SYLLABUS

Plant Diversity and Evolution Lab (11:216:412) {undergraduate, 1 credit}
&
Plant Systematics Lab (16:215:508) {graduate, 1 credit}

Instructor
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Short course description
This companion lab to the lecture class emphasizes learning species and family plant identification, understanding macroevolutionary patterns of global plant diversity, and learning biodocumentation and plant collecting for inventories and scientific plant research. Class includes fieldtrips, independent projects, use of online tools, and hands-on lab activities.

INTRODUCTION

The evolution and diversification of land plants have shaped life on Earth both in past times and today and are crucial for the survival of terrestrial ecosystems and the human species. This is the lab class for the class Plant Diversity and Evolution / Plant Systematics. The class includes developing skills in plant identification (especially of NJ plants), learning vouchering techniques for inventories, pharmaceutical screening, and plant breeding, phylogenetic analysis using molecular and morphological data (for graduate students), and understanding macroevolutionary patterns in morphology and species diversification. Digital and online tools and resources will be strongly emphasized in working on real world problems such as local biodiversity inventories (Flora of Rutgers Campus project) and identification of unknown wild plants (GoBotany website and other online resources). Labs will include freshly collected or dried material of hundreds of species (from local areas, Rutgers Gardens, supermarkets and farmer markets, Floriculture greenhouse, teaching collection, and Chrysler Herbarium).

LEARNING GOALS

In this lab you will:

1. Build appreciation for the diversity of plant life on the planet and use botanical language to categorize that diversity
2. Interpret data derived from modern analytical and experimental tools used by plant scientists to understand plant diversity and evolution
3. (graduate students): Reconstruct phylogenies of plant groups using software to analyze DNA sequence data and morphology
4. Use plant morphology vocabulary to classify structures on 200 plants and to describe evolutionary relationships between plant groups
5. Identify 80 genera of common New Jersey native and naturalized plants using printed and digital resources

6. Recognize 150 plant species in 40 major plant families of ecological and human importance
7. Prepare 10 voucher specimens of fresh plants for biodocumentation and research (graduate students: 20 vouchers)

ASSESSMENT

How you reach the learning goals in class will be assessed through the evaluation and grading of:

- Weekly Lab reports
- Flora of Rutgers Campus participation and data quality (graduate students need 20 unique observations; undergrads 10 unique observations)
- Herbarium collection (graduate students need 20 unique observations; undergrads 10 unique observations)
- Lab quizzes

COURSE WEBSITE http://onlinelearning.rutgers.edu

The course website have syllabus, lectures, readings, self-assessment quizzes (not graded), links to on-line educational resources (movies, websites, podcasts) and projects, and dropboxes for uploading assignments. Please refer to the schedule to find each week's lecture, assignment, self-assessments, and other resources.

SUPPLIES NEEDED FOR LABS AND FIELDWORK

Hand lens (10X) preferably with neckband so you don't drop it and loose it – good illuminated hand lenses can be bought through Amazon and other websites (for example, SE Illuminated Loupe, model B0013E3DAG, 10-20x, 21 mm), other models are fine too.

10-30 cm ruler (make sure it is marked in both cm and inches)

Plastic bags (for collecting plants in the field)

Field notebook and water resistant pen or pencil.

Plant press and blotting paper (provided by the Chrysler Herbarium, short-term loans or you can buy your own, for example at Carolina Biological Supply)

Old newspapers and cardboard for plant pressing (Daily Targum has the perfect size)

Dissecting kit including (can be ordered through Carolina Biological Supply, Student Dissecting kit 1 is fine), including:

Fine point forceps

Dissecting needle/long pin, for dissecting of grasses and other small flowers in field and lab (regular sewing pin with plastic head is fine)

Razorblades or scalpel (for cutting plants, some blades provided in lab)

Latex gloves (for handling of alcohol-preserved samples, will be provided in lab)

Garden shears or heavy-duty scissors or field knife (good for plant collecting, optional)

Pencils and erasers for lab reports and lab drawings. Colored pens can be used too. Please use pencils for lab reports, especially for drawings, not pens.

