook counties. It was first reported from Minnesota by L. S. Cheney working in Cook County in 1881 near the Devil Track River. Several other populations have been found since then.

L. p. var. melanocarpa is a loosely cespitose plant with green to glaucous basal and cauline leaves sparsely beset with a few long white hairs. The tall arching inflorescence stem (to 0.7 meter) with flowers on long, wirey, drooping peduncles bears flowers in mid-summer. Towards August, dark colored fruit capsules are produced. Most *Luzula* bear an elaiosome on the seed but *L. p. var. melanocarpa* has only a sparse tuft of hairs.

Typical habitat for *L. p. var. melanocarpa* is in the deep shade of moist aspen-birch-fir-spruce forests especially where these transition to rich black spruce or white cedar swamps.

Luzula multiflora (Retz.) Lej. (Syn. *L. campestris* L.) (woodrush)



Luzula multiflora is also a densely caespitose grass-like plant. It is found in wooded or open habitats. The wetland rating of *L. multiflora* is FACU.

L. multiflora has leaves similar to those of *L. acuminata* but the tips of the leaves end in a blunt callous-like tip. Also the flowers are borne in short-cylindric globose clusters at the ends of the branches.

The seed capsules are subglobose. Seeds are ovoid to broadly elliptic, brown with a hard aril-like outgrowth (caruncle).

***Juncus arcticus* Willd. var. *littoralis* (Engelm.) Boivin (wire-rush)**
***Juncus effusus* L. var. *solutus* Fern. & Wieg. (soft-rush)**
***Juncus filiformis* L. (thread-rush)**



Juncus arcticus var. *littoralis* (including *J. balticus*) is a rush of brackish or calcareous waters and shores with stems growing in rows from thick, long rhizomes. *J. effusus* and *J. filiformis* are caespitose to densely caespitose and grow to about 1 meter. *J. effusus* occurs in marshes and wet meadows and is often included in wetland seed mixes, too. *J. filiformis* grows in bogs, sandy shores, and alpine meadows. The wetland rating for of *J. arcticus* var. *littoralis* and *J. effusus* is OBL and FACW for *J. filiformis*.

J. arcticus var. *littoralis*, *J. effusus*, and *J. filiformis* have inflorescences that appear to be oriented laterally. This is because the basal leaves are bladeless and the involucral leaf extends beyond the inflorescence and so appears to be a continuation of the stem.

J. arcticus var. *littoralis* differs from *J. effusus* and *J. filiformis* by its broadly round-ovate inner prophylls as

opposed to deltoid-ovate inner prophylls in *J. effusus* and *J. filiformis*. Also the stems of *J. arcticus* var. *littoralis* are finely and irregularly ridged when dry. In *J. filiformis* the ribs are finely striate and continuous. Those of *J. effusus* may be smooth or with 30 to 60 low inconspicuous ridges.

The flowers also are distinctive. The tepals of *J. arcticus* var. *littoralis* are lanceolate, 3-4.7 mm long, with a conspicuous dark stripe down each side of the mid-rib. In *J. filiformis* the tepals are can be distinguished into sepals and petals. The sepals are 2.7 to 4.3 mm long, lanceolate while the petals are 2.3 to 4.1 mm long, acute or obtuse and slightly shorter than the sepals. Otherwise they are the same color brown. In *J. effusus* the tepals are stramineous (hay colored), broadly lanceolate and acute.

The fruit capsules of *J. arcticus* var. *littoralis* are trilocular, short beaked, acute, and exceed the perianth by 0.5 to 1 mm. In *J. filiformis* they are trilocular, 2.4 to 3.7 mm, obovoid, and short beaked. In *J. effusus* they are trilocular, shorter than or about equaling the perianth, the tip broadly obtuse or rounded to truncate but seldom mucronate.



Juncus torreyi Coville and *J. nodosus* L.



Juncus torreyi is stout stemmed erect plant to 1 meter found in wet soil and shallow standing water in full sun especially in the prairie regions. Its wetland rating is FACW. *J. nodosus* is shorter and more slender and grows in a variety of wet habitats such as bogs, shores, and marshes. Its wetland rating is OBL.

The clustered round heads of *J. torreyi* resemble *J. nodosus* but the species differ on several points especially in characters of the inflorescence. In addition, the stems of *J. torreyi* grow singly from rhizomes like *J. nodosus* but are thicker. Both species also have tuberous thickenings on the rhizomes at intervals and terete, septate leaves.

The number of flowers per head in *J. torreyi* is 25 to 100 in 2 to 10 tightly globose heads 2 to 4 cm in diameter. The tepals are awl-like, linear, and narrow to thin, stiff points. Sepals measure 3.5 to 54.5 mm and are longer than the petals. Both species have 6 stamens.

J. nodosus has 2 to 10 less compact globose heads or even loose heads with from 5 to 25 flowers. The tepals are acuminate and wide at the base. Sepals and petals are about equal in size.

In both species, the fruit tapers into a slender dehiscent beak and the seeds are tailed at both ends.

Stem leaves of *J. torreyi* number from 2 to 5 and the pale, scarios margins of the sheaths are prolonged into scarios auricles about 5 mm long. In *J. nodosus* stems leaves number 2 or 3, the auricles yellow and smaller at about 0.5 mm. the leaves of both are septate.

**Upper left: Inflorescence of *Juncus torreyi*.
Lower left: Scarios margin of leaf sheaths and prolonged auricle of *Juncus torreyi* indicated by arrow.**



Juncus canadensis J. Gay.



Juncus canadensis is a caespitose plant with stout stems to 1 meter. It occurs along shores, in swamps and marshes and on wet soil in disturbed wetlands. Its wetland rating is OBL

J. canadensis has erect, septate and terete leaves about 1.5 to 2.5 mm thick. The inflorescence is compact to loose with a few to several rounded- pyramidal heads. These contain 5 to 10 flowers each.

The tepals of *J. canadensis* flowers are awl-like, linear with 3 nerves. Sepals measure 2.7 to 3.8 mm and the petals are a little longer. Stamens are usually 3 or sometimes 6 in number.

The fruit is a trigonous prismatic capsule 3-4.5 mm long abruptly contracted to a narrow beak. The partitions of the capsule are incomplete. Seeds are fusiform with white appendages more than half the length of the seed.

ALNUS (ALDERS, FAMILY BETULACEAE):
ALNUS VIRIDIS (VILLARS) DE CANDOLLE
VAR. CRISPA (AITON) TURRILL (GREEN ALDER) AND
ALNUS INCANA (L.) MOENCH. SUBSP. RUGOSA (DU ROI) R. T. CLAUSEN

September 19, 2005

Gary B. Walton

The alders, *Alnus incana* subsp. *rugosa* and *A. viridis*, are common shrubs in wet areas in northeastern Minnesota. The two species are distinguished by several non-overlapping characteristics. Hazelnuts have leaves similar to *Alnus*.



Above: A black ash swamp in the early spring with the shrub layer of *Alnus incana* subsp. *rugosa*.

Characteristics separating *Alnus incana* subsp. *rugosa*, *Alnus viridis* var. *crispa*, and *Corylus*.

