Syllabus (Revised 10/15/17)
BIOL F697, Directed Study, Vegetation Description and Analysis
Fall 2017

General Course Information

Title: Directed Study: Vegetation Description and Analysis
Course number: BIOL F697
Credits: 3 credit-hours, 2 lecture + 1 laboratory (Note: Students participating in the field trip July 27-Aug 3 and lectures will receive 3 credits. Those participating only in the lecture portion will receive 2 credits.)

Prerequisites BIOL 115, BIOL 116; BIOL 239 Introduction to Plant Biology, or BIOL 271 Principles of Ecology, or BIOL 331 Plant Systematics, or permission of instructor
Location: lectures – Arctic Health 252; Field Trip to North Slope Bunnel and O'Neill.
Meeting Time: Lecture M 2:15-4:15, Lab: W 2:15-5:15

Instructor: Skip Walker
Office: Arctic Health Bldg Room 254
Office hours: Open
Office phone: 474-2460
Email: dawalker@alaska.edu

Required text:

Kent, M. 2012. *Vegetation description and analysis: a practical approach*. 2nd Edition, West Sussex, John Wiley & Sons, 414 pp.

Other recommended texts:

Mueller-Dombois, L. D. and Ellenberg, H., 1974: *Aims and Methods of Vegetation Ecology*. John Wiley and Sons, New York (reprinted in 2003 by Blackburn Press)

McCune, B. and Grace, J., 2002: *Analysis of ecological communities*. Gleneden Beach, Oregon: MjM Software Design, 300 pp. Or

Peck, J.E. 2016. multivariate Analysis for Ecologists Step by Step2nd Edition. MjM Software Design, Gleneden Beach Or 192 pp.

Supplemental Readings: Readings from the primary literature may be assigned throughout the semester. The content of the readings will be determined considering the educational needs of the student. Those readings will be discussed during weekly meetings.

Course goals: The goals for the course are: (1) to provide students with a comprehensive set of sampling and analysis methods used in vegetation science, and (2) to develop an understanding and appreciation of vegetation, its composition, structure and function, its wide diversity, and role in local, regional and global ecosystems.

Learning outcomes: The student will be able to analyze and synthesize typical vegetation plot data to aid the completion of thesis work, or to provide a more rounded general knowledge of vegetation in relationship to permafrost and the Arctic physical environments.

Instructional methods: Material will be presented via PowerPoint presentations and made available on the Web after the lesson. Written and oral communication with instructor will be a key factor in assessing student comprehension.

Evaluation: The student will complete three major graded components.

1. Table analysis of the field data
2. Ordination analysis of the field data
3. Independent paper that uses the analyses to discuss a topic related to Arctic Vegetation or Arctic Ecosystems
4. Oral presentation of the paper

Required supplies:
10x-power hand lens for field identification of plants
8.5 x 11-inch notebook for field reference collection and methods notes
Clothing adequate for spending several hours outdoors conducting field work (including day pack, rain gear (top & bottom), waterproof boots, coat/sweater, hat, gloves)

Course Description

Catalog description:

BIOL F698 Directed Study: Vegetation Analysis

3 Credits
Methods of vegetation science including sampling, classification, gradient analysis, ordination, field description. Field trip to Arctic Alaska.
Prerequisites: BIOL 239 or BIOL 233 or BIOL 271, or BIOL 331 or permission of instructor.
Stacked with BIOL F689 (2+3)

Course description: Concepts and methods of vegetation sampling, classification, gradient analysis. The course teaches students a comprehensive set of sampling and analysis methods used in vegetation science, providing them with practical skills applicable for research and management. Students collect, analyze and interpret vegetation data collected in the Brooks Range, Alaska.

Expected proficiencies for taking the course: Ability to read, comprehend, and assimilate written information in scientific texts and journals; basic math skills (including algebra); basic word processing and spreadsheets); basic writing and presentation skills, background in biology, ecology, and plants and/or other biological or Earth sciences such as geology, geomorphology, zoology, climatology and remote sensing.

More detailed description:
This course will give students a broad overview of concepts and methods of description and analysis of plant community data. Students will collect a set of field data that they will use for

analysis and production of an oral report and final written report that will be due at the end of the course. There are no exams. The methods include vegetation sampling, classification, gradient analysis, and exploration of the relationship of species distributions to their environment. Most of the class will be devoted to obtaining comprehensive skills for vegetation sampling and analysis. The first week will be a field trip to northern Alaska to become familiar with Arctic plants, plant communities, and plot sampling protocols. The second part of the course will be a series of lectures and independent classification and analysis of data that were collected during the first week. There are two graded exercises that are essential to understanding the material.

Instructional Methods

Lectures:
Lectures on practical methods and discussion of the history, theory and approaches to vegetation sampling, description, and analysis. Labs will include a week-long field orientation to sampling methods and Arctic vegetation. Labs in Fairbanks will cover herbarium and plant identification, soils analysis, methods of ordination, and vegetation classification.

Students are expected to attend the lectures and read the assigned literature. Students will need to read the assigned material to understand the methods covered in this course.

