Ecological Toxicology ESM 420/520: Fall Quarter 2023

Instructor: Kaley Major, Ph.D., she/her
Email: kaleym@pdx.edu
Class: Mondays/Wednesdays 12:00 pm to 1:50 pm, LH 249
Office Hours: Mondays 2:00 pm to 3:00 pm, SRTC 139B

Course Learning Outcomes:

- Understand the basic framework of chemical regulation in the United States
- Be familiar with the major classes of contaminants that have affected ecotoxicological receptors in the environment
- Understand how physical and chemical properties affect toxicity
- Be familiar with a variety of toxic endpoints, both long and short-term, across levels of biological organization
- Understand basic dose-response concepts and how toxicological assays are used to develop regulatory endpoints
- Understand the types of information needed to make effective risk-based decisions

Canvas: This course uses Canvas as the main learning platform. If you haven't used Canvas before, I recommend you take the PSU Learning Center's remote readiness course (https://www.pdx.edu/learning-center/online-remote-learning-support-canvas) this week. If you've used Canvas and you just need occasional technical support, contact the OIT Helpdesk (https://www.pdx.edu/technology/support). If they can't help you, please let me know.

Lecture Materials: Powerpoint files for the lectures will be available on Canvas before class, usually the night before.

Readings: Readings for each lecture are listed on the syllabus (below). Articles will be available on Canvas. It is important to read these articles to understand foundational information that will be used to create PowerPoints and discussions. There is an optional textbook that can be used as a reference if desired, but all necessary information from the book will be condensed into PowerPoint slides.
Optional Textbook: Principles of Ecotoxicology by Walker, Sibly, Hopkin, Peakall, 4th edition

Homework Assignments: Homework assignments will be posted on Canvas a minimum of one week before they are due. Completed assignments should be submitted through Canvas. See due dates on the syllabus (below). Note that graduate students (ESM 520) may be required to answer an additional question on homework assignments.

Paper and Presentation: All students are required to complete a 4-6 page paper and a 3-5 minute presentation to the class about a chemical (or chemical class) or receptor of ecotoxicological significance. A detailed project description and rubric will be available within the first two weeks of class. Note that graduate students (ESM 520) may have a different grading rubric than undergraduate students (ESM 420).

Exams: The midterm and the final exam will be taken via Canvas. Exams will be open book/open note. Once a student initiates the exam, they will have a set amount of time to complete it (2 hours for the midterm, 3 hours for the final). Once started, it must be submitted in one sitting. Students may initiate their exam anytime after it becomes available on Canvas up until the due date/time.

Grading:	Homework (2@ 25 pts each):		= 50points
	Midterm Exam		= 50 points
	Final Exam		= 50 points
	Paper and Presentation		= 50 points
		Total	= 200 points

Percentage Scale:	95-100 = A
	90-94 = A-
	85-89 = B+
	80-84 = B
	75-79 = B-
	70-74 = C+
	65-69 = C
	60-64 = C-

Late Work Policy: Each student will receive one "24-hour extension" that may be used to extend the deadline by 24 hours for either homework assignments or the paper without penalty. To use a 24-hour extension, email me your assignment directly, noting that you intend to use the extension. 24-hour extensions cannot be used for exams or student presentations. If homework or the paper is turned in late without a 24-hour extension available, 2 to 5 points will be deducted for each day that the item is late, depending on the assignment.

Academic Integrity: In the American college and university system, scholars and students use the ideas of their peers and predecessors to build new knowledge and understandings; in interdisciplinary fields such as environmental science and management, collaboration is an essential part of problem-solving, and one we emphasize in ESM courses. Institutions that depend on the free and open exchange of ideas and information also depend on a culture of academic integrity. Consequently (and as you have probably noticed) there are formal and informal sanctions against academic misconduct in this university and in this department. I expect that all work that you submit in this class will represent an original synthesis of your own ideas and the ideas of others. That means that information generated by others and used in your work must be clearly attributed to its original source, and either paraphrased in your own words or placed in quotation marks. If you are uncertain about whether conduct constitutes a violation or not, please ask questions. If you can't ask questions early, ask them late, and err on the side of transparency. For help identifying plagiarism and learning how to avoid it, this online guide is a good starting place: http://guides.library.ucla.edu/bruin-success/citing.