Taxon	Leaves and buds	Young twigs	Catkins
<i>Alnus incana</i> subsp. <i>rugosa</i>	Buds stalked and not glutinous. Leaves both finely and coarsely serrate and sometimes also lobed; whitened or green below, sometimes pubescent; main veins (8 to 14) and smaller veins very prominent below.	Light brown becoming grayish; glabrous.	Not glutinous; pistillate catkins sessile or short stalked; staminate catkins purple, opening before leaves.
<i>Alnus viridis</i> var. <i>crispa</i>	Buds sessile and glutinous. Leaves glutinous below; finely and regularly serrate; glabrous below or sometimes pubescent only along veins (except var. <i>mollis</i>); only main veins (6 to 9) prominent below.	Red to reddish-purple; glabrous.	Glutinous; pistillate catkins long stalked; staminate catkins greenish-brown, opening with leaves.
<i>Corylus</i> spp.	Buds nearly sessile, pubescent and not glutinous. Leaves irregularly double serrate and sometimes lobed; dark green above pale below, pubescent at least on main veins (6 to 12); petioles puberlent (<i>C. cornuta</i>) or bristly glandular hairy (<i>C. americana</i>).	Brown, glabrous to slightly pubescent (<i>C. cornuta</i>) or bristly glandular hairy (<i>C. americana</i>).	Not glutinous; catkins opening before leaves; pistillate flowers in small budlike clusters; staminate catkins brown and either sessile (<i>C. cornuta</i>) or stalked (<i>C. cornuta</i>)

***Alnus viridis* (Villars) de Candolle var. *crispa* (Aiton) Turrill (green alder)**
(Synonym *Alnus crispa* (Aiton) Pursh)



Alnus viridis var. *crispa* is a small multi-stemmed shrub to meters found on shores, watercourses, rocky banks, bogs, and moist woods in cold climates. It also occurs rather frequently in moist areas of abandoned iron mine pits. Both *A. viridis* var. *crispa* and *A. incana* subsp. *rugosa* will colonize disturbed moist ground and so create confusion as to the nature of a particular plant community. The wetland rating of *A. viridis* var. *crispa* is FAC.

A. viridis var. *crispa* can be distinguished from *A. incana* subsp. *rugosa* by the glutinous coating on the leaves, buds, and catkins. The leaves of *A. viridis* var. *crispa* are broadly elliptic to ovate, rounded to sub-cordate at the base, and with many sharp teeth along the margins. The lower surface of the leaves is glutinous (from small glands on the leaf surface). A pubescent variety described from around the Great Lakes has been named *Alnus crispa* (Aiton) Pursh var. *mollis* Fernald. Pubescence along leaf vein nodes is variable in this species but true var. *mollis* is definitely pubescent on the lower side of the leaf. The Flora of North America Vol. 3 does not distinguish var. *mollis* and treats it as a synonym of *Alnus viridis* (Villars) de Candolle var. *crispa* (Aiton) Turrill by including all *Alnus viridis* plants with leaf "surfaces abaxially glabrous to velutinous or occasionally tomentose, moderately to heavily resin-coated".

The winter leaf buds of *A. viridis* var. *crispa* are sessile and glutinous with five imbricate scales. Both pistillate and staminate catkins bloom as the leaves unfold. Pistillate catkins are on slender stalks up to 1 cm or slightly longer.

A. viridis var. *crispa* is a circumboreal species occurring in North America largely in Canada and Alaska and along the northern tier of the United States. There are several distinct regional varieties

Top left: Lower leaf surface of *Alnus viridis* showing glutinous coating. Under magnification some fine hairs can be seen on vein nodes.

Middle left: Upper leaf surface. Note the finely serrate leaf margins.

Bottom left: Long stalked pistillate catkins.

***Alnus incana* (L.) Moench. subsp. *rugosa* (Du Roi) R. T. Clausen (tag alder)**
(Synonym *Alnus incana* (L.) Moench. var. *americana* Regel)
(Synonym *Alnus rugosa* (Du Roi) Sprengel)



Alnus incana subsp. *rugosa* is a scraggly multi-stemmed shrub with grayish to brown bark prominently marked with horizontal lenticels, growing to 8 meters and tending to sprawl with age. *A. incana* subsp. *rugosa* is a common shrub found in a variety of wetland habitats including swamps, bog edges, wet meadows, along shores and watercourses, and moist woods and thickets. Although *incana* subsp. *rugosa* (under the synonym *A. rugosa*) is listed as an "OBL" species, it does not tolerate flooding or highly saturated soils the way willows (*Salix*) can.



Besides not having any glutinous secretions on its leaves, buds, or catkins it differs from *A. viridis* in several other ways. The oval to obovate leaves, the bases with margins both finely and coarsely serrate and sometimes lobed. The lower surface may be whitened or green below, sometimes pubescent especially along the veins. The main veins and smaller veins are prominently raised on the lower surface and correspondingly impressed above.

The winter leaf buds of *A. incana* subsp. *rugosa* are stalked, not glutinous, and with 2 to 3 bud scales. Both pistillate and staminate catkins bloom before the leaves unfold. Pistillate catkins are sessile or on short stalks less than 1 cm.

A. incana is a circumboreal species found in Alaska, Canada, and along the northern tier of the United States. Root nodules on both species of *Alnus* contain bacteria that live in a symbiotic relationship with the plant and fix atmospheric nitrogen.



Top left: Upper leaf surface of *Alnus incana* subsp. *rugosa*. Note coarsely serrate leaf margins.

Middle left: Lower leaf surface. The numerous raised veins are clearly visible

Bottom left: Short stalked pistillate catkins.

Alnus incana nomenclature and wetland indicator status

There is on some lists of wetland plants an alder called "*Alnus incana*" which is deemed a "FACU" species in Region 3. The National List (Reed 1988) maintains that *A. incana* (L.) Moench, is "FACU" and *A. rugosa* (Du Roi) Sprengel is "OBL" for Region 3. The Minnesota list, adapted from Reed, also asserts *A. incana* to be "FACU" and *A. rugosa* to be "OBL". The 1996 draft revision of Reed states *A. incana* is a "FACU" species and *A. rugosa* (this time under the name *Alnus incana* ssp. *rugosa*) is an "OBL" species. It is not clear from these lists what these species of *Alnus* are.

Some botanists have thought *Alnus incana* occurs in North American (and in fact it does, as the species concept is presently understood) but the species they describe occupies wetlands not uplands. Fassett (1957) differentiated between *A. incana* and *A. rugosa*. He described *A. incana* as having leaves doubly serrate, strongly whitened below and pistillate catkins stalked. *A. rugosa* was described as having leaves simply toothed, green beneath and some pistillate catkins not stalked. Actually, it is possible to find thickets of alder with plants exhibiting traits of both "species", i.e., leaves doubly serrate, strongly whitened below and some (or none) pistillate catkins stalked. The specimens of *Alnus incana* ssp. *rugosa* shown above are from a population of plants that exhibit just those combinations of characteristics. Fassett admits the two species intergrade.

Fassett includes both *A. incana* and *A. rugosa* as true wetland plants across their range in North America. He does not make the distinction that *A. incana* grows on dry sites while *A. rugosa* grows on wet sites. Nor do Voss (1985) or Gleason and Cronquist (1992) distinguish these as separate species with separate habitat requirements. Instead, Voss believes that the species referred to as *Alnus rugosa* might be better understood to be the North American subspecies of the circumboreal species *A. incana*. In North America this would be *A. incana* ssp. *rugosa* and in Eurasia *A. incana* ssp. *incana*. Gleason and Cronquist refer to eastern North American variety of *A. incana* as *Alnus incana* var. *americana*. The Flora of North America Volume 3 (FNA) also notes that the American *Alnus incana* is very similar to the European variety and that it grows in such habitats as:

"Stream banks, lake shores, bogs, swamps, margins of wet fields, swales, and roadsides, often forming dense thickets"

Regarding the ecology of *Alnus incana* the FNA states,

"*Alnus incana* subsp. *rugosa* is an important shoreline and meadow colonizer in boreal and north temperate areas of the Canadian Shield, and a weedy successional species in damp areas along roadsides throughout its range."