Digital camera, or phone with camera (access to digital camera is mandatory, OK if you borrow one).

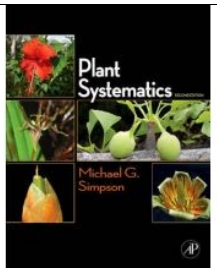
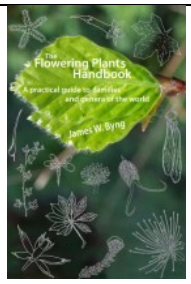
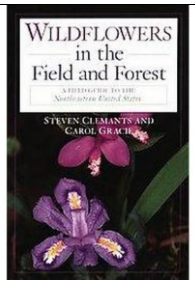
Clothing (please dress appropriately when doing fieldwork, take precautions to avoid ticks and poison ivy, etc., sturdy boots, don't get sunburned or dehydrated)

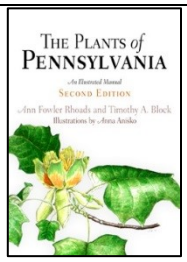
Laptop (recommended, not necessary; you need access to computer & internet outside of lab)

BOOKS and other COURSE MATERIALS

To aid in your study, we are providing a **manual of how to identify the 50 most common families (downloadable from the website)**, a **list of families** that you should be able to recognize and a worksheet for these, **a list of ethnobotanical and common wild species** you should learn, and a list of **plant morphology** words you should know after the class is over.

Textbook and other books (available at Barnes & Noble in New Brunswick, and at other retailers – borrowed books are perfectly fine):

	Simpson, M. 2011. ***Plant Systematics***, edition 2. Elsevier Press. (available at the Campus Bookstore). This is the text book for the lecture course and it will be necessary for the lab as well. **MANDATORY for LAB CLASS.** Note, part of this book (family descriptions) will function as a dictionary to look up information in, the other chapters will be highly important to read carefully and understand. (If you get edition 1 there will be differences from edition 2 and some chapters will be missing or rewritten.)
	Byng, J. S. 2015. ***The Flowering Plants Handbook***. **RECOMMENDED/OPTIONAL**. Fantastic book with worldwide coverage. Focuses on families and genera, not species. The book contains descriptions of all currently recognised flowering plant families, morphological notes for 6656 genera (all current genera for 398/413 families) and over 3000 images and illustrations. Available in print and as an e-book. Order from http://www.plantgateway.com/publishing/ or through Amazon.
	Clemants, S. &. C. Gracie. 2006. ***Wildflowers in the Field and Forest****: A Field Guide to the Northeastern United States* (Jeffrey Glassberg Field Guide Series). Oxford University Press. **OPTIONAL BOOK**, but it is highly recommended to have at least one local flora. However, only includes wildflowers, so no trees, shrubs, or grass-like plants are included. Great photos.
	Haines, A. 2011. ***Flora Novae Angliae****: A manual for the identification of Native and Naturalized Higher Vascular Plants of New England.* New England Wildflower Society & Yale University Press, New Haven. **OPTIONAL BOOK** but highly recommended for those of you that will continue to identify wild plants after the class is over. Includes all vascular plants, many line drawings, no photos. Comprehensive with good keys, no photos, small drawings, and covers nearly all New Jersey plants even if we are not in New England (only southern and some coastal plants are absent). The companion website is GoBotany.

	Rhoads, A.F. & T.A. Block. 2007. ***The Plants of Pennsylvania***: *An Illustrated Manual*. Ed. 2. University of Pennsylvania Press. **OPTIONAL BOOK** but highly recommended for those of you that will continue to identify wild plants after the class is over. Includes all vascular plants, some line drawings, no photos. Totally comprehensive with good keys, and covers most of New Jersey plants around the Rutgers Campus. Heavier and thicker than Flora Novae Angliae, but somewhat easier to use.)

