ESM 427-527 Watershed Biogeochemistry Spring 2025

Where/When: VSC 415, Portland State University / Tues and Thurs 12-13:50
Instructor: Dr. Jennifer L. Morse (jlmorse@pdx.edu; 503-725-2826)
Drop-in Hours: Tues 9:30-10:30am; Thurs 10:30-11:30am; or by appointment (in person or Zoom)
Drop-in meetings Zoom Link: https://pdx.zoom.us/j/7024512248
Texts: Schlesinger & Bernhardt 2020. Biogeochemistry: An Analysis of Global Change (4th ed)
Available as an ebook (must be logged into PSU library). Other materials are posted in Canvas.
Recommended prerequisites: 2 chemistry courses; ecology and environmental science courses
Lecture slides: Will be placed in Canvas before the lecture. Zoom recordings will be automatically transcribed and posted to Canvas after the lecture.
Sustainability: This course contributes to the study of sustainability by giving students opportunities to connect scientific and societal aspects of biogeochemistry with applications in environmental management and policy.

Land Acknowledgment: Portland State is located on the traditional homelands of the Multnomah, Kathlamet, Clackamas, Tumwater, Watlala bands of the Chinook, the Tualatin Kalapuya, and many other Indigenous nations of the Columbia River. We acknowledge the ancestors of this place and understand that we are here because of the sacrifices forced upon them. By recognizing these communities, we honor their legacy, their lives, and their descendants.

Course Format: This course is fully in-person, but lectures will be recorded via Zoom and posted in Canvas, to allow students who may need attendance flexibility to stay caught up in the course. There is no attendance requirement per se, but your experience will be of lesser quality and your participation grade will be affected if you do not come to class. I am open to accommodations if you need them, so please talk to me and see the Disability Resource Center for a formal request to start the process.

Course Description: This course is an introduction to biogeochemistry, the study of the chemical interactions between living and non-living components of the environment and how they shape the Earth, with a focus on the watershed scale. Central to the study of biogeochemistry in the modern world is an understanding of how human activities have altered cycles of energy and matter. Biogeochemical cycles are fundamental to all forms of life; understanding the processes and controls at the watershed scale is important to managing environmental problems that can result from altered biogeochemical cycles.

Learning Objectives:

1. Understanding the Earth as a chemical system with abiotic and biotic components.
2. Learn about biogeochemical cycling in different ecosystem contexts, with a focus on the watershed scale.
3. Discuss, analyze, and write about biogeochemical research findings in depth.
4. 527 only: Co-lead a group project to present a case study in watershed biogeochemistry

Required Technology: To successfully complete this course, you will need access to a computer and an internet connection. The word processing and spreadsheet work for this course can be completed in the Google suite, which you have access to through your PSU account, or in Microsoft Office, which is available here. to all students free of charge. Bringing a laptop or tablet with wifi will be helpful for some activities but not required.

Public health: Please stay up to date on your immunizations and keep our community safe by staying home when sick and following the most recent health guidelines. Some in our community may feel more comfortable continuing to wear a mask. While that is a personal decision that I support, please respect the choice of colleagues and students who keep their masks on and please refrain from asking others to wear a mask.

Inclusivity and Access Aims:

- Students from all backgrounds, perspectives, and degree programs will be well served by this course, so that your learning needs are addressed both in and out of class.
- The diversity that students bring to this class is viewed as a resource, strength, and benefit.
- I present materials and activities that are respectful of diversity: gender, sexuality, disability, age,

socioeconomic status, ethnicity, race, and culture.

- Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups.
- Please let me know of any religious or other events that may conflict with any of our class meetings this term so that we can make arrangements.

Instructor Expectations:

- Choose your own adventure! In this course, we have undergraduate, post-bac, and graduate students in many degree programs, including Environmental Science, Environmental Studies, and Environmental Management, among others. As such, I expect everyone to engage with the topics and materials at their level and degree of interest. I present a wide variety of source materials, scientific concepts, complex environmental problems, and open-ended questions for discussion, as opposed to mastery of content. I also offer some opportunities for individual choice in assignments and activities. In this way, I hope you will engage with the topics, materials, and activities in ways that interest you and motivate you. This is especially true for graduate students who are preparing for environmental careers, but all students should feel empowered and supported in pursuing topics that are connected to their particular interests.
- Do the work and ask questions: If the materials are challenging to read and understand, do your best, ask questions, and connect with other students. This is part of learning! Your skills will improve with practice and engagement. I allow students to resubmit homework assignments, to learn from my feedback and improve their work. I think this helps you get more out of the course.
- Clear communication: Please communicate with me early if any issues arise throughout the term that interfere with your ability to keep up with the class.
- Summary: come to class ready to discuss materials and ask questions; be respectful and adhere to the code of conduct; turn in work on time. I expect that everyone who puts in a good effort in the course will be successful!

