

## SOIL MORPHOLOGY AND CLASSIFICATION SOIL/GEOG 472- Fall 2021

T 1:30-2:45; In person, Thomas and Brown Hall, 303

R 1:30-5:15; In person lab, Skeen Hall 122



<b>Instructor</b> Colby Brungard <a href="mailto:cbrung@nmsu.edu">cbrung@nmsu.edu</a> Office Hrs: by appointment	<b>TA</b> Seth Burruss <a href="mailto:cburruss@nmsu.edu">cburruss@nmsu.edu</a> Office Hrs: by appointment
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**Soils** are the substrate upon which we live. They provide nutrients and water to plants that supply our food. They strongly influence spatial patterns of natural vegetation. They filter pollutants, store and exchange carbon with the atmosphere, and provide a record of climate change. Soils are just plain cool. Please join me this semester in exploring the fascinating world of soil genesis, morphology, and classification. In this class you will learn skills that are immediately applicable and necessary for multiple jobs in state and federal agencies and in the private sector as well as skills that are foundational for graduate studies in soil, range, and environmental science, hydrology, climatology, geology, and ecology.

### Your Instructor

My name is Colby Brungard. One remarkable thing about me is that I never intended to go to college, much less wind up teaching at one! I grew up in a semi-agricultural area of northern Colorado (near the towns of Boulder and Lyons) on the edge of a mesa. I spent a lot of time exploring this area on foot and in a 4x4 and wound up with deep seated questions about why mountains, valley, mesas, and rivers existed where they did (I now know that I was and still am interested in soil-geomorphology). I did well in geology, PE, and welding class, but I barely graduated high school. After high school I spent two years in the Philippines as a missionary for the Church of Jesus Christ of Latter-day saints. This experience only increased my wonder of the natural world (particularly when I got to experience a volcanic eruption up close), but it also developed my desire to help other people improve their lives. After I got back from the Philippines I didn't really have any specific plans for my future so I worked and bounced around several universities until I stumbled across a course in physical geography at Utah State University that started to answer some of my questions about how landscapes develop. After getting married and completing a summer internship with the Bureau of Land Management I found myself in a soils class which I thought was absolutely fascinating. The professor teaching the course eventually gave me a job in her lab because of my internship experience, and then offered me a chance to pursue two graduate degrees (even though I told myself I would never go to graduate school). One of the first things I did as a graduate student was to attend a workshop of desert soil-geomorphology at NMSU. Little did I know that I would eventually get a job here (9 years later).

Graduate school took a long time and it was difficult at times. I once spent several weeks trying to figure out how to calculate uncertainty from my wind tunnel measurements. I finally gave it up at 3am one morning and just did the best I could. After graduating I did a postdoc (also at USU) and told myself I would never get a job in academia. However, I applied for a position at NMSU anyway and they gave me the job!

I have now studied soils for 14 years and have taught this class for 4 years at two universities. My specific field of interest is still soil-geomorphology, but I couple it with soil survey. My research generally focuses on spatial predictive strategies for using big data and machine learning to predict soil classes and properties across large areas (like the continental USA) and then using this information to support land use and management decisions, but I also use UAV's, spectrometry, and geophysical instrumentation at times.

For hobbies I like fly-fishing. At least I liked it until I moved to southern NM where there isn't any water and even less fish! I now spend most of my free time remodeling our house and spending time with my wife and kids (4 + 1 on the way). I would really like to get back into exploring, especially in the Gila Wilderness.

### **Our Itinerary (AKA Course Objectives)**

I have a lot of fun teaching this class and I've designed this class in a way I think you will like. We'll be reading about soil formation, and then applying this information through in-class activities and immersive labs. I don't view my role in this class as 'information transfer', instead my role is to help you develop skills. I favor a sports analogy; I am a coach and you are an athlete. Lecture does you little good. Instead, my teaching philosophy is that I teach you skills, let you practice, and guide your skill development.

Because you won't be assessed on how well you can listen to lecture, but instead on how well you understand the material and describe a soil, we will be using a 'flipped' classroom. That means that instead of delivering information to you via lecture, I will instead use our class and lab time to guide you through activities and exercises designed to help you master these skills and abilities.

Using a flipped class approach requires you to read from the textbook *before* you come to class so that you have the necessary information. Your before-class study will give you the information that we will then build on by using extensive in-class activities. You WILL be called on by name to share your thoughts with other classmates and answer questions.

### **FAQs**

**What will I be expected to do in this class (i.e., how do I get a good grade)?**

1. Complete Before Class reading: A lot of our success in this class depends on you completing the assigned reading *before* class. Because life is busy and I know that you (and I) are doing more than just taking this class, I provide outlines to guide your reading. Readings are due before class and are submitted via canvas. Please be aware that technical issues require that answers are one (1) word only and that the answers exactly match the words given with the reading assignment (this means you need to spell the words right to get credit and I won't correct answers for misspelling). Reading assignments will ALWAYS be assigned on Tuesday and be due the following Tuesday.

