

UWSP Biology 342/542: Vascular Plant Taxonomy

Instructor: Dr. Stephanie Lyon

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Office hours: M 10-11 AM, TH 12-1 PM

Course Description:

A survey of major groups of vascular plants with emphasis on identification, classification, and evolution. Lab emphasizes representative families and genera of flowering plants in Wisconsin, the use of keys and manuals, and the production of a plant collection. **Schedule:** M/W 9:00-9:50 (TNR 120), T/TH (TNR 300): Sec1 8:00-9:50, Sec 2: 10:00-11:50, Sec3: 1:00-2:50. **Prerequisites:** Either Biology 101 *or* Biology 130. **Lecture slides, handouts, grades, and other materials will be posted on D2L.**

Learning Outcomes:

- Recognize c. 80 families and 100 genera of Wisconsin vascular plants on sight (see list).
- Demonstrate utility with taxonomic keys.
- Correctly interpret and utilize descriptive botanical terminology.
- Demonstrate techniques for collecting, documenting, processing, and identifying vascular plant specimens.
- Understand how to read and interpret phylogenetic trees.
- Understand the basic principles and rules of botanical nomenclature and classification.
- Understand the role of phylogenetic systematics in classification, and basic methods in phylogenetics.
- Understand relationships among the major groups of vascular plants, and key events in their evolution.
- Explain several of the major forces driving vascular plant diversification.

Required Texts:

- Course packet (**soon to be available** at Campus Bookstore—**handouts will be provided until then!**)
- Simpson, M.G. 2010. *Plant Systematics*. 2nd edition. Elsevier-Academic Press.
- Voss, E.G. and A.A. Reznicek. 2012. *Field Manual of Michigan Flora*. University of Michigan Press

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 supplies:

- **Lab notebook** for drawings and observations (will check towards end of semester, ~ 5% of grade)
- **Dissecting kit** and **plant press**, to be checked out from the Biology stockroom, TNR 193C
- A hand lens, 10-15X, is useful but not required. Available for sale at the Museum of Natural History (LRC)

Other useful references:

- UW-Green Bay websites, by Gary Fewless:
 - Trees of Wisconsin: http://www.uwgb.edu/biodiversity/herbarium/trees/tree_intro01.htm
 - Shrubs of Wisconsin: http://www.uwgb.edu/biodiversity/herbarium/shrubs/Shrub_intro01.htm

- Ferns and Lycophytes of Wisconsin: http://www.uwgb.edu/biodiversity/herbarium/pteridophytes/pteridophytes_of_wisconsin01.htm
- 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
- Online Virtual Flora of Wisconsin: <http://wisflora.herbarium.wisc.edu/>
- Angiosperm Phylogeny Website: <http://www.mobot.org/mobot/research/APweb>
- USDA Plants Database: <http://plants.usda.gov/>

Grading scale:

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

Grade components (1000 points total):

3 lecture exams, each 100 points	30%
3 lab practicals, each 100 points	30%
Plant collection, 150 points	15%
Weekly keying quizzes, each 10 points	12%
5 lab group projects, each 10-20 points	8%
Lab notebook	5%

Plant collection:

10 plants, native or naturalized (check WisFlora site for up-to-date scientific names). You may hand in up to 5 additional specimens for extra credit. Appropriately collected, pressed and dried, with collection labels, to be submitted in newspaper sheets inside a folder with your name on it. Plant collections submitted prior to Thanksgiving break will receive extra credit—I will also provide moderate assistance with identification during scheduled office hours up until Thanksgiving.

Accommodations and Absences:

If you are eligible for special accommodations (*i.e.* through Disability Services), please contact me outside of class ASAP. Attendance in lab is mandatory. If you know ahead of time that you will miss lab because of a religious observance or a schedule UWSP athletic event, please let me know ASAP. I will only excuse other absences for illness or serious family emergencies, and will require documentation.

Electronic device policy:

Mobile phones are not be used in my class—turn them on silent, and put them away. Studies have shown that taking notes by hand (*i.e.* pen and paper) improves information processing and retention—but if you feel you require a laptop in lecture, please see me for approval. Laptop computers and tablets are not to be used in lab, except with my permission.

