

Instructor

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Office hours: MW 10:00 am-12:10 pm and by appointment

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.

Teaching Assistant

Margo N. Paces
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Course information

Meeting time and place: Lecture/Lab MW 8:00–10:00 am, Berndt 440; Field TR 8:00 am – 2:30 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 vascular plants 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. Secondly 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. 2015. Flora of Colorado. Botanical Research Institute of Texas, Fort Worth, TX. ISBN: 978-1-889878-45-4.
- 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:

Canvas: I will use Canvas as a repository for any lecture material and plant lists. This will also provide links to pertinent botanical resources.

SEINet (Southwest Environmental Information Network) (<http://swbiodiversity.org>): 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. To access select the “Flora Projects” tab followed by the “Teaching Checklists” selection and look for those associated with FLC. 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
Graminoid Worksheet	20 pts
Plant Collection	100 pts
Class collection participation	50 pts
Final exam	100 pts

Total: 380 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 identification takes lots of practice to learn the patterns corresponding to individual families, genera, and species. Thus most of our time will be used toward your learning these suites of characters.

Field trips:

We will be in the field on Tuesday and Thursday. Field trips are scheduled to run from 8 am to 2:30 pm. I will try to stick to this schedule but some days a late return may be possible due to the distance covered in the field, so plan accordingly. 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 most field trips you should bring a plant press as we will be collecting specimens as a group – I’ll let you know if this will not be needed. 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 specific assignments.

Quizzes: We will have an average of two quizzes each week. These quizzes will be held in the field and will require you to identify specimens to family and/or use your key to identify plants to species. 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. Note that the use of common species or family names is not allowed – all correct names will be their Scientific or Latin names.

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. This will be divided into two parts over two days.

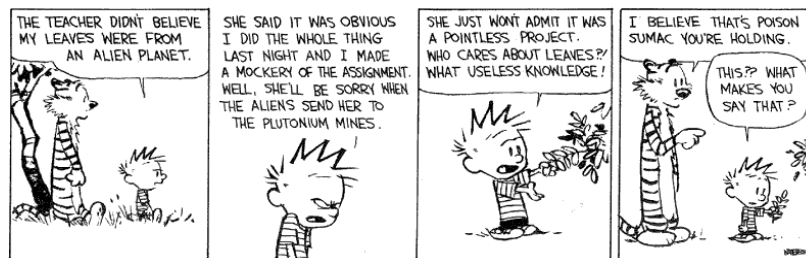
Nomenclature Homework: This assignment will review pertinent concepts in plant naming following the International Code of Botanical Nomenclature (ICBN) including Latin name formation, author citation, synonymy, priority of publication, typification, diagnosis, etc.

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.

Graminoid worksheet: This will be a worksheet geared toward giving you practice in the keying of grasses, sedges, and rushes (Families Cyperaceae, Juncaceae, and Poaceae). It will be completed during class time.

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.

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 Canvas 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 Canvas) 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 (These must be returned or you will be charged 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 can work with you to format labels for these collections as they must also be databased.
- 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 on July 8.

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. FLC health and safety policies prohibit any food and beverage in laboratories. As our course is meeting in the laboratory at all times DO NOT bring ANY food or drink (this includes water) to class. (Field days are of course different and I encourage you to bring as much food and drink as you wish.) You must also adhere to all of the general laboratory safety rules for FLC biology labs presented below. Additionally 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 or marijuana products both when on and off campus.

Biology Laboratory Safety Rules and Procedures:

Everyone in biology labs must follow these safety rules and procedures.

- It has been said that “common sense isn't very common.” Please use common sense to keep yourself and classmates safe, and the laboratory running smoothly. You are each responsible for maintaining the cleanliness and safety of the lab.
- No food or drinks are allowed during a lab session. The only exception is food or drink provided by the instructor as part of the laboratory.
- Only closed-toe shoes are to be worn in the lab. Open-toe sandals are not permitted.
- Keep hands and other objects away from your face, nose, eyes, ears, and mouth. Do not apply cosmetics while in the lab.
- When working with bacterial cell cultures, work areas/surfaces should be wiped down with disinfectant before and after lab use.
- Hands should be washed after handling bacteria and before leaving the laboratory.
- Laboratory coats are optional. They do protect your clothing from stains and reagents.
- When working around open flames from a Bunsen burner, long hair should be secured behind your head.
- Be careful around Bunsen burners. Flames cannot always be seen.
- All unnecessary books, purses, briefcases, etc., should be kept off the countertops during lab work.
- Never pipette anything by mouth (including water). Use pipetting devices.
- Label all materials with your name or initials, date, and any other applicable information (e.g., type of media, organism, etc.).
- When handling chemicals, note any hazard codes or warnings on the container and take the appropriate precautions indicated.
- Do not pour chemicals down the sink without first checking with your instructor.

