

BOTANY 401
VASCULAR FLORA OF WISCONSIN
http://botany.wisc.edu/courses/botany_401/
Spring 2016

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|--------------------|------|-----------------|----------------|--|--------------------------------------|
| Lecture: | T Th | 9:55-10:45 p.m. | Birge 346 | Kenneth J. Sytsma kjsytsma@wisc.edu | |
| Laboratory: | | | | | |
| | 301 | M W | 1:30-3:30 p.m. | Birge 243 | Jeff Rose jeffrey.rose@wisc.edu |
| | 302 | T Th | 1:30-3:30 p.m. | Birge 243 | Chloe Drummond cdrummond@wisc.edu |

Office Hours:

| | | |
|-------------------|-----------|---|
| Kenneth J. Sytsma | Birge 250 | 11-12 T Th or by appointment (262-4490) |
| Jeff Rose | Birge 258 | 11-12 T or by appointment (262-4422) |
| Chloe Drummond | Birge 256 | 12-1 W or by appointment (262-4422) |

Texts:

- Voss, E.G. & Reznicek, A.A. 2012. *Field Manual of Michigan Flora*. University of Michigan Press. Ann Arbor. ISBN 9780472118 [\$25 via University of Michigan Press online]
- Black, M.R. and E.J. Judziewicz. 2009. *Wildflowers of Wisconsin and the Great Lakes Region A Comprehensive Field Guide*. University of Wisconsin Press. Madison - just published guide specific to Wisconsin; nicely illustrated with descriptions, diagnostic features, and biogeographical distributions. ISBN 9780299230 [approximately \$25 on Amazon]

Optional: (copies are available in the lab; check them out to see if you want to purchase)

- Cobb, B., E. Farnsworth, and C. Lowe. 2005. *Ferns of Northeastern and Central North America. 2nd edition. [Peterson Field Guides]*. Houghton Mifflin, Boston, MA. – the best up-to-date guide to ferns and their relatives. ISBN 06183949600
- Harris, J. G. and M. W. Harris. 1994. *Plant Identification Terminology. An Illustrated Glossary*. Spring Lake Publ. Spring Lake, Utah. ISBN 0964022168
- Barnes, B.V. and W.H. Wagner, Jr. 2003. *Michigan Trees: A Guide to the Trees of the Great Lakes Region*. University of Michigan Press – one of the best books on trees (and some shrubs) of this area. ISBN 0472089218
- Petrides, G. A. 1986. *Peterson Field Guides: Trees and Shrubs*. Houghton Mifflin Co. - superb guide to all woody plants (trees, shrubs, vines) in NE and N Central USA and adjacent parts of Canada. ISBN 0395175798

Purchase a hand lens, forceps and dissecting kit for use in the lab — all are available at the University Bookstore.

Notes and handouts:

Powerpoint slides are available at the "Lecture" link. Color pdfs (1 slide per page) should be useful for viewing. Black and white pdfs (4 slides per page) can be printed out if wanted. Lecture outlines may be helpful in class. These are optional but can be downloaded as one pdf here for printing and 3 hole punching.

Lab handouts will be provided in each lab session.

Grading:

400 points possible

Class participation (20 points). You will be graded based on attendance in both lecture and lab! The nature of the course and the material covered necessitate keeping up with the topically linked lectures and labs. Talk to the instructor or TA in advance of missing class or need to attend a different section of lab.

1 written report (30 points) on a vascular species in Wisconsin considered Endangered, Threatened, or Special Concern due on **April 12**. See handout for more information.

2 lecture/lab examinations (180 points total, 90 points each) on **Feb 29-Mar 1** and **April 18-19**. The examinations will be during the laboratory session.

1 field final examination (90 points) during exam week (**May 8-14**). Scheduling to be done later.

Forest site plant collection and report (80 points) due during exam week (**May 8-14**). See later handout on forest plots for more information — but site should be chosen no later than Mar 16-17 before Spring Break.

Field Trip:

An optional half to full day field trip to a mesic hardwood forest and dry prairie in southern Wisconsin will be given on **Saturday, April 30**. We will see plants and communities that will have been discussed during class.

