Syllabus WILD / SOIL 5350-6350 WILDLAND SOILS  
Spring Semester 2017  
MWF 9:30 am -10:20 pm NR 217  

Learning facilitator: Dr. Helga Van Miegroet, Professor, Wildland Soils and Biogeochemistry  
Office: BNR 157 (797-3175; cell 770-1275)  
E-mail: helga.vanmiegroet@usu.edu  
Scheduled Office Hours: M W F: 11 am - 2 pm (or by appointment)  
Because these office hours may not fit every student’s schedule, or I may be busy with a student when you come by the office, I strongly advise anybody to contact me by E-mail to make alternative arrangements if necessary.  
My apologies for those times I will not be available for consultation due to professional or personal obligations.  

Prerequisites: each student is expected to have a working knowledge of concepts typically covered in introductory chemistry and soils classes. Students should honestly evaluate their deficiencies and will be pointed towards additional background readings.  

Course Objectives: This course builds on basic concepts regarding soil-plant interactions; soil formation; biological modification of soil properties; and soil chemistry. It places these basic concepts within the context of the specific physical, chemical, and biological properties of wildland soils, their role in our natural environment, and their use by society. The course is geared towards upper level undergraduate and graduate students within the different disciplines of natural resources and soils. Specific class content and format will vary according to background and interest of the students participating in this class. Content of the class is determined by the learner and thus strongly relies on student participation.  

Student expectations: At the end of this class, the students will:  
(1) be able to comprehensively read a variety of documents, analyze and synthesize concepts, and critically evaluate opposing viewpoints;  
(2) become proficient in using various sources of information on physical, chemical, and biological soil properties, and understand how these are measured or assessed;  
(3) understand role of soils in the structure and function of ecosystems across spatial and temporal scales;  
(4) be able to identify physical, chemical, and biological properties of wildland soils that are critical to ecosystem response to anthropogenic stressors, management, landuse shifts, and/or changing environments;  
(5) have a broad understanding of soil-plant interactions, the mechanisms and patterns of nutrient cycling in wildland ecosystems, and the concept of site quality, soil productive capacity, and ecological functioning of soils.  

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<thead>
<tr>
<th>IDEA (Evaluation) Course Objectives</th>
<th>Importance Rating</th>
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<tr>
<td>Gain factual knowledge (terminology, classifications, methods, trends)</td>
<td>Important</td>
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<tr>
<td>Learn fundamental principles, generalizations and theories</td>
<td>Important</td>
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<tr>
<td>Learn how to find and use resources for answering questions or solving problems</td>
<td>Essential</td>
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<tr>
<td>Learn to APPLY course material (to improve thinking, problem solving, and decision making)</td>
<td>Essential</td>
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<tr>
<td>Develop specific skills and competencies needed by professionals in field related to this course</td>
<td>Important</td>
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<tr>
<td>Acquire skills working with others</td>
<td>Important</td>
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<tr>
<td>Learn to ANALYZE and CRITICALLY EVALUATE ideas and arguments</td>
<td>Important</td>
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**Instructor expectations:** you can expect Dr. Van Miegroet to come to class on time and prepared to provide insights into soil science and eager to share her enthusiasm about the topic and her area of expertise. She will be your learning facilitator and will provide assistance in your learning process when and where possible. She commits to providing guidance and advice to all who actively seek it, within or outside the classroom setting. She will meet with any student who requests it; however, in recognition of the multiple (personal and professional) commitments in our respective lives, students may have to exercise some patience and flexibility with scheduling consultations outside regular class hours.

**Readings:** The suggested readings are intended to assist you in understanding and learning the concepts that are presented and discussed in class. Because of expected differences in preparation among students, some readings may be redundant for some, while providing new information for others. Some readings will overlap and/or represent an alternative coverage of a particular topic. They may provide a basic explanation or elaborate on issues and provide greater detail.