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. Our 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. **If you have, or think you may have, a disability that may affect your work in this class, please contact your instructor.** You may also 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/drc.

Date **Subject Material**

9/27 Lecture 1: Introduction to Ecotoxicology
- Walker et al., Introduction & Ch 1 (optional), focus on tables and figures in ppt
- Eggen et al., 2004. Challenges in ecotoxicology
- Krimsky 2017. The unsteady state and inertia of chemical regulation under the US Toxic Substances Control Act

10/2 Lecture 2: Physical & Chemical Properties: Fate and Transport of Pollutants in the Environment
- Walker et al., Ch. 1, Ch 2, Ch 3, Ch 4 & Ch 5 (optional), focus on tables and figures in ppt

10/4 Lecture 3: General Toxicological Principles: Dose–Response: Acute & Chronic Toxicity & Low Dose Effects
- Walker et al., Ch 6 (optional), focus on tables and figures in ppt
- Fagin 2012. The learning curve

Due today: ***Extra Credit (1 pt) Intro Survey 11:59 p.m.***

10/9 Lecture 4: Biochemical & Physiological Effects: Mechanisms of Toxicity & Biomarkers
Reading:
- Walker et al., Ch 7 & Ch 8 (optional), focus on tables and figures in ppt
- Feist et al., 2005. Contaminants growth and reproductive physiology sturgeon Columbia River

10/11 Lecture 5: Chemical Interactions - Toxicity and Biomarkers
- Walker et al, Ch. 9; Ch. 10 (optional), focus on tables and figures used in ppt

10/15 Homework #1 Due, Sunday October 15, 11:59 pm

10/16 Lecture 6: The Scientific Method & Ecotoxicology - Exxon Valdez Oil Spill
- Hilborn and Ludwig, 1993. The limits of applied ecological research
- Holloway, 1996. Sounding out science
- Peterson et al., 2003. Long-term ecosystem response to the Exxon-Valdez oil spill

10/18 Lecture 7: Atrazine and Amphibian Deformities Controversy
- Hayes et al., 2002. Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses
- Rohr. 2017. Atrazine and amphibians: A story of profits controversy and animus

Due Today (11:59 p.m.): Email me which chemical or receptor you plan to focus on for your paper/presentation

10/23 Lecture 8**:** Glyphosate
- Guyton et al., 2017. Caricongenicity of tetrachlorvinphos parathion malathion diazinon glyphosate
- Myers et al., 2016. Concerns over use of glyphosate based herbicides and risks associated with exposures
- Service, 2016. News Focus Glyphosate the conservationist friend

Date **Subject Material**

10/25 **Exam review only**
Timed midterm exam (2 hours to complete on Canvas) will become available for timed testing on Wednesday October 25 at 5:00 p.m. The midterm will cover topics reviewed in Lectures 1 through 8 and will close Sunday October 29 at 11:59 p.m.

10/30 Lecture 9: Mercury in Willamette River Fish and Bioaccumulation
- Hope and Rubin, 2005. Mercury levels and relationships in water, sediment, and fish tissue in the Willamette Basin, Oregon
- Eckley et al., 2017. Water-level fluctuations influence sediment porewater chemistry and methylmercury production in a flood-control reservoir

11/1 Lecture 10: PCBs and Killer Whales in Puget Sound
- Ross et al., 2000. High PCB concentrations in free ranging pacific Killer Whales, *Orcinus orca*: Effects of age, sex, dietary preference
- Desforges et al., 2018. Science. Predicting global killer whale population collapse from PCB pollution

11/6 Lecture 11: Dioxins, Furans, and PCBs in PNW River Otters, Fish and Birds
- Harding et al.,1999. Reproductive and morphological condition wild mink and river otters OC contamination
- Thomas and Anthony, 2003. Blue Heron Chemical Contaminants PNW
- Cook et al., 2003. Effects of AhR mediated early life stage toxicity on lake trout populations in Lake Ontario 20th century