Evaluation and Grades: All assignments will be graded on a point basis and weighted as shown below. Assignments and due dates are shown on the course schedule.

Grades:			Grading scale:	
Participation	10%		90-100	A
Discussions	15%		80-89	B
Homework	40%		70-79	C
Group presentation	20%		60-69	D
News	15%		< 60	F

Attendance and Participation: (10%) Attendance and active participation are expected, including problem-solving sessions, class discussions, etc. However, if you are sick or have been exposed to a sick person (whether it's COVID or not), please stay home and take care of yourself, so that you don't get anyone else sick. Please communicate with me about your absence ahead of time.

Readings and Discussions: (15%)

- Materials for discussions will be posted in Canvas under each week's Module.
- Prior to each class, students must complete the assigned materials.
- All students should be prepared to discuss assigned materials and ask/answer questions during class.
- Each student must submit one question and one response in the Canvas Discussion that relates to the materials assigned for that day by 11AM on the day of class.
- Each student must submit a follow-up post in the Canvas Discussion that addresses one thing they learned from the discussion. The follow-up post will be due before 11AM the day after the in-class discussion.
- Completeness and quality of the discussion questions and responses will be counted for this grade.
- One day of missed posts will be allowed without penalty.

News: (15%) Students will work alone (ESM 527) or in pairs (ESM 427) to give a 5-10min Google Slides presentation and lead a 5-min discussion of a recent news article relating to biogeochemistry in Week 10.

Homework: (40%) These will be three assignments posted in Canvas; the first two are each worth 15%; HW3 is worth 10%. They will be posted electronically in Canvas at least one week before the due date. Time may be given in class to work on the assignments, and you may work together to solve the problems, but you must submit your assignment individually and show/explain your work. Assignments are due in Canvas at noon on the due date.

Presentations (20%)**:** Group presentations on case studies in watershed biogeochemistry, giving an overview of biogeochemistry research topics at a long-term ecological research site focused on the topic of the week. Groups will be led by students in ESM 527 and consist of 4-7 members. Presentations will be allotted 15-25 minutes and take place in Weeks 4-9. Students will sign up for groups/dates and clear their topic with the instructor. Details will be posted in Canvas.

Late Work and Resubmissions: Each student will be allowed to submit one homework up to 3 days late without penalty or justification; beyond that, you will lose 10% for each day the assignment is late. If your circumstances need more flexibility, please talk to me so that we can find a solution that works for you. Homeworks can be resubmitted for partial credit if you incorporate my feedback and follow the resubmission process that will be posted in Canvas. Resubmissions will be due one week after graded materials have been returned.

Communication and Availability: I am happy to answer questions via email (I rarely check my voicemail), but please allow 24-48 hours for a response and check the syllabus and Canvas first! I encourage you to visit during my drop-in hours to discuss the course and any issues or questions you have about it. If you are having difficulties with the course, please come see me early in the term.

Course schedule:

	Tuesdays				Thursdays			
Week	Date	Topic	What to Read	What is Due	Date	Topic	What to Read	What is Due
1	4/1	Intro to BGC	1		4/3	Review and projects	2, 3	DF
2	4/8	Hydrology	4	DF	4/10	Atmospheric chemistry	5, 6	DF; GP topics
3	4/15	Soils	7	DF	4/18	Soils	8	DF
4	4/22	Terrestrial C cycle	9	DF; **HW1**	4/24	Terrestrial C cycle	10	DF; GP1
5	4/29	Terrestrial N&P cycles	11	DF	5/1	Terrestrial N&P cycles	12	DF; GP2
6	5/6	Wetlands	13	DF	5/8	Wetlands	14	DF; GP3
7	5/13	Inland waters	15	DF; **HW2**	5/15	Inland waters	16	DF: GP4
8	5/20	Coastal systems	17	DF	5/22	Coastal systems	18	DF; GP5
9	5/27	Urban ecosystems	19	DF; **HW3**	5/28	Urban ecosystems	20	DF; GP6
10	6/3	BGC in the news	**Share slides**		6/5	Presentations		**Share slides**
DF: discussion forum; GP: group presentation; HW: homework								

Additional Important Resources

1. Student Conduct Code

Portland State has a well-defined conduct code. This link takes you to the official description.
Conduct: We are to realize the highest ethical standards of behavior, as per the Code of Conduct to which we are bound: http://www.pdx.edu/dos/codeofconduct#ProscribedPSU. If you have not yet done so, please go through the on-line training for creating a safe, respectful campus:
https://d2l.pdx.edu/d2l/home/425907 . Plagiarism or other academic dishonesty will not be permitted and will yield a failing grade for the project. Please consult the Purdue OWL, one of the TAs, or me regarding plagiarism and other writing issues: https://owl.english.purdue.edu/owl/resource/589/01/

