



AGRN 417: SOIL GENESIS & CLASSIFICATION

“Be it deep or shallow, red or black, sand or clay, the soil is the link between the rock core of the earth and the living things on its surface.”

— Roy W. Simonson (1957)

COURSE DESCRIPTION

The study of soil genesis and classification deals primarily with (i) the formation and evolution of soils, (ii) their organization and categorization as natural bodies resulting from natural factors and processes, and (iii) their distribution throughout the world. Physical, chemical, mineralogical, and morphological soil characteristics are studied in the field and in the laboratory, and are then used to classify soils. These soil characteristics are the result of the processes (biological, chemical, physical) that have controlled the development of soils, and which are influenced by environmental factors which regulate their feasibility, rate, and extent. This course will provide you with tools that will enable you to interpret the messages found in the soil that tell us what has happened in the past and guide us toward soil management strategies that will be successful now.

INSTRUCTOR

Dr. Jim Thompson
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Office Hours: Wednesday and Friday, 11:00 a.m. – 1:00 p.m.; or by appointment

I was born and raised in Pittsburgh, PA. I received a B.S. in Agronomy from Penn State University in 1990, an M.A. in Geography from The Ohio State University in 1992, and a Ph.D. in Soil Science with a minor in Water Resources from the University of Minnesota in 1996. I was on the faculty in the Department of Agronomy at the University of Kentucky from May 1997 to February 2001, and in the Department of Soil Science at North Carolina State University from March 2001 to August 2004. I joined the faculty in the Division of Plant and Soil Science at West Virginia University in August 2004. Areas of study in soil science that interest me include soil management and land use planning, soils and landscapes, soil hydrology, wetland identification and delineation, and soil spatial variability.

I have taught or assisted in the teaching of many courses over the last 26 years, including introductory physical geography, introductory climatology, soil conservation and land use planning, wetland soils, problem solving in natural resources, and various introductory soil science courses. I teach soil judging (AGRN 125), soil survey and land use (AGRN 415), soil genesis and classification (AGRN 417), and pedology (AGRN 552); and I am a co-instructor of applied wetlands ecology and management (PLSC 574) here at WVU. While I have taught this material before, I am continually looking for opportunities to improve this course. As such, your input (comments, suggestions, etc.) throughout the term will be welcomed. My goal is to make this course, and soil science, interesting and challenging, yet enjoyable.

SCHEDULE

Lecture Monday-Wednesday-Friday, 10:00 – 10:50 AM, 1007 Agricultural Sciences Building
Laboratory Wednesday, 2:00 – 4:50 PM, 1309 Agricultural Sciences Building

PREREQUISITES

The formal prerequisite for this course is AGRN 125. While not required, AGRN 202/203 (prior or concurrent) is strongly recommended. It will also be important for you to be comfortable with mathematics and graphing principles, be able to manipulate simple equations, and have an understanding of basic chemical principles. Additionally, writing skills will be important for this course. I will expect you to communicate clearly using proper grammar and spelling on written assignments.

TEXTBOOKS*Required*

Buol, S.W., R.J. Southard, R.C. Graham, and P.A. McDaniel. 2011. Soil Genesis and Classification, 6/E. Wiley-Blackwell.

This book is available in electronic format through the WVU Libraries at: <https://reserves.lib.wvu.edu/>. Logon using your myID to access the eReserves for AGRN 417.

Recommended

Soil Survey Staff. 2014. Keys to Soil Taxonomy, 12/E. U.S. Department of Agriculture, Natural Resources Conservation Service, Washington D.C.

Soil Survey Staff. 2015. Illustrated Guide to Soil Taxonomy. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska.

These books are available in PDF format from the USDA-Natural Resources Conservation Service at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/?cid=nrcs142p2_053580.

LEARNING OUTCOMES

Upon successful completion of this course you will be able to:

1. Describe the basic morphological properties of soils in the field, including horizonation, color, texture, structure, and consistence.
2. Recognize the processes that are active in soils and responsible for individual soil characteristics.
3. Understand the interaction of soil forming factors and processes in the formation and evolution of soils.
4. Identify diagnostic horizons and other important pedological features used to classify soils.
5. Know the hierarchies of *Soil Taxonomy* and the diagnostic criteria used at each level of the system.
6. Classify soils based on soil profile descriptions and selected laboratory characterization data.
7. Relate how individual and aggregated soil properties relate to human concerns for the use of soils.

