Biology 302 – Field Systematic Botany
Summer IV 2014

"Nomina si nescis, perit et cognitio rerum" (If you do not know the names of things, the knowledge of them is useless)

Linneaus
Critica Botanica 1737

Instructor

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Outside of office hours the best way to contact me is via email. I will respond to your email within 24 hours. I do not carry around a smart phone or remain in constant email contact so do not expect an immediate response.

Course information

Meeting time and place: Lecture/Lab MWR 8:00–10: 00 am, Berndt 440; Field T 8:00 am – 4:30 pm. The lab and herbarium will be open and available for independent work until at least noon on all class days. You will need to invest time after class to complete your required assignments.

Course Description

Field Systematic Botany is designed to teach you the skills necessary to identify plants (principally Angiosperms) in the field and lab. We will primarily focus on two specific aspects of plant identification 1) family recognition and 2) species determination using technical characters in keys and published floras. These skills are invaluable for work in various aspects of biodiversity research. Secondarily we will touch on other aspects of botanical systematics including field collection skills, the basics of botanical nomenclature, the use of modern classifications, herbarium use, and modern biodiversity databases.

Prerequisites: BIO 206 (General Botany), BIO 260 (Genetics)

Specific Objectives (in no particular order)

1. Be able to use the proper terminology for vegetative and reproductive features used in the identification of vascular plants.
2. Become proficient at using technical keys for the identification of flowering plants.
3. Learn to recognize approximately 35 different plant families of SW Colorado.
4. Learn to use proper scientific names.
5. Be able to prepare high quality voucher specimens for ecological and biodiversity research.
6. Gain an understanding of the relationships between evolutionary history and plant classifications.
7. Demonstrate basic knowledge and skill in using biodiversity data.
8. Demonstrate proper use of herbarium-derived data.
9. Understand the importance of precise systematic data for use in management, conservation and research activities.

Required texts:

- Ackerfield, J. 2013. The Flora of Colorado. Colorado State University Herbarium, Fort Collins, CO. (Pre-press manuscript)
- Simpson, M. G. 2010. Plant Systematics, 2nd Edition. Elsevier Inc, Burlington MA.. ISBN: 978-0-12-374380-0
- Harris, J. G. and M. W. Harris. 2001. Plant Identification Terminology, 2nd edition, Spring Lake Publishing, Spring Lake, UT. ISBN: 978-0-96402-216-4

Required Supplies (available at FLC bookstore – probably not shelved with textbooks – ask clerk for assistance)

10x handlens
1 Rite-in-the-Rain, Horizontal Line All-Weather Notebook, No. 391

Course Websites:

Moodle: I will use Moodle as a repository for any lecture material and plant lists. Most of these will also be made available in class. This will also provide links to pertinent botanical resources.

SEINet (Southwest Environmental Information Network): This is a tremendous resource for plant systematic data. I will be uploading interactive checklists following our various outings which will help with your review of required taxa. These will be available under the "Teaching Checklists" option on the home page (http://swbiodiversity.org) The "Flash Card Quiz" under the "Games" option is a great way to study plant recognition.

Course Evaluation

Quizzes (both family id and keying) (10 pts. each)	70 pts.
Nomenclature HW	20 pts
Herbarium database HW	20 pts
Plant Collection	100 pts
Class collection participation	50 pts
Final exam	100 pts
Total:	**360 pts**

Your grade will be a sum of the earned points you have accrued throughout the term and follow a typical grade distribution. Due to the short time frame of this course I will NOT accept any late work and there will be NO make-up quizzes or exams.

Course Organization

Lecture/Lab:

This class will have a minimal level of traditional lecture although some material will be presented in this form. Much of our time will be spent in "lab" working with plants collected in the field. Plant systematics and plant identification in particular take lots of practice to learn the patterns corresponding to individual families or genera. Thus most of our time will be used toward your learning these suites of characters.