Additional useful books – Trees and shrub guides, Moss floras, Lichen floras, Aquatic plant floras, Gleason and Cronquist's flora (a bit outdated, but excellent for career botanists nonetheless), etc., are welcome additions and can be used as well.

Botanical dictionaries, Recommended is Harris & Harris, *Plant Identification Terminology: An Illustrated Glossary*, but there are many other useful books out there about plant morphology and the meaning of scientific names.

LAB WORKSHEETS AND NOTE TAKING

When observing and evaluating plants and their characters drawings are an invaluable tool. Bring a sharp pencil and an eraser to lab. Draw many pictures of plant parts in your notebooks and on your lab worksheet, mark down the names of the parts and plants (Latin genus and family names required), explain in detail the arrangement, texture, color, and shape of each part, both so we know you understand what you look at and for you to remember later. Write legible and neat. Lab worksheets that are not readable by us will not be graded. Grades will be assessed based on both drawings and text (contents and understanding only, not artistic ability - no Picasso or da Vinci is expected here).

ATTENDANCE and GROUP WORK RULES

If you miss a lab due to an emergency, you will have to arrange a make-up session with the teacher and teaching assistant as soon as possible. If you know you are going to be away for a valid reason, contact the TA ahead of time for makeup work. Some plant material is scarce and hard to get, so there is no guarantee that all material will be available at a later date. Even if you miss a lab you will have to take the lab quiz as scheduled. You can work in teams during the lab (not at quiz time!) if you like, but NEVER copy anybody else's text for the lab assignments or projects. All work handed in by you should be your own work written in your own words. Any plagiarism or cheating will be reported to higher authorities (see Academic Integrity below).

LAB AND FIELD SAFETY

Many plants are poisonous and can cause severe reactions, even death. Be careful not to get anything in your eyes or your mouth, unless we specifically say it is edible. We might also work with alcohol-preserved specimens. Gloves will be provided for this (1 pair per person). Wash your hands after working with all material, and you cannot **eat** in the lab. Edible plants will be provided in the hallway outside the lab (where you also have access to restrooms for handwashing). Dress in suitable clothes for the outdoor field trips – boots/sneakers, long pants and long-sleeved shirts are recommended. Be aware of ticks and mosquitos, poison ivy and plants with thorns. Do not go alone to remote places and bring a cell phone in case you get lost and/or need help. Use common sense and be responsible.

GRADING and ASSIGNMENTS

Undergraduates will be graded according to undergraduate standards, graduates according to graduate standards on similar assignments. Some parts of lab worksheets will only apply to graduate students. All in-class quizzes and labs are different for undergrads and graduates to reflect different learning requirements.

Lab (Practical) quizzes – 30 min

The hands-on lab exams will include material from the labs and the relevant parts in the textbook. The three lab quizzes will cover the material seen in the lab plus some 'unknowns' and focus on the families and species you need to know by heart, plant identification, and plant terminology. Included in the lab quizzes will be, among other things, determining plants using keys, descriptions of plants or plant parts, morphological terms, and determination of plant families to know (see list).

Cheat sheet

During lab quizzes you are allowed to bring with you 2 pages (one sheet) of ***handwritten*** notes on a cheat sheet (in any language). No computer text is allowed on these sheets, only your own handwriting and drawings. (It has been shown that the preparation by hand of such notes helps you learn the material, and is also an excellent way to provide yourself with a quick review page for future use (students usually keep these for the future). You can write small, in different colors, and in any text type you want, but you are only allowed one sheet for each quiz period, giving a total of 3 cheat sheets at the end of class. No other materials and help are allowed during lab quizzes. We will inspect all cheat sheets before the exam starts. **Note – cell phones, computer, and calculators are absolutely not allowed during quizzes.**

