

## UWSP Biology 342/542: Vascular Plant Taxonomy

Instructor: Dr. Stephanie Lyon ("Stephanie")

Email: slyon@uwsp.edu

Office: CBB 212, Cell (no office phone!): 608-358-0401

Office hours: Mon 2:00 – 3:00 PM, Wed 10:00-10:50 AM or by appointment (email me!)

### Course Description:

A survey of major groups of vascular plants with emphasis on identification, classification, and evolutionary trends. Lab emphasizes representative families and genera of vascular plants in Wisconsin, the use of keys and manuals, and the production of a plant collection. **Schedule:** M/W 1:00-1:50 (CBB 101), T/TH (CBB 276): Sec1: 10:00-11:50, Sec2: 1:00-2:50, Sec 3: 3:00-4:50. **Prerequisites:** Biology 101, 111, or 130

### Learning Outcomes:

- Recognize c. 100 families and 120 genera of Wisconsin vascular plants on sight (see list below).
- Correctly interpret and utilize descriptive botanical terminology.
- Demonstrate utility with taxonomic keys and proper techniques for collecting vascular plant specimens.
- Understand and apply basic principles and rules of botanical nomenclature (naming) and classification (organizing).
- Understand how to construct and interpret phylogenetic trees and explain how phylogeny informs modern botanical classification.
- Describe the taxonomically and evolutionary important *characteristics* of major groups of vascular plants, as well as the evolutionary *relationships* among these groups.

### Required Texts:

- Voss, E.G. and A.A. Reznicek. 2012. ***Field Manual of Michigan Flora***. University of Michigan Press. **Bring this to lab for keying exercises**, starting after first exam. (Alternatively you can store in lab—but PLEASE use masking tape to label your book).
- Simpson, M.G. 2010. ***Plant Systematics***. 2nd edition. Elsevier-Academic Press.
- A few additional required readings will be posted on Canvas throughout the semester.

### Other supplies:

- **A lab notebook** with at least partially **unlined pages**, at least 6" x 9". A suitable option can be purchased from the instructor for \$3.
- **Dissecting kit** (available at Bio/Chem stockroom) and **plant press** (available from Herbarium/instructor). I also strongly recommend storing your dissecting kit in lab.
- A hand lens, 10-15X, is useful but not required. Various options can be purchased online.

**Recommended Texts** (copies also available in lab):

- Black, M. and E. J. Judziewicz. 2009. *Wildflowers of Wisconsin and the Great Lakes Region: A Comprehensive Field Guide*. 2nd edition. Univ. of Wisc. Press.
- Harris, J. G. and M. W. Harris. 1994. *Plant Identification Terminology. An Illustrated Glossary*. Spring Lake Publ., Utah.

**Other useful references:**

- UW-Green Bay websites, by Gary Fewless:
  - [Trees of Wisconsin](#)
  - [Shrubs of Wisconsin](#)
  - [Ferns and Lycophytes of Wisconsin](#)
- Gleason, H.A. and A. Cronquist. 1992. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada, Second Edition*. Also the *Illustrated Companion to Gleason & Cronquist's Manual*, N. Holmgren, P.K. Holmgren, H.A. Gleason. 1998. Both published by New York Botanical Garden.
- Smith, W. 2009. *Trees and Shrubs of Minnesota*. University of Minnesota Press.
- Judziewicz, E.J., R.W. Freckmann, L.G. Clark & M.R. Black. 2014. *Field Guide to Wisconsin Grasses*. Univ. of Wisconsin Press.
- Hipp, A. 2008. *Field Guide to Wisconsin Sedges*. Univ. of Wisconsin Press.
- Skawinski, P.M. 2010. *Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Submerged and Floating-Leaf Aquatic Plants*. Available from the author: [Lakeplants@yahoo.com](mailto:Lakeplants@yahoo.com)
- [Online Virtual Flora of Wisconsin](#)
- [Minnesota Wildflowers](#) (great source for images and information on local species of flowering plants)
- [Angiosperm Phylogeny Website](#)

**Grading scale:**

93% and above = A	73-77% = C
90-92% = A-	70-72% = C-
88-89% = B+	68-69% = D+
83-87% = B	60-67% = D
80-82% = B-	below 59.5% = F
78-79% = C+	

**Grade components (~800 points total):**

4 lecture exams, each 50 points	25%
4 lab practical exams, each 50 points	25%
Plant collection OR iNaturalist project, 150 points	18.75%
Keying quizzes, each 10 points	12.5%
Lab notebook, total 100 points	12.5%
Weekly review quizzes, each 5 points	6.25%

### Exams:

Lecture exams and lab exams will be held on the same day, in our lab room. The exam period will begin with a 50-minute lecture exam (mostly multiple choice/true-false/matching, usually with a page of long-answer questions focused on the supplemental readings assigned in that section), followed by a 1-hour lab practical consisting of multiple stations set up throughout the room. On the lecture portion ONLY, you may use a hand-written 3 x 5 in (double-sided) index card with notes. About over half of the lab practical points will come from correct identification of specimens to **genus** and **family**, but other questions may include names of important structural features (*e.g.* stipules, flower parts, inflorescence type, fruit type, leaf arrangement, *etc.*) or important details of ecology (*e.g.* habitat, nutritional mode, pollinators).