Field trips:

We will have one day-long field trip every Tuesday. Field trips should be expected to take the whole day and we may visit multiple sites during one trip. Your personal gear should include sturdy, closed-in shoes, long pants, sun protection, food and plenty of water for the entire day. If you are particularly sensitive to insects insect repellent may be useful. If you have anaphylactic reactions to insect stings please let me know and provide your own appropriate medicine (ie. epipen) and inform myself on how to administer.

You should bring your field book, your Flora of Colorado, handlens, and your Plant Identification Terminology book with you on field trips. On some field trips you will need to bring a plant press as we will be collecting specimens as a group – I'll let you know when this is required. You will need to take notes in the field as I will spend time discussing plant identification traits, plant natural history, etc. Some of the material I discuss in the field will be required and not repeated in a lecture setting. We will focus on various goals on different field trips. Some trips will be centered on observing species to learn family characters. Other days will be focused on floristic collection.

All trips will result in a list of observed and required families and/or species. Following the field trip I will provide a list of all required families and/or genera and species. These lists will also be uploaded to the SEINET site as a checklist.

I will expect all students to be prompt and we will leave at 8AM. I will not wait for late students and you will not be able to make up material missed by your absence.

Information on selected assignments etc.

Quizzes: We will have an average of two quizzes each week. There will be a field quiz during most field trips which will require you to identify specimens to family and/or use your key to identify plants to species. We will also have some quizzes in the lab. For keying quizzes, while I hope that you will all determine the correct family or species, I will award partial credit for the correct family and/or genus determinations. To earn either full or partial credit on a keying quiz you must write out the number of each couplet you take starting with the Key to Families and ending with the specific epithet.

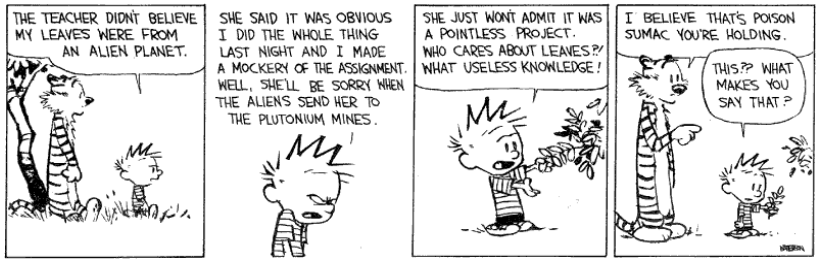
Final exam: We will have one exam at the end of the term which will be partially based on lecture material, sight identification of plant families/genera and/or species, and the keying of an unknown specimen.

Nomenclature Homework: This assignment will review pertinent concepts in plant naming following the International Code of Botanical Nomenclature (ICBN) including Latin name formation, author citation, synonymy, priority of publication, typification, diagnosis, etc.

Herbarium Database Homework: The availability of biodiversity information in electronic format is changing the way that scientists and resource managers use systematic data. This assignment will show you the types of information available and have you practice with specific applications of this data.

Class Collections: On selected field trips we will be collecting specimens as a group to document the flora of the area. You will properly collect voucher specimens and use time in and outside of class to work on species identification with your group. You will provide a species list and the documented specimens.

Herbarium Plant Collection:



The plant collection must include 25 identified and properly labeled specimens representing different species (or infraspecific taxa). These 25 specimens must come from a minimum of 10 different families. All specimens must be labeled with complete collection information (collector's name, collection number, family, genus, species, author citation, collection date, locality, and any additional information regarding ecology or plant form) and corresponding to the format used in the FLC Herbarium (There is a Word template available on Moodle to assist you with making your labels).

