



EVPP 378/BIOL 379

SPRING 2022

## Ecological Sustainability (Mason Core Capstone + RS)

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

|                                    |   |
|------------------------------------|---|
| <b>INSTRUCTOR:</b>                 | <b>Dr. Changwoo Ahn</b><br>Professor of Environmental Science and Policy  |
| <b>OFFICE:</b>                     | 3034 David King Hall (office hour: by appoint. or after Thur class)   |
| <b>PHONE:</b>                      | (703) 993-3978  |
| <b>E-MAIL:</b>                     | cahn@gmu.edu  |
| <b>WEBSITE:</b>                    | <a href="http://www.changwooahn.com">http://www.changwooahn.com</a>   |
| <b>TA &amp; Backup instructor:</b> | Stephanie Schmidt (sschmi11@gmu.edu)  |
| <b>CLASS TIME:</b>                 | <b>Lecture/Discussion:</b> <u>3 pm -4:15 pm</u> , Tuesdays/Thursdays<br><b>Lab/Field:</b> Wednesdays <u>1:30 PM-4:10 PM</u> |
| <b>LOCATION</b>                    | Lecture: Planetary Hall 224<br>Lab & Fields (DK 3031 or Wetland Mesocosm Compound)  |
| <b>CREDIT HOURS:</b>               | 4   |
| <b>PREREQUISITE:</b>               | BIOL 308 or permission of instructor.   |
| <b>REQUIRED TEXT:</b>              | 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:
  - Articulating and refining a scientific hypothesis or a specific question for the goal of the study to be provided.
  - Gathering evidence appropriate to the question.
  - Applying 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](http://masonimpact.gmu.edu) under “student”.

## **RECOMMENDED 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 in Ecological Sustainability per semester. The study will teach students to build, assess, and monitor the trajectory of ecosystem change while gaining the knowledge and skills of how to conduct an ecological experiment. **Soil ecosystems will be emphasized in Spring 2022 as part of Dr. Ahn's on-going *The Dirt Project***, an interdisciplinary science-art-humanity study, especially focusing on the literacy and science of soil color and soil organic matter (i.e., a proxy for soil carbon). Especially soil carbon ecology will be emphasized, including researching and discussing the etymology of soils (dirt). **Students will gain a decent level of ecological literacy of soil ecological sustainability and hands-on experience of conducting a field-based, experiment to collect and analyze quantitative environmental data of soil properties.** It is a combination of environmental literacy of soils, data science, and science communication.

## **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 of a chosen topic (e.g., soil color and carbon ecology), **2)** exposure to scientific methods to collect/analyze/report the information of soils and their colors as a research project along with field trips, 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 relevant to the content of the class. For the field/lab activities, the schedule may be subject to minor changes in response to logistics and weather (& also COVID situations for SP 2022).

## **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 and participate in group presentation (ppts) of those papers. Each group will present the summary of the paper chosen in class for 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 following may help your preparation for your presentations.

*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) based upon the designated field study to be conducted throughout the semester. 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 final presentation for my feedback. Your final paper (& final version ppt)/ is due by May 11 (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 COMMUNICATING 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 fieldwork and field trips, 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 DK 3006). 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). 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) (1000~1500 words limit with photos) that will be due by next field/lab session. For each lab/field, specific instruction will be provided.

| <b>GRADING: (subject to minor changes)</b>                      | <b>% of Grade</b>                         |
|---|---|
| <b>Lecture</b>  | <b>GRADING (subject to minor changes)</b> |
| Mid-term (I)  | 20  |
| Paper presentation (G)  | 20  |
| Final Paper/Presentation (I/G)                                  | 20  |
| <b>Lab/Field</b>  |   |
| Lab/Field research work (G)                                     | 20  |
| Lab/Fieldwork/Field trip reports-method and data analysis (I/G) | 20  |
| <b>TOTAL POINTS</b>   | <b>100</b>                                |

\*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).

## UNIVERSITY POLICY

### Safe Return to Campus

All students taking courses with a face-to-face component are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage (<https://www2.gmu.edu/safe-return-campus>). Similarly, all students in face-to-face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system and students will receive either a Green, Yellow, or Red email response. Only students who receive a "green" notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class. Students are required to follow Mason's current policy about facemask-wearing. As of August 11, 2021, all community members are required to wear a facemask in all indoor settings, including classrooms. An appropriate facemask must cover your nose and mouth at all times in our classroom. If this policy changes, you will be informed; however, students who prefer to wear masks either temporarily or consistently will always be welcome in the classroom.

**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 including race, economic status, gender expression and identity, sex, sexual orientation, ethnicity, national origin, first language, religion, age, and disability.

**ACADEMIC INTEGRITY** Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic 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 full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

### **COUNSELING AND PSYCHOLOGICAL SERVICES**

If you experience feelings of anxiety, panic, depression, sadness during the semester, Student Health Services and Counseling and Psychological Services Offices (703-993-2380) provides a range of resources to assist and support you. Students can call (703-993-2831) or walk-in during open hours to schedule an appointment to talk with a healthcare provider. If you or someone you know experiences a mental health crisis or emergency, seek help immediately. Call 911 for local emergency services, the National Suicide Prevention Lifeline (1-800-273-8255), or text the Crisis Text Line (741-741) anytime. Visit <http://caps.gmu.edu> for more information.