### Course project (Pick ONE):

#### **Plant collection:**

A collection of **ten pressed plant specimens** (each worth 15 points) is required for this course. Each specimen must represent a distinct species of vascular plant. All specimens must be wild-collected (***not planted or cultivated***), and correctly identified **to species**. For specimens collected in Wisconsin, please consult the WisFlora site for the most up-to-date name and classification.

To receive full credit, specimens must be appropriately collected (*e.g.*, they ***must include reproductive structures***), properly pressed and dried, and include correctly formatted, accurate, and complete **collection labels** printed on special archival paper (assistance will be provided when you are ready to print). You may also hand in **up to 5 extra credit specimens** (from any family), worth 5 points each. Collections are to be **submitted in newspaper sheets** (you will NOT mount your own specimens) inside a folder with your name on it, together with an evaluation sheet, by the final day of classes. There will be a **designated box** in our lab room.

**NOTE:** I strongly recommend collecting MORE than 10-15 specimens. Most likely, at least some of your collections will be inappropriate for some reason or another (especially when you are just learning to press plants), or frustratingly difficult to identify. If you collect a few extra specimens, you will have the flexibility to choose which specimens you turn in for credit.

#### **iNaturalist collection:**

A set of 40 research-grade iNaturalist observations (photos with date, time, locality, and a community-verified identification to species) of wild, vascular plants. You will be required to submit a spreadsheet containing links to the observation records as well as descriptions (using botanical terminology) of the specimens photographed. A given species may be observed more than once, but it must be from a distinct locality. More information about this option will be provided soon.

### Keying quizzes:

Beginning after the first exam, there will be weekly keying exercises (“quizzes”). These quizzes will take place in the last 45 or so minutes of our scheduled lab time and will typically consist of both an individual component and a group component. You will need *at least* 1-2 copies of

the *Michigan Flora* per lab group. There may also be other resources available to you in the classroom, but I ask that you restrict your discussions to your assigned lab group.

### Lab notebook (now includes "group exercises"):

Nearly every lab period, I will have specimens for you to examine, dissect and draw. Generally these will be a mixture of pressed specimens, living specimens flagged in the Tropical Conservatory, and fresh and/or preserved material for dissection. The best way for you to really understand the course material is to **actually handle specimens**, dissect them **under the microscope**, describe them, draw and label them, and compare them with similar-looking specimens. You do not have to be an artist to succeed in this class, but I do expect to see **labeled drawings**, floral formulas (when applicable), and other notes in your notebook—I'll give you specific recommendations at the beginning of the lab. The lab notebook is intended to be a tool FOR YOU—so don't hesitate to write down any additional information you find helpful. **Note change from original:** The "group exercises" point component has been reallocated here! Instead of turning in group copies for the couple exercises we will do in lab this semester, I will be asking people to copy their final versions of maps, dichotomous keys, etc. into their notebooks.

### Canvas quizzes:

We will cover *a lot* of material in this class. To encourage regular review, you will be assigned **weekly Canvas review quizzes**. These quizzes should be taken on your own time, ideally during the week to which they apply. Each quiz will consist of 5 questions, on key terms, concepts, characters, and taxa relevant to the current/previous week's material. All quizzes relevant to a particular exam must be completed **before midnight prior to the exam day**. The first one of these quizzes will be a syllabus quiz.

### General expectations and study hints:

Vascular plant taxonomy is a challenging course. Much of the vocabulary will be new to you, and all of the scientific names and technical terms can feel overwhelming even to professional botanists. You will need to put in significant effort, both inside and outside of class, to keep up with the material.

To prepare and review, I highly recommend doing the relevant readings in the (online) **lab manual** and your **textbook**. The optional texts may also be very helpful to you. I strongly encourage people to **study in groups** (when gathering is appropriate, depending on the status of the pandemic), to share whatever study tools you have developed (**flashcards, etc.**), and to drill yourself using the **study specimens** in the hall. Study guides, Quizlet flashcards, and other supplement review materials will be made available to you in prior to each exam.

### Accommodations and Absences:

If you are eligible for accommodations (*i.e.* through Disability Services), please contact me outside of class ASAP.