EXPECTATIONS

I will expect you to:

1. Read and understand the information contained in this syllabus
2. Attend all lectures and laboratory sessions.
3. Read assigned portions of text **BEFORE** each lecture.
4. Ask questions and participate in class discussions.
5. Notify me ahead of time if you cannot be present for a lab or an exam.

You should expect me to:

1. Come to class and be well prepared.
2. Start and end class on time.
3. Use a variety of teaching methods, not just lecture.
4. Encourage and accept points of view different from my own.
5. Encourage questions and discussion during class.
6. Be available after class, during office hours, or any other time you have questions or concerns.
7. Return graded assignments and exams in a timely manner and provide appropriate feedback on your performance. My goal is to return them one week after the due date.
8. Appreciate that this is not the only class you are taking this semester.

EVALUATION AND GRADING CRITERIA

Your course grade will be determined by from a variety of different assessment techniques. The majority of your grade (60%) will be based on lecture exams. Laboratory assignments will constitute 20% and a term project another 15%. The remaining 5% of your grade will be based on participation in lectures and laboratory sessions.

ASSESSMENT	Date	Percent
EXAM 1 (SOIL MORPHOLOGY; SOIL FORMING PROCESSES)	16 September	12%
EXAM 2 (SOIL FORMING FACTORS)	14 October	16%
EXAM 3 (SOIL CLASSIFICATION, SOIL TAXONOMY)	11 November	16%
FINAL EXAM (COMPREHENSIVE)	13 December	16%
LABORATORY ACTIVITY REPORTS AND ASSESSMENTS	Weekly	20%
PROJECT	5 December	15%
ATTENDANCE		5%
TOTAL		100%

EXAMS will consist of thought questions and numerical problems based on the content of lectures and laboratory activities, with answers given in a multiple choice, matching, fill-in-the-blank, short answer, or brief essay format. They will not just ask you to regurgitate information found directly in the textbook. If you cannot take an exam because of an excused absence (see Excused Absences), a make-up exam will be given **WITHIN ONE WEEK** after the regularly scheduled exam. If you know in advance that you will need to take the make-up exam, you must notify me in writing prior to the scheduled exam time. The make-up exam may not be the same exam that is given to the rest of the class.

LABORATORY ACTIVITIES are an integral aspect of this course. Assessments will include (i) exercises that will be completed during our weekly meetings and submitted before the end of the class period and (ii) laboratory activity reports assigned as homework to be completed prior to the next laboratory period. The **LABORATORY ACTIVITY REPORTS** will allow you to further examine the rationale for the laboratory activities, or analyze and interpret data you collected. Laboratory activity reports will be **DUE AT THE BEGINNING OF LAB ON THE WEDNESDAY OF THE WEEK FOLLOWING THEIR ASSIGNMENT**, but they will be accepted late for up to three working days after the due date. However, a penalty will be assessed on all late submissions, unless the late submission is the result of an excused absence (see Excused Absences):

- If turned in after the beginning of lab 75% credit*
- If turned in by 4:00 p.m. on Thursday 50% credit*
- If turned in by 4:00 p.m. on Friday 25% credit*
- If turned in after 4:00 p.m. on Friday 0% credit*

All submitted materials **MUST BE TYPED**; graphs and tables should be created using a spreadsheet or word processor. Overall, submitted materials should be neat, legible, and otherwise reflect a professional product.

FIELD TRIPS will permit travel to different regions of the state to view important and unique soil types and soil forming environments. This will give you an opportunity to view multiple soil profiles, examine different soils and parent materials, study different diagnostic horizons and features, and see soils of multiple soil orders. Three day-long field trips are being planned. They will occur on Wednesdays, and are considered part of the laboratory portion of the course. These field trips are authorized University activities, such that you will be provided signed excuse forms that you can submit to the instructors of your other courses.