2. Academic Honesty

The issue of academic dishonesty has become a growing issue with which most universities have had to contend. There are various reasons why students 'cheat' in their classes such as lack of time, unwillingness to put forth own effort, lack of understanding of course material or assignments, and a different interpretation of what constitutes academic dishonesty. In this class, academic dishonesty is broadly defined as the use of someone else's work as yours. This includes some obvious actions such as:

- Having someone take a class for you
- Having someone take or complete part of your test or an assignment for you
- Having someone else write a paper, or a section of a paper for you
- Using a quote or direct passage from some secondary source (e.g., book, article) in a paper without citing it (this does not include your responses provided on tests that are taken directly from the professor's lecture or other class material]
- Working collaboratively on projects or assignments that are expected to be completed on an individual basis.
- There also other actions that are considered academically dishonest that are less obvious:
    - Submitting a paper that utilizes another person or source's theories, thoughts, ideas, concepts without proper citation
    - Using a paper or assignment, or a segment of a previous paper or assignment created by another group in which you participated.
    - Taking material off the Internet and using it without full disclosure and proper citation. This includes use of generative AI programs.

The above list of actions is not intended to be exhaustive. If you have any question about what is an appropriate way to cite particular information, please contact your instructorA.

3. DRC statement: Access and Inclusion for Students with Disabilities

PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment.
If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, drc@pdx.edu, https://www.pdx.edu/disability-resource-center.

- If you already have accommodations, please contact me to make sure that I have received a faculty notification letter and discuss your accommodations.

- Students who need accommodations for tests and quizzes are expected to schedule their tests to overlap with the time the class is taking the test.
- Please be aware that the accessible tables or chairs in the room should remain available for students who find that standard classroom seating is not useable.
- For information about emergency preparedness, please go to the Environmental Health and Safety webpage (https://www.pdx.edu/environmental-health-safety/) for information.

4. Title IX Reporting Obligations

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. We expect a culture of professionalism and mutual respect in our department and class. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the Office of Equity and Compliance or the Office of the Dean of Student Life.
Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment or sexual violence to a confidential employee who does not have this reporting responsibility, including an Interpersonal Violence Advocate at the Women's Resource Center (503-725-5672), the Queer Resource Center (503-725-9742), or Center for Student Health and Counseling (SHAC): 1880 SW 6th Ave, (503) 725-2800. This Sexual Misconduct Website provides a complete of those confidential employees and off campus resources. For more information about Title IX please complete the required student module Creating a Safe Campus in D2L.

5. Mandatory Safe Campus Online Training Module

If you have not done so already, please complete the Safe Campus Module. The course is titled "Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault." PSU ***requires*** all students to take the learning module entitled "Creating a Safe Campus: Preventing Gender Discrimination, Sexual Harassment, Sexual Misconduct and Sexual Assault." The module should take approximately 45 minutes to complete and contains important information and resources.
If you or someone you know has been harassed or assaulted, you can find resources on PSU's Enrollment Management & Student Affairs: Sexual Prevention & Response website at http://www.pdx.edu/sexual-assault. PSU's Student Code of Conduct makes it clear that violence and harassment based on sex and gender are strictly prohibited and offenses are subject to the full realm of sanctions, up to and including suspension and expulsion. If you are having technical difficulties with the module contact OIT's help desk at 503-725-HELP (4357) or help@pdx.edu. If you have any questions about the module requirement refer to Safe Campus Module FAQs or contact saveact@pdx.edu. Do not contact your instructor.

6. Students' Right to Privacy

The Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. Â§ 1232g; 34 CFR Part 99) is a Federal law that protects the privacy of student education records. Under FERPA, students have the right to inspect and review their education records maintained by the school. Schools are not required to provide copies of records unless, for reasons such as great distance, it is impossible for parents or eligible students to review the records. Schools may charge a fee for copies.
Students have the right to request that a school correct records which they believe to be inaccurate or misleading. If the school decides not to amend the record, the student has the right to place a statement with the record setting forth his or her view about the contested information.
Generally, schools must have written permission from the student in order to release any information from a student's education record. However, FERPA allows schools to disclose those records, without consent, to certain parties or under the specific conditions (34 CFR Â§ 99.31): for example, school officials with legitimate educational interest; other schools to which a student is transferring; financial aid officers; state and local authorities in cases of health and safety emergencies; etc.

