EVPP 378/BIOL 379 **SPRING 2021**

Ecological Sustainability (Mason Core Capstone + RS)

COVID-19 Safety, please see https://www2.gmu.edu/safe-return-campus

INSTRUCTOR:	Dr. Changwoo Ahn Professor of Environmental Science and Policy
OFFICE:	3034 David King Hall (office hour: by emails and right after class)
PHONE:	(703) 993-3978
E-MAIL:	cahn@gmu.edu
WEBSITE:	http://www.changwooahn.com
TA & Backup instructor:	Stephanie Schmidt (sschmi11@masonlive.gmu.edu)
CLASS TIME:	Lecture/discussion: 10:30 am -11:45 am, Tuesdays/Thursdays Field work/trips: Wednesdays 1:30 PM-4:10 PM
LOCATION	Lecture (Virtual) Lab & Fields (Peterson Hall 2413 or Wetland Mesocosm Compound)
CREDIT HOURS:	4
PREREQUISITE:	BIOL 308 or permission of instructor.
REQUIRED TEXT:	Reading materials/handouts from various sources will be provided.

RS COURSE STATEMENT

This class's is designed as a Research and Scholarship (RS) Intensive course, which means the students are given the opportunity to actively participate in the process of scholarship and will make a significant contribution to the creation of an interdisciplinarily-oriented product. Thus, in this class you will be critically reading and studying literature that is original and relevant in both scope and subject matter. Through this kind of authentic inquiry in the *interdisciplinary* approach, you will learn first-hand what it means to produce scholarship in the field of Ecological Sustainability Sciences.

In this RS course, students will:
1) Build their understanding of an original RS project via literature study.
2) Communicate knowledge from a scholarly project through a variety of media presentation (e.g., creative writing, photos, video clips, short documentary, and drawing etc.)
3) Engage in scholarly inquiry by:

- Articulate and refine a scientific hypothesis or a specific question for the goal of the study to be provided.
- Gather evidence appropriate to the question.
- Apply appropriate scholarly conventions when reporting and/or performing- science paper writing workshop will be incorporated as part of the class.

This course has both a **RS** designation and a **Mason Impact (MI)** designation. Students are required to submit their final project to the undergraduate education office. The link to complete the

submission can be found at masonimpact.gmu.edu under "student".

RECOMMENDED TEXT AND REFERENCES

Bigham JM and Ciolkosz (Eds). 1993. Soil Color -Proceedings of a symposium sponsored by Divisions S-5 and S-9 of the Soil Science Society of America in San Antonia, Texas, 21-26 Oct. 1990.
Clive Adams and Dr. Dara Montag (Eds). SoilCulture -Bringing the Arts down to Earth. Center for Contemporary Arts and the Natural World.
Barbara Richardson (ed). 2015. DIRT – A love story (36 short essays), 2015. ForeEdge
David R. Montgomery. 2012. Dirt – The Erosion of Civilizations, University of California Press (https://www.youtube.com/watch?v=sQACN-XiqHU)

ECOMMENDED JOURNAL SOURCES (e.g., Web of Science)

Journal pdfs will be provided for class reading. Sources may include but not limited to Soil Society of American Journal, Journal of Environmental Quality, Ecological Engineering, Applied Soil Ecology, Frontiers in Ecology and Environmental Science, and more.

COURSE GOALS

The course is to develop critical reading and thinking skills related to a chosen topic(s) in Ecological Sustainability per semester. Students learn about ecosystem's ability to self-organize as they develop over time and respond to management and disturbance through a field study. The study will teach students to build, assess, and monitor the trajectory of ecosystem change while gaining the knowledg e and skills of how to conduct an ecological experiment. Soil ecosystems will be emphasized in Sprin g 2020, especially focusing on the literacy and science of soil color and soil carbon. Especially soil co lor ecology will be emphasized, including researching and discussing the etymology of soils (dirt). St udents will gain a decent level of ecological literacy of soil ecological sustainability and hands-on exp erience of conducting a field-based, observational experiment to collect and analyze quantitative data.

SPECIFIC COURSE OBJECTIVES

Students will complete the class with: 1) a thorough literature research and discussion on the key issues/concepts, history, culture, and languages for ecological sustainability, 2) exposure to scientific and artistic methods to document/report/collect the information of soils and their colors from a variety of environmental conditions through field trips/exercises, and 3) understanding soil ecosystem services and how they support humanity and society.

