Soils 4120/5120: Genesis, Morphology and Classification of Soils
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This course focuses on soils as natural landscape components. This soil science discipline is called "Pedology". Emphasis is on the inter-relationships between soils, native plant communities, climate and geology. You will learn to describe and classify soils in the field and to interpret the history of a soil from its morphology and chemistry. We will see how soil properties are used to classify the soil and discuss soil surveys and other sources of soil information.The course then examines use of this information in developing a variety of interpretations for different land uses. Soils are an important interface between biological and physical components of ecosystems, and an understanding of soils is one of the cornerstones of good natural resource management.

The course will be centered on the influence of soils on land management in the Rocky Mountains and adjacent basins and plains. Field trips in the Laramie Basin and surrounding mountains will be used to demonstrate the ties between soils and vegetation, geology, topography, climate, and time. However, the principles involved in the course have world wide application.

We will discuss such issues as sustainable agriculture, both cropping and grazing systems, and forestry; use of landscapes as watersheds and for wildlife habitat. We will also discuss the probable influence of global climate change on human use of soil systems and the use of soils for disposal of sewage and hazardous wastes. You will be introduced to the mechanics of soil profile description, the identification of important soil horizons, and the use of the USA soil classification system- "*Soil Taxonomy*".

Required text for the class is a bound 130 page document available from the book store entitled: "Soil 4120/5120: Genesis, Morphology and Classification of Soils". Continuous change in Soil Taxonomy (major revisions every two years) results in texts that are out of date almost at printing. They still cost $90 to $140. Because of this, I have put together a document for your use which I update annually. Price is $15.75 and I make no money on these. The packet is available at the Bookstore.

The class grade is based on two hour exams (40%), a two hour final exam (30%), a term project (15%), and attendance/participation on the field labs (15%}. Participation in the field trips is mandatory. Everyone is allowed to miss one field lab without penalty. You will be required to do a term project involving describing

a soil in the field, classifying the soil, and developing interpretations for appropriate land uses.

Laboratory Experiences

The laboratory is planned around five field trips which will typically involve one to two hours looking at soils plus travel time. We will start with trips to the Snowy Range and work our way to lower elevations as the course progresses, and the weather worsens. When the weather prohibits field trips, there will be several indoor labs (Room 30, Agriculture Building) as well as opportunity for you to work on your term projects. We will be able to see examples of seven of the twelve Soil Orders on these trips. We will adhere to the scheduled return time of 5:15 pm., baring vehicle problems, landslides, etc. We will not be more than 5 or 10 minutes (walking time) from the vehicles on these trips, but you should wear warm clothes and mud shoes. A wind breaker jacket is always a good idea in Wyoming.

Because the weather can make the taking of notes difficult in the field, I will provide you with a set of notes from each field trip. These will cover the taxonomy of the soils which we see and the main theme of the trip. Each trip will be designed to illustrate several key points such as the influence of vegetation on organic carbon distribution, the influence of parent material on soil salinity and mineralogy, etc. If at any time on the field trip you are not sure what the point of the trip is-ask! I encourage questions in both the field and in class. I would much rather discuss a few topics in sufficient detail to be fully understood, than to cover a lot of ideas superficially.

Additional Requirements For Students Enrolled in 5120

Students signed up for the course as 5120 rather than 4120 will have the additional responsibility of giving a presentation on their soil project (15-20 minutes). Each student enrolled in 5120 must describe a soil profile individually and submit an individual report. The presentation will be scheduled for one of the later lab periods and will involve a discussion of the description, genesis, classification and management potential of the soil studied. We will meet several times (graduate students only) during the scheduled laboratory periods to discuss some issues related to scientific research and professional development.

Extra Reading Opportunities

There is a wealth of literature in scientific journals and texts on Soil Genesis, Morphology and Classification. If your curiosity is aroused by any of the topics we talk about in class or on the field trips, and you want to learn more; ask and I will be happy to point you to some reading materials. There is a lot of information out there. Some of it is even interesting!

Soil 4120/5120 Term Project

The term project is designed to provide experience in describing and classifying soils in the field. Activities required include:

1. Digging a pit and making a complete description of a soil in the field and its environmental (landscape) setting.

2. Completing such chemical tests as may be required to classify the soil. These typically include pH and electrical conductivity.

3. Using field soil morphology and chemistry to identify diagnostic horizons for classification in Soil Taxonomy (family level).

4. Interpret the soil for three possible land uses (discussing limitations for each use based on soil characteristics).

This effort will be detailed in a six to eight page term paper. In addition to describing and classifying the soil, you will need to discuss the probable genetic history of the soil; addressing such issues as present and past vegetation, soil parent material, climate change, site stability and the effects of current land use upon the soil. Explain the "Five Factors" for your soil.

I will provide you with a shovel, tray sample box to turn in with your report, acid bottle, color book, water bottle, tape measure, etc I can help you find a site if you're not sure where to go; You will have one lab period released from the normal field trips to collect your soil samples. I will be happy to help you with classifying the soils and will provide guidelines for the land use interpretations.

You may do this project individually, or (if enrolled in 4120) in a group of two or three if you prefer. If you work in a group, you should indicate the division of effort. **Everyone** should go to the field to collect the samples, one of you may do soil color in the lab while the other person does the word processing, etc. The ability to work together is a valuable skill; perhaps one of the most valuable you can learn in college. Even if enrolled in 5120, you may find it useful to pair up for the expedition to the field, but each individual in 5120 should end up describing and writing up their own pedon.

Be careful with the shovel, acid etc. (i.e. don't hurt yourself!) **If you sample on private land, don't trespass!** Refill the soil pit carefully whether you are on private or public land.

SOIL 4120/5120 Lecture Schedule

Lecture	Date		Topic
1.	August	23	Organizational Information. Why soils are important. Soil forming factors.
2.	August	25	Models of Soil Formation. Why rocks weather to soil.
3.	August	30	Soils and Biological Diversity. Below ground environment.
4.	September	1	Soils and Landscapes. Mountains, plains, deserts.
5.	September	6	Soil Formers: Plants, microbes.
6.	September	6	Soil Destroyers: Burrowing rodents, erosion, humans.
7.	September	13	Soil Horizons/Profiles. Diagnostic Horizons/Pedons
8.	September	15	Structure of Soil Taxonomy.
9.	September	20	Soil moisture and temperature regimes
10.	September	22	Forest soils: Alfisols, Spodosols, Ultisols, Oxisols
11.	September	27	Deserts: Aridisols, Entisols
12.	September	29	Grasslands. Mollisols, Vertisols, Alpine.
13.	October	4	Soil profile review pictures.
14.	October	6	First hour exam. Identification of soil features, horizons, taxonomy.
15.	October	11	Shadow of the Volcano: Andisols
16.	October	13	Wet/Cold Landscapes: Gelisols, Histosols, Inceptisols
17.	October	18	Tropical Soils/ Land use.
18.	October	25	Urban land.
19.	October	27	Soils/Food.
20.	November	1	Anthromorphic Soil Order proposal.
21.	November	3	Hour Exam 2. The Soil Orders
22.	November	8	Soil Survey, Soil Mapping Units, GIS.
23.	November	10	Soil Information. Reliability. NCSS, On sites.
24.	November	15	Rangeland Soils, Interactions with grazing systems/ pastoralisim.
25.	November	17	Forest Soils/Forest management.
26	November	22	Reclamation/Restoration of Soils on drastically disturbed lands.
27.	November	29	Soils in Archeology.
28.	December	1	Wrap up, catch-up..
29.	December	5 to 9	Final Exam Week. Two-hour exam.