EVPP 378 **SPRING 2025**

Ecological Sustainability

INSTRUCTOR:	**Dr. Changwoo Ahn**
	Professor of Environmental Science and Policy
OFFICE:	3034 David King Hall (office hours: by appointment or after Wed. class)
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WEBSITE:	http://www.changwooahn.com
CLASS TIME:	Lecture: 3 pm -4:15 pm, Mondays/Wednesdays
	Lab/Field: Wednesdays 1:30 PM-4:10 PM
LOCATION	Lecture: Innovation Hall 215G
	Lab & Fields (DK 3021, Ahn Lab and/or Wetland Mesocosm Compound)
CREDIT HOURS:	4
PREREQUISITE:	BIOL 308 or permission of instructor.
REQUIRED TEXT:	Reading materials/handouts will be provided
SUGGESTED READING:	The Serviceberry by Robin Wall Kimmerer (2024)

RS COURSE (also as Mason Apex to be) STATEMENT

This Mason Core Capstone (Apex) course is designed as a Research and Scholarship (RS) Intensive course, which means students can participate actively in research and scholarship training. Thus, in this class, you will be critically reading and studying original and relevant literature 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 a scholarship in Ecological Sustainability Sciences.

In this RS course, students will:
1) Build their understanding of an original RS project via critical literature study on complex environmental topics/issues.
2) Communicate knowledge from a scholarly project through various media presentations (e.g., creative writing, photologs, short videos and/or short documentaries, etc.)
3) Engage in the scholarly inquiry by:

- Articulating and refining a scientific hypothesis and/or a specific question for the study's goal to be provided
- Gathering evidence appropriate to the question by applying necessary lab/field methodologies
- Synthesizing knowledge obtained from all class activities to discuss the outcomes of projects
- Applying appropriate scholarly conventions when reporting the results of the project- Peer and/or near-peer presentations will be part of communicating the outcomes of the research project. For final papers, a science paper writing workshop will be provided

COURSE GOALS & LEARNING OUTCOMES

The course is to develop critical reading and thinking skills related to contemporary topics in Ecological

Sustainability. The course will train students to build, assess, and monitor the trajectory of environmental changes while applying as well as gaining the knowledge and skills of how to conduct a research project. Two ongoing research themes, Wetlands as NBS (Nature-Based Solutions) and Applied Soil Ecology will be emphasized in Spring 2025. The class project focuses on environmental (hydrologic) monitoring through soil color changes.
Students will gain a decent level of literacy of ecological sustainability, and hands-on experience in conducting a field-based experiment to collect, analyze, and effectively communicate environmental data.

SPECIFIC COURSE OBJECTIVES
Students will complete the class with **1)** thorough literature/book research and discussion on the key issues/concepts, history, culture, and languages of a chosen topic, **2)** exposure to scientific methods to collect/analyze/report the information of a field-based research project for the chosen topic, and **3)** communicating the science of ecological sustainability, focusing mostly on ecosystem services and biodiversity, and how they support humanity and society, 4) exposure to real-world careers paths in environmental sustainability (via specifically arranged guest lectures and field trips)

COURSE STRUCTURE AND FORMAT: The 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 field trips that are 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.

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

STUDENT PAPER PRESENTATIONS:
Each student is required to read papers or book chapters assigned and participate in group presentations (ppts) of those papers. Each student group will present the summary of the paper chosen in class for **15-20 minutes** (ppt presentation of ~10 ppt slides recommended) to be followed by leading a discussion session with the entire class. Each member of the group must contribute equally to the presentation while participating in its delivery. The instructor will explain the protocol of "equal contribution" between the group members for paper presentations. The ppt file should be sent to the instructor before the class presentation for any feedback. The following may help with your preparation for good 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/

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

FINAL PAPER AND PRESENTATION:
Each student is required to write a research paper based on the designated field study to be conducted throughout the semester*. Specifics on the subject and the format will be explained and discussed during the class. A PowerPoint presentation of each project is also required (15-20 minute presentation

and 5 minutes Q &A). Students are allowed to collaborate on final papers, yet individual final submission is required. Specifics will be instructed. Email me ppt files for feedback at least a day before the final presentation. Your final paper and/or final version ppt **is due by May 9 (to be emailed by noon****). **No late assignment will be accepted****.

