BIO/NATSC 375: Soil Ecology with Laboratory

Time & Locations: Lecture MWF 1:00-1:50 in GHH 300; Laboratory W 2:00-4:50 in MNS 107

Instructor: Dr. Loren B. Byrne Phone: X 3890 Email: lbyrne@rwu.edu
Office: 243 MNS Office Hours: Monday 10-11 & 2-3, Tuesday 1-2, Wednesday 10-11, or by appt.

Quotes that summarize Dr. Byrne's teaching & learning philosophy:

"The mind is not a vessel to be filled but a fire to be kindled." ~ Plutarch
"Teachers open the door. You must enter by yourself." ~ Chinese proverb
"(Intelligence) is 1% inspiration and 99% perspiration." ~ Thomas Alva Edison
"Today a reader, tomorrow a leader." ~ W. Fusselman
"When we try to pick out anything by itself, we find it is tied to everything else in the universe." ~ John Muir
"High-quality learning is absolutely essential for high-quality living." ~ L. Dee Fink

Required texts:

No required textbook. Assigned readings will be provided as hand-outs or on Blackboard.

Course description (from the catalog):

This course serves as an in-depth exploration of soils as unique habitats for life with a focus on understanding variables that affect the abundance, diversity and interactions of terrestrial organisms and, in turn, their influence on soil physicochemical properties, biogeochemical cycles and other variables that impact the well-being and sustainability of human societies (e.g., agricultural production, clean water availability). Topics to be covered include soil food webs, microbial ecology, soil aggregate formation, carbon and nitrogen cycling, relationships between soils and aboveground ecology, and the effects of human activities on soil biodiversity. During laboratory sessions, students will explore the basic biology of soil organisms, conduct research projects, and learn methods for sampling soils and organisms in the field.

Course goals/outcomes:

As a result of this course, students are expected to gain knowledge and understanding about:

- the basic properties of soils
- the basic biology and ecology of organisms living in soils
- the fundamental biogeochemical processes that occur in soils
- how to apply knowledge about soils and their ecology to interpreting and solving contemporary societal and environmental problems facing humanity

In addition, students are expected to:

- improve their skills for critically reading, writing, discussing and thinking about ecology
- increase their appreciation for and interest in learning more about soil organisms and ecology!

Assignment submission & communications:

The professor uses Blackboard for submission of assignments and to provide course materials. Email (.rwu accounts only) is also used regularly to provide course information and communicate important reminders.

Attendance policy:

Because we form a learning *community* in this course, the presence and participation of each student in each class benefits us all. Thus, attendance is expected (*read: required*) for all class meetings. Excused absences will be granted only for legitimate reasons (severe illness or other extenuating circumstances such as family emergencies) and only when the student informs the professor (by email is OK) in advance of the expected absence (ASAP or at least 12 hours notice for emergencies or illness).

- If you will miss class for legitimate religious observances, you must inform the professor ASAP.
- You will not receive credit for missed in-class work or exams due to unexcused absences.
- NO MAKE-UP opportunities will be given to earn points for missed in-class work.
- Students are responsible for turning assignments in on time even if they miss the class period when the assignment is due. *Points will be deducted* from all assignments turned in late.

Academic integrity and classroom civility (including cell phone policy)

By becoming an RWU student, you have agreed to abide by the Academic Integrity pledge ("…to pursue the highest ideals of academic life… to be honest…") which means that you will not cheat, fabricate information, plagiarize, be fraudulent or damage others' work. The University Statement on Plagiarism in the Undergraduate Catalog reads: "A first offense may result in failure of the course involved, plus an entry on the student's permanent record. A second offense is punishable by expulsion from the University." **So don't plagiarize!** I have become skilled at finding plagiarism and will have no problems documenting this or any other instances of academic dishonesty in any student's permanent file and/or allowing the student to fail the course.