Week	Lecture	Lab	Readings
1: 9/05-9/08		Intro to field and herbarium methods	Ch.1
	Intro & Nomenclature	Common families—meet at Schmeekle	Ch.16
2: 9/12-9/15	Phylogenetic systematics	Vegetative morphology; EX1: Cladogram	Ch.2:17-22,24-9
	Evolution of vascular plants	Lycophytes & Ferns I	Ch.3:55-62;4:73-81
3: 9/19-9/22	Diversity of ferns & lycophytes	Ferns II	Ch.4:82-122
	Evolution of seed plants	Using keys; EX2: Key construction	Ch.15
4: 9/26-9/29	Conifers I: Taxaceae, Pinaceae	Conifers	Ch.5
	Conifers II: Cupressaceae; <i>Topic: Historical Biogeography</i>	Lab practical I	Mao <i>et al.</i> 2012
5: 10/03-10/06	Evolution of Angiosperms	Floral morphology & inflorescences	Ch.6
	Lecture Exam 1	Fruit & seed morphology	Ch.9
6: 10/10-10/13	ANITA grade & Magnoliids	ANITA & Magnoliids	Ch.7:182-200
	Monocots I: Alismatids	EX3: Pollination biology—meet at Greenhouse	Ch.7:200-232
7: 10/17-10/20	Monocots II: “Lillioids”; <i>Topic: Pollinators & Speciation</i>	Monocots I	Breitkopf <i>et al.</i> 2015
	Monocots III: Commelinoids 1	Monocots II	Ch.7:232-249
8: 10/24-10/27	Monocots III: Commelinoids 2	Monocots III: Poales	Ch.7:249-264
	Ranunculids; Proteales	Ranunculids	Ch.8:275-286
9: 10/31-11/03	Saxifragales; Rosids I: Vitales, Rosales	Rosids I	Ch.8:286-93; 331-9
	Rosids II: Fagales, Fabales, Curcubitales	Rosids II, EX4: Species delimitation	Ch.8:312-31; 339-47
10: 11/07-11/10	Rosids III; Malpighiales, etc.; <i>Topic: Evolutionary Rates</i>	Lab practical II	Davis <i>et al.</i> 2007
	Rosids IV: Myrtales, Malvales, Brassicales, Sapindales	Rosids III	Ch.8:347-71
11: 11/14-11/17	Lecture Exam 2	EX5: Molecular phylogenetics	Review Ch.2
	Caryophyllales	Caryophyllales	Ch.8:295-312
12: 11/21-11/23	Asterids I: Ericales, Cornales	Asterids I-II	Ch.8:372-389
	Asterids II: Gentianales, Solanales	(THANKSGIVING)	
13: 11/28-12/01	Asterids III: Lamiales, Boraginales	Asterids II-III	Ch.8:389-416
	Asterids IV: Dipsacales, Apiales, Asterales, Aquifoliales	Asterids IV: Asteraceae	Ch.8:416-435
14: 12/05-12/08	Asterids V: Asteraceae; <i>Topic: Hybrid Speciation</i>	Lab practical III	Ungerer <i>et al.</i> 1998
	Species Concepts	Work on plant collections	Ch.19
15: 12/12-12/15	Molecular phylogenetics	Plant collection DUE by end of day, Dec 14	Ch.14
	Plant Oddities; <i>Topic: Mycoheterotrophic plants</i>		Merckx & Freudenstein 2010

FINAL EXAM WEDNESDAY, December 21, 10:15-12:15, TNR 120

PLANTS TO LEARN

Learn to recognize the following genera for sight recognition (without books or notes) on the lab practical exams. The material on the lab exam will be live material (recently collected or from the greenhouse) whenever possible. 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 (such as floral formulas, fruit type, leaf shape and arrangement, *etc.*). Specimens of each family and genus on this list will be on demonstration during labs, and a study set of specimens will be posted in the hall display cases until the lab practical exam. (Additional images are available on the WisFlora site.) No materials may be removed from the lab. The lab is usually open weekdays from about 8:00 a.m. until about 10:00 p.m. The lab will be open on weekends—if you can get into the building!