2. Participate in lecture: Our classes are highly participatory. During every class you will be asked to engage with the material. This means that you will be given a question, work on the question either alone or with other classmates, and then be randomly called on by name to respond to the question. It is completely okay if your answer isn't correct. I try to ask questions that help me understand how you are thinking about a topic. During class we will also spend time working through in-class activities which are designed to help you apply the material that you have read about and that we have reviewed in class. I may collect in class activities to be graded.

3. Complete lab reports: Lab reports summarizing and interpreting data collected during field laboratories are required. Students should compile and synthesize data as a team, but the actual lab reports should be written by only one person (writing is not a team sport!). The person who writes the report must change for each lab report. I suggest that whoever writes the report does so with enough time for the rest of the group to review it. Reports are normally due one week after the field lab, but depending on delays due to weather, report due-dates may be renegotiated. Some lab reports may involve a sequence of two or more soils/landscapes/land uses. Because I believe in the importance of practice and feedback (coach/athlete analogy) and because writing is a vital skill for your future career (really!), following grading, each group will have the opportunity fix and return the improved report for a better grade.

4. Comprehensive lab report: A significant portion of your grade will consist of a mapping interpretation exercise close to the end of the semester in which you will sample, describe, and classify multiple soil profiles and assign them to a soil map unit component and ecological site. Students work together in teams describing and interpreting soil and landscape features. Field experience is essential to a soil science education, so attendance is required. The work that you do will directly support an on-going soil survey of part of the Jornada Basin and be used in research and teaching. Your field data collection and report will take a large portion of November to complete.

### **What about field labs?**

Labs are field trips. All field labs will be held on Thursdays. To ensure adequate time for each field lab, we will incorporate in-class time, so labs will run from 1:30 pm to 5:15 pm starting on Aug 26<sup>th</sup>. At each lab site we will visit a soil profile(s). You will describe soil properties and landscape features. We will also classify, interpret, and discuss the soil-landscape in terms of soil genesis and behavior. You will be assigned to a lab group and you will work with this group throughout the semester on labs.

Required Lab Equipment: Field boots, long pants, wide brimmed hat, sunblock, **soil knife** (dulled hunting-style knife works well); clipboard and paper or notebook; pencils/pens; 10X hand lens (recommended), other as desired by individual. WATER is a must. We will be working in hot, sunny, dry conditions, especially in the beginning of the semester.

### Lab transportation:

Option 1: We meet at 1:30 pm near the fountain/pond in the northwest corner of Skeen Hall, then all carpool in a department van to the lab location.

Option 2: Except for the first lab, you drive to the individual field sites yourself. Each field site except one is < 30 min from campus. You will be expected to arrive at each field site between 1:45 and 2:00 pm. I will put the locations on Canvas so you can navigate to each site.

In the event that face-to-face labs are canceled by NMSU during the semester, we will creatively figure out a way to continue with field labs.

**What if I miss class?** I appreciate the effort that you make to attend this highly participatory class. I will attempt to record the Tuesday lecture portion of the class, but since these are not traditional 'lectures' but interactive sessions I have some doubt that you can succeed just by watching them. Field labs are exceptionally difficult, if not impossible to make up. If you have to miss a lab it is up to your lab group to figure out how to contribute.

COVID clause: If you become ill or need to care for someone who is ill, please let me know as soon as is reasonable. We will work out an arrangement for completing coursework that suits your situation.

### **Do I need the text book?**

YES! We will be using [Soils: Genesis and Geomorphology](#). Schaetzl, R.J., Thompson, M.L. 2016. Cambridge University Press. NY. The majority of your weekly readings will come from this book so please order it soon. You will need it by the second full week of classes.

You will also receive a copy of the following books. These should be returned to me after the class is over.

Soil Survey Staff. 2014. Keys to Soil Taxonomy, 12th ed. USDA-Natural Resources Conservation Service, Washington, DC. Available electronically.

Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and Soil Survey Staff. 2012. Field book for describing and sampling soils, Version 3.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE. (also available electronically).

### **What is the grading scheme?**

Grades will be based on the percentage of questions that you get right. For example, if the assignment had 100 questions and you got 80 correct then you would get 80 points for that assignment. At the end of the course, your final grade will be based on the percentage of points you score out of the total possible points.

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F <60% (Fractional grading will be +/- 2.5% within the ranges except that an A+ can only be earned with  $\geq 100\%$ ). If you feel that graded material has been incorrectly *tallied*, please bring it to my attention immediately.

**CODE OF CONDUCT:** Please see the Student Code of Conduct in The Student Handbook: (<http://deanofstudents.nmsu.edu/student-handbook/1-student-code-of-conduct/>) Pay particular attention to III. B. Academic Misconduct. Academic misconduct will not be tolerated and will result in severe penalties including an F in the class. This means not copying your classmates' answers and no plagiarism (e.g., copy and paste from Internet). According to the NMSU Advising website: *“Estimated study time per credit during a 15-week semester is 2-3 hours per week for each enrolled credit.”*

**STUDENTS WITH DISABILITIES:** If you have, or believe you have, a disability and would benefit from accommodations, you may wish to self-identify. You can do so by providing documentation to the Services for Students with Disabilities (SSD) Office located in Corbett (phone: voice 646-6840, TTY 646-1918). If you are already registered with the SSD office and need accommodations, please provide your “Accommodation Memo” from the SSD within the first two weeks of class.