What Fassett, Voss, Gleason and Cronquist, and the FNA Vol.3 say about *Alnus rugosa/Alnus incana* make it clear that this is a circumboreal species with several regional varieties and that all are wetland plants and that none are considered facultative upland plants even if stands are sometimes found on non-hydric soils.

CAREX PART 10: STELLULATAE

September 19, 2005

Gary B. Walton

The STELLULATAE are a group of very similar and somewhat difficult species of sedges. They are characterized by lenticular to planoconvex achenes; 2 stigmas; usually several sessile spikes per culm, gynaeandrous spikes; plump perigynia distended by the achene with serrate or at least sharp-edged margins and spongy at the base; perigynia of at least the lowermost spike spreading or reflexed.

There are at least five species in our area: *Carex interior*, *C. sterilis*, *C. arcta*, *C. exilis*, and *C. echinita*. A species of the Maritime Provinces, New England, and northern Michigan, *C. wiegandii*, may also occur in Minnesota.

Carex sterilis Willd. and *Carex interior* L. Bailey



Carex sterilis is a tufted approximately 30 to 60 cm tall plant with triangular scabrous culms bearing 3 to 5 leaves per culm. *C. sterilis* is a calciophilic species and occurs in rich and calcareous fens. The wetland rating of *C. sterilis* is OBL. *C. sterilis* is a rare species in Minnesota occurring in calcareous wetlands. It is listed as a "Threatened species" by the Minnesota DNR. *C. interior* is a very common species occurring in a variety of wet habitats and is not a strict calciophile. Its wetland rating is OBL.

Leaves of *C. sterilis* are 1 to 3 mm wide, clustered around the basal third of the culm and equal to it or slightly shorter. The culm is scabrous along the angles near the top. Spikes per culm number from 3 to 8,

are sessile, 3 to 13 mm long, with 5 to 25 perigynia, and crowded or sometimes the lowermost spike is remote from the others. The perigynia are spreading to reflexed, castaneous (dark reddish-brown, chestnut), ovate to deltoid and 2.1 to 3.8 mm long, 0.4 to 0.66 times long as wide, 5 to 12 nerved at least dorsally, and serrulate at the distal end. The perigynia end in a prominent, softly bidentate beak.

C. interior differs in these important ways:

- 1) 2 to 6 small spikes per culm, usually, with 5 to 15 perigynia.
- 2) The terminal spike very often with a staminate base.
- 3) Perigynia green or tan, 4 to 12 nerved dorsally, conspicuously serrulate distally, the beak shallowly bidentate.
- 4) Perigynia ovate to triangular-ovate, 2.2 to 3.2 mm by 1.1 to 1.8 mm or 1.4 to 2 times as long as wide.

Carex arcta F. Boott



Carex arcta is a densely tufted plant to 60 cm of sedge meadows, marshes, stream banks, woodland pools and other wet places. Its wetland rating is OBL.

The culm of *C. arcta* has 7 to 15 green sessile spikes in an ovoid to cylindrical cluster with 20 to 45 perigynia per spike. Perigynia are greenish, spreading, ovate to lance-ovate, 2.2 to 3.4 mm long, several nerved dorsally and few-nerved or nerveless ventrally. The perigynia end in a prominent serrulate beak. Bracts of the spikes are inconspicuous or the lowermost may be long and hair-like.

LUZULA (WOOD RUSH) AND JUNCUS (SOFT RUSH) (FAMILY JUNCACEAE) PART 2

September 19, 2005

Gary B. Walton

***Juncus vaseyi* Engelm. , *J. greenii* Oakes & Tuckerman, *J. tenuis* Willd.**

Juncus vaseyi, *J. greenii*, and *J. tenuis* are densely caespitose perennials from short rhizomes. They are often present in wet meadows, especially *J. vaseyi* and *J. greenii*. , *J. tenuis* is more common on paths and other openings with compacted moist to wet soil. *J. vaseyi* and *J. greenii* may also occur in similar disturbed habitat but are more frequently found along the edges of ditches, in borrow pits with a high water table, moist depressions, shorelines, and desiccating pools where they are sometimes found together. Although *J. greenii* occurs with *J. vaseyi* on moist soils, it also occurs very frequently on dry soils. The wetland rating for *J. vaseyi* is FACW; for *J. greenii* and *J. tenuis* it is FAC. *J. vaseyi* is also listed as a “Special Concern Species” in Wisconsin.

J. vaseyi grows from 30 to 80 cm with slender, terete basal leaves 5 to 20 cm long. The compact, obpyramidal inflorescence measures 1 to 4 cm long. The flowers are prophyllate with lanceolate acute tepals. Petals measure 3 to 4.5 mm long and are shorter than the fruiting capsule. The trilobular, oblong-cylindric fruiting capsule measures 4 to 5.1 mm long. It is filled with numerous fusiform 0.5 to 0.8 mm long seeds with a distinct slender pale appendage (0.2 to 0.4 mm long) at both ends and become mucilaginous when wet.





J. greenei is similar to *J. vaseyi* but its leaves are filiform and although the inflorescence is obpyramidal it is also much more open after flowering. The flowers are prophyllate with lance-oblong tepals, sepals 2 to 4 mm, petals 1.9 to 3.4 mm and much shorter than the fruiting capsule. The fruiting capsules are trilocular, ovoid-cylindric with numerous oblong to obovoid, fusiform seeds (0.3 to 0.6 mm long) that are merely pointed at the ends.

J. tenuis is also densely tufted with flat leaves (1 to 1.5 mm wide) that may become involute. It has a loosely branched inflorescence with oblong to slightly ovoid imperfectly trilocular fruiting capsules (2.6 to 4.2 mm) shorter than the sepals (3 to 5.5 mm). The seeds (0.3 to 0.5 mm long) are merely pointed at the ends. These become mucilaginous when wet.

THE LYCOPHYTES (QUILLWORTS, SPIKEMOSSES AND CLUBMOSES) PART 3:
LYCOPIDIUM

September 19, 2005

Gary B. Walton

The running clubmosses:
***Lycopodium annotinum* L., *Lycopodium clavatum* L.,**
and *Lycopodium lagopus* (Laestadius ex C. Hartman) G. Zinserling



The running clubmosses are in the same genus (*Lycopodium*) as the ground or princess pines. These differ from each other chiefly by growth form: upright stems from aboveground trailing horizontal stems as opposed to upright stems from subterranean horizontal stems. Yearly growth also seems to be faster in the running clubmosses but forking of individual branches is less than in the ground pines.

Key to the running clubmosses:

1A) Leaves 8-ranked, semi-whorled, stiff with a sharp tip, smooth margins to slightly toothed:

Lycopodium annotinum

1B) Leaves 10-ranked, narrow, ending in a hair-like tip, margins slightly toothed: 2

2A) Strobili (1)2-4(-6) on branching stems, leaves spreading: *Lycopodium clavatum*

2B) Strobili single on non-branching stems, leaves ascending to appressed: *Lycopodium lagopus*

Lycopodium annotinum L. (bristly clubmoss)



This common clubmoss can be found in a variety of moist to dry coniferous forests often in acidic soil. The wetland rating of *Lycopodium annotinum* is FAC.

The stiff semi-whorled (4 leaves per whorl) leaves of *L. annotinum* are 8-ranked, with smooth to slightly toothed margins and end in a sharp tip. The horizontal stems run across the soil or slightly below it, rooting and branching at intervals. The upright stems may be single or once or twice forked and have definite annual constrictions. Fertile branches end in a single, sessile spore cone.

L. annotinum plants with stiff, tightly appressed, ascending, leaves with entire and horizontal stems consistently underground been named *L. annotinum* var. *pungens*. This form is often found in acidic poor forested fens with deep moss layers. This varietal status of *L. annotinum* var. *pungens* is no longer considered valid and is regarded as a response to soil conditions.

Although similar to *L. clavatum* and *L. lagopus* these differ from *L. annotinum* by having soft, hair-tipped leaves in 10 ranks and strobili (2 to several in *L. clavatum*) on stalked peduncles.

Lycopodium clavatum L. (staghorn clubmoss)
and *Lycopodium lagopus* (Laestadius ex C. Hartman) G. Zinserling (one-cone clubmoss)

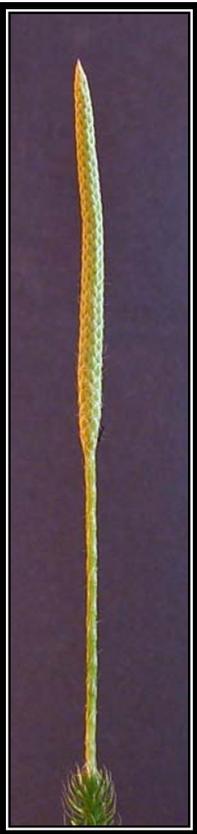


Lycopodium clavatum and *L. lagopus* are two very similar species. Both are running clubmosses with horizontal aboveground stems and upright shoots with clustered branches and few lateral branches. The annual bud constrictions are abrupt and distinct. Leaves are entire with a hair-like tip. Spore cones are borne on elongate peduncles (the spore cone is always sessile in *L. annotinum*).

L. clavatum differs by its spreading leaves that are often ascending near the upper third of the branch and ascending. The peduncles are between 3 and 13 cm with pseudowhorls of tightly appressed leaves and then branched into 2 to 5 alternate stalks each ending in 0.5 to 1.5 cm strobili.

L. lagopus the leaves are ascending to appressed throughout. The peduncles are similar in size and foliage as *L. clavatum* but always end in a single 0.5 to 1.5 cm strobilus. Rarely there may be two but then they are sessile or even fused at the base.

L. clavatum occurs in open fields and forests, sometimes along the edges of swamps. It is global in its distribution. *L. lagopus* occurs in similar but more often drier habitat and is circumboreal in its distribution. The wetland rating of *L. clavatum* is FAC. *L. lagopus* has no wetland rating but this is probably because the species was only recently recognized as separate from *L. clavatum* with which it was once included as a variety (*L. clavatum* var. *megastachyon*).



Top left: Branched strobili stalks of *Lycopodium clavatum*.
Top right: *L. clavatum* branch and leaves.
Lower left: Solitary strobilus stalk of *L. lagopus*.
Lower right: Branch and leaves of *L. lagopus* (very similar to related *L. clavatum*) and junction of branch with strobilus peduncle.

The ground pines:

***Lycopodium obscurum* L., *L. hickeyi* Wagner, Beitel, & Moran, and *L. dendroideum* Michaux**



Lycopodium dendroideum

The ground or princess pines are a difficult group to differentiate. All three species in our area are tree-like in appearance (but not in size) with needle-like leaves. Main differences between *Lycopodium obscurum* and *L. hickeyi* are leaves of main stem appressed, annual bud constrictions inconspicuous (*Lycopodium obscurum*) and Leaves of main stem below tightly appressed, annual bud constrictions absent (*L. hickeyi*). *L. dendroideum* has spreading not appressed prickly leaves on the main stem.

Even so, differentiation of species is difficult and *L. hickeyi* was once included as a variety of *L. obscurum* (*Lycopodium obscurum* var. *isophyllum*) as has *L. dendroideum* (*L. obscurum* var. *dendroideum*). The key on the next page should prove helpful (or maybe not).

Key to the ground or princess pines:

1A) Leaves arranged so that branches appear flattened in cross section, leaves ascending, linear, in 6 ranks, 1 on upperside, 4 lateral, and 1 on underside, the leaf of the underside smaller the rest equal in size, widest in middle, leaves of main stem appressed, annual bud constrictions inconspicuous:

Lycopodium obscurum

1B) Leaves arranged so that branches appear rounded in cross section, leaves of stem appressed or not: 2

2A) Leaves of main stem spreading, prickly, annual bud constrictions inconspicuous, branch leaves spreading, in 6 ranks with 2 upperside, 2 lateral, and 2 underside, the leaves equal in size: *Lycopodium dendroideum*

2B) Leaves of main stem below tightly appressed, annual bud constrictions absent, the leaves ascending, in 6 ranks, 1 on upperside, 4 lateral, and 1 on underside, equal in size, linear, widest in middle: *Lycopodium hickeyii*

***Lycopodium dendroideum* Michx. (princess pine)**

Lycopodium dendroideum is a small (to 15 cm tall) plant with upright treelike shoots from a deep subterranean rhizome. It occurs in dry to moist forests, wooded edges, and brushy fields. Its wetland rating is FAC.

The upright shoots of *L. dendroideum* are branched with many smaller branches. Annual bud constrictions are absent so the growth of the pervious year seems to meld into the growth of the current year. The leaves are spreading not appressed, prickly, linear, equal in size and arranged in 6 ranks: 2 above, 2 lateral, and 2 below. Lateral branches are round in cross section.

As in all the ground pines, the strobili number from one to several and are sessile in the upper branches.



Left: Spreading prickly stem leaves of *Lycopodium dendroideum*.

Right: Branch of *Lycopodium dendroideum*.

Lycopodium hickeyi W. H. Wagner, Beitel, & R. C. Moran and *Lycopodium obscurum* L.



Lycopodium hickeyi (synonym *Lycopodium obscurum* L. var. *isophyllum* Hickey) is similar in form and size to *L. dendroideum* and *L. obscurum*. It and *L. obscurum* grow in mesic shrubby openings, woodland edges, and mesic open forests. *L. hickeyi* has no wetland rating but it was only recently separated from its sister species *L. obscurum*, which is FACU. Available information on the habitat preferences of *L. hickeyi* would indicate that it is at least a FAC species if not a FACU.

L. hickeyi stems are subterranean with upright aboveground treelike shoots with many branches. The leaves are all equal in length, ascending, in six ranks (1 above, 4 lateral, 1 below). The leaf arrangement gives the branches a rounded cross section. In *L. obscurum* the arrangement is the same but the lower leaf is smaller than the other leaves. In both species the annual bud constrictions are inconspicuous.



Top: *Lycopodium hickeyi* with strobili.

Lower left: *L. hickeyi* stem showing tightly appressed leaves.

Bottom left: *L. hickeyi* branch with faintly visible annual bud constrictions (arrows).

A FEW ATTEMPTS TO DETERMINE PLANT COMMUNITIES USING DIFFERENT METHODOLOGIES



DETERMINING PLANT COMMUNITY TYPES- #1
Four Cook County Wetlands

June 8, 2005

Gary B. Walton

The following species lists are from actual sites in northern Minnesota. These are normal native plant communities with no obvious evidence of human impact. All are in the Laurentian Mixed Forest, the Northern Superior Uplands ecological section in Cook County, Minnesota.