Things to keep in mind

- Your plants must be wild-collected and can come from any geographical location or environment.
- You cannot collect cultivated garden plants - they must be a part of the native flora!
- In making the collection you must remain aware of where you can legally collect and ask permission if necessary.
- Do not collect cacti or any rare or endangered species. If not sure ask me or don't collect.
- You may use a Plant Collection Worksheet (available on Moodle) for each specimen to assist you in gathering the required information for completing your final specimen label.
- You will be able to sign out a plant press, hand clippers, spade and GPS unit to assist with your collecting (and these must be returned or a charge will be placed on your student account for their replacement).
- Drying of plants can be performed in the dryer in the herbarium.
- All specimens must include fertile material unless our key does not require it to make an accurate determination.
- Plants must be turned in pressed and dried with each plant in separate folded newspaper. Each specimen must be accompanied by a properly formatted label. This should all be turned in in a large manila folder (available in the herbarium)
- 2 specimens must be properly mounted for inclusion in the herbarium
- I encourage you to find interesting places to collect – Interesting places = interesting plants.
- And lastly I hope that you will see this assignment as FUN and not work.

The collection will be graded based on the following requirements:

Identification: Specimens will require proper identification.

Specimen quality: All specimens must be dry and properly pressed and presented in folded newspaper cut to the proper size of a herbarium specimen.

Label data: Your labels must be complete – follow the Plant Collection Worksheet and sample label on the template for guidance. Metric units should be used for elevation and for describing any size data. The only English unit I will accept will be miles (ex. "5 miles West on Forest Rd. 200") since it is so widely used in the US. You may use either Latitude/Longitude or UTM for giving coordinates. Be sure to include the datum used.

Specific taxa: I will not accept as part of your collection any Gymnosperms unless your collection represents a new county record. You may collect Pteridophytes but you will be limited to a maximum of two specimens. Your total collection will be required to have at least two specimens from the family Asteraceae and two monocot specimens.

Due Dates: Your collection will be due in two parts. 10 specimens will be due at the end of week 3. The remaining 15 plants will be due the day before the final exam.

Other useful text references

In addition to the required identification text there are many very good references for the flora of our region. The following is a list of these other published resources, in no particular order. All of these will be available for your use in the herbarium.

- Weber, W. A. and R. C. Wittmann. 2012. Colorado Flora: Western Slope, 4th edition. University Press of Colorado, Boulder, CO. (This is seen as the "standard" guide for Colorado. Its keys can be difficult and the taxonomy followed is not standard. There is also an "Eastern Slope" volume which is best for plants east of the Continental Divide)
- Heil, K. D., S. L. O'Kane, L. M. Reeves, and A. Clifford. 2013. Flora of the Four Corners Region: Vascular plants of the San Juan River Drainage, Arizona, Colorado, New Mexico, and Utah. Missouri Botanical Garden Press, St. Louis, MO. (This is by far the best single resource for plant identification in our local area. It is a bit too big and pricy for use in the field however)
- Allred, K. W. and R. D. Ivey. 2012. Flora Neomexicana III: An illustrated identification manual. Lulu.com. (Illustrated keys to the flora of New Mexico)
- Welsh, S. L., N. D. Atwood, S. Goodrich, L. Higgins, eds. 1987. A Utah Flora. Great Basin Naturalist Memoir 9. Brigham Young University, Provo, UT. (Good standard flora for Utah. There are newer editions but this is the one we have and this edition is available as a free PDF download if you are interested)
- Culver, D. R. and J. M. Lemly. 2013. Field Guide to Colorado's Wetland Plants; Identification, Ecology and Conservation. Colorado Natural Heritage Program, Fort Collins, CO. (Obviously just restricted to wetlands. Available as a free PDF download from CONHP website)
- Shaw, R. B. 2008. Grasses of Colorado. University Press of Colorado, Boulder, CO.

Other Course policies (the required stuff)

Academic Integrity:

The Biology Department upholds College policy on Academic Integrity. Therefore, students who commit acts of academic dishonesty (a.k.a. cheating, copying, plagiarizing):

1) on homework or other less major assignments, will receive a ZERO on the assignment in question, and will be reported to Academic Affairs.