### **Sexual Harassment, Sexual Misconduct, and Interpersonal Violence**

George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in order to promote community well-being and student success. *Faculty members are required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's [Title IX Coordinator](#) per [university policy 1412](#). If you wish to speak with someone confidentially, please contact the [Student Support and Advocacy Center](#) (703-380-1434), [Counseling and Psychological Services](#) (703-993-2380), [Student Health Services](#), or [Mason's Title IX Coordinator](#) (703-993-8730; [cde@gmu.edu](mailto:cde@gmu.edu)).*

| <b>Date</b> | <b>Topic</b> (subject to minor changes)   |
|-------------|---|
| JAN 25      | Syllabus orientation, Getting to know, safety for COVID-19                        |
| JAN 27      | Ecological Sustainability -concepts, IBPES report, Ecology and energy, and Groups |
| FEB 1       | Soil vs. Dirt, The language of Dirt in our culture                                |
| FEB 3       | GMU <b>Office of Sustainability (Sarah)</b> , Patriot Green Fund & Project        |
| Feb 8       | Why soil matters? Overview of soil ecology and biodiversity                       |
| FEB 10      | Dirt Project -history and background, Soil properties                             |
| FEB 15      | Dustbowl -History and background, Film watching (TBD)                             |
| FEB 17      | Nature and properties of soil – overview, <b>Paper 1</b>                          |
| FEB 22      | Basic biogeochemistry and ecosystem ecology, soil properties and soil carbon      |

|               |  |
|---------------|--|
| FEB 24        | Wetland ecology and soil biogeochemistry, <b>Paper 2</b>   |
| MAR 1         | Hydric soils and their characteristics   |
| MAR 3         | Paper review and discussion, <b>Papers 3</b>   |
| MAR 8         | Nix Color sensor and SOM SOPs -data collection protocol (with Steph)                             |
| MAR 10        | SOP orientation and exercise ( <u>Steph</u> ), <b>Papers 4</b>                                   |
| MAR 15/17     | <b>Spring break</b>  |
| <u>MAR 22</u> | TBA – field work   |
| MAR 24        | <b>Mid-term exam</b>   |
| MAR 29        | DK Lab SOPs for SOM and lab orientation  |
| MAR 31        | Soil themes in pop culture – songs, <b>Paper 5</b>   |
| APR 5         | A case study of ecological sustainability – Creating and restoring urban wetlands <b>Paper 6</b> |
| APR 7         | Field work, review and Q/A   |
| APR 12        | <b><u>Special guest lecture – Mr. Sean Gagnon</u></b>  |
| APR 14        | EcoScience + Art & The Rain Project, <b>Paper 7</b>  |
| APR 19        | Research writing, War and Weather video/discussion, <b>Paper 8</b>                               |
| APR 21        | FIELD STUDY Data analysis and discussion ( <u>Steph</u> )  |
| APR 26        | Neighborhood ecology- accidental wetlands and stormwater management (field trip)                 |
| APR 28        | FIELD STUDY Data analysis and discussion/Final Paper writing                                     |
| MAY 3         | FINAL FIELD STUDY PRESENTATION (GROUPS 1, 2)   |
| MAY 5         | FINAL FIELD STUDY PRESENTATION (GROUPS 3, 4)   |

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**MAY 11\*** Final Paper Due (to be emailed **by noon**)

#### LAB/FIELDS

| <b>Date</b> | <b>Topics and activities</b>  |
|-------------|---|
| JAN 26      | No class  |
| FEB 2       | Orientation (DK 3006)   |
| FEB 9       | No class, World Wetland Day   |
| FEB 16      | <i>Dirt- the Movie</i> –take memos and summarize for your review of the film          |
| FEB 23      | No class  |
| MAR 2       | Wetland Mesocosm Compound/ field methods  |
| MAR 9       | No class  |
| MAR 16      | <b>Spring break</b>   |
| MAR 23      | Field method and field work   |
| MAR 30      | Field work - SOP orientation, Field soil data   |
| APR 6       | Field work – Data collection/Lab processing   |
| APR 13      | A special lecture or field trip to <u>Four Mile Run Conservatory</u> (Mr. Kurt Moser) |
| APR 20      | Group work – Data analysis  |
| APR 27      | HM trip -Ecologically engineered beaver dam & wetland                                 |
| May 4       | Group work – Data analysis  |

#### **CLASS RESEARCH PROJECT:**

*Data Science meets Ecological Literacy of Soils – “Soil color sensor data and soil organic matter” -4 groups*

#### **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. **Paper 1**
2. James I. McClintock . 1992. Gary Snyder's Poetry & Ecological Science, *The American Biology Teacher*, Vol. 54, No. 2 (Feb., 1992), pp. 80-83
  3. 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).
  4. 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. **Paper 6**
  5. 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. **Paper 5**
  6. 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 - **Paper 2.**
  7. Schmidt S. and Ahn, C. 2021. Predicting forested wetland soil carbon using quantitative color sensor measurements in the region of northern Virginia, USA", *Journal of Environmental Management* 300, 15 December 2021, 113823 **Paper 7**
  8. Schmidt S. and Ahn, C. 2021. Analysis of Soil Color Variables and their Relationship between Two Field-Based Methods and its Potential Application for Wetland Soils. *Science of the Total Environment* 783: 147005
  9. 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). **Paper 3**
  10. 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.
  11. 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, **Paper 4**
  12. 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
  13. Travis Beck 2013. Principles of Ecological Landscape Design. Island Press
  14. Protecting Wetlands- Is the government doing enough? *CQ Researcher*, Oct 3,2008. 18(34):793-816.
  15. Gian Franco Capra, Antonio Ganga & Allan F. Moore. 2021. Songs for our soils. How soil themes have been represented in popular song. *Soil Science and Plant Nutrition* 63(5): 517-525 **Paper 8**