11/8 Lecture 12: Pharmaceuticals and Personal Care Products: Types, Occurrence, Effects
- Ankley et al., 2007. Repeating history: pharmaceuticals in the environment
- Boxal et al., 2012. Pharmaceuticals and Personal Care Products in the Environment: What Are the Big Questions?
- Hughes et al., 2012. Global Synthesis and Critical Evaluation of Pharmaceutical Data Sets Collected from River Systems

11/12 ***Homework # 2 Due, Sunday, November 12, 11:59 pm***

11/13 Lecture 13: Coho Urban Runoff Syndrome
- Tian et al., 2021. A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon
- Tian et al., 2022. 6PPD-Quinone: revised toxicity assessment and quantification with a commercial standard

Student Presentations

11/15 Lecture 14: Microplastics in the Environment
- Rochman et al., 2019 ETC Focus Rethinking microplastics as a diverse contaminant suite

Student Presentations

11/19 ***Papers due, Sunday, November 19, 2023, 11:59 p.m.***

11/20 Lecture 15: Per- and polyfluoroalkyl substances (PFAS)
- Wang et al., 2017. A never ending story or per and polyfluoroalkyl substances

Student Presentations

Date **Subject Material**

11/22 No class.

11/27 Lecture 16: Evolutionary Ecotoxicology
- Oziolor et al., 2021. Evolutionary toxicology – an informational tool for chemical regulation?

11/29 Lecture 17: Clean Water Act: Water Quality Standards and Beyond
- (*Skim for main concepts*) Stephen et al., 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses

Final Exam Review

12/1-12/7 ***Timed final exam (3 hours to complete on Canvas) will become available for timed testing in the evening on Thursday, November 30. The final will be technically cumulative, but will more heavily focused on Lectures 9 through 17. Final Closes on Thursday, December 7 at 11:59 p.m.***

Other Resources & Scholarships

ESM email list: Please send an email to esmoffice@pdx.edu if you would like to be added to the ESM Undergraduate Student email listserve. The listserve announces ESM events, forwards information about jobs, scholarships, and grants, and sends reminders about deadlines.

ESM Webpage: Don't forget to check out the ESM webpage for all sorts of info on what the department is doing: www.pdx.edu/esm, Helpful links:
- AESS seminar webpage: https://sites.google.com/a/pdx.edu/esm-science-seminar/
- Jobs & Internships: https://www.pdx.edu/environmental-science/jobs-internships
- Co-op Program: https://www.pdx.edu/environmental-science/esm-cooperative-education-program.
- Advising: https://www.pdx.edu/environmental-science/undergraduate-advising
- ESM Directory: https://www.pdx.edu/environmental-science/facultystaff-directory
- Office Hours: https://www.pdx.edu/environmental-science/esm-faculty-and-staff-office-hours

Department scholarships and other awards: http://www.pdx.edu/esm/awards-and-scholarships
Undergraduate students interested in the Paul Croy or Barry Commoner awards should check out their descriptions on the ESM website. Graduate and undergraduate students may apply for the ESM Bushby scholarship, and graduate students may apply for the Dunnette Travel Award. You can find out more information about ESM scholarships and awards at the weblink above.

LSAMP (Louise Stokes Alliance for Minority Participation): is dedicated to enhancing the undergraduate experience for underrepresented students in Science, Technology, Engineering, and Mathematics. Funded by the National Science Foundation, 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/.

Institute for Sustainable Solutions (ISS)-LSMAP – Climate and Disaster Resilience Internship Program: The LSAMP supports several paid climate resilience, water resources, and disaster preparedness focused internships. The program supports Portland State University students who identify as members of racially underrepresented groups in STEM as identified by the National Science Foundation (African American/Black, Alaska Native, Native American, Latino/Latine, Native Hawaiian, or Pacific Islander). Check out: https://www.pdx.edu/alliance-minority-participation/resilience-internship-program or contact lsamp@pdx.edu.

McNair Fellows Program: for first-generation to college students as well as students from backgrounds underrepresented in the sciences: **http://www.pdx.edu/mcnair-program/**.

Emergency Support and Hardship Funds: The college has resources that may be available to you for financial emergencies and hardships. Contact Carol Gabrielli at <cg@pdx.edu> or 503-725-5902, the student support specialist in the College Dean's Office for more information.