2) on exams, major papers or reports will earn a ZERO and be automatically removed from the COURSE, and will be reported to Academic Affairs.

Any student who accumulates two reported incidents of dishonesty with the Academic Affairs office will have a formal hearing with the Academic Standards Committee and faces academic dismissal from the College.

Attendance:
I expect all students to attend all class sessions. If this will be a problem I would suggest dropping the course.

Classroom conduct:
While I hope it goes without saying, please respect the rights of myself and your fellow classmates. Additionally please leave mobile phones, pagers, iPods, etc, at home or turn them off and keep them stowed during class. I will not allow texting or checking of messages on any electronic device during class time. If this becomes a problem you will be asked to forfeit your device. Such activity is not only very disrespectful but also interferes with your ability to learn. You may think it savvy to look up plant identification on your phone but it is counterproductive to developing the skill of accurate observation and interpretation.

There will be NO usage of alcohol or drugs at any time during the course according to FLC policy. There will also be NO use of any tobacco products both when on and off campus.

Accommodations:
Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with the Disability Services Office. If you qualify for services through the Disability office, bring your letter of accommodations to me as soon as possible so I can make the appropriate arrangements. Letters are available through Dian Jenkins, Coordinator of Disability Services, 280 Noble Hall, 247-7459.

Tentative Schedule

Readings: Harrington: Harrington, H. D. 1977. How to identify grasses and grasslike plants. (In course pack)
Murrell: Murrell, Z. E. 2010. Vascular Plant Taxonomy. (In course pack)
Simpson, M. G. 2010. Plant Systematics, 2nd Edition.

Wk	Date	Topics	Reading/ Assignment
1	June 9-12		
	Mon.	Introduction – What is it and the importance of biological systematics. Plant classification activity Bookkeeping stuff	Simpson: Chap. 1, 15
	Tues.	Field – on campus keying and group collection in the mountain shrubland community (Scavenger hunt; Introduction to keying; Collection/pressing techniques)	Simpson: Chap. 17
	Wed.	Review of observed families Continued unknown identification	
	Thurs.	Botanical Nomenclature and New species description	Simpson: Chap. 16 **Nomenclature HW** – Due. Monday Jun. 16
2	June 16-19		
	Mon.	Herbaria; Biodiversity Databases	Simpson: Chap. 18 **Herbarium Database HW** – Due Monday Jun. 23
	Tues.	Field – Echo Basin Area – (Rampart Hills, Coyote Park) – middle montane zone community (Class collection) **Quiz**	
	Wed.	Review of observed families Continued unknown identification	
	Thurs.	**Quiz** Herbarium practice - plant mounting	
3	June 23-26		
	Mon.	Focus Cyperaceae – principally *Carex*	Harrington Chap. 6 &7
	Tues.	Field – Boyce Lake Vicinity – Scout Lake/Spud Lake – wetland species – additional montane zone **Quiz**	
	Wed.	Review of observed families Keying practice (mostly *Carex*)	
	Thurs.	**Quiz** Keying practice (mostly *Carex*)	**Plant Collection Pt. 1 Due**

4	June 30-July 3		
	Mon.	Focus on Poaceae	Harrington Chap. 1-4
	Tues.	Field – Pass Creek Trail/Engineer Mountain – upper montane/ subalpine zone, spruce/fir forest **Quiz**	
	Wed.	Review of observed families Keying practice (Poaceae)	
	Thurs.	**Quiz** Keying practice with grasses	
5	July 7-10		
	Mon.	Applications of plant systematic knowledge	
	Tues.	Field – (Jura Knob) – alpine zone (Class collection – This area consisting of some unique soil outcrops has not been sampled and there are no collections in any herbarium.) **Quiz**	
	Wed.	Wrap-up and review – Time for continued unknown id from Jura Knob	**Final Plant Collections Due**
	Thurs.	**Final Exam**	