Labs:
Wednesday laboratories will be spread among the following activities: 1 lab field sampling methods; 1 lab for herbarium and plant identification; 1 lab for soils analysis, 6 labs for vegetation analysis methods: 4 for ordination, 2 for classification.

Lab write-ups:
There will be 4 lab write-ups. These are designed to give the students an opportunity to apply analytical skills they have learned to data they have collected. These analyses will contribute to the oral and written presentations summarizing the data.

Final papers:

Graduate students will choose 2-3 analytic approaches used in the class (or other approaches if appropriate) and apply them to a data set, for example data for a thesis. These papers should present a thorough analysis of the data with considerable part of the paper devoted to background, questions, hypotheses and thorough description and analysis of the data; in other words the paper should synthesize material from a wide spectrum of the class analytical methods The paper should be 2500-3500 words, in standard scientific format, with an abstract, introduction, methods, results, discussion, conclusions, acknowledgements and references, and figures and tables at the end of the paper, with a minimum of 10 peer-reviewed journal articles.

Final oral presentations:
Each student will present their final in a conference-style oral presentation, for about 20 minutes for undergraduate students (30 minutes for graduate students), with 20 minutes for questions. Criteria for grading both the written and oral presentations that be handed out early in the semester.

Course Schedule and Assignments

Readings:

Kent = Kent, M., 2012: *Vegetation Description and Data Analysis: A Practical Approach*. New York: John Wiley and Sons.

MD&E = Mueller-DuBois, L. D. and Ellenberg, H., 1974: *Aims and Methods of Vegetation Ecology*. Boca Raton: CRC Press.

McC&G = McCune, B. and Grace, J., 2002: *Analysis of ecological communities*. Gleneden Beach, Oregon: MjM Software Design, 300 pp.

Date	Topics/Activities (labs are highlighted in gray)	Reading assignments	Assignments DUE
Summer: Field trip to North Slope Jul 27- Jul 4, 2017	**FIELD LAB: Students receiving 3 hours of credit.** Field orientation to field work, vegetation science sampling methods, glacial surfaces, and river and glacial chronosequences; collection of 5 plot samples (relevés): Galbraith Lake, Grizzly Glacier, Atigun Pass, Imnavait Creek, Toolik Lake, Happy Valley, Sagwon. Approximately 20 hours of field lab.		**None**
Fall: Wed 30 Aug	**Lecture 1**: Overview of course; Plant community Concepts	1. Course syllabus 2. Kent, Chapter 1 (p. 1-21) "Quantitative plant ecology and vegetation science"). 3. Kent, Chapter 2 (p. 23-48), "Environmental gradients, plant communities and vegetation dynamics"	**None**
Mon 4 Sep	**Labor Day – No class Lab 1:** Data entry from field sheets to Excel spread sheets	Catch up on reading from last lesson.	**None**
Wed 6 Sept	**Lab 1: North Campus Lands, Relevé sampling #1.** Clothing adequate for spending several hours outdoors conducting field work (including day pack, rain gear (top & bottom), waterproof boots, coat/sweater, hat, gloves), notebook, pencil.	1. Lab 1 Handout 2. Be familiar with website for identification of common Arctic plants at http://www.geobotany.uaf.edu/teaching/biol474/allplants.php.	Hand in relevé sheets at end of class for check. **Proposals for final papers and oral presentations (25 points)**
Mon 11 Sep	**Lecture 2.** Description of vegetation in the field	1. Kent, Chapter 3, pp. 49-99. Focus on p. 60-80 .	**None**

Wed 13 Sep	**Lab 2:** 1. Overview of AVA-AK database (Lisa Druckenmiller) 2. Check Grizzly field sheets against voucher collections. 3. Transfer species & environmental data to Excel spread sheets.	1. Kent, Chapter 4., pp. 101-138. Nature and properties of vegetation data. 2. Walker, D. A., Breen, A. L., Druckenmiller, L. A., Wirth, L. W., Fisher, W., Raynolds, M. K., et al. (2016). The Alaska Arctic Vegetation Archive (AVA-AK). *Phytocoenologia*, *46*, 221–229.	**Preliminary outlines final papers and oral presentations (25 points).**
Mon 18 Sep	**Lecture 3:** Soils in one lesson.	1. Barbour et al. (1987). Chapter 17. Soils, p. 407-433. 2. Kent, Chapter 4, p. 99-138. Nature of vegetation data. 3. Kent Chapter 5, p. 140-170. Basic statistical methods for understanding multivariate analysis. **Note:** There is a whole course in these two chapters, which provide basic information regarding structure of vegetation data and types of statistics useful for understanding them. We will not have time to delve into these methods. Please read carefully and gather what you can.	
Wed 20 Sep	**Lab 3:** Soils analyses: pH, grain size, soil color (Soils Lab, 335 O'Neil Bldg)	1. Lab 3 Handout (Soils).	Add soils data to the Excel environmental data matrix
Mon 25 Sep	**Lecture 4:** Ordination 1:Direct gradient analysis, weighted averaging	1. Kent, Chapter 6 "Ordination methods" through "the continuum index and weighted averages ordination (p. 171-178). 2.	
Wed 27 Sep	**Lab 4:** Species and environmental data matrices, relevé data entry and preparation for ordination with PC-Ord (computer lab, 301 Bunnell Bldg.)	1. Lab 4 Handout (Releve Data entry). 2. Review Kent Chapter 4 "Nature and properties of vegetation data, pp. 101-120.	**Final species and environmental data matrices due at end of lab for check.**