Assigning of course grades will be on the following scale:

LETTER GRADE	PERCENTAGE
A	90.0-100
B	80.0-89.9
C	70.0-79.9
D	60.0-69.9
F	<60.0

COURSE WEBSITE

A companion web site at http://james_thompson.plantandsoil.wvu.edu/courses/agrn_417 has been developed to support this course. It includes the syllabus, lecture and laboratory schedules, reading guides, and other course-related documents. As a work in progress, any comments or suggestions you have will be most welcome.

COURSE ORGANIZATION*Lecture*

Lecture periods will be used to present and discuss the majority of the material for this course. Class time will be used for active learning exercises, example problems, and discussion of more complex material. The framework of the course will be a traditional lecture; however, the presentation will be frequently interrupted for demonstrations, discussions, and small group interactions. Exams will also be given during lecture periods. Attendance is required.

Laboratory

The laboratory will provide hands-on experience in a variety of skills related to soil genesis and classification (either in the lab or in the field). During each session you will complete various exercises and participate in other activities. There will also be time for further discussion of subject matter. Attendance and completion of all activities is required.

Out-Of-Class Time

You will use the textbook for coverage of basic concepts and terminology. To help you be a more effective reader, I have created reading guides, which are derived from the assigned readings from the textbook. The purpose of the reading guides is to help you recognize and bring together the key concepts contained in the assigned readings. These reading guides will be available on the course website and are provided for your benefit—they will not be collected or graded.

LABORATORY AND FIELD TRIP POLICIES

When in the laboratory there shall be:

- No tobacco use.
- No food or drink.
- No sandals or open-toed shoes.
- No cellular telephone use.

For field trips, we go as scheduled, regardless of weather. Come prepared for potential weather conditions, and plan to take notes outside.

The Division of Plant and Soil Sciences will provide transportation for field trips. The University assumes no responsibility when students provide for their own transportation.

ATTENDANCE

You are expected to attend all lectures, laboratory sessions, and field trips.

Please be on time. Arriving late disrupts class and is inconsiderate of other students. Exams will be based primarily on material covered in class. Therefore, regular attendance of lectures should lead you to greater success in this course. A valid written excuse (see [Excused Absences](#)) is required for missing a laboratory session.

EXCUSED ABSENCES

You must have a valid excused absence to submit a late homework assignment without deduction or to take a make-up exam. Valid excuses include participation in scheduled University events or emergencies (illnesses, accidents, natural disasters, or family crises). In the case of scheduled conflicts (field trips, athletic events, judging contests), you must provide a written notice from the instructor, coach, or other official **IN ADVANCE**. For unanticipated absences, you must provide documented proof of the incident leading to your absence upon your return to campus.

CONDUCT

You are expected to conduct yourself in a mature manner that is considerate and respectful of your classmates, the instructor, and yourself to insure an atmosphere that is conducive to learning. Any person who disrupts class or lab will be asked to leave.

COLLABORATION

You will frequently break into small, informal groups during class discussions. This will allow for greater participation and more open discussion of current lecture topics. You are also encouraged to discuss laboratory problem sets and prepare for exams together. In addition to me, your classmates (or former students, or other professors) are valuable resources—use them. However, all work you submit is to be solely your own (see [Academic Integrity](#)).

ACADEMIC INTEGRITY

We all share responsibility for upholding the principles of academic integrity. This includes students, faculty, staff, and administrators. To that end, cheating, plagiarism, or any other acts of academic misconduct will not be tolerated, and will be punishable in accordance with University policy. According to the WVU Student Conduct Code (<http://campuslife.wvu.edu/r/download/180235>):

West Virginia University expects that every member of its academic community share its historic and traditional commitment to honesty, integrity, and the search for truth. In addition, West Virginia University is concerned with the living and learning environment of all its students. It is expected that each person will grow to have greater respect for self, others, and property.