PSU Scholarships: https://www.pdx.edu/student-finance/scholarships – Portland State University has an array of scholarships available to undergraduate and graduate students. Check out the PSU scholarship website for detail about types of scholarships, how to apply, and deadlines.

PSU Free Food Pantry & Market – Food Pantry: https://psufp.com/make-an-appointment: All PSU Students are invited to visit the pantry once per week by making an appointment up to 21 days in advance, or by showing up during open hours and waiting in line for a walk-in.

Food Market: https://www.pdx.edu/student-access-center/food-assistance: The Second Monday of each month please visit us instead at our Free Food Market on the South Park Blocks. The Pantry will be closed these days. The Free Food Market brings fresh produce and other food items to PSU students and the greater PSU community. This partnership is an effort to increase student access to healthy food options and to reduce student food insecurity.

Additional Academic Resources

Title IX Reporting: Portland State is committed to fostering a safe, productive learning environment. Title IX and our school policy prohibit discrimination on the basis of sex, which regards sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We expect a culture of professionalism and mutual respect in our department and class. 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 to PSU's Title IX Coordinator, the Office of Equity and Compliance, or the Dean of Student Life and cannot keep information confidential. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the **Office of Equity and Compliance** (complaints against faculty or staff): https://www.pdx.edu/diversity/file-complaint-discriminationharassment or the **Office of the Dean of Student Life** (complaints against students): https://pdx-advocate.symplicity.com/public_report/index.php. If you would rather share information about sexual harassment or sexual violence to a confidential employee who does not have this reporting responsibility, you can contact a confidential advocate at the Women's Resource Center: **503-235-5333** or https://psuwrc.youcanbook.me/, or another confidential employee found on the sexual misconduct resource webpage: https://www.pdx.edu/sexual-assault/get-help.

Advising & Career Services: https://www.pdx.edu/careers/
The University Career Center provides resources and services to meet the career development and job search needs of students and alumni. The Center develops employer, campus, and community partnerships to support students and alumni in obtaining career positions, internships, part-time employment, and on-campus jobs. Contact the career center <503-725-4613> for assistance with career or job exploration, preparation and planning, job searching, and making career changes and transitions. Or schedule an in-person or virtual appoint by clicking the appointment tab on the Career Center's main page. You can also find out more about ESM specific careers at: and https://www.pdx.edu/careers/what-can-i-do-degree-environmental-studiesenvironmental-sciences.

Library Research Tutorials: http://guides.library.pdx.edu/home/howto and http://guides.library.pdx.edu/esm - The Library research how to guides and tutorials are an opportunity to explore new research strategies and refresh your research skills. Tutorial take approximately 20 to 30 minutes to complete, and how to guides provide useful resources for everything from how to format citations, evaluating source quality to writing literature reviews. You can also reach out to Elizabeth Pickard < epickard@pdx.edu>, the ESM subject librarian for help finding sources or navigating library resources.

Health Notes

Illness, or Positive Test for COVID-19:

- If you are feeling sick, do not come to campus.
- Please notify me (i.e. your instructor), should you need to miss a class period for health reasons so that we can discuss strategies to support your learning while you are away.
- If I become ill or need to quarantine during the term, I or another member of the ESM faculty or staff will notify you via PSU email about my absence and how course instruction will continue.

As the instructor of this course, the University has given me the authority to ask you to leave the classroom if you are ill. If you cannot comply with this health requirement, I may make a referral to the Office of the Dean of Student Life.

Guidance May Change:
Please note that the University rules, policies, and guidance regarding health requirements may change at any time at the direction of the CDC, State, or County requirements.

Center for Student Health and Counseling (SHAC):
SHAC provides accessible mental health, physical health and dental services. If needed, call the Center for Student Health and Counseling (SHAC) to discuss your needs and situation at 503-725-2800: https://www.pdx.edu/health-counseling/.

In addition to physical health and dental services, SHAC counseling services supports the emotional health and wellbeing of PSU students. To schedule an appointment, call 503.725.2800 or schedule online through the Patient Portal: https://www.pdx.edu/health-counseling/patient-portal. Resources are available for:

- Learning Disorders
- Trauma
- Anxiety
- Greif
- Anti-racism
- Coping & Healing
- Trans Health
- Military Personnel & Veterans
- And More