Using the Native Plant Communities of Minnesota Field Guide determine the native plant community indicated by the species checklists and information about land and hydrology. Determine the wetland types using the keys and descriptions in Cowardin, Circular 39, and Eggers.

Some of the sedges, grasses, and certain other monocots and shrubs are indicators of pH and water chemistry. It would be a good idea to look these up in a floristic text like Voss or Gleason and Cronquist before proceeding. Or check the lists in the Native Plant Communities of Minnesota Field Guide to see what it says about pH and minerotrophic species. Sites 1-3 are associated with slow moving streams (one rather large) through peaty soils with black spruce further back from the streams. Site 4 is a small pool in a birch forest.

Site #1

Site description: Abandoned beaver pond. At one time a cedar swamp as evidenced by standing white cedar. *Carex lasiocarpa* is abundant. There are patches of *C. utriculata* and *C. interior* is frequent. *Myrica gale* is occasional. Most of the plants are in standing water.

Species: *Carex lasiocarpa*, *C. utriculata*, *C. michauxiana*, *C. interior*, *Potentilla palustris*, *Myrica gale*, *Triadenum fraseri*, *Calamagrostis canadensis*, *Dulichium arundinaceum*, *Glyceria canadense*, *Scirpus cyperinus*.

Site # 2

Site description: Along a somewhat large and slow (no rapids or falls) river in an extensive peatland. *Carex lasiocarpa*, ericaceous shrubs, and *Myrica gale* are common. There is about two inches of water over much of the site.

Species: *Carex lasiocarpa*, *C. michauxiana*, *C. cryptolepis*, *Juncus* spp., *Iris versicolor*, *Muhlenbergia mexicana*, *Calamagrostis canadensis*, *C. inexpansa* (syn. *C. neglecta*), *Myrica gale*, *Chamaedaphne calyculata*, *Utricularia intermedia*.

Site #3

Site description: Floating mat along beaver pond some muddy depressions in peat. Also, tunnels and trails through mat made by beavers. *Carex lasiocarpa* and ericaceous shrubs are abundant. Most of the plants are above the water but some extend into it along the shore of the pond.

Species: *Chamaedaphne calyculata*, *Kalmia polifolia*, *Vaccinium oxycoccus*, *Alnus rugosa*, *Larix laricina*, *Carex lasiocarpa*, *Rhynchospora alba*, *Scheuchzeria palustris*, *Pogonia ophioglossoides*, *Muhlenbergia uniflora*, *Agrostis geminata*, *Utricularia cornuta*, *Drosera rotundifolia*.

Site #4

Site description: Shallow pool at base of steep hill in upland paper birch forest. Sedges and shrubs on small root hummocks above water.

Species: *Carex leptalea*, *C. paupercula*, *C. rostrata*, *C. flava*, *Alnus rugosa*, *Rhamnus alnifolia*, *Salix planifolia*.

DETERMINING PLANT COMMUNITY TYPES- #2

June 8, 2005

Gary B. Walton

The following species lists are from actual sites in northern Minnesota. They are normal native plant communities. The first is on the shore of Lake Superior and the next two are a few miles inland. All are located in the Laurentian Mixed Forest, the Northern Superior Uplands ecological section in Cook County.

Using the Native Plant Communities (NPC) of Minnesota Field Guide determine the native plant community indicated by the species checklists and information about land and hydrology. One in particular will not key out correctly if you ignore the substrate (you'll find yourself in a western county). Use the 50% rule to determine if these are hydrophytic communities. If any are hydrophytic communities then determine the wetland types using the keys and descriptions in Cowardin, Circular 39, and Eggers.

Site #1

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Scarce, where present is composed largely of decomposed plant materials in crevices of bedrock or a mixture of gritty sand and living moss.

Landscape: Rock outcrop. Very little plant cover most of which is confined to the edges of shallow pools and rock crevices.

Field characteristics: Rock out crop of amygdaloidal basalt, some calcite veins. Water from precipitation, waves, and from small trickles that seep out from rock fractures and from between forest soil and rock interface somewhat further back from lake.

Species Checklist for Site #1

Agrostis scabra

Calamagrostis lacustris

Scirpus cespitosus

Potentilla fruticosa

Physocarpus opulifolius

Pinguicula vulgaris

Drosera rotundifolia

Lobelia kalmii

Primula mistassinica

Euphrasia hudsoniana

Solidago ptarmicoides

Xanthoria (a lichen)

Site #2

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Thin, composed largely of decomposed plant materials in crevices of bedrock or a mixture of gritty sand and living moss (*Polytrichum* and *Pleurozium*) and lichens (largely *Cladina* and *Cladonia* species).

Landscape: Rock outcrop in mixed upland jack pine and black spruce forest.

Field characteristics: Rock out crop of rhyolite. Water from precipitation, and from small trickles that seep out from rock fractures and from between forest soil and rock interface. Some large trees of jack pine and black spruce. Most woody plants are shrubs.

Species Checklist for Site #2

Diphasiastrum tristachyum

Picea mariana

Pinus banksiana

Festuca ovina

Deschampsia flexuosa

Schizachne purpurascens

Danthonia spicata

Corydalis sempervirens

Epigaea repens

Arctostaphylos uva-ursi

Vaccinium angustifolium

Solidago nemoralis

Hieracium aurantiacum

H. scabrum

Salix humili

Site #3

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Sandy mud and shingle-like basalt fragments

Landscape: Depression in mixed upland boreal conifers/hardwoods forest.

Field characteristics: Shallow pool.

Species Checklist for Site #3

Isoetes echinospora var. *braunii*

Carex cryptolepis

C. lenticularis

C. utriculata

Eleocharis acicularis

Scirpus subterminalis

Sparganium minimum

S. angustifolium

Potamogeton spirillus

Typha latifolia

Iris versicolor

Ranunculus flammula

Sium suave

Polygonum amphibium (syn. *P. natans*)

Hippuris vulgaris

DETERMINING PLANT COMMUNITY TYPES- #3

June 12, 2005

Gary B. Walton

The following species lists are from actual sites in northern Minnesota. All are normal (not obviously human impacted) native plant communities located far from urban centers.

Using the Native Plant Communities (NPC) of Minnesota Field Guide determine the native plant community indicated by the species checklists and information about land and hydrology. Determine the type of wetland community using the keys and descriptions in Cowardin, Circular 39, and Eggers.

SITE 1

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: Laurentian Uplands

Soils: Peat

Landscape: Large depression in moraine.

Field characteristics: Black spruce and tamarack trees regenerating from branches under thick layer of *Sphagnum* moss. Tree canopy very sparse, most less than 20 feet tall.

Canopy species

Larix laricina - tamarack

Picea mariana - black spruce

Shrub Layer

Andromeda glaucophylla - bog rosemary

Kalmia polifolia - bog laurel

Ledum groenlandicum - Labrador tea

Herb and Low Woody Plant Layer

Eriophorum spissum - cottongrass

Smilacina trifolia - 3-leaved Solomon's seal

Vaccinium oxycoccus - small cranberry

V. myrtilloides - blueberry

Gaultheria hispidula - snowberry

SITE 2

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: Toimi Uplands

Soils: Peat

Landscape: Near drumlins eastern edge. Sand and gravel ridges, low hills.

Field characteristics: Mat of vegetation extending around small lake in a hollow with a small outlet at one end. There are very few trees and most are shrub size except where mat contacts uplands and grades into upland and wetland coniferous forests. There is a mixture of *Sphagnum* moss and sedges. The lake contains various submerged and floating aquatics principally *Nymphae odorata*, *Utricularia vulgaris*, and *Brassenia schreberi*.

Shrub Layer

Picea mariana - black spruce

Alnus rugosa - tag alder

Chamaedapne calyculata - leatherleaf

Ledum groenlandica - Labraodor tea

Kalmia polifolia - bog laurel

Herb and Low Woody Plant Layer

Platanthera clavellata -club-spur orchid (rare species)

Aerethusa bulbosa -dragon's head orchid (rare species)

Pogonia ophioglossoides -whorled pogonia orchid

Rhynchospora fusca -sooty beaked rush (rare species)

R. alba -white beaked rush

Carex paupercula - poor sedge

C. limosa - sedge

C. lasiocarpa -sedge

Iris versicolor - wild iris

Sarracenia purpurea -pitcher plant

Drosera rotundifolia - sundew

Utricularia cornuta - horned bladderwort

Menyanthes trifoliata - bog buckbean

Vaccinium oxycoccus - small cranberry

ANSWERS TO DETERMINING PLANT COMMUNITY TYPES

December 20, 2005

Gary B. Walton

Answers to determining plant community types- #1

Location of all sites: Laurentian Mixed Forest, the Northern Superior Uplands ecological section in Cook County, Minnesota. Species checklists are all from relatively undisturbed natural habitats.

Site #1

Site description: Abandoned beaver pond. At one time a cedar swamp as evidenced by standing white cedar. *Carex lasiocarpa* is abundant. There are patches of *C. utriculata* and *C. interior* is frequent. *Myrica gale* is occasional. Most of the plants are in standing water.

Species: *Carex lasiocarpa*, *C. utriculata*, *C. michauxiana*, *C. interior*, *Potentilla palustris*, *Myrica gale*, *Triadenum fraseri*, *Calamagrostis canadensis*, *Dulichium arundinaceum*, *Glyceria canadense*, *Scirpus cyperinus*.

NPC METHOD

Open Rich Peatland, Wet Meadow/Carr and Marsh Indicator Species (p. 20-21)

Open Rich Peatland

Carex lasiocarpa abundant

Wet Meadow/Carr

Carex utriculata, *Calamagrostis canadensis* both common but not as abundant as *Carex lasiocarpa*

Marsh

Scirpus cyperinus

The abundance of *Carex lasiocarpa* might lead to Open Rich Peatland as a first choice but the presence of *Carex utriculata* and *Calamagrostis canadensis* might make Wet Meadow/Carr a better choice. Peatland species such as *Andromeda*, *Chamaedaphne*, and *Sphagnum* are not present and except for *Myrica gale* no shrub species are present except along the edges. This site was once a forested white cedar swamp but was flooded by beavers that have since abandoned the site. The pond has drained and sedges are now growing on the old pond bed among the dead cedar trees.

The only choice offered by the NPC Method is a very general one, WMn82 or Northern Wet Meadow/Carr. The text on pp. 292-203 is slightly helpful but does not sufficiently capture the finer distinctions of this site. This is a forested rich peatland that was altered by flooding and then draining and is now a *Carex lasiocarpa* dominated marsh.

Cowardin: Palustrine Emergent Wetland Persistent or Palustrine Forested Wetland Dead

Circular 39: Type 3- Inland shallow fresh marsh

Site # 2

Site description: Along a somewhat large and slow (no rapids or falls) river in an extensive peatland. *Carex lasiocarpa*, ericaceous shrubs, and *Myrica gale* are common. There is about two inches of water over much of the site.

Species: *Carex lasiocarpa*, *C. michauxiana*, *C. cryptolepis*, *Juncus* spp., *Iris versicolor*, *Muhlenbergia mexicana*, *Calamagrostis canadensis*, *C. inexpansa* (syn. *C. neglecta*), *Myrica gale*, *Chamaedaphne calyculata*, *Utricularia intermedia*.

NPC METHOD

Open Rich Peatland, Wet Meadow/Carr and Marsh Indicator Species (pp 20-21)

Open Rich Peatland

Carex lasiocarpa, *Chamaedaphne calyculata*, *Utricularia intermedia*

Wet Meadow/Carr

Calamagrostis canadensis

Marsh

none

Probably an Open Rich Peatland

Go to Key NSU-D1, page 32

a: *Calamagrostis canadensis* -8 points

a': none

$a = -8$, $a' = 0$, so $a' + a = -8$ which is < 0 , go to b

b: *Calamagrostis canadensis* -4 points

Chamaedaphne calyculata -3 points

b': *Utricularia intermedia* 8 points

Carex lasiocarpa 6 points

$b = -7$, $b' = 14$, so $b' + b = 7$ which is > 0

Conclusion: OPn92, Northern Rich Fen (Basin), go to page 286 for details. This conclusion seems accurate.

Cowardin: Palustrine Scrub-Shrub Broad Leaved Evergreen

Circular 39: Type 6- Shrub Swamp (little or no *Sphagnum* so cannot be typed as a bog), Scrub-Shrub, Non-tidal, Fresh

Site #3

Site description: Floating mat along beaver pond. Some muddy depressions in peat. Also, tunnels and trails through mat made by beavers. *Carex lasiocarpa* and ericaceous shrubs are abundant. Most of the plants are above the water but some extend into it along the shore of the pond.

Species: *Chamaedaphne calyculata*, *Kalmia polifolia*, *Vaccinium oxycoccus*, *Alnus rugosa*, *Larix laricina*, *Carex lasiocarpa*, *Rhynchospora alba*, *Scheuchzeria palustris*, *Pogonia ophioglossoides*, *Muhlenbergia uniflora*, *Agrostis geminata*, *Utricularia cornuta*, *Drosera rotundifolia*.

NPC METHOD

Open Rich Peatland, Wet Meadow/Carr and Marsh Indicator Species (pp 20-21)

Open Rich Peatland

Carex lasiocarpa, *Chamaedaphne calyculata*

Wet Meadow/Carr

none

Marsh

none

Probably an Open Rich Peatland

Go to Key NSU-D1, page 32

a: *Alnus rugosa* -7 points
a': none

$a = -8, a' = 0$, so $a' + a = -7$ which is < 0 , go to b

b: *Vaccinium oxycoccus* -5 points
Chamaedaphne calyculata -3 points
Alnus rugosa -2 points
b': *Utricularia intermedia* 8 points
Carex lasiocarpa 6 points

$b = -10, b' = 14$, so $b' + b = 4$ which is > 0

Conclusion: OPn92, Northern Rich Fen (Basin), go to page 286 for details. This conclusion seems accurate.

Cowardin: Palustrine Emergent Wetland Persistent and Palustrine Scrub-Shrub Wetland Broad Leaved Evergreen

Circular 39: Type 3- Inland Shallow Fresh Marsh, Emergent Wetland, Semi-Permanently Flooded, Fresh and Type 6- Shrub Swamp, Semi-Permanently Flooded, Fresh.

Site #4

Site description: Shallow pool at base of steep hill in upland paper birch forest. Sedges and shrubs on small root hummocks above water.

Species: *Carex leptalea*, *C. paupercula*, *C. rostrata*, *C. flava*, *Alnus rugosa*, *Rhamnus alnifolia*, *Salix planifolia*.

NPC METHOD

Open Rich Peatland, Wet Meadow/Carr and Marsh Indicator Species (pp 20-21)

Open Rich Peatland

none

Wet Meadow/Carr

none

Marsh

none

Cannot be typed using the NPC Method. Using the alternative key (pp. 328-330) is also not satisfactory. This is a very small marsh/carr (graminoid/woody shrub dominated hydrophytic plant community) in an upland forest.

