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 course work in general biology or environmental science, or consent of instructor
- Recommended: one additional course in General Ecology (e.g., EBIO 2040), Plant Ecology, Landscape Ecology, Plant Systematics, Biogeography, or other 3000/4000 level course in ecology or physical geography

Credits – Three 4000-level EBIO credits

Schedule – 3 weeks (2-4 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 –

  - Copies available at MRS, having your own copy is optional.
- **Recommended Floras** — One course copy of both available at MRS

2. **Instructors**

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

Gwen Kittel (MS Botany), Professional Ecologist, Boulder, CO  
email: Gwen.Kittel@colorado.edu
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 (Tentative) – 15 July–1 August 2019

<table>
<thead>
<tr>
<th>Week 1:</th>
<th>M</th>
<th>Tu</th>
<th>W</th>
<th>Th</th>
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<tbody>
<tr>
<td><strong>Theme</strong></td>
<td>MRS &amp; Course Intro</td>
<td>Global</td>
<td>Regional</td>
<td>Landscapes</td>
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<tr>
<td><strong>Activity</strong></td>
<td>Climate &amp; Physiognomy</td>
<td>Aims and Applications</td>
<td>Physiography</td>
<td>Structure &amp; Function</td>
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<tr>
<td></td>
<td>North American Vegetation/Biomes</td>
<td>Fieldtrip Day 1: Plains to Montane (Greenbelt Plateau, Betasso Preserve)</td>
<td>Fieldtrip Day 2: Subalpine to Alpine (Niwot Ridge)</td>
<td>Data Analysis Workshop: Lifezone Transect</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td>Vegetation Classification</td>
<td>Quadrats, Transects</td>
<td>Plant Lifeforms &amp; Taxonomy</td>
<td>Soil Taxonomy</td>
</tr>
<tr>
<td><strong>Deadlines</strong></td>
<td></td>
<td></td>
<td></td>
<td>Research Idea due</td>
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<tr>
<td><strong>Evening/Weekend Assignment</strong></td>
<td>Readings Essay 1: Field Sampling Techniques (due Tuesday am)</td>
<td>Readings</td>
<td>Research Idea due Tuesday am</td>
<td>Essay 2: Lifezone Transect (due Thursday am)</td>
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<tr>
<th>Week 2:</th>
<th>M</th>
<th>Tu</th>
<th>W</th>
<th>Th</th>
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<tbody>
<tr>
<td><strong>Theme</strong></td>
<td>Research Design</td>
<td>Statistics</td>
<td>Floristics</td>
<td>Communities</td>
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<tr>
<td><strong>Activity</strong></td>
<td>Lifezone Results Workshop</td>
<td>Field: Mtn Bogs (C1)</td>
<td>Field study: Elk Meadow – Community Diversity Data Analysis Workshop</td>
<td>Project consultations Pilot studies</td>
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<td></td>
<td>Global Mountain Ecology</td>
<td>Lab: Major Plant Families</td>
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<tr>
<td><strong>Skills</strong></td>
<td>Field study design</td>
<td>Statistical tools</td>
<td>Plant Taxonomy, Dichotomous Keys, Herbarium Collections</td>
<td>Field study design</td>
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<tr>
<td><strong>Deadlines</strong></td>
<td>Essay 2 due</td>
<td>Research proposal due</td>
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<tr>
<td><strong>Evening/Weekend Assignment</strong></td>
<td>Research proposal (due Monday am)</td>
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<td>Fri-Sun - Complete project data collection</td>
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<tr>
<th>Week 3:</th>
<th>M</th>
<th>Tu</th>
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<th>Th</th>
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<tbody>
<tr>
<td><strong>Theme</strong></td>
<td>Projects</td>
<td>Projects</td>
<td>Projects</td>
<td>Projects</td>
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<tr>
<td><strong>Deadlines</strong></td>
<td>Draft PPT due</td>
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<td>Journals due</td>
<td>PowerPoints due</td>
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<tr>
<td><strong>Activity</strong></td>
<td>Data Analysis Project consultation</td>
<td>Analysis &amp; PowerPoints Project consultation</td>
<td>PowerPoints Project consultation</td>
<td>Presentations Class photo</td>
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University & Course Policies –

Accommodation for Disabilities or Temporary medical condition or injury

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 or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website.

- 12/2018

Professional Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. 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.

Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

- 12/2018

Academic Integrity / Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: 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 who are 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 at the Honor Code Office website.

Students should note that their work may be evaluated with a plagiarism detection service; and that this service retains a copy of the submitted work for future comparisons.

- 12/2018

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by 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 cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

- 12/2018

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.

In this class, it is your responsibility to make such requests to your professor at the start of the course.

- 12/2018

General Course Policy on Absences

Missing a class is pretty detrimental to your 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 above). 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