COURSE STRUCTURE AND FORMAT: Class will be a mixture of lectures, studying literature and presenting its summary, group (and class) discussion, class research project relevant to the theme of the class along with visits and field trips to local parks and area that may include a variety of soil conditions on and off campus. For the field/lab activities, the schedule may be subject to changes in response to logistics and weather (& also COVID situations for SP 2021).

CLASS PARTICIPATION

I hope to foster a classroom of active exchange among students and between students and the instructor. I will facilitate these through class discussions, active learning in groups, and sustainability fieldtrips/fieldwork outside the classroom. However, I cannot do this alone – you must all participate. Successful class participation requires preparation. Successful class discussions also require the right atmosphere, we must all remember to be courteous in our comments and criticisms and open to contrasting ideas from others.

CLASS DISCUSSION

Discussion will be facilitated based on the questions from reading summaries for each topic. The instructor will provide students with reading materials at least a week before the subject matter will be discussed. Whenever each subject paper contains scientific data presentation interpretation and communication of scientific data will be covered. Every student must participate individually or as a group in discussion.

STUDENT PAPER PRESENTATIONS:
Each student is required to read papers or book chapters assigned, submit a summary of the paper (**2 pages top, 800-900 words limit, single spaced, 1' for all margins** –DO NOT copy and paste from the paper for your summary), and get ready for lecture and/or group discussion. Your summary of the chosen paper should include **two questions** of yours at the end of the summary on terminology, concepts and interpretation of the results presented in each paper. This will require you to do some research on-line or through library materials to share the answers with the rest of the class. One group will present the summary of the paper chosen for your review in class for 15-20 minutes (**ppt presentation**) to be followed by guided discussion with the entire class. The ppt file should be sent to the instructor before class presentation for feedback. The group members that presents a paper summary will be exempt from submitting their paper summary yet lead a discussion session after the presentation with instructor's moderation. In addition, we will read some papers together more thoroughly along with lectures in an investigative mode. The following may help your preparation for your presentations.

FYI: Edward R. Tufte. The visual display of quantitative information, 2nd ed.
(http://www.edwardtufte.com/tufte/)

Professional Poster Presentation by OSCAR at GMU (make sure to check all the details in this website)
https://oscar.gmu.edu/students/poster-info/

FINAL PAPER/PROPOSAL AND PRESENTATION:
Each student is required to write a research paper or a research proposal (e.g., Patriot Green Fund Proposal or a research grant proposal) on a specific subject of urban ecosystem processes with intense literature review as part of the class for grades. Specifics on the subject and the format will be explained and discussed during the course of the class. Power point presentation of each paper is also required (15-20 minute presentation and 5 minutes Q &A). Students are allowed to collaborate on final paper/proposals, yet individual final submission is required. Students are encouraged to use a variety of media, including photos, videos, and web resource to be creative for their final product. Email me ppt files at least a day before (**by April 26**) final presentation (April 27 & April 29) for my feedback. Your final paper/proposal (& final version ppt)/ is due by **May 6 (to be emailed by noon)**. **No late assignment will be accepted**.

COURSE POLICY AND EXPECTATIONS: Class attendance is strongly recommended. Be punctual. Lateness is disruptive and disrespectful to your peers and to me. There will be strong emphasis on active and effective **participation** in class discussions, not only during the class presentations and discussion periods following these presentations, but also throughout all the other class periods. I expect each of you to be present and prepared for each class. This will involve having read the assigned material before each class. I strongly recommend not to use your cell phones during the class. *Academic dishonesty* will not be tolerated (honor code responsibilities). *Minor changes in course organization and content* may be required throughout the semester, thus students will be made aware and asked for input if such actions are needed. Late assignments will not be accepted.

CLASS E-MAIL AND COMMUNICATIONG WITH ME:
I will frequently e-mail to remind you of deadlines or to clarify points from a lecture. In addition, all class activities are facilitated by emails, so please use GMU e-mail (**@gmu.edu) to facilitate any communication, questions, and discussion. This course will not use Blackboard this semester. Please check your e-mail **daily**. When you email your assignments be sure to label your file with your last name, date, and course number (e.g., ahn0205-490). If you email a question of general interest, I will likely send my response to the entire class list. Be sure to take full advantage of your classmates, the library, and the web as learning resources. Finding answers and solutions among yourselves by tapping into the multitude of resources available to you is generally a more gratifying and educationally valuable approach than seeking answers from a single authority. Blackboard will not be used for the class.