Cowardin: Palustrine Emergent Wetland Persistent and Palustrine Scrub-Shrub Wetland Broad Leaved Deciduous

Circular 39: Type 3- Inland Shallow Fresh Marsh, Emergent Wetland, Semi-Permanently Flooded, Fresh and Type 6- Shrub Swamp, Semi-Permanently Flooded, Fresh.

Answers Determining Plant Community Types- #2

Site #1

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Scarce, where present is composed largely of decomposed plant materials in crevices of bedrock or a mixture of gritty sand and living moss.

Landscape: Rock outcrop. Very little plant cover most of which is confined to the edges of shallow pools and rock crevices.

Field characteristics: Rock out crop of amygdaloidal basalt, some calcite veins. Water from precipitation, waves, and from small trickles that seep out from rock fractures and from between forest soil and rock interface somewhat further back from lake.

Species Checklist for Site #1

Agrostis scabra

Calamagrostis lacustris

Scirpus cespitosus

Potentilla fruticosa

Physocarpus opulifolius

Pinguicula vulgaris

Drosera rotundifolia

Lobelia kalmii

Primula mistassinica

Euphrasia hudsoniana

Solidago ptarmicoides

Xanthoria (a lichen)

NPC METHOD

Cliff/Talus, Rock Outcrop, Lakeshore Indicator Species

Cliff/Talus

none

Rock Outcrop

None

Lakeshore

Potentilla fruticosa, *Potentilla fruticosa*, *Solidago ptarmicoides*

Lakeshore, go to NSU-C3 page 30

a: None but *Campanula rotundifolia* and *Potentilla tridentata* are in vicinity (although not in plot) so 1- and -2 points respectively

a': None

$a = -3$, $a' = 0$, so $a' + a = -3$ which is < 0 , go to b

b: none but *Ribes oxycanthoides* seen in vicinity so -1 point

b': *Agrostis scabra* 3 points

Solidago ptarmicoides 2 points

Physocarpus opulifolius 2 points

Scirpus cespitosus 1 point

Campanula rotundifolia and *Potentilla tridentata* are in vicinity (although not in plot) so 3 points each

$b = -1$, $b' = 8$, so $b' + b = 7$ which is > 0

Conclusion: LKu43, Lake Superior Rocky Shore, go to page 266 for details. This seems an accurate but obvious description. Is it a wetland? Only in very small parts where species like *Scirpus cespitosus* and *Drosera rotundifolia* are growing.

Cowardin: Lacustrine Littoral Rocky Shore Bedrock

Circular 39: N/A

Site #2

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Thin, composed largely of decomposed plant materials in crevices of bedrock or a mixture of gritty sand and living moss (*Polytrichum* and *Pleurozium*) and lichens (largely *Cladina* and *Cladonia* species).

Landscape: Rock outcrop in mixed upland jack pine and black spruce forest.

Field characteristics: Rock out crop of rhyolite. Water from precipitation, and from small trickles that seep out from rock fractures and from between forest soil and rock interface. Some large trees of jack pine and black spruce. Most woody plants are shrubs.

Species Checklist for Site #2

Diphasiastrum tristachyum

Picea mariana

Pinus banksiana

Festuca ovina

Deschampsia flexuosa

Schizachne purpurascens

Danthonia spicata

Corydalis sempervirens

Epigaea repens

Arctostaphylos uva-ursi

Vaccinium angustifolium

Solidago nemoralis

Hieracium aurantiacum

H. scabrum

Salix humilis

NPC METHOD

Cliff/Talus, Rock Outcrop, Lakeshore Indicator Species

Cliff/Talus

Cladina and *Cladonia*

Rock Outcrop

Cladina and *Cladonia*, *Corydalis sempervirens*,

Lakeshore

None

Rock Outcrop, go to NSU-C2 page 29

The key on page 29 is scarcely discerning but it is obvious from the physical description of the site that this is a rock outcrop not a cliff or lakeshore. As for subtypes (see pp. 249-255) these seem a matter of how complete the species checklist and site description are. One could call this "ROn12" or "Ron23" but in several years it is very likely that this site will be fully covered by a low growth of jack pine and black spruce. Many of these outcrop habitats may be ephemeral almost disappearing as trees grow over them and reappearing after a fire other catastrophe removes the trees.

Cowardin and Circular 39: N/A not a wetland.

Site #3

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: North Shore Highlands

Soils: Sandy mud and shingle-like basalt fragments

Landscape: Depression in mixed upland boreal conifers/hardwoods forest.

Field characteristics: Shallow pool.

Species Checklist for Site #3

Isoetes echinospora var.
braunii

Carex cryptolepis

C. lenticularis

C. utriculata

Eleocharis acicularis

Scirpus subterminalis

Sparganium minimum

S. angustifolium

Potamogeton spirillus

Typha latifolia

Iris versicolor

Ranunculus flammula

Sium suave

Polygonum amphibium (syn.

P. natans)

Hippuris vulgaris

NPC METHOD

This is a difficult one. It is most obviously a shallow pond (about 1 to 4 feet deep and approximately 0.75 acre). *Carex utriculata* is an indicator species for wet meadow/carr but the physical appearance of the site does not suggest this at all. *Potamogeton spirillus* and a few other *Potamogeton* species are found here in some abundance. These are indicator species of a marsh according to the NPC Method. The next step is to go to Key NSU-D3 on page 32.

Couplet a, a': It is an isolated pond not influenced by water level fluctuations of Lake Superior so go to couplet b, b'.

Couplet b, b': Only small portions of the pond are "dominated" by *Typha latifolia*. Some *Scirpus validus* was found here during a later visit in the summer of 2005. To call this MRn93 or Northern Bulrush-Spikerush Marsh seems forced. The description on page 299 does not clarify the matter. Plants like *Polygonum amphibium* lean the decision to wet meadow/carr which is also unreasonable. Appendix C does not help, either.

This is another one of the many small, shallow ponds on basalt and rhyolite bedrock in Cook County that are vegetated by *Carex cryptolepis*, *C. utriculata*, *Ranunculus flammula*, *Iris versicolor*, *Sium suave*, and *Polygonum amphibium*. Other species can include *Carex vesicaria*, *C. katahdinensis*, *Juncus filiformis*, *Rhamnus alnifolia*, *Thalictrum venulosum*, and *Galium tinctorum*.

Cowardin: Lacustrine Limnetic Unconsolidated Bottom and Lacustrine Limnetic Aquatic Bed Rooted Vascular and Lacustrine Limnetic Emergent Wetland Persistent

Circular 39: Type 3- Inland Shallow Fresh Marsh, Semi-Permanently Flooded, Fresh

Answers Determining Plant Community Types- #3

SITE 1

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: Laurentian Uplands

Soils: Peat

Landscape: Large depression in moraine.

Field characteristics: Black spruce and tamarack trees regenerating from branches under thick layer of *Sphagnum* moss. Tree canopy very sparse, most less than 20 feet tall.

