FIELD METHODS IN VEGETATION ECOLOGY

Summer 2023— Syllabus

19 June – 7 July 2023

University of Colorado Mountain Research Station

1. Overview

Field Methods in Vegetation Ecology is a survey of physical and biological processes that control the distribution and dynamics of vegetation and common methods used to understand these patterns. Through fieldwork and individual projects, students will gain hands-on experience regarding concepts and field methods in vegetation science. Based at the CU Mountain Research Station, we will spend 3 weeks exploring the ecology of the region – from Great Plains grasslands to the Continental Divide, with a focus on dynamics of upper montane, subalpine, and alpine landscapes. Fieldwork will emphasize conceptual bases for and practicalities of vegetation research.

Course components –

- Background lectures
- Field trip (Plains-to-tundra altitudinal transect)
- Field exercises
- Readings
- Individual research projects

Prerequisites –

- One year of course work in general biology or environmental science, or consent of instructor

Credits – Three 4000-level EBIO credits

Schedule – 3 weeks (4 weekdays/week – see Schedule below), 8am-5pm, some days 7:30am-5pm.

Time for completing assignments and project fieldwork may require working over the weekends (Friday-Sunday).

Texts –

- Mueller-Dombois & Ellenberg. 2003. *Aims and Methods of Vegetation Ecology*, Reprint of 1st edition, Blackburn Press. ISBN: 978-1930665736.
  - Copies available at MRS, having your own copy is optional.
  - To purchase, I recommend getting a used copy of the *original* printing (higher quality production): 1974, John Wiley & Sons, ISBN: 0471622907. http://www.bookfinder4u.com/IsbnSearch.aspx?isbn=0471622907
- *Recommended Floras* — One course copy of both available at MRS
  - Ackerfield. 2015. *Flora of Colorado.* BRIT Press, Botanical Research Institute of Texas, Fort Worth, TX. 818 pp.
  - Weber & Wittmann. 2012. *Colorado Flora: Eastern Slope,* 4th ed. ISBN: 978-1-60732-140-8. ~$28.

2. Instructors

Dr. Timothy Kittel, INSTAAR
email: kittel@colorado.edu
webpage: http://instaar.colorado.edu/~kittel/

Karin Edwards, Field Botanist

3. Topics

Specific objectives are to:

- Understand the goals and key concepts of vegetation science
- Know how to design and implement a vegetation field study
- Be familiar with general foundation information on common classification systems and North American vegetation
- As a model for working in other ecosystems, be familiar with Colorado Front Range vegetation in terms of (1) common species and plant lifeforms and (2) controls over landscape distribution of predominant vegetation types
- Identify common Colorado Rocky Mountain vascular plants

General topics include:

(1) Concepts of communities – complementary perspectives

(2) Vegetation classification systems – physiognomic, floristic approaches (e.g., US National Vegetation Classification system)

(3) Structure and function of North American biomes/ecoregions

(4) Survey of factors controlling the distribution and dynamics of vegetation at continental, regional, landscape, and site scales – and ways to study vegetation at each of these scales

- Climate, physiography, soils, biotic interactions, time (succession, disturbance, etc.)

(5) Concepts in field research design for –

- Assessing vegetation in space (classification, mapping, microhabitat studies)
- Assessment in time (vegetation dynamics, monitoring)
- Setting up hypotheses-driven experiments

(6) Practicalities of field research –

- Problem formulation
- Sampling protocol development (field technique selection, sampling design, etc.)
- Orienteering: map, compass, GPS, clinometer
- Supplemental data resources – vegetation/soil maps, site histories
- Data management (QA)
- Data analysis (see Statistics)
- Communication of results (graphic visualization, oral and written presentation)

(7) Plant identification skills –

- Major vascular plant family characteristics
- Identification of common Colorado Rocky Mountain genera and species
- Use of dichotomous keys

(8) Statistics – tools and design considerations –

- Descriptive stats
- Exploratory stats – cluster analysis, ordination
- Hypotheses testing