Schools may disclose, without consent, "directory" information such as a student's name, address, telephone number, unless the student has requested that the school not disclose directory information about them. For additional information about the law, see these sites https://www.pdx.edu/registration/student-records-privacy-policy

7. Returning Work to Students

FERPA requires faculty to be very careful in safeguarding our students' right to privacy when returning students' exams papers.
Faculty can do one of the following:

1. Return work directly to students in class
    - Pass out assignments to students at the end of class
    - Students retrieve their work, before or at the end of class, in individual, labeled file folders or envelopes that guard the confidentiality of the work inside, under the observation of the instructor, ensuring that only the student whose name is on the label removes the material.
2. Return work and send feedback electronically.
3. Students arrange to pick up work from instructors outside of class.
4. Students provide instructors with a self-addressed and stamped envelope that instructors can use to return material directly to students.

8. Communication

Questions and Email: As much as possible, please ask questions during and after class and come to my office hours. If these times do not work for you, send me a message to set up an alternative time. Please don't leave a voicemail on my office phone. If you email me, please follow these general guidelines:

- include an informative subject line (e.g., ESM 221, assignment #1)
- include a salutation (e.g., Hello Dr. Morse,…)
- include your name
- do not expect an immediate reply. Some days I will be able to respond to your email within the day, while other times it may take me 1-2 days to respond.

9. Canvas Learning Management System

Hardware/software requirements: This course uses Canvas as the web-based course management system. It can display material on a wide range of platforms from desktops to tablets to phones, but you may need to use functions that are only available on a fully functioning browser. If your device/browser combination is not fully supported, please make other arrangements for taking quizzes or submitting work. Many computers are available across campus, in the library or campus computer labs, to use or borrow.
Submitting documents to Canvas: It is best to submit documents as .docx or .pdf.
Viewing .pdf documents on a smart phone: We will often supply .pdf documents and these can be challenging to read on a small screen. Our best advice is to find a larger screen device. Our second recommendation is to download the .pdf and then use a PDF viewer on your phone.

10. Resources & Services:

ESM webpage for info on the department: https://www.pdx.edu/environmental-science/
Career Services: https://www.pdx.edu/careers/ and
https://www.pdx.edu/careers/what-can-i-do-degree-environmental-studiesenvironmental-sciences
Departmental honors: http://www.pdx.edu/environmental-science/esm-undergraduate-honors-program
Disability Resource Center: https://www.pdx.edu/disability-resource-center/ If you are a student with a documented disability and are registered with the Disability Resource Center, please contact me so that we can arrange whatever academic accommodations you need.

ESM student council: Email the ESM student council <esmsc@pdx.edu> with ideas for developing the ESM community, issues regarding student advocacy or to join the council.
Financial insecurity: https://www.pdx.edu/student-finance/emergency-fund
Food insecurity: https://www.pdx.edu/student-access-center/food-assistance
Global Diversity and Inclusion: http://www.pdx.edu/diversity/
Learning Center/Free Tutoring: http://www.pdx.edu/tutoring/ PSU library rm 245
Library Research Tutorials: http://guides.library.pdx.edu/home/howto and http://guides.library.pdx.edu/biology
LSAMP (Louise Stokes Alliance for Minority Participation) enhances the undergraduate experience for underrepresented students in STEM. Funded by the NSF, our LSAMP program focuses on: Creating a community among LSAMP scholars that values excellence, diversity, and persistence; and Expanding opportunities for LSAMP scholars through participation in undergraduate research experiences and leadership initiatives. If you're interested in finding out more, visit our LSAMP center in 103 Epler Hall, talk to ESM-LSAMP faculty advisory member Cat de Rivera <derivera@pdx.edu>, SRTC 238e, or check out: https://www.pdx.edu/alliance-minority-participation/
Mental and physical health: https://www.pdx.edu/health-counseling/
Multicultural Centers: https://www.pdx.edu/cultural-resource-centers/multicultural-student-center ; https://www.pdx.edu/cultural-resource-centers/native-american-student-community-center ; https://www.pdx.edu/cultural-resource-centers/la-casa-latina-student-center ; https://www.pdx.edu/cultural-resource-centers/pacific-islander-asian-asian-american-student-center https://www.pdx.edu/cultural-resource-centers/middle-east-north-africa-south-asia-initiative ; https://www.pdx.edu/cultural-resource-centers/pan-african-commons
PSU Food Pantry: SMSU 47A, https://sites.google.com/pdx.edu/psufoodpantry/home
Queer Resource Center: https://www.pdx.edu/queer-resource-center
Veterans: If you are a Veteran and have questions about University services or need assistance with your transition from military to campus life, please contact Chris Goodrich, Coordinator of Veterans Services at the Office of Veterans' Services, SMSU room 425.
Women's Resource Center: http://www.pdx.edu/womens-resource-center/
Writing Center: for class assignments, resumes... https://www.pdx.edu/writing-center Cramer Hall rm 188
Please consult the Purdue OWL regarding *plagiarism* and other writing issues:
https://owl.english.purdue.edu/owl/resource/589/01/
Additional Student Resources: https://www.pdx.edu/dean-student-life/student-resources