- Do not pour culture media fluids with bacteria or agar down the sink.
- Return all chemicals, reagents, cultures, and glassware to their appropriate places.
- Flame transfer loops, wires, or needles (all made of metal) before and immediately after use when transferring biological material.
- Do not walk around the laboratory with transfer loops, wires, needles, or pipettes containing biological material.
- Report any broken equipment immediately to your instructor.
- Immediately report any broken glassware, especially those containing bacteria or biological material.
- Immediately report any chemical or biological fluid spills to your instructor.
- Follow all instructions given by your instructor for cleaning up any spills or broken glass.
- If you are injured in the laboratory, immediately inform your instructor.
- Always wipe and clean the lenses of your microscope before putting it away. Use the appropriate tissue paper and cleaning solution for this purpose.
- Do not remove any materials from the laboratory without permission from your instructor.
- Dispose of wastes in their proper container, there are separate containers for sharps, broken glass, hazardous materials and biohazardous materials.

Waste Disposal

- Dispose of items in special bags or receptacles as indicated. If you have a question regarding the proper disposal of an item, ask your instructor.
- Use a Biohazard (orange/red) bag for agar plates (plastic Petri plates) containing any biological material.
- Use a desktop plastic waste container for used plastic micropipette tips; these containers will be emptied into a Biohazard (orange/red) bag for autoclaving.
- Use a Biohazard “orange/red bag” container for contaminated cotton swabs.
- Use a Sharps container for needles, glass slides, syringes, pipettes, other types of sharps.
- Use a “Glass waste” container for broken glassware and for used microscope slides.
- Any glassware containing liquid culture medium in which bacteria have been grown must be autoclaved before disposal.
- In general, non-contaminated items that pose no threat can be disposed of by placing them in the regular trash. Any sharp object (“sharps”), contaminated or not, should be discarded into the sharps container.

(Biology department lab safety guidelines prepared by SH on August 29, 2014; adapted from:
<http://www.as.yosu.edu/%7Ecrcooper/LabRules.pdf>)

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. (Available on Canvas)
Simpson, M. G. 2010. Plant Systematics, 2nd Edition.

Wk	Date	Topics	Reading/ Assignment
1	June 8-11		
	Mon.	Introduction – Overview of plant 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 and plant id; Collection/pressing techniques)	Simpson: Chap. 17
	Wed.	Classification and Nomenclature, Family Concepts, Botanical Nomenclature and New species description (Be sure to have watched Botany: A blooming history prior to Wednesday’s class – link on Canvas)	Simpson: Chap. 16 Video: Botany: A Blooming History – A confusion of names Nomenclature HW – Due. Monday Jun. 15
	Thurs.	Field – on campus, work on FLC Campus Flora, Group Dichotomous key practice	
2	June 15-18		
	Mon.	Herbaria; Biodiversity Databases	Simpson: Chap. 18 Herbarium Database HW – Due Monday Jun. 22
	Tues.	Field – Echo Basin Area – I – middle montane zone community (Oak scrub/Parks) Quiz	
	Wed.	Review of observed families Herbarium Techniques and use	
	Thurs.	Field – Echo Basin Area – II – middle montane zone community (Aspen/Mixed conifer/Stream side communities) Quiz	
3	June 22-25		
	Mon.	Identification of Graminoids I (Cyperaceae, Juncaceae)	Harrington Chap. 6 & 7 Graminoid worksheet
	Tues.	Field – Boyce Lake Vicinity – wetland species – additional montane zone Quiz	

	Wed.	Review of observed families Graminoid work	
	Thurs.	Field – Scout Lake/Spud Lake or Purgatory Flats – wetland species – additional montane zone Quiz	Plant Collection Pt. 1 Due
4	June 29-July 2		
	Mon.	Identification of Graminoids II (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.	Field – Alpine Location to be determined (potential localities – West Lime Creek Trail, Little Molas Lake, Andrews Lake) Quiz	
5	July 6-9		
	Mon.	Open time for herbarium work	
	Tues.	Field – Jura Knob? – alpine zone (This area consisting of some unique soil outcrops has not been sampled and there are no collections in any herbarium.) Quiz	
	Wed.	In-class Final Time for continued unknown id	Final Plant Collections Due
	Thurs.	Field Final Exam – Kennebec Pass via Junction Creek	