**Supplemental Readings:** Supplemental Readings, Assignments and important messages related to this class will be posted via the USU CANVAS system, and students should visit the CANVAS site regularly for updates and posted materials.

**Class Content:**

**Part 1: Instructor-determined:** Background information on soil – plant – climate interaction and soil formation / classification

**Part 2 Students and instructor collectively decide** what broad questions/topics we want to discuss and use as the framework for further formal learning. After making our choice about the overarching issue(s) we want to address, each student will evaluate individually what they already know, and collectively they will then decide what they need to learn. We will break this down into specific learning objectives and address these goals sequentially. We will periodically tie back our individual learning goals to the overarching question we want to address and evaluate how we are achieving our learning goals.

**Evaluation of learning success:** A final grade will be assigned to each student based the following (suggested) relative weighting in the following activity/performance areas:

- Assignments (individual & group) = 25%;
- Class Discussions, Case studies & Directed Readings (input, participation, questionnaires etc) = 20%;
- Intermediate Assessment = 25%;
- End-of-term Assessment = 25%;
- Student Professionalism and Citizenship = 5%

**Homework Assignments, Case studies, Class Exercises and Paper Discussions:** In the course of the semester there will be a number of assignments to familiarize you with the basic principles covered in this class. We will look at a number of case studies and papers to illustrate concepts. This will involve class discussions of assigned readings, specific individual or group class exercises and student-lead discussions that will require preparation on your part. Homeworks and case studies will be graded (individually or as a group), and you will also be assessed on your preparation of discussion readings and participation in class discussions.
Graduate Credit: Students taking this class for graduate credit (WILD-PSC 6350) are expected to contribute to the class content by identifying a paper related to the focus of this class (and their own interests), composing a number of leading discussion questions, acting as class discussion leader(s), and providing a questionnaire for other students to fill out. Potential dates (Wed.) are 22 March; 29 March; 5 April; 12 April; 19 April (exact dates to be finalized dependent on graduate student enrollment in this course). A sign-up sheet will go around in February. Depending on the number of graduate students enrolled for this course, this may involve pairing students with similar interests.

Assessments: There will be one mid-course assessment to evaluate your progress towards the course learning objectives, and one end-of-term comprehensive assessment to evaluate your ability to apply concepts learned in this course to specific circumstances or scenarios. The assessment formats will be decided in consultation with the students.

Citizenship and Professionalism: Students will be evaluated on their professional and life skills, which include participation in: class discussion (participation without being asked; only when asked; none); collaborative skills (works toward group goals voluntarily; only when asked; non-participatory); work ethic (turns in assignments on time and neatly; not punctual; late & sloppy work); courtesy/respect (respectful of others; disruptive and/or lack of respect of other viewpoints); tardiness and absenteeism (always present & on time; frequently tardy; absent/tardy without valid explanation).

Conflicts with other course & university activities: Because of the diversity of students participating in this class, it is impossible to foresee and plan for all possible conflicts. It is the responsibility of the student to bring those to the attention of the instructor as early as possible in the course and make alternative arrangements as needed. Classes will not be canceled for fieldtrips, meetings, symposia, or extracurricular activities.

Honor System: Students are expected to adhere to the standards of academic honesty as outlined in The Code of Policies and Procedures for Students at Utah State University (revised April 2009), Article VI, Section 1. Cheating, falsification of information, or plagiarism (presenting written work of others as your own) will not be tolerated.

Accommodations for Disabilities: In coordination with the Disability Resource Center, reasonable accommodations will be provided for qualified students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Accommodations and alternative format print materials (large print, diskette or Braille) are available through the Disability Resource Center, University Inn (797-2444).
Outline of possible topics and associated background reading in textbook

Class Content: After presentation of background information on soil – plant – climate interaction and soil formation/classification by the instructor to set the stage, we (students and instructor collectively) will decide as to what broad questions/topics we want to discuss and use as the framework for further formal learning. After making our choice about the overarching issue(s) we want to address, each student will evaluate individually what they already know, and collectively they will then decide what they need to learn. We will break this down into specific learning objectives and address these goals sequentially. We will periodically tie back our individual learning goals to the overarching question we want to address and evaluate how we are achieving our learning goals.

