

Environment and Natural Resources 5260

Soil Landscapes: Morphology, Genesis and Classification

Autumn Semester 2019

3 CREDIT HOURS

Instructor:

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Lecture: 12:40 – 1:35 PM WF 333C Kottman Hall

Lab: 9:55 AM – 12:00 PM M 370 Kottman Hall

I. SCOPE

ENR 5260 is a course in *pedology*: the science of soil genesis, classification and mapping. The emphasis is on concepts of soil variation at the landscape scale, and on evolving methods for understanding, depicting and modeling soil diversity. Processes resulting in soil variation are critically examined with an emphasis on the development of models for predicting temporal and spatial variation in soil attributes. The course considers quantitative techniques devised for analyzing the soil continuum and explores major global taxonomic systems for soils.

II. OBJECTIVES

In ENR 5260, students will

- a. develop an understanding of the diversity of soils in the landscape.
- b. understand the major genetic processes that generate patterns of soil variation at the landscape scale.
- c. understand the concepts of soil classification.
- d. become familiar with the underlying principles of U.S Soil Taxonomy and the World Reference Base for Soil Classification.
- e. utilize the USDA soil classification system, “Soil Taxonomy” to classify soils to the Soil Family level.
- f. understand concepts of soil variability, soil bodies and units used for depicting soil diversity.
- g. understand the methods used for mapping soils and for analyzing soil landscapes.
- h. develop an understanding of digital soil mapping methods, soil-landscape models, and geospatial tools for efficient soil survey at multiple scales.
- i. gain an appreciation for soil forming processes and the evolution of soils, and to understand methods of modeling soil genesis.
- j. explore the major concepts and models of soil geomorphology.

III. STUDENT LEARNING OBJECTIVES

Students will

- a. recognize the complexity of soil landscapes and their diversity in space and time.
- b. appreciate traditional and new (digital) methods for understanding and depicting soil diversity.
- c. understand of the principles of soil classification.
- d. use the two major global systems – US Soil Taxonomy and the World Reference Base, to classify soils.
- e. learn methods for modeling soil physical, chemical, and biological processes active in soil genesis.
- f. gain experience in digital soil mapping techniques using geographic information systems, remote sensing, and predictive soil-landscape models.

IV. APPROACH

- a. Discussion and practical study of the concepts of soil variability, soil bodies and methods of dividing the soil continuum.
- b. Discussion and application of the soil classification systems developed by the National Cooperative Soil Survey, and the World Reference Base.
- c. Discussion of soil taxa to the Family level, including their morphology, classification, genesis, distribution, and use.
- d. Discussion of soil-forming factors and processes, and quantitative modeling applied to understanding soil evolution.
- e. Field study and description of the geomorphological characteristics of some Ohio soil catenas and an evaluation of these soil landscapes relative to soil-forming factors and processes.
- f. Application of geospatial techniques to develop predictive soil landscape models.

V. ASSIGNMENTS

Class Work:

Each student will be responsible for all material covered in the lecture, laboratory, and field trips. Most of the material discussed in this course is adequately covered in the text, and reading assignments are provided.

Field Trips:

Three Saturday field trips will be taken to describe and classify representative Ohio soil landscapes and to consider the factors responsible for their formation. Each student must attend at least two of the three field trips. However, participation in all three field trips is strongly encouraged. Some exam questions will be drawn from information provided on the field trips.

VI. GRADING

Laboratory 30%

Field Trips 10%

Assignments 30%

Final Exam 30%

VII. INSTRUCTIONAL MATERIALS

TEXT

The following textbook is highly recommended (not compulsory).

Soils: Genesis and Geomorphology, by R. Schaetzl and M.L. Thompson. Second Edition. Cambridge University Press, 2015

REFERENCE

Soil Genesis and Classification, Fifth Edition, by S.W. Buol, R.J. Southard, R.C. Graham, and P.A. McDaniel. Iowa State Press. 2002.

Soils: A New Global View, by T.R. Paton, G.S. Humphries, and P.B. Mitchell. Yale University Press, 1995.

Additional instructional materials will be posted on Carmen. These additional materials are available in alternate formats upon request.

VIII. DISTRIBUTION OF CLASS TIME

2 hours of lecture per week and a two hours laboratory/discussion period.

Readings refer to Schaetzl and Thompson, 2nd Edition.