In addition, maintaining academic integrity (e.g., civility) includes respecting others and learning how to disagree with ideas while not being disagreeable. All students should respect their classmates and the learning environment of a classroom; this includes not being disruptive by talking out of turn or texting on mobile devices! **Such disruptions are distracting and disrespectful to the professor and students and will not be tolerated**. Any student who violates these classroom policies will bear the consequences following the definitions, policies and procedures described in the University Catalog. In addition students may be asked to leave the classroom if they do not conduct themselves civilly or cannot refrain from texting in class. In such instances, the student will receive an unexcused absence with loss of credit for in-class activities.

Academic support services

If you are a student with a disability and you wish to receive academic accommodations for any aspect of this course, you must first register with Student Accessibility Services on the second floor of the University Library in the Center for Academic Development. All students wishing to receive accommodations must inform the professor and submit required forms ***7 days*** (± 1 day) in advance of the date for which accommodations are sought.

Important dates: September 20 - last day to drop the course without receiving a W
October 22 - last day to drop the course and receive a W

Required work and grading (developed with student input)

Students' grades will be based on the following assignments:	**% Value of final grade**
➢ Home- and in-class work (e.g., half sheets, reading worksheets)	20
➢ Semi-weekly quizzes (lowest score dropped or one can be missed)	20
➢ "Soil ecology blog" memos	15
➢ "Professor for a day" biodiversity presentations	15
➢ Lab attendance and participation (including discussions)	10
➢ Lab work (worksheets, data collection, small projects)	10
➢ Grant or policy proposal project (proposal, peer-review, presentation)	10

Grading scale and the meaning of grades:

A= ≥ 93% - Excellent	A- = 90-92.9% Great	B+ = 87-89.9% Very Good	B= 83-86.9% Good	B- = 80-82.9% Good
C+= 77-79.9% Average	C= 73-76.9% Average	C- = 70-72.9% Average	D= 60-69.9% Poor	F= ≤59.9% Failure

Suggestions for improving your success in this (and all) classes:

- Actually do the readings! This will help increase your success as a student and biologist.
- Spend ≥2 hrs per class period outside of class (≥6 hrs per week) reading, studying and working on projects.
- Maintain a list of vocabulary words and their definitions; learning words and how to use them correctly is essential to becoming a successful and respected person/scientist/student!
- Write down questions and muddy-points in your notes and ASK about them discuss in class.
- After each class, write down several questions from the reading and info covered in class that you think would make good exam questions. (These could be given to Dr. Byrne to actually use!)
- Study for quizzes and exams by answering the questions listed 1) on the class schedule**,** 2) at the end of relevant chapters in the textbook, and 3) that you have written in your notes
- Work with classmates to improve your learning! Study together, edit each others' papers, etc.