EXAM 1:

Lycopodiaceae: *Diphasiastrum*, *Huperzia*,
Dendrolycopodium

Botrychiaceae: *Botrychium s.l.*

Equisetaceae: *Equisetum*

Osmundaceae: *Osmunda s.l.*

Dryopteridaceae: *Dryopteris*

Pteridaceae: *Adiantum*

Onocleaceae: *Onoclea*

Polypodiaceae: *Polypodium*

Athyriaceae: *Athyrium*

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

Taxaceae: *Taxus*

Cupressaceae: *Juniperus*, *Thuja*

EXAM 2:

Nymphaeaceae: *Nuphar*, *Nymphaea*

Aristolochiaceae: *Asarum*

Alismataceae: *Sagittaria*

Araceae: *Arisaema*, *Symplocarpus*

Asparagaceae: *Maianthemum*, *Polygonatum*

Iridaceae: *Iris*

Orchidaceae: *Cypripedium*

Liliaceae: *Erythronium*

Melanthaceae: *Trillium*

Smilacaceae: *Smilax*

Commelinaceae: *Tradescantia*

Cyperaceae: *Carex*

Poaceae: *Andropogon*, *Bouteloua*, *Phragmites*

Typhaceae: *Typha*

Berberidaceae: *Berberis*, *Podophyllum*

Papaveraceae: *Dicentra*, *Sanguinaria*

Ranunculaceae: *Aquilegia*, *Anemone* [*Hepatica*],
Caltha, *Ranunculus*, *Thalictrum*

Nelumbonaceae: *Nelumbo*

Grossulariaceae: *Ribes*

Hamamelidaceae: *Hamamelis*

Saxifragaceae: *Mitella*

Vitaceae: *Vitis*

Rosaceae: *Potentilla*, *Prunus*, *Rosa*, *Spiraea*

Rhamnaceae: *Rhamnus*, *Frangula*

Ulmaceae: *Ulmus*

Cannabaceae: *Celtis*

Urticaceae: *Urtica*

Fabaceae: *Lupinus*, *Robinia*, *Trifolium*

Cucurbitaceae: *Echinocystis*

Betulaceae: *Betula*, *Carpinus*, *Corylus*, *Ostrya*

Juglandaceae: *Juglans*

Myricaceae: *Comptonia*

Fagaceae: *Fagus*, *Quercus*

EXAM 3:

Euphorbiaceae: *Euphorbia*

Salicaceae: *Salix*

Violaceae: *Viola*

Oxalidaceae: *Oxalis*

Onagraceae: *Oenothera*

Lythraceae: *Lythrum*

Geraniaceae: *Geranium*

Brassicaceae: *Alliaria*

Malvaceae: *Tilia*

Anacardiaceae: *Rhus, Toxicodendron*

Sapindaceae: *Acer*

Amaranthaceae: *Amaranthus, Chenopodium*

Cactaceae: *Opuntia*

Caryophyllaceae: *Silene*

Montiaceae: *Claytonia*

Phytolaccaceae: *Phytolacca*

Polygonaceae: *Persicaria*

Portulacaceae: *Portulaca*

Cornaceae: *Cornus*

Ericaceae: *Chamaedaphne*

Polemoniaceae: *Phlox*

Gentianaceae: *Gentiana*

Rubiaceae: *Galium*

Apocynaceae: *Asclepias*

Solanaceae: *Solanum*

Lamiaceae: *Physostegia, Lycopus*

Plantaginaceae: *Penstemon, Plantago*

Verbenaceae: *Verbena*

Apiaceae: *Eryngium, Osmorrhiza, Pastinaca*

Araliaceae: *Aralia, Panax*

Caprifoliaceae: *Lonicera, Viburnum*

Adoxaceae: *Sambucus*

Campanulaceae: *Campanula, Lobelia*

Asteraceae: *Ageratina, Ambrosia, Centaurea,*

Cirsium, Hieracium, Solidago, Taraxacum