Canopy species

Larix laricina - tamarack

Picea mariana - black spruce

Shrub Layer

Andromeda glaucophylla - bog rosemary

Ledum groenlandicum - Labrador tea

Kalmia polifolia - bog laurel

Herb and Low Woody Plant Layer

Eriophorum spissum - cottongrass

V. myrtilloides - blueberry

Smilacina trifolia - 3-leaved Solomon's seal

Gaultheria hispidula - snowberry

Vaccinium oxycoccus - small cranberry

NPC METHOD

This is a peatland so you need to decide if it is a forested rich peatland or an acidic peatland. The sparse and stunted tree canopy along with species like *Andromeda glaucophylla*, *Kalmia polifolia*, and *Eriophorum spissum* point to it being acidic so go to Key NSU-B4 on page 27

a: *Ledum groenlandicum* -3

a': None

a = -3, a' = 0, so a + a' = -3 which is < 0, go to b

b: Only bog species present (see Appendix D)

b': None

b = 0, b' = 0, so b + b' = 0

Conclusion: APn80, Northern Spruce Bog. Details on page 222. This conclusion seems accurate but very obvious.

Cowardin: Palustrine, Forested Wetland, Needle-leaved Evergreen

Circular 39: Type 8- Bog, Forested Wetland, Saturated, Fresh

SITE 2

Ecological Province: Laurentian Mixed Forest

Ecological Section: Northern Superior Uplands

Subsection: Toimi Uplands

Soils: Peat

Landscape: Near drumlins eastern edge. Sand and gravel ridges, low hills.

Field characteristics: Mat of vegetation extending around small lake in a hollow with a small outlet at one end. There are very few trees and most are shrub size except where mat contacts uplands and grades into upland and wetland coniferous forests. There is a mixture of *Sphagnum* moss and sedges. The lake contains various submerged and floating aquatics principally *Nymphaea odorata*, *Utricularia vulgaris*, and *Brassenia schreberi*.

Shrub Layer

Picea mariana - black spruce

Alnus rugosa - tag alder

Chamaedapne calyculata - leatherleaf

Ledum groenlandica - Labraodor tea

Kalmia polifolia - bog laurel

Herb and Low Woody Plant Layer

Platanthera clavellata -club-spur orchid (rare species)

Aerethusa bulbosa -dragon's head orchid (rare species)

Pogonia ophioglossoides -whorled pogonia orchid

Rhynchospora fusca -sooty beaked rush (rare species)

R. alba -white beaked rush

Carex paupercula - poor sedge

C. limosa - sedge

C. lasiocarpa -sedge

Iris versicolor - wild iris

Sarracenia purpurea -pitcher plant

Drosera rotundifolia - sundew

Utricularia cornuta - horned bladderwort

Menyanthes trifoliata - bog buckbean

Vaccinium oxycoccus - small cranberry

This is another peatland so you need to decide if it is a forested rich peatland, open rich peatland, or an acidic peatland (see pp. 20-21). The sparse and stunted tree canopy point to an open peatland. Species like *Sarracenia purpurea*, *Drosera rotundifolia*, *Menyanthes trifoliata*, *Rhynchospora alba*, *Carex lasiocarpa* and *C. limosa* indicate an open rich peatland as opposed to an acidic peatland. An abundance of *Nymphaea odorata*, *Utricularia vulgaris*, and *Brassenia schreberi* along the shore suggests the water is not too acidic at least along the edge of the vegetation mat where they grow. The orchids (*Platanthera clavellata*, *Aerethusa bulbosa*, and *Pogonia ophioglossoides*) all very plentiful here are also indicators of a rich peatland. Probably the best choice is Open Rich Peatland, Key NSU-D1 on page 32.

a: <i>Alnus rugosa</i>	-7 points
a': <i>Sarracenia purpurea</i>	4 points
<i>Menyanthes trifoliata</i>	1 point

$a = -7, a' = 5$, so $a + a' = -2$ which is < 0 , go to b

b: <i>Vaccinium oxycoccus</i>	-5 points
<i>Chamaedapne calyculata</i>	-3 points
<i>Alnus rugosa</i>	-2 points
b': <i>Utricularia cornuta</i>	8 points
<i>Carex lasiocarpa</i>	6 points

$b = -10, b' = 14$, so $b + b' = 4$ which is > -1 .

Conclusion: OPn92, Northern Rich Fen (Basin). This conclusion seems accurate.

Cowardin: Palustrine, Scrub-Shrub Wetland, Broad-leaved Evergreen

Circular 39: Type 8- Bog, Scrub-Shrub Wetland, Saturated, Fresh

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Bold face = photograph

Asterisk (*) = discussion/description

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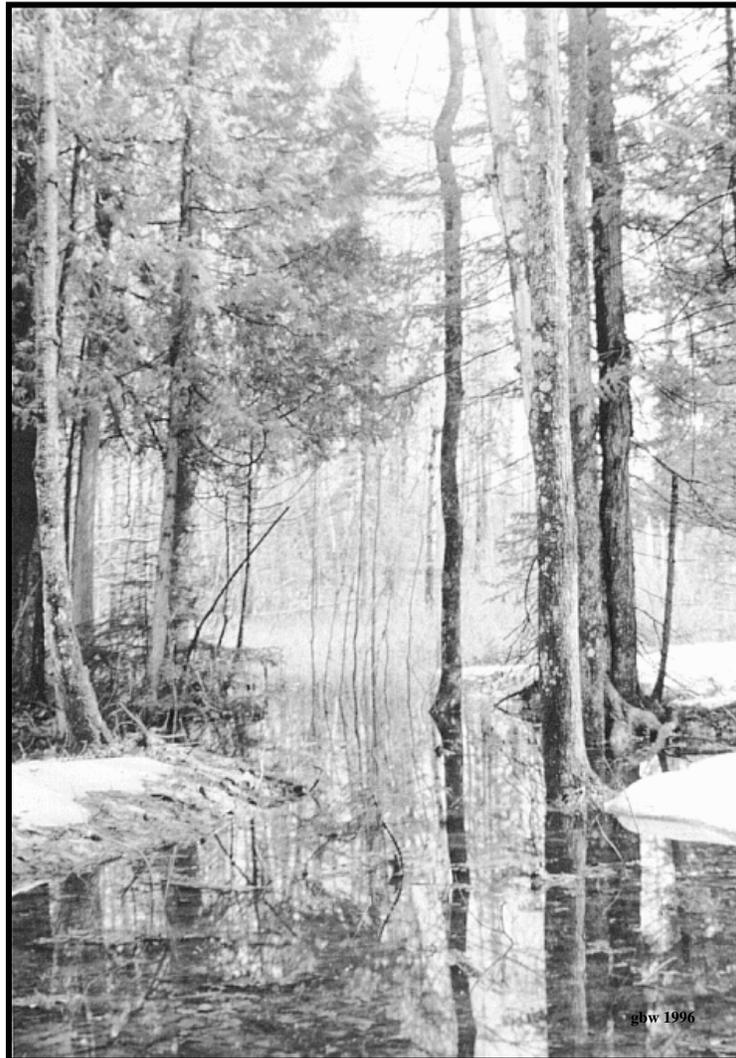
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January 20, 2006

Gary B. Walton

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All vascular plant species, native, introduced, and adventive found in the northeastern USA.
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Maps of plant species in Minnesota by county. Somewhat out of date for northern counties.
- 4) Scoggan, H. J. 1978. Flora of Canada, Parts 1-4. National Museums of Canada, Ottawa.

Good descriptions of many northern species that also occur in Minnesota.
- 5) Smith, Jr., J.P. 1977. Vascular Plant Families. Mad River Press. Eureka, CA

Glossary of terms, illustrations of plant parts and shapes, descriptions of families.
- 6) Voss, E. G. 1972. Michigan Flora Vol. 1-3. Cranbrook Institute of Science and University of Michigan Herbarium.

A well written set in three volumes of all known vascular seed plants found in Michigan. Many species overlap with Minnesota thus making these books extremely useful.