If you need to miss a lecture, please make sure you review the posted slides on Canvas and take notes on that day's material, but you do not need to contact me. **If you need to miss a lab, please let me know via email.** There are graded activities (group exercises, lab notebook

entries, keying quizzes) associated with nearly every lab session. For lab notebook entries, you can work from online content if necessary--though real material is SO much better—but keying quizzes are more difficult to make up. Note that I automatically drop the lowest keying quiz score for everyone, so you have one “skip” built in already.

**Extra credit:**

Watch for opportunities throughout the semester!

## **PLANTS TO LEARN**

Learn to recognize the following genera and families for sight recognition (without books or notes) on the lab practical exams. Because **these materials will not be the same specimens or photographs used in the study sets**, you should learn to recognize these taxa by their main taxonomic features (floral formulas, fruit type, leaf shape and arrangement, *etc.*). Families in bold need to be recognized at the family level *ONLY*. For all other families, be able to identify the **family in general as well as the specific genera listed**. Specimens of each family and genus on this list will be on demonstration during labs, and a study set of specimens will be available for review in the hall outside of our lab room. Our teaching lab is accessible whenever the building unlocked, typically weekdays from 6:00 a.m. until 10:00 p.m and Saturday 10 a.m. to 6 p.m.

### **EXAM 1:**

Lycopodiaceae: *Diphasiastrum*, *Huperzia*, *Dendrolycopodium*

Selaginellaceae: *Selaginella*

Isoetaceae: *Isoetes*

Ophioglossaceae: *Botrychium s.l.*

Equisetaceae: *Equisetum*

Osmundaceae: *Osmunda s.l.*

Dryopteridaceae s.s.: *Dryopteris*

Athyriaceae: *Athyrium*

Onocleaceae: *Onoclea*

Pteridaceae: *Adiantum*

Polypodiaceae: *Polypodium*

Pinaceae: *Picea*, *Pinus*, *Tsuga*, *Abies*, *Larix*

Taxaceae: *Taxus*

Cupressaceae: *Juniperus*, *Thuja*

Ginkgoaceae: *Ginkgo*

(Note: "s.l."=*sensu lato* or "in the broad sense", used when there are conflicting opinions on the scope of what a genus should include. Many botanists now sub-divide *Botrychium* and *Osmunda* into several different genera, but I wanted to avoid adding to your list of genera to know for this first exam!)

### **EXAM 2:**

Nymphaeaceae: *Nuphar*, *Nymphaea*

**Magnoliaceae**

**Annonaceae**

**Lauraceae**

**Piperaceae**

Aristolochiaceae: *Asarum*

Alismataceae: *Sagittaria*

Araceae: *Arisaema*, *Lemna*, *Symplocarpus*

**Hydrocharitaceae**

**Potamogetonaceae**

Liliaceae: *Erythronium*  
Melianthaceae: *Trillium*  
Smilacaceae: *Smilax*  
Asparagaceae: *Maianthemum*, *Polygonatum*  
Iridaceae: *Iris*, *Sisyrinchium*  
Orchidaceae: *Cypripedium*

### **Arecaceae**

Commelinaceae: *Tradescantia*  
Cyperaceae: *Carex*  
Poaceae: *Andropogon*, *Phragmites*  
Juncaceae: *Juncus*  
Typhaceae: *Typha*

### **Bromeliaceae**

### **EXAM 3:**

Berberidaceae: *Berberis*, *Podophyllum*  
Papaveraceae: *Dicentra*, *Sanguinaria*  
Ranunculaceae: *Aquilegia*, *Caltha*, *Ranunculus*  
Grossulariaceae: *Ribes*  
Hamamelidaceae: *Hamamelis*  
Saxifragaceae: *Mitella*  
Vitaceae: *Vitis*  
Fabaceae: *Lupinus*, *Robinia*  
Polygalaceae: *Polygala*  
Rosaceae: *Potentilla*, *Prunus*, *Rosa*  
Rhamnaceae: *Rhamnus*, *Frangula*  
Ulmaceae: *Ulmus*  
Cannabaceae: *Celtis*  
Urticaceae: *Urtica*

### **Moraceae**

Cucurbitaceae: *Echinocystis*  
Betulaceae: *Betula*, *Carpinus*, *Ostrya*  
Juglandaceae: *Juglans*  
Myricaceae: *Comptonia*  
Fagaceae: *Fagus*  
Euphorbiaceae: *Euphorbia*  
Salicaceae: *Salix*  
Violaceae: *Viola*  
Oxalidaceae: *Oxalis*  
Onagraceae: *Oenothera*  
Lythraceae: *Lythrum*  
Geraniaceae: *Geranium*  
Anacardiaceae: *Rhus*, *Toxicodendron*