(9) How field studies interface with other areas in vegetation/landscape/ecosystem science –

- Conservation, land management
- GIS, remote sensing applications
- Simulation (numerical) modeling – parameterization, validation

4. Grading, based on –

- Participation in field exercises (20%)
- Written assignments & in-class activities (45%)
- Project (design, implementation, and presentation) (30%)
- Field journal (5%)

Final grades assigned as follows: A 90-100%, B 80-89%, C 70-79%, D 50-69%, F <50%

5. Schedule –

Week 1:	**M**	**Tu**	**W**	**Th**
	MRS & Course Intro			
Theme	*Global*	*Regional*	*Landscapes*	*Communities*
	Climate & Physiognomy Aims and Applications	Physiography Structure & Function	Topography, Soils	Biotic Interactions, Disturbance
Activity	North American Vegetation/Biomes Colorado Lifezones Five Key Factors	Fieldtrip Day 1: Plains to Montane (Greenbelt Plateau, Betasso Preserve)	Fieldtrip Day 2: Subalpine to Alpine (Niwot Ridge)	Data Analysis Workshop: Lifezone Transect
Skills	Vegetation Classification	Quadrats, Transects Plant Lifeforms & Taxonomy	Soil Taxonomy Map & Compass	Data Management/QA, Analyses/Graphics Soil Analysis
Deadlines				Research Idea due (a.m.) Essay 1 due Sat 5pm
Evening/Weekend Assignment	Readings Essay 1: Field Sampling Techniques (due Friday) →	Readings	Research Idea due tomorrow am →	Essay 2: Lifezone Transect (due Tuesday) →

Week 2:	**M**	**Tu**	**W**	**Th**
Theme	*Research Design* *Statistics*	*Floristics*	*Communities*	*Projects*
Activity	Lifezone Results Workshop Global Mountain Ecology	Lab: Major Plant Families	Field study: Elk Meadow – Community Diversity Data Analysis Workshop	Project consultations Pilot studies
Skills	Field study design Statistical tools	Plant Taxonomy, Dichotomous Keys, Herbarium Collections	Field study design	
Deadlines		Essay 2 due	Research proposal due (a.m.)	
Evening/Weekend Assignment	Research proposal (due Weds am) →			Fri-Sun - Complete project data collection

Week 3:	**M**	**W**	**Th**	**Fr**
Theme	*Projects*	*Projects*	*Projects*	*Projects*
Deadlines		Draft PPt due (a.m.)		Journals due (a.m.) PowerPoints due (a.m.)
Activity	Data Analysis Project consultation	Analysis & PowerPoints Project consultation	PowerPoints Project consultation	Presentations Class photo

University & Course Policies –

***Course Policy on Absences* –** Missing a class can be detrimental to your final grade, this is especially so given that there are only 12 class days for a 3-credit course. Each day contributes directly both to your participation grade and any graded activity for the day, and cannot be excused or made up unless you have a documented legitimate reason (such as those noted below). Each day works out to be ~3 pts out of 100 for the final grade, enough to change the letter grade. In addition, there's an indirect impact of missing skills or other information related to take-home assignments or individual projects that is covered on any given day. (7/2018)

University Policies – See https://www.colorado.edu/academicaffairs/policies-customs-guidelines/required-syllabus-statements for links (updated 5/2022)

Classroom Behavior – Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on classroom behavior and the Student Conduct & Conflict Resolution policies.

Requirements for COVID-19 – As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu).

Accommodation for Disabilities – If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website.

Preferred Student Names and Pronouns – CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Academic Integrity / Honor Code – All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code website.

Students should note that their work may be evaluated with a plagiarism detection service; and that these services retain a copy of the submitted work for future comparisons. (7/2018)

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation – CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and the support resources can be found on the OIEC website.

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options. To learn more about reporting and support options for a variety of concerns, visit Don't Ignore It.

Religious Holidays – Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. See the campus policy regarding religious observances for full details.

It is your responsibility to make such requests to your professor at the start of the course. (7/2018)