BIO/NATSC 375 Semester schedule

Week	Lecture/discussion topic	**Readings** (IS= selections from intro soils books) Jigsaw indicates each student reads one of several assigned articles
1	9/1: Introductions 9/3: Why should we care about soil?	 9/3: Dailey et al. 1997
2	**PART 1: What are the basic properties of soils?** 9/8: What is soil? A natural, dynamic, functioning body 9/10: How does soil form? Where does it come from?	 9/8: National Geographic article 9/10: IS
3	9/13: weathering and movement of sediments 9/15: ecological succession, pedogenesis & profile development 9/17: soil physical properties I: color and texture	9/13: IS 9/15: IS 9/17: IS
4	9/20: soil physical properties II: aggregate formation 9/22: soil physical properties III: agg. stability, BD & pores 9/24: soil chemical properties I: water	9/20: IS 9/22: Jastrow et al. 1998 9/24: IS
5	9/27: soil chemical properties II: mineralogy, fertility & CEC 9/29: Soil heterogeneity: taxonomy and mapping 10/1: Synthesis: soil quality and sustainability	 9/29: soil order websites 10/1: TBA
6	**PART 2: Who lives in the soil? Where? What do they do?** 10/4: Introduction: taxonomy, limiting factors & habitat structure 10/6: bacteria 10/8: fungi	 10/6: student chosen 10/8: student chosen
7	*Tuesday*10/12: mycorrhizae and the rhizosphere 10/13: protozoans, rotifers, tardigrades 10/15: nematodes	10/12: student chosen 10/13: student chosen 10/15: student chosen; Baskin ch. 2
8	10/18: earthworms 10/20: mites 10/22: arachnids	10/18: student chosen; Baskin ch. 4 10/20: student chosen 10/22: student chosen
9	10/25: myriapods and isopods 10/27: non-insect hexapods: collembolans, diplurans, proturons 10/29: insects	10/25: student chosen 10/27: student chosen 10/29: student chosen
10	11/1: vertebrates 11/3: soil food webs **PART 3: Ecosystem dynamics & biogeochemical cycles** 11/5: The C cycle I: inputs	11/1: student chosen 11/3: jigsaw 11/5: Horwath 2007 (Ch 12)
11	11/8: The C cycle II: decomposition 11/10: The N cycle I 11/12:The N cycle II	11/8: Chapin et al. ch 7 11/10: Chapin et al. ch 9 11/12: Groffman et al. 1988
12	11/15: Above-below ground interactions I 11/17: Above-below ground interactions II 11/19: Student chosen	11/15: Baskin ch 8 11/17: TBA 11/19: TBA
13	11/22: Student chosen	11/22: TBA
14	**PART 4: How have humans impacted soils?** 11/29: Agriculture I: traditional 12/1: Agriculture II: organic 12/3: Urbanization effects	 11/29: Hendrix et al. 1986 12/1: jigsaw 12/3: Byrne 2006
15	12/6: Invasive species effects on soils 12/8: Soils and global change I 12/10: Soils and global change II	12/6: jigsaw 12/8: TBA 12/10: TBA
	12/13: Synthesis and wrap up: future directions in soil ecology	12/13: **TBA**

Final exam period, 12/17, 4-6pm:

****The professor reserves the right to modify this schedule at any time if necessary****

Assignment and assessment details (Part 1):

A. Home- and in-class work (e.g., quizzes, group activities, all half-sheet assignments; XX% of final grade) will assess students' recall and understanding of concepts and vocabulary from readings and class presentations and discussion (levels 1-2 of Bloom's taxonomy, on Blackboard) as well as develop higher-level critical thinking skills (Bloom's levels 3-6) including application of concepts to problems and self-reflection.

- **Assessment criteria** *(point values vary by assignment; no points given due to unexcused absences)*
  - Recall and comprehension questions: Correct answers will receive full credit and incorrect answers or "I don't know" will receive no credit.
  - Short-answer questions (application, interpretation or opinion-based) will be evaluated on evidence of higher-level critical thinking (refer to Bloom's table on blackboard for key words that provide evidence). Answers with clear evidence of synthetic, analytical or self-reflective thinking will receive full credit. If limited evidence of such thinking is indicated, partial credit will be given. Answers providing no evidence of critical thinking or that lack relevance to readings will receive no credit.
  - For group activities, all group members will receive the same score based on a group product. Groups completing the activity and providing a fully satisfactory written response providing evidence of critical engagement with the topic will receive full credit. Groups completing most of the activity and/or proving a less than satisfactory written response or product will receive partial credit. Groups failing to complete the activity or exhibiting behaviors that suggest a low level of engagement with the topic and providing an unsatisfactory written response will receive no credit.

B. Info about the "professor-for-a-day" assignment, other assignments and labs will be provided in a timely manner.

C. Laboratory schedule

September	1	Intro discussion, learning reflection and assignment planning
	8	Soil cube dissection
	15	Field trip: Pardon Grey Reserve —soil and specimen collection
	22	Field trip: Kettle Pond Farm
	29	Campus ecosystem profile study
October	6	Campus ecosystem profile study
	13	Soil microflora (bacteria & fungi) and microfauna (protozoans & nematodes)
	20	Earthworms, mites and arachnids
	27	Myriapods, isopods, and hexapods
November	3	Begin grant or policy proposal
	10	Continue proposal work; Discussion with Mark Bradford
	17	C + N cycle diagrams
December	1	Continue proposal work
	8	Peer review of proposal
	17	Final exam period- TBA