Mon 2 Oct	**Lecture 5**: Ordination 2: Indirect ordination: Bray and Curtis ordination (polar ordination, PO)	1. Kent Chapter 6, "Ordination methods" through "Bray and Curtis (polar) ordination" (pp. 178-194).	
Wed 4 Oct	**Lab 5:** Introduction to PC-ORD (1) Polar ordination,	1. Lab 5 Handout (Ordination). 2. McC&G, Chapter 13 "Introduction to Ordination (p. 102-113); Chapter 17 "Bray and Curtis (Polar) ordination (p. 143-148);	
7-13 Oct: Skip in Svalbard for Arctic Biomass Workshop Reading and Review: Kent Chapter 4, 5, and 6 Kent, p. 101-214; McC&G, Chapters 13, 17, 20			
Mon 16 Oct	**Lecture 6**: Ordination 3: Review of Polar ordination; Principal Components Analysis (PCA)	Kent, Chapter 6, "Ordination methods" through "Principal components analysis (PCA)" (pp. 194-213).	
Wed 18 Oct	**Lab 6:** PC-ORD (2) Detrended correspondence Analysis (DCA). Exploration of NMS, DCA, dendrograms and TWINSPAN in PC-ORD.	1. Kent, Chapter 6, "Ordination methods" through "Detrended Correspondence Analysis (DCA)" (pp. 214-236). 2. MCC&G, Be familiar with chapters 13 (introduction); 14 & 15 (PCA); 16 (NMS); 17 (B&C); 20 (DCA); and 21 (CCA)	
Mon 23 Oct	**Lecture 7:** Ordination 4. Reciprocal Averaging (RA), Correspondence analysis (CA), Detrended correspondence analysis (DCA)	Kent Chapter 6, Numeric Multi-dimensional scaling (NMS), Correspondence Analysis (CA), Detrended Correspondence Analysis (DCA), Canonical Correspondence Analysis (CCA) pp. 214-271.	
Wed 25 Oct	**Lab 7:** Table sorting and classification of class data using Excel.	Lab 7. Sorted Table analysis handout.	
Mon 30 Oct	**Lecture 8:** Braun-Blanquet Table analysis & syntaxonomy	1. Kent, Chapter 7, (p. 273-305), Phytosociology and the Zurich-Montpellier	**Ordination exercise due (100 pts)**

		(Braun-Blanquet) school of subjective classification)	
Wed 1 Nov	**Lab 8:** Table sorting, analyses for final paper		
Mon 6 Nov	**Lecture 9:** Numerical classification	1. Kent, Chapter 8, (p. 308-358) Numercial classification, cluster analysis and phytosociology.	**Sorted-table exercise due Tables" for grade (100 pts).**
Wed 8 Nov	**No Lab: Work on analyses and text for oral presentations and final**		
Mon. 13 Nov	Questions preparation for oral presentations		
Wed 15 Nov	Student oral presentations		**Send copy of oral presentations to Skip**
Mon 20 Nov - 9 Dec	No Class: Work on papers		**20 Nov: First draft of papers due for check of progress** **9 Dec: Final papers due Send .doc file to Skip.**

Course Policies

Academic integrity:

Anyone observed cheating on an examination will receive a "0" for that examination. Anyone found to have used someone else's work without crediting that person (plagiarizing) will receive a "0" for the assignment. When in doubt, always identify your sources. This applies to all material derived from the web. Please speak with me if you have any questions about how to properly use other people's work.
For additional detail, see
http://www.uaf.edu/library/instruction/handouts/Plagiarism.html

Attendance & participation:

Students are expected to attend every class and lab, which will begin promptly. Attendance will be taken, and 10 points given for on-time attendance. Late students will receive 5 points.
Students are expected to participate in class discussions. Both attendance and participation will contribute to the final grade.

Evaluation

Grades:

Grades will be based on the following criteria:	Undergraduate	Graduate
Lab report assignments (2 @100 points/report)	200	
Final paper proposal and outline	50	
Final paper	300	
Oral presentation to class	200	
TOTAL	750	

Final grades will be as follows: greater than or equal to 90% = A; 80-89% = B; 70-79% = C; 60-69% = D; < 60% = F.

Assignments are due at the beginning of class on the days shown in the syllabus. 5% of the total points will be deducted for every day an assignment is late.

Support Services

Students are encouraged to contact the instructor with any questions, or to clarify the lecture or the assignments. I will be happy to review drafts of assignments and answer questions any time. Arctic Health, Room 254. Phone 474-2460, dawalker@alaska.edu. Home phone: 451-0800.

Disabilities Services

The instructor will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities. Any student needing special accommodation should talk with the instructor before the class or lab in question. These discussions will be held confidential.

Notice of nondiscrimination:

The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at
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