Reference material:

Selected papers will be available electronically to complement the material in the textbook – this will be announced in class with the relevant topics discussed

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<thead>
<tr>
<th>Topic</th>
<th>Suggested Reading in 4th Ed</th>
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<tr>
<td><strong>Part 1 – Structured topics</strong> (week 1)</td>
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<tr>
<td>Introduction</td>
<td>Chapter 1</td>
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<tr>
<td>What are forest / wildland soils?</td>
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<td>Land Use issues</td>
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<td><strong>Soil Formation and classification (week 2-6)</strong></td>
<td>Chapter 2 &amp; 3 &amp; posted readings</td>
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<td>Major soil orders - Pedogenic processes</td>
<td>Chapter 3</td>
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<td>Relationship soil - vegetation</td>
<td>Chapter 2</td>
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<td>Interpreting information - Taxonomy</td>
<td>Chapter 10</td>
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<td>Working with soils surveys en digital resources</td>
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<td>–&gt; Guest Lecture &amp; class exercise</td>
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<td><strong>Part 2 – Possible topics (week 7-15)</strong></td>
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<tr>
<td><strong>Soil Physical properties</strong></td>
<td>Chapter 5, 10</td>
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<tr>
<td>Texture- Structure - Porosity - Bulk density</td>
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<td>Influence on plants and soil organisms</td>
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<td>Management Effects</td>
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<td>Temperature</td>
<td>Chapter 10</td>
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<td>Factors causing variability, what are the effects?</td>
<td>–&gt; Discussion of papers, case study</td>
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<td>Soil water</td>
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<td>Retention, movement, availability</td>
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<tr>
<td>Water balance - Management effects</td>
<td>–&gt; Case studies, discussion of papers</td>
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<tr>
<td><strong>Erosion and Mass movement</strong></td>
<td>Posted Readings</td>
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<tr>
<td>Water infiltration</td>
<td>Chapter 5</td>
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<td>Surface erosion - Mass wasting</td>
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<td>Measuring and predicting erosion</td>
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<td>Effect of land use and management</td>
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Soil Chemistry
Clay Minerals
Soil charge: Cation exchange, adsorption, fixations
  Base saturation
Acidity: Total, exchangeable, titratable
Nutrient mobility - Adsorption

Chapter 7 & 8
Chapter 3 (p 26-33)

Soil organic matter dynamics
Role of soil organic matter
Organic matter dynamics
  Accumulation of carbon in soil and litter layer
  Decomposition and its controlling factors
Rhizosphere
Morphology, Classification and interpretation
Differences between wildland ecosystems
Spatial Variability
Managing for carbon

Chapter 6
Chapter 4
Chapter 11
Chapter 9
Chapter 15

Soil Quality - Site Productivity
What is soil quality
  vs. soil fertility vs. site productivity?
Nutrient availability – Nutrient cycling
  Interaction between soil and plant properties
Assessment tools
Influence of disturbance & management

Chapters 4-10, 12, 14, 16
Chapter 4-8
Chapter 9, 10, 16
Chapter 12, 13, 14

Land Use, Management and Effects of Disturbance
Prescribed and natural fire
Harvesting & Silvicultural practices
Vegetation conversion - what happens to the soil functions?
Wildland soils as processors of pollutants: effluent, biosolids, mine drainage
Grazing effects
Recreational use of wildlands: what is soft use?
Biomass for energy
Environmental stressors: Global change, air /water pollution
How do we assess C sequestration?
Effects of global climate change

Chapter 13
Chapter 12
Chapter 11
Chapter 7 & 8
Chapter 15
Chapter 16