Sessions	Topics	Readings
1	Course objectives, requirements, grading History of the science of Pedology	Chapter 1
1	Concepts of soil and soils, soil units and entities and bodies, pedons and horizons	Chapters 2, 3
3	Soil morphology (color, structure, texture etc), soil constituents, soil components, field soil description	Chapters 2, 3
4	Soil properties: mineralogical, chemical, physical, biological	Chapters 4, 5, 6, 7
8	Soil classification: principles, Soil Taxonomy, World Reference Base, numerical techniques	Chapter 8
2	Soil Genesis –Weathering processes	Chapter 9
2	Genesis: Parent Materials	Chapter 10
1	Genesis: Pedoturbation	Chapter 11
1	Genesis: Pedological Models	Chapter 12
2	Soil Profile Development Processes	Chapter 13
2	Soil Geomorphology: catenas and landscape models	Chapter 14
1	Models and dating for soil chronology and paleopedology	Chapters 15, 16

Laboratory Sessions

Week	Activity	Objective
1	Soil and landscape interpretation Using traditional techniques.	To gain experience in using a pocket stereoscope to identify cultural, landscape, and soil characteristics.
2	Web Soil Survey, Soil Web, and Soil Explorer.	To gain experience in accessing and using online soil information.
3	Soil Texture Determination.	To develop proficiency in the determination of soil texture by “feel”.
4	Soil Color.	To gain experience in the determination of soil color using Munsell Soil color Book, chroma meter, and mobile sensor.
5	Soil Descriptions.	To gain experience in the delineation of soil horizons and in describing soil color, texture, structure, consistence and ped surface features.
6	Landscape Transect.	To gain experience delineating soil boundaries based on evaluations of parent materials, landforms, landscape position, slope, wetness class, erosion class, and soil depth.
7	Mapping Project	Soil mapping in the real world.
8	Urban soils	To gain experience in identifying horizons, layers, and other features unique to anthropogenic soils.
9	Soil Classification through Great Group Level.	To gain experience classifying pedons using Soil Taxonomy.
10	Soil Classification through Family Level.	To gain experience classifying pedons using Soil Taxonomy
11	Describe and Classify Soil.	To demonstrate proficiency in the description and classification of soils using the World Reference Base
12	Mapping Project (continued)	Soil mapping in the real world.
13	Use of Soil Survey Information in a GIS Format.	To demonstrate the use of Geographic Information Systems to store, visualize and model soil survey information.

UNIVERSITY RESOURCES

The university has a variety of resources in place to support students and a safe campus environment. Students experiencing stress, sleep problems, anxiety, depression, interpersonal concerns, death of a significant other, and alcohol use or any event that has significantly impacted your concentration on education, work or family matters are encouraged to contact the Office of Student Life at 614-292-9334 (<https://studentlife.osu.edu/>) and/or Counseling and Consultation Services (CCS) at 614-292-5766 (www.ccs.osu.edu) for assistance, support, and advocacy. CCS offers a number of FREE drop-in-when-you-are-able workshops (<http://www.ccs.ohio-state.edu/drop-in-workshops/>). No registration is necessary, no prior appointment is needed, and workshops are open to all enrolled OSU students.

Academic Integrity:

This course adheres to the Code of Student Conduct (<http://studentaffairs.osu.edu/csc/>) and policies set by the OSU Committee on Academic Misconduct (<http://oaa.osu.edu/coam.html>). All students should familiarize themselves with these materials, and act appropriately. Academic misconduct is defined by the Ohio State University's Code of Student Conduct (Section 3335-23-04) as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Academic misconduct will not be tolerated in this class. For more information, please feel free to review the "Ten Suggestions for Preserving Academic Integrity" <http://oaa.osu.edu/coamtensuggestions.html> or "Eight Cardinal Rules of Academic Integrity" <http://www.northwestern.edu/provost/students/integrity/rules.html>.

Accommodating Students' Learning:

For circumstances approved by the university, we can make accommodations that facilitate your learning in this class. If you have university-approved circumstances that require special accommodations (e.g., student athlete, ROTC, Marching Band, a disability), it is your responsibility to let the instructor know at the beginning of the semester or as soon as it comes to your attention during the semester. You are also required to inform the instructor about a need to miss class prior to any excused absence. If you have a disability, then please register with the [Office for Disability Services \(ODS\)](#) as soon as possible by contacting (614) 292-3307, and let your instructor know.

Reporting Incidents of Bias:

To ensure a safe learning environment, please speak to the instructor immediately if you feel that you have experienced bias (whether based on race, ethnicity, gender identity or expression, sexual orientation, religion, national origin, age or sex) within the classroom. You can also anonymously report any incidents of bias experienced on campus to the [Bias Assessment Response Team \(BART\)](#).

Career Services:

The School of Environment and Natural Resources has a Career Services Office located in 210 Kottman Hall. Please call the main office at 614-292- 2265 or email senr@osu.edu to schedule an appointment or use the available Express Walk-In Hours hosted every Friday 9am – 4pm.