LABS & FIELD TRIPS:
Students are required to participate in scheduled field trips and fieldworks, and to do lab assignment as necessary. Field trips are scheduled for **some Wednesdays 1:30 PM – 4:10 PM** and/or on-campus lab sessions (in Wetland Mesocosm Compound or Peterson Hall 2413). Instructor will discuss about the field trips before they occur. Additional work in any of lab or fields should be arranged with both Dr. Ahn and TA (Stephanie Schmidt) as necessary for your class project. Limited yet laboratory space for your class project work, if needed, can be made available in Ahn Wetland Ecosystem Lab (3071 and 3079a David King Hall). Coordination with Dr. Ahn is imperative. For most field trips/work you may want to wear shoes that can get wet or soiled. Transportation will not be provided for local field trips, car-pooling is strongly recommended. The cost of food and your share of the transportation costs (i.e., gas) are at your own expense. Masking and physical distancing for all activities are required.

Also needed for field trips may include field notebook (e.g., paper or electronic –phone, pads), camera (or your smartphone that can take pictures and videos), pencil, calculator and/or just your smartphone with photo-taking capacity. Old clothes and boots/shoes for fieldwork, rain gear upon weather conditions.

LAB REPORT
Field/lab sessions will require a written report with photos (if available) (~1000 words limit with photos) that will be due by next field/lab session. For each lab/field, specific instruction will be provided. For field site visits each group will participate in writing a factsheet about the site and its soil characteristics, including mostly "natural history" of the site. Specific instruction will be provided for each field trip with addresses and directions for the locations prior to the trip.

GRADING: (subject to minor changes)	**% of Grade**
Lecture	**GRADING (**subject to minor changes)
Mid-term-open book (I)	**20**
Reading assignment summary & presentation (I/G)	**25**
Final Project Paper/Proposal and Presentation (I/G)	**25**
Lab/Field	
Field research work (G)	**15**
Lab/Field trip reports (I/G)	**15**
TOTAL POINTS	**100**

*I = Individual; **G = Group (2-3 people max. depending on the total number of students);

- Failure to meet deadlines for reading summaries, assignments, and project paper will result in losing 2pts per day in the final grade.
- Your course will be determined using the following straight scale: A+ (97-100), A (94-96), A- (90-93), B+(85-89), B (80-84), C (70-79), D (60- 69), F(<60).

DISABILITY SERVICES is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit http://ds.gmu.edu/ for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474.

ESP DEPARTMENT an intentionally inclusive community, promotes and maintains an equitable and just work and learning environment. We welcome and value individuals and their differences inc luding race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, nation al origin, first language, religion, age, and disability.

ACADEMIC INTEGRITY Mason is an Honor Code university; please see the Office for Academ ic Integrity for a full description of the code and the honor committee process. The principle of acad emic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give ful l credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. V igorous discussion and debate are encouraged in this course, with the firm expectation that all aspect s of the class will be conducted with civility and respect for differing ideas, perspectives, and traditio ns. When in doubt (of any kind) please ask for guidance and clarification.

NOTICE OF MANDATORY REPORTING OF SEXUAL OR INTERPERSONAL MISCONDUCT*:* As a faculty member, I am designated as a "Non-Confidential Employee," and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, stalking, sexual exploitation, complicity, and retaliation to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance or support measures from Mason's Title IX Coordinator by calling 703-993-8730, or emailing *titleix@gmu.edu*.

CLASS RESEARCH PROJECT -"***Data Science meets Ecological Literacy of Soils - soil col or sensor data collection using a smartphone application and soil carbon***" -to be explained an d discussed.