BOTANY 401 – VASCULAR FLORA OF WISCONSIN - 2016 LECTURE SCHEDULE

| Week | Date | Lecture Topic |
|---------------------|--------------|--|
| 1 | Tues, Jan 19 | Introduction, Wisconsin Flora and Vegetation |
| | Thur, Jan 21 | Nomenclature, Classification, Seed-free Vascular Plants I |
| 2 | Tues, Jan 26 | Seed-free Vascular Plants II, Gymnosperms |
| | Thur, Jan 28 | Flower and Fruit Morphology in Angiosperms |
| 3 | Tues, Feb 2 | Water Lilies and Buttercups |
| | Thur, Feb 4 | May Apples and Sycamores |
| 4 | Tues, Feb 9 | Spring Beauty and Sundews |
| | Thur, Feb 11 | Currants and Raspberries |
| 5 | Tues, Feb 16 | Elms, Mulberries, and Legumes |
| | Thur, Feb 18 | Violets, Aspens, and Gourds |
| 6 | Tues, Feb 23 | Wisconsin's Endangered Flora |
| | Thur, Feb 25 | Oaks, Birches, and Evening Primroses [No Lab Feb 24/25: Review Session] |
| 7 | Tues, Mar 1 | Mustards, Mallows, and Maples [Exam 1 in lab, Feb 29 / Mar 1] |
| | Thur, Mar 3 | Assembly of Great Lake Forests |
| 8 | Tues, Mar 8 | Blueberries and Gentians |
| | Thur, Mar 10 | Nightshades and Morning Glories |
| 9 | Tues, Mar 15 | Mints and Snapdragons |
| | Thur, Mar 17 | Honeysuckles and Carrots [Forest Site Location given to TA] |
| Spring Break | | |
| 10 | Tues, Mar 29 | Bellflowers and Asters |
| | Thur, Mar 31 | Arums, Lilies, and Orchids |

| Week | Date | Lecture Topic |
|------|---|--|
| 11 | Tues, Apr 5 Thur, Apr 7 | Spiderworts, Sedges, and Grasses Wisconsin's Invasive New Flora |
| 12 | Tues, Apr 12 Thur, Apr 14 | DNA Barcoding of our Flora Report due: Endangered Species [No Lab Apr 11/12: Review Session] NO LECTURE [No Lab Apr 13/14: Review Session] |
| 13 | Tues, Apr 19 Thur, Apr 21 | NO LECTURE Exam 2 in lab, Apr 18/19 NO LECTURE Local field trip in lab, Apr 20/21 |
| 14 | Tues, Apr 26 Thur, Apr 28 Sat, Apr 30 | Field Work – no lecture/lab Field Work – no lecture/lab Saturday field trip - optional |
| 15 | Tues, May 3 Thur, May 5 | Field Work – no lecture/lab Field Work – no lecture/lab |

May 8 -14 Final Exam in the Field (to be scheduled later)

BOTANY 401 – VASCULAR FLORA OF WISCONSIN - 2016 LAB SCHEDULE

| Week | Date | Lab Topic |
|---------------------|---------------------------------|---|
| 1 | MT, Jan 18/20 WR, Jan 20/21 | NO LAB 1. Vegetative Characters of Vascular Plants; Keying |
| 2 | MT, Jan 25/26 WR, Jan 27/28 | 2. Seed-free Vascular Plants 3. Gymnosperms |
| 3 | MT, Feb 1/2 WR, Feb 3/4 | 4. Flower and Fruit Morphology in Angiosperms 5. Water Lilies and Buttercups |
| 4 | MT, Feb 8/9 WR, Feb 10/11 | 6. May Apples and Sycamores 7. Spring Beauty and Sundews |
| 5 | MT, Feb 15/16 WR, Feb 17/18 | 8. Currants and Raspberries 9. Elms, Mulberries, and Legumes |
| 6 | MT, Feb 22/23 WR, Feb 24/25 | 10. Violets, Aspens, and Gourds Open Review Session in Lab |
| 7 | MT, Feb 29/Mar 1 WR, Mar 2/3 | Exam 1 in Lab (covering labs 1-10) 11. Oaks, Birches, and Evening Primroses |
| 8 | MT, Mar 7/8 WR, Mar 9/10 | 12. Mustards, Mallows, and Maples 13. Blueberries and Dogwoods |
| 9 | MT, Mar 14/15 WR, Mar 16/17 | 14. Gentians, Milkweeds, and Nightshades 15. Mints and Snapdragons [Forest Site Location given to TA] |
| Spring Break | | |
| 10 | MT, Mar 28/29 WR, Mar 30/31 | 16. Carrots and Honeysuckles 17. Bellflowers, Asters, and Goldenrods |

| Week | Date | Lab Topic |
|------|---|---|
| 11 | MT, Apr 4/5 WR, Apr 6/7 | 18. Arums, Lilies, and Orchids 19. Spiderworts, Sedges, and Grasses |
| 12 | MT, Apr 11/12 WR, Apr 13/14 | Open Review Session in Lab Open Review Session in Lab |
| 13 | MT, Apr 18/19 WR, Apr 20/21 | Exam 2 in Lab (covering labs 11-19) Local field trip in lab |
| 14 | MT, Apr 25/26 WR, Apr 27/28 Sat, Apr 30 | Field Work – no lecture/lab Field Work – no lecture/lab Saturday field trip - optional |
| 15 | MT, May 2/3 WR, May 4/5 | Field Work – no lecture/lab Field Work – no lecture/lab |

May 8-14 Final Exam in the Field (to be scheduled later)

VASCULAR FLORA OF WISCONSIN

Botany 401 — Spring 2016

FOREST STUDY SITE AND PLANT COLLECTION

Choose a forest site, as pristine as possible, for your study. To avoid problems, try to locate forest site up to 20 acres for which you can get permission (friend, relative, etc.) to enter and collect a representative plant for each (non-rare) species that have adequate population sizes. Dane County or surrounding counties would be preferred (see the instructor if your site is further away). Working in groups of up to about four is helpful for both finding a site (if you are not from around this area) and car-pooling. You will be required to recognize on site certain plant species that grow in your approximately 20-acre study site. This means that you should be able to provide the scientific name, the family name, and a common name for the plants. Species that you should know include all angiosperms that come into flower before the final exam, all trees and shrubs whether they flower or not, and the ferns, lycopods, and horsetails that are producing spores. You can work singly or in small groups – then hand in one plant collection, but you will be asked to document the effort you put into the collection. **The deadline for picking a site (and letting your lab instructor know) is March 16 or 17 – sooner the better as some trees and herbs may already be flowering.**

This collection of dried, pressed, identified, and fully labeled plant specimens is due at the end of the semester and is required to pass the course. Your lab instructor will grade the collection on the basis of (1) completeness of sampling for species in your site, (2) correctness of identification, (3) proper preparation of material (presence of flowers, fruits, or other reproductive parts; representative leaves, stems, and roots if possible; pressing; and drying); (4) adequate labeling; and (5) mounting of 1 or more specimens (check with TA on what specimens and how many should be mounted; previously collected specimens but unmounted by former students may be substituted for mounting as necessary).

GUIDE TO PLANT COLLECTING

Do not collect in city, county, or state parks and other designated natural areas. Do not collect in the University of Wisconsin Arboretum. Collecting in these places require special permits, without which fines can be issued. Practice plant conservation in your collecting! Do not dig up entire plants, especially if you are unsure of whether the species is rare, endangered, or threatened. Become acquainted with the DNR publication (available in lab) that lists these plant species. Be careful of plants in certain communities under current stewardship or study (most prairies, including roadside remnants).

Collecting the Plants

1. Plants should be collected in flower or fruit (or other reproductive parts for non-flowering plants). Specimens without these reproductive organs are termed "sterile", and are not usually worth collecting.
2. For small herbs, the entire plant should be collected, including the underground parts. For large herbs, a portion of the underground parts, a part of the stem with attached leaves, plus the inflorescence can make up the sample.
3. For woody plants, branches or twigs bearing leaves and flowers (or fruits or cones) are sampled. Leaves should be padded with extra paper so that the large twigs do not cause the leaves to curl while drying due to air-pockets in the press.

4. Collections should be plentiful enough to nearly fill a folded newspaper sheet (except for small plants that are rare at the place where they were collected; in such cases this should be explained on your label). The leaves and other plant organs should be spread out, before drying, to form a single layer as much as possible.

Constructing the Plant Press

1. The plant press is constructed out of 2 sheets of plywood (12 X 18 inches) as backing, layers of corrugated cardboard (corrugations run cross-wise not lengthwise), and one or two layers of blotters between cardboard. The press is kept tightly closed by two straps or ropes.
2. The plants are pressed within folded newspapers that are individually placed between two blotters or between a blotter and cardboard if only one layer of blotters is used. The newspaper must be small enough to fit within the plywood backing and cardboard layers. Ideally, use a single bi-folded section of the *Daily Cardinal* as it is perfectly sized for the plant press. Pressing plants within these dimensions will insure that the dried plants can be later mounted on the standard herbarium sheets.
3. Presses will be supplied to each student and must be returned to the lab instructor when the collection is handed in.

Pressing Procedures

1. Plants can be collected in the field, trimmed to the appropriate size, immediately pressed in newspaper, placed between the two rigid ends of a plant press, and securely tightened. This "field press" can simply consist of the end boards and pre-cut newspaper sheet. Later the sheets can be placed within blotters and properly dried. Alternatively, the plants can be placed in bags and pressed later. Some plants will quickly drop their petals or wilt so care must be taken that these plants are pressed soon.
2. Roots should be cleaned and free of excess dirt before they are put into the press.
3. Unwanted parts, dead leaves, extra roots or leaves, etc., should be trimmed off before pressing.
4. Plant parts should be arranged so there is as little overlap as possible; stems should be bent sharply and neatly to fit in the paper, not curved or twisted.
5. Plants should not be layered or massed together within the newspaper. If the plant is too large to place in a single fold of newspaper, the plant may be divided into 2 or more sections, each pressed separately and indicated with the collection number and the phrase "1 of 2" or "2 of 2", etc.
6. A **field notebook** should be kept, in which all collections are numbered and all locality data and other notes are written down. Your name and the collection number for each plant should be written, as well, on the front edge of the newspaper sheet in which it is pressed.

Drying Procedures

It is important that the specimens be thoroughly dried by placing the plant press over a heat source: heater vent, fan-driven space heater, radiator, light bulbs, etc. Driers are provided in the lab. Succulent or wet specimens should have the blotters changed as needed to prevent molding. Press straps should be tightened from time to time during the drying process, to keep specimens from wrinkling.

Labels

Notes should be taken in a field notebook at the time the collection is made (not done from memory, days later at home). Each plant specimen (that is, a particular species collected at a given time and place) is given a separate number in the book. This field information is later

transferred to labels that are handed in with the specimens. **Labels must be produced using the available template labels on the lab computers and printed off.**

Locality: Designate this by county and site, accurately enough so that someone else could find the exact place later. This can be expressed by mileage along a highway, distance from a town or from some geographical feature like a hill or lake. **Lat/Long using GPS or Google Earth are mandatory.** Township, range, and section are optional (townships maps for Wisconsin are available in lab).

Habitat: Designate this in general terms, describing the nature of the site where the plant grew. Examples are: roadside banks, open pasture, boggy meadow, shrubby thicket, shaded woods, rock slide, river bank, cliff, sand dune, etc. Important factors in plant distribution are the amount of light at the site, available moisture, nature of the soil, density of other plant growth, steepness of slope, etc.

Species name: The correct name (**according to University of Michigan Herbarium website**) should include the genus, specific epithet, and authority. The family name should be included on the top. Thus, identification of the species can use Gleason & Cronquist, Spring Flora, Michigan Flora, Peterson Guides, etc., but final name of the species must be checked with the Michigan flora online (it will list all other names or synonyms along with the accepted name).

Other necessary data: Designate the form of the plant (herb, shrub, tree, height, etc.) if this cannot be determined from the specimen. Give the original flower color. Optional information includes the names of other species growing with the one collected, the soil type, the plant community, abundance of the species. The date of the collection, your name, and collection number are mandatory.

Example of a typical label:

ONAGRACEAE
Oenothera clelandii Wagner

WISCONSIN, Iowa Co. Dry prairie along RR track, N
of Helena, 3/4 mi. N on Hwy C from Hwy 14.
43°10'23.99"N 90° 1'17.05"W
T8N, R4E, N 1/4 Sec 16

Scattered individuals, to 1 m high, corolla yellow.
Growing with *Froelichia floridana*, *Desmodium* sp.

21 Sept 1985

Sytsma 5013

Collection report

A report must accompany your plant collection. This should include a description of the site (geographical location, vegetation type, disturbance) and a list of species (with family and common name) in the collection. Other species noted but not collected (not in flower, large trees) should be included in the description.

Handing in the plant collection (during exam week)

Each specimen is kept in its original pressing paper (or put into a clean new paper), the finished label is inserted loose along with the specimen and the collection ordered alphabetically by family. You must mount at least 3 specimens (from your collection or from a set made available by your instructor) – more information will be provided by your lab instructor. On the outside of the bundle, under the string, place your report. Never put tape or glue on your specimens or newspapers. Also, you must return your press.

Desirable tools and equipment for collecting plants

Hand-lens or pocket magnifier; about 10X

Small pocket knife and/or pruning shears

Trowel or hand-pick (for digging up underground parts)

Large plastic freezer or garbage bags

Field notebook and pencils

Plant press, including newspapers and corrugated cardboard

Field manuals for plant identification

Plant Collection Checklist

_____ Collection Report: including a description of the site (geographical location, vegetation type, disturbance), and other species noted but not collected (not in flower, large trees).

_____ Cover sheet: a list of all plants in collection, including families and collection numbers.

_____ Folder containing all specimens

_____ Mounted specimens: three plants must be mounted per student. So if your group has four people, there should be 12 mounted specimens on top inside the folder **.

_____ Clearly numbered newspapers containing the remaining, unmounted specimens. Inside each newspaper should be one loose specimen and its accompanying label.

Notes about labels: each and every specimen, mounted or not, **MUST** have a completely filled-out label. For mounted specimens, these will be glued to the lower right-hand corner of the herbarium sheet. For unmounted specimens, the labels should be placed loose inside each folded newspaper.

** When filling out labels, the names of all members of your group should be included where it asks for collector name. **ON THE MOUNTED SPECIMENS ONLY:** the individual responsible for that particular mounted plant should have their name **first**. You will be graded individually on the quality of your mounted specimens, and we will only know which specimens are yours if your name is first on the label. Name order doesn't matter for the unmounted specimens.

Conservation of Wisconsin's Rare Plants ***Vascular Flora of Wisconsin***

Description: You will write a short report on one selected vascular plant (species or subspecies) that is considered Endangered, Threatened, or Special Concern in Wisconsin. The complete list can be found on the WI DNR website:

<http://dnr.wi.gov/topic/endangeredresources/etlist.html>

A sign up sheet for each plant species will be available in the Lab.

Objectives: 1) Become familiar with the issues of conservation of rare plant species in Wisconsin. 2) Gain expertise on one rare plant species in the Wisconsin flora. 3) Integrate concepts from a diverse set of areas: systematics, biogeography, conservation, and ecology. 4) Improve written communication and presentation of scientific research and ideas.

You will be required to research and report on the following topics, and any others that you feel are necessary:

- Basic biology (e.g., growth form, flowering times, pollination biology, other life history features) and ecology (e.g., habitat, soil type, moisture regime, mycorrhizal associations) of the plant (*photo images may be attached to report – please cite source of images*)
- Distribution within Wisconsin and elsewhere in North America or the world (*maps may be attached to report – please cite sources of maps*)
- Taxonomic issues (if any) with the species or subspecies.
- Global and state ranks? What do these ranks mean? Articulate the differences between the terms: *endangered*, *threatened*, and of *special concern*.
- Reason(s) plant is rare in Wisconsin. Is it rare in other states/provinces?
- What is being done to protect populations of this species in Wisconsin? In other states?
- What additional measures, in your opinion, should be implemented to protect this species? Why? Be specific.
- Other topics as applicable for your plant species.

Specifics:

This report should be minimally 3 pages in length (double-spaced, 12 pt Times New Roman font, 1" margins). References should be included and cited in the text. The list of references, any photo images, or maps is not included in the 3 page minimum requirement. Your grade will reflect the completeness of your report, depth of thought in addressing the above questions, thoroughness of literature research, and the overall quality of writing and presentation of your report.

Report should be printed out and handed in by **Tuesday, April 12**; please also email the Word formatted file to your lab instructor (not pdf).

The report is worth 30 pts (out of total 400 pts for course).