Any student found to have committed or have attempted to commit academic misconduct is subject to the disciplinary sanctions outlined in Article IV of the Student Conduct Code. Academic misconduct is defined to include, but is not limited to, any of the following:

1. Acts of dishonesty, including but not limited to the following:
 - (a) Plagiarism includes, but is not limited to, the following: (i) Submitting as one's own work the product of someone else's research, writing, artistic conception, invention, or design; that is, submitting as one's own work any report, notebook, speech, outline, theme, thesis, dissertation, commercially prepared paper, musical piece or other written, visual, oral or electronic/computerized material that has been copied in whole or in part from the work of others, whether such source is published or unpublished; (ii) Incorporating in one's submission, without appropriate acknowledgment and attribution, portions of the works of others; that is, failing to use the conventional marks and symbols to acknowledge the use of verbatim and near-verbatim passages of someone else's work or failing to name the source of words, pictures, graphs, etc., other than one's own, that are incorporated into any work submitted as one's own.
 - (b) Cheating and dishonest practices in connection with examinations, papers, and projects including, but not limited to: (i) Obtaining help from another student during examinations; (ii) Knowingly giving help to another student during examinations, taking an examination or doing academic work for another student, or providing one's own work for another student to copy and submit as his/her own; (iii) The unauthorized use of notes, books, or other sources of information during examinations; (iv) Obtaining without authorization an examination or any part thereof.
2. Disruption or obstruction of, or leading or inciting others to disrupt or obstruct teaching, research, administration, disciplinary proceedings, other University activities.
3. Physical abuse, verbal abuse, threats, intimidation, coercion and/or other conduct which threatens or endangers the health or safety of any person. Engaging in harassment or repeated unwanted contact, rising to the level of illegal harassment, including, but not limited to, stalking.

Please talk to me if you have any questions or concerns regarding any activity that may be interpreted as an attempt at academic dishonesty. In particular, if your questions relate to your own work, please see me **before** the assignment is due to discuss the matter.

STATEMENT OF REASONABLE ACCOMMODATION

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 mandates that faculty provide reasonable accommodations to students with disabilities. These accommodations are based on the premise that students with disabilities need an equal opportunity to acquire information and demonstrate what they have learned; not have an advantage over others in the class. This does not mean lowering class standards, but it may mean having students learn and express knowledge in a different mode.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please make appropriate arrangements with the WVU Office of Accessibility Services, located at 1085 VanVoorhis Road, Suite 250 (293-6700; <http://accessibilityservices.wvu.edu/>).

CHILDREN AND GUESTS IN CLASS

Many students have children and it is not always possible to find reasonable childcare. If you are unable to find child care facilities, your children are welcome in class. It is the parent's responsibility to minimize the disturbance to the class. Also, a guest of yours on campus is welcome to attend class with you.

TENTATIVE COURSE SCHEDULE

NOTE: ALL DATES AND TOPICS ARE SUBJECT TO CHANGE

WEEK	TOPIC	DATE	READING
1	COURSE OVERVIEW	17 AUGUST	SYLLABUS
	BASIC PRINCIPLES	19 AUGUST	CH. 1, P. 3-7, 12-16, 17-21, 29-34
LABORATORY: SOIL MACROMORPHOLOGY (LAB)			
2	SOIL MACROMORPHOLOGY	22 AUGUST	CH. 2, P. 35-45
	HORIZON DESIGNATIONS	24 AUGUST	CH. 2, P. 45-51
	EPIPEDONS	26 AUGUST	CH. 2, P. 51-57
LABORATORY: SOIL MORPHOLOGY (FIELD)			
3	DIAGNOSTIC SUBSURFACE HORIZONS	29 AUGUST	CH. 2, P. 57-62
	SOIL CHARACTERIZATION AND COMPOSITION I	31 AUGUST	CH. 2, P. 62-76
	SOIL CHARACTERIZATION AND COMPOSITION II	2 SEPTEMBER	
LABORATORY: SOIL MORPHOLOGY (FIELD)			
4	LABOR DAY—NO CLASS	5 SEPTEMBER	
	DYNAMIC SOIL PROPERTIES	7 SEPTEMBER	CH. 2, P. 80-87
	PROCESSES OF SOIL FORMATION I	9 SEPTEMBER	CH. 5, P. 163-169
LABORATORY: SOIL MORPHOLOGY (FIELD)			
5	PROCESSES OF SOIL FORMATION II	12 SEPTEMBER	CH. 4, P. 141-161
	PROCESSES OF SOIL FORMATION III	14 SEPTEMBER	CH. 5, P. 169-179
	EXAM I	16 SEPTEMBER	
LABORATORY: SOIL MORPHOLOGY (FIELD)			
6	SOIL AS A NATURAL BODY I	19 SEPTEMBER	CH. 3, P. 89-102
	FIELD TRIP I	21 SEPTEMBER	
	SOIL AS A NATURAL BODY II	23 SEPTEMBER	CH. 3, P. 113-118
LABORATORY: FIELD TRIP I			