Review Papers and References for Research Project:

1. Ahn C, Jones S. 2013. Assessing organic matter and organic carbon contents in soils of created mitigation wetlands in Virginia. Environ Eng Res 18(3):151-156. http://dx.doi.org/10.4491/eer.2013.18.3.151
2. Conrad, C. C., & Hilchey, K. G. (2011). A review of citizen science and community-based environmental monitoring: issues and opportunities. *Environmental Monitoring and Assessment*, *176*(1), 273–291. https://doi.org/10.1007/s10661-010-1582-5
3. James I. McClintock . 1992. Gary Snyder's Poetry & Ecological Science, The American Biology Teacher, Vol. 54, No. 2 (Feb., 1992), pp. 80-83
4. Franzmeier, D. P., Yahner, J. E., Steinhardt, G. C., & Sinclair, H. R. (1983). Color patterns and water table levels in some Indiana soils. *Soil Science Society of America Journal*, *47*(6), 1196–1202. https://doi.org/10.2136/sssaj1983.03615995004700060027x
5. Genthner, M. H., Daniels, W., Hodges, R. L., & Thomas, P. (1998). Redoximorphic Features and Seasonal Water Table Relations, Upper Coastal Plain, Virginia (pp. 43–60). https://doi.org/10.2136/sssaspecpub54.c3
6. He, X., Vepraskas, M., Lindbo, D., & Skaggs, R. (2003). A method to predict soil saturation frequency and duration from soil color. *Soil Science Society of America Journal*, *67*(3), 961–969. https://doi.org/10.2136/sssaj2003.9610
7. Palta, M. M., Grimm, N. B., & Groffman, P. M. (2017). Accidental urban wetlands: Ecosystem functions in unexpected places. *Frontiers in Ecology and the Environment*, *15*(5), 248–256. https://doi.org/10.1002/fR
8. Schmidt, S. A., & Ahn, C. (2019). A comparative review of methods of using soil colors and their patterns for wetland ecology and management. *Communications in Soil Science and Plant Analysis*, *50*(11), 1293–1309. https://doi.org/10.1080/00103624.2019.1604737
9. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture [USDA-NRCS]. (n.d.) Web Soil Survey. http://websoilsurvey.sc.egov.usda.gov/
10. Stiglitz, R., Mikhailova, E., Post, C., Schlautman, M., & Sharp, J. (2016a). Evaluation of an inexpensive sensor to measure soil color. *Computers and Electronics in Agriculture*, *121*, 141–148. https://doi.org/10.1016/j.compag.2015.11.014.
11. Stiglitz, R., Mikhailova, E., Post, C., Schlautman, M., & Sharp, J. (2016b). Teaching soil color determination using an inexpensive color sensor. *Natural Sciences Education*, *45*(1). https://doi.org/10.4195/nse2016.03.0005.
12. Stiglitz, R., Mikhailova, E., Post, C., Schlautman, M., & Sharp, J. (2017). Using an inexpensive color sensor for rapid assessment of soil organic carbon. *Geoderma*, *286*, 98–103. https://doi.org/10.1016/j.geoderma.2016.10.027.
13. Stiglitz, R., Mikhailova, E., Post, C., Schlautman, M., Sharp, J., Pargas, R., Glover, B., & Mooney, J. (2017). Soil color sensor data collection using a GPS-enabled smartphone application. *Geoderma*, *296*, 108–114. https://doi.org/10.1016/j.geoderma.2017.02.018.
14. Tiner, R. W. (2017). *Wetland indicators: A guide to wetland identification, delineation, classification, and mapping* (Second edition). Boca Raton, FL: CRC Press. http://www.ncwetlands.org/wp-content/uploads/Tiner-2017-Wetland-indicators.pdf
15. Torrent, J., & Barrón, V. (1993). Laboratory measurement of soil color: Theory and practice. *Soil Color*, 21–33. https://doi.org/10.2136/sssaspecpub31.c2
16. USDA - NRCS. (2018). *Field Indicators of Hydric Soils in the United States, Version 8.2* (p. 45). Washington, D.C.: USDA-NRCS, in cooperation with the National Technical Committee for Hydric Soils.
17. Vepraskas, M. J., He, X., Lindbo, D. L., & Skaggs, R. W. (2004). Calibrating hydric soil field indicators to long-term wetland hydrology. *Soil Science Society of America Journal*, *68*(4), 1461–1469. https://doi.org/10.2136/sssaj2004.1461.
18. Bradshaw, Corey JA et al. 2021. Underestimating the Challenges of Avoiding a Ghastly Future, Frontiers in Conservation Science | www.frontiersin.org, January 2021 | Volume 1 | Article 615419