### **Rutaceae**

Sapindaceae: *Acer*

Brassicaceae: *Berteroa*

Malvaceae: *Tilia, Malva*

**EXAM 4:**

Droseraceae: *Drosera*

Polygonaceae: *Persicaria*

Amaranthaceae: *Amaranthus, Chenopodium*

Caryophyllaceae: *Silene*

Montiaceae: *Claytonia*

Cactaceae: *Opuntia*

Cornaceae: *Cornus*

Ericaceae: *Chamaedaphne, Vaccinium*

Primulaceae: *Lysimachia*

Polemoniaceae: *Phlox*

Gentianaceae: *Gentiana*

Rubiaceae: *Galium, Mitchella*

Apocynaceae: *Asclepias*

Solanaceae: *Physalis, Solanum*

**Convolvulaceae**

**Boraginaceae**

Oleaceae: *Fraxinus*

Lamiaceae: *Lycopus, Monarda*

Plantaginaceae: *Chelone, Linaria, Plantago*

Verbenaceae: *Verbena*

**Orobanchaceae**

Lentibulariaceae: *Utricularia*

Aquifoliaceae: *Ilex*

Campanulaceae: *Campanula, Lobelia*

Asteraceae: *Ambrosia, Centaurea, Cirsium, Solidago*

Apiaceae: *Daucus, Osmorrhiza*

Araliaceae: *Aralia, Panax*

Caprifoliaceae: *Lonicera*

Adoxaceae: *Sambucus, Viburnum*

		Lecture (M/W)	Lab (Tu/Th)	Simpson (2 ed.) pgs
"week" 1	Sep 2	No lecture	Plant collections & herbaria	
week 2	Sep 7	No lecture (Labor day)	Schmeekle, iNaturalist & Wisconsin's Big 15	
	Sep 8/9	Taxonomy: Naming	Tree thinking exercise	Ch. 1: 17-18
week 3	Sep 13/14	Taxonomy: Classifying	Dichotomous keys & Veg. morphology	Ch. 16
	Sep 15/16	Vascular plant evolution & characteristics	<b>On your own:</b> Veg. morphology in the conservatory	Ch. 3: 55-62, 15
week 4	Sep 20/21	Lycophytes & Ferns	Lycophytes & Ferns I	Ch. 4: 73-81
	Sep 22/23	Seed plant evolution & characteristics, Gymnosperms	Ferns II, Practice using keys	Ch. 4: 82-122
week 5	Sep 27/28	Gymnosperms II	Gymnosperms I & II	Ch. 5
	Sep 29/30	Review	<b>EXAM 1</b>	
week 6	Oct 4/5	Angiosperm evolution & characteristics	Flowers, fruits & inflorescences	Ch. 6
	Oct 6/7	ANA grade & Magnoliids	ANA & Magnoliids	Ch. 7: 182-200
week 7	Oct 11/12	Monocots I: Acorus & Alismatales	Monocots I	Ch. 7: 200-10
	Oct 13/14	Monocots II: "Lilliod" monocots	Monocots II	Ch. 7: 211-29
week 8	Oct 18/19	Monocots III: Orchids & Commelinids 1	Monocots III	Ch. 7: 230-49
	Oct 20/21	Monocots IV: Poales	Monocots IV	Ch. 7: 249-64
week 9	Oct 25/26	Review	<b>EXAM 2</b>	
	Oct 27/28	Intro to Eudicots; Ranunculales, Saxifragales	Ranunculales & Saxifragales	Ch. 8: 275-93
week 10	Nov 1/2	Rosids I: Vitales, Fabales, Rosales	Rosids I	Ch. 8: 331-9
	Nov 3/4	Rosids II: Fagales, Cucurbitales, COM clade	Rosids II	Ch. 8: 339-47
week 11	Nov 8/9	Rosids III: Geraniales, Myrtales & Sapindales	Rosids III	Ch. 8: 347-57
	Nov 10/11	Rosids IV: Malvales & Brassicales	Rosids IV	Ch. 8: 357-71
week 12	Nov 15/16	Review	<b>EXAM 3</b>	
	Nov 17/18	Caryophyllales	Caryophyllales	Ch. 8: 295-312
week 13	Nov 22/23	Asterids I: Cornales & Ericales	Asterids I	Ch. 8: 374-388
	Nov 24/25	No lecture	No Lab (Thanksgiving)	
week 14	Nov 29/30	Asterids II: Gentianales, Solanales	Asterids II	Ch. 8: 412-416
	Dec 1/2	Asterids III: Boraginales, Lamiales	Asterids III	Ch. 8: 389-94, 400-12
	<b>Friday, Dec 3: Lab notebooks due (returned following week in lab)</b>			
week 15	Dec 6/7	Asterids IV: Aquifoliales & Asterales	Asterids IV	Ch. 8:426-35
	Dec 8/9	Asterids V: Dipsacales & Apiales	Asterids V	Ch. 8:417-26
	<b>Friday, Dec 10: Final projects due (Labeled, pressed collection or iNaturalist spreadsheet)</b>			

**Tuesday, Dec 14: Final exam 12:30-2:30**