- ***The length of final paper: min. 2,500 words up to 3000 words (excluding tables and figures) with references (min. 20 references)***

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 a 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 using your cell phones during 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 COMMUNICATION 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 email**, so please use GMU e-mail (**@gmu.edu)** to facilitate any communication, questions, and discussion. Please check your e-mail and Blackboard announcement page **daily**. When you email your assignments be sure to label your file with your first name, date, and course number (e.g., Firstname0205-425). If you email a question of general interest, I will likely send my response to the entire class list via BB. 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.

LABS & FIELD TRIPS: Students are required to participate in scheduled fieldwork, field trips and do lab assignments as necessary. Field (& lab) work and/or field trips are scheduled for **Tuesdays 1:30 PM – 4:10 PM** and/or on-campus lab sessions (in Wetland Mesocosm Compound or DK 3071/3079a-Ahn Lab). The instructor will discuss the field trips before they occur. Additional work in any of the labs or fields should be arranged with Dr. Ahn as necessary for your class project. Limited laboratory space for your class project work, if needed, can be made available in Ahn Wetland Ecosystem Lab. For field trips/fieldwork, 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.

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

LAB REPORT

Some field/lab sessions will require a written report with photos (if available) (**900~ <1000 words** recommended with photos) that will be due by the next field/lab session. For each lab/field, specific instruction will be provided.

GRADING: (subject to minor changes)	**% of Grade**
Lecture	**GRADING (**subject to minor changes)
Mid-term exam (I)	**10**
Literature review and presentation (I/G)	**20**
Final Paper-Presentation (I/G)*	**30 (10/20)**
Homework + BB discussion (I)	**10**
Lab/Field	
Lab/Fieldwork Participation- method and data analysis (G)	**15**
Field trip reports (IG)	**15**
TOTAL POINTS	**100**

*I = Individual; **G = Group (3-4 people max. depending on the total number of students enrolled);

- Failure to meet deadlines for reading summaries, assignments, and project paper will result in losing 2pts per day in the final grade
- For all Group work (G), student names must be spelled out with their responsibilities and contributions to the task (e.g., paper presentations, field/lab work, and data collection etc.). For the paper review presentation, all group members are required to spell out the section of the paper each is in charge of and participate in the integration of all sections of the paper for presentation. The quality of the presentation will be assessed by categories such as Excellence (95-100), Good (90-94), Average (81-89), and Poor (70-80).
- *Extra credit opportunities* are available for assisting with lab/wetland compound work (up to 5 points to the final score for the letter 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 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

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 .

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 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).*

Date	**Topic** (subject to minor changes)
JAN 22	Syllabus, orientation, groups, AHN website
JAN 27	Ecological Sustainability -**Reading A**
JAN 29	Ecological Sustainability - Biodiversity and Biocomplexity
FEB 3	Biogeochemistry (C, N, P, S – the case of FGD)
FEB 5	Ecological literacy for soils- **Reading B**
FEB 10	Dirt project/Soil properties, **Paper 1**
FEB 12	Guest lecture (Mr. Sean Gagnon) on campus wetland delineation
FEB 17	**Papers 2 and 3**
FEB 19	Guest lecture for the paper (Dr. Schmidt), **Paper 4**
FEB 24	Wetland ecology - Hydric soils
FEB 26	Wetland ecology- Soil colors **Paper 5**
MAR 3	Hydric soils and SOM
MAR 5	Paper review, **Papers 6 and 7**
MAR 10-16	**Spring break**
MAR 17	Special guest lecture –Sean Gagnon
MAR 19	**Mid-term exam**
MAR 24	SOPs for SOM and lab orientation
MAR 26	SOPs for soil color (NIX)
MAR 31	Nature-Based Solutions- sp.issue, **Paper 8**
APR 7	Creating and restoring urban wetland, **Paper 9**
APR 9	Floating wetlands- The Rain Project, **Paper 10**
APR 14	The Rain Project -data analysis and discussion, **Reading C**