NOTE: ALL DATES AND TOPICS ARE SUBJECT TO CHANGE

WEEK	TOPIC	DATE	READING
7	SOIL AS A NATURAL BODY III	26 SEPTEMBER	CH. 3, P. 102-113
	SOIL AS A NATURAL BODY IV	28 SEPTEMBER	CH. 3, P. 118-129
	SOIL AS A NATURAL BODY V	30 SEPTEMBER	
LABORATORY: SOILS & LANDSCAPES (FIELD)			
8	SE REGIONAL SOILS CONTEST—NO CLASS	3 OCTOBER	
	SE REGIONAL SOILS CONTEST—NO CLASS	5 OCTOBER	
	SOILS IN SPACE AND TIME I	7 OCTOBER	CH. 3, P. 129-138
LABORATORY: NONE			
9	SOILS IN SPACE AND TIME II	10 OCTOBER	CH. 3, P. 138-140
	FIELD TRIP II	12 OCTOBER	
	EXAM II	14 OCTOBER	
LABORATORY: FIELD TRIP II			
10	SOIL CLASSIFICATION I	17 OCTOBER	CH. 6, P. 181-182; CH. 7, P. 207-210
	SOIL CLASSIFICATION II	19 OCTOBER	CH. 7, P. 210-232
	SOIL CLASSIFICATION III	21 OCTOBER	
LABORATORY: TBD			
11	ENTISOLS	24 OCTOBER	CH. 11, P. 283-292
	INCEPTISOLS	26 OCTOBER	CH. 14, P. 321-329
	ALFISOLS	28 OCTOBER	CH. 8, P. 233-248
LABORATORY: SOIL TAXONOMY (LAB)			
12	ULTISOLS	31 OCTOBER	CH. 18, P. 375-384
	SPODOSOLS	2 NOVEMBER	CH. 17, P. 361-373
	MOLLISOLS	4 NOVEMBER	CH. 15, P. 331-347
LABORATORY: SOIL CLASSIFICATION (LAB)			
13	SOIL SCI. SOC. OF AM. MEETINGS—NO CLASS	7 NOVEMBER	
	SOIL SCI. SOC. OF AM. MEETINGS—NO CLASS	9 NOVEMBER	
	EXAM III	11 NOVEMBER	
LABORATORY: NONE			
14	GELISOLS & HISTOSOLS	14 NOVEMBER	CH. 12, P. 293-305 & CH. 13, P. 307-320
	OXISOLS & VERTISOLS	16 NOVEMBER	CH. 16, P. 349-359 & CH. 19, P. 385-395
	ARIDISOLS & ANDISOLS	18 NOVEMBER	CH. 10, P. 265-281 & CH. 9, P. 249-264
LABORATORY: SOIL CLASSIFICATION (LAB)			
15	THANKSGIVING BREAK—NO CLASS	21 NOVEMBER	
	THANKSGIVING BREAK—NO CLASS	23 NOVEMBER	
	THANKSGIVING BREAK—NO CLASS	25 NOVEMBER	
LABORATORY: NONE			

NOTE: ALL DATES AND TOPICS ARE SUBJECT TO CHANGE

WEEK	TOPIC	DATE	READING
16	SOILS & LANDSCAPES I	28 NOVEMBER	CH. 20, P. 397-409
	SOILS & LANDSCAPES II	30 NOVEMBER	CH. 20, P. 409-423
	SOIL USE & MANAGEMENT I	2 DECEMBER	CH. 21, P. 425-435
LABORATORY: TBD			
17	SOIL USE & MANAGEMENT II	5 DECEMBER	
18	FINAL EXAM	TUESDAY, 13 DECEMBER, 2:00 PM-4:00 PM	