Late hand-in

Lab worksheets can be handed in immediately after the lab, or on the Monday the week after the lab during the lecture class, or in the instructor's mailbox in Foran Hall (290 Foran Hall), or directly to the TA. The deadline date for all lab reports are 4 days after each lab (=Mondays). If not handed in by 5 PM on the due date, any assignment will get an automatic immediate 20% point reduction, if still late after 3 days (= handed in on Thursday one week after lab) it will not be graded. **If you do not submit a herbarium collection you will automatically fail the course.**

Grading points	**Points (graduate/undergraduate)**
Lab Quizzes	90 (3 quizzes @ 30 points each)
Lab and fieldtrip worksheets	110 (11 worksheets @ 10 points each)
Flora of Rutgers Campus (FoRC)	40/20 (2 points per herbarium collection, same as below)
PhyloLab Assignment	20/0 (extra credit for undergrads)
Herbarium Collection Assignment	100/50 (20/10 collections @ 5 points each)
Attendance and participation	20/20
Total	380/290 points

For projects, points will be taken off for misspellings, wrongly formatted text, sloppiness, not adhering to given formatting guidelines and similar mistakes, and all and any plagiarism will be reported to the Office of Student Conduct.

We will use the gradebook on the course website so you can check your current grade at all times. If you feel like you are falling behind, come and talk to us about ways to improve your performance. We are here to help you learn, and our goal is for all students to achieve an A if they put in the effort and use the learning resources provided.

Final grades:

A	90-99 %	C	70-74 %
B+	85-89 %	D	60-69 %
B	80-84 %	F	less than 60% of total grade
C+	75-79 %		

There will be no curving of grades, however we reserve the right to upgrade the grades of students that show outstanding participation in the class.

PROJECTS

There are three projects for this course. All projects are independent, i.e., not group projects. The Phylolab assignment is optional for undergrads (as extra credit). For all of these, see separate handouts with further instructions.

Assignment 1: Herbarium Collection, 10 specimens (graduate students, 20 specimens)

Assignment 2: Flora of Rutgers Campus (FoRC); 10 observations (graduate students, 20 observations)

Assignment 3: PhyloLab (graduate students only, extra credit for undergraduates)

Uploading of files: The PhyloLab assignment has to be handed in using the dropbox on the course website. Name the files YourName_assignment1.pdf, and we only accept pdf or Word (.doc, .docx) files.

ACADEMIC CONDUCT AND INTEGRITY

All instances of plagiarism or other unacceptable and unethical academic conduct will be reported to the Office of Student Conduct or the Graduate School and might result in warnings or suspension according to Rutgers' official rules. Believe me, you do not want this to happen to you. See special handout about Rutgers policy in Academic Integrity.

Especially, ***write everything by yourself, and never copy text from the internet or publications*** – we are using turnitin.com to check all text handed in by students. Please follow copyright laws and source citations when using images of any kind (see handout). Please remember to cite all sources for information in any reports (see handout). Reference lists have to include all authors and full title of each paper.

During lab quizzes, avoid looking at other students worksheets at all times, and do not talk to each other. Students not following these rules will be removed from the lab and get a 0 on the quiz.

SOURCING, CITATION OF REFERENCES, USE OF IMAGES, etc.

Non-refereed, unscientific web sites are not acceptable as sources of information unless for images or maps. You should get all information from books, book chapters, and scientific articles (these can of course be searched for, read on, and downloaded via the web). So, DO

NOT CITE WEBSITES, unless they are SCIENTIFIC websites, that lists references and true sources for facts. When you include a list of references follow the ***correct citation format*** (see instructions), and cite image sources properly. An url is not a source. See separate handouts regarding this with very important information.

NOTICE FOR STUDENTS WITH DISABILITIES

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: https://ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. To begin this process, please complete the Registration form on the ODS web site at: https://ods.rutgers.edu/students/registration-form.