APR 16	Ecosystem restoration, **Reading D**
APR 21	Research communication,
APR 23	Data presentation/science paper writing
APR 28	Project discussion per group
APR 30	FINAL Presentation and Q/A
MAY 5	FINAL Presentation and Q/A

LAB/FIELDS (subject to minor changes)

Date	**Topics and activities**
JAN 21	No class
JAN 28	No class
FEB 4	Lab Orientation (DK 3006)
FEB 11	No class
FEB 18	Ahn Wetland Compound (AWC)/project field site orientation
FEB 25	Individual/group work
MAR 4	Ahn Wetland Compound -field methods for plants and soils
MAR 11	**Spring break**
MAR 18	AWC – wetland soils
MAR 25	AWC -Nix and SOM SOPs -data collection
APR 1	Individual/group work -lab/field work planning
APR 8	Fieldwork – Data collection/Lab processing (Group)
APR 15	Fieldwork – Data collection/Lab processing (Group)
APR 22	Huntley Meadow Park -History, Ecology, and Eco-engineering
APR 29	Project discussion, Q/As

CLASS RESEARCH PROJECT: subject to minor changes

Data Science meets Ecological Literacy of Soils as Influenced by the Environment –
"Soil color sensor data and soil organic matter in two different campus green spaces"

Peer-Reviewed Journal Articles for the Class Research Project:

1. Ledford, K., Schmidt, S, **Ahn, C**. 2022. Assessing carbon storage potential of forested wetland soils in two physiographic provinces of Northern Virginia, USA. *Sustainability 14: 2048,* **Paper 1**
2. 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 1-1**
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 2**
5. 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 3**.

6. Schmidt S. and Ahn, C. 2022. A protocol for digitizing colors: the case of measuring color variables for forested wetland soils, USA. *Environmental Monitoring and Assessment 194: 726*, **Paper 4**
7. 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 - **Paper 5**
8. 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 6**
9. Turk JK and Young RA. (2020) Field Conditions and the accuracy of visually determined Munsell soil color. *Soil Science Society of America Journal* 84:163-169. **Paper 7**
10. 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 8**
11. Swetha RK and Chakraborty (2021). Combination of soil texture with Nix color sensor can improve soil carbon prediction. *Geoderma 382 (114774).* **Paper 8-1**
12. Mitsch et al., 2023. Contrasting two urban wetland parks created for improving habitats and downstream water quality. Ecological Engineering 192:106976. **Paper 9**
13. McAndrew, B, **Ahn, C**., Spooner J. 2016. Nitrogen and sediment capture of a floating treatment wetland on an urban stormwater retention pond – the case of the Rain Project, *Sustainability* 8, 972; doi:10.3390/su8100972.**Paper 10**

Articles for Class Discussion

14. James I. McClintock . 1992. Gary Snyder's Poetry & Ecological Science, The American Biology Teacher, Vol. 54, No. 2 (Feb., 1992), pp. 80-83 **Reading A**
15. The Nation's Corn Belt Has Lost a Third of Its Topsoil- Smithsonian Magazine-**Reading B** https://www.smithsonianmag.com/science-nature/scientists-say-nations-corn-belt-has-lost-third-its-topsoil-180977485/?fbclid=IwY2xjawG-0GlleHRuA2FlbQIxMQABHWRFfUse6W3rGxIHf50CchF_URvN1Sic96swtpGR41iqHTqFrPp2LmgmpQ_aem_fL8IH6__ZgSIzDvP_whfgg
16. Ahn C, Schmidt S. 2019. Designing wetlands as an infrastructural element for urban development in the era of climate change. *Sustainability* 11, MDPI, Open Access Journal, vol. 11(7), pages 1-10, March., **Reading C**
17. Dee, S, Korol, A , Ahn, C.., Lee, J , Means A. 2018. Patterns of vegetation and soil properties in a beaver-created wetland located in the coastal plain of Virginia, Landscape and Ecological Engineering 14(2): 209-219.**Reading D**
18. Natural and Constructed Wetlands for Ecosystem Restoration- EE special issue (June 2024) https://www.sciencedirect.com/special-issue/10WFWNDZH1F
19. The Serviceberry -Abundance and Reciprocity in the natural world by Robin Wall Kimmerer 2024

Paper review groups:

Field project work/data collection groups: