

Freshwater Ecology (Bio 476/576)

Fall 2023

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Instructor info:



Dr. Megan Fork
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Office hours by appointment:
 Mon 1-3, Wed 4:30-6 & Thu 11-12:30,
 on Zoom or in person (SSN 380)

At-a-glance

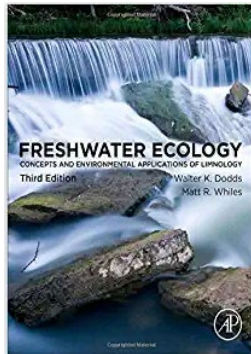
Lecture: Mon & Wed 11-11:50, Lab: Wed 1-3:45

Broad topics:

- Watersheds and water movement
- Light, heat, and oxygen
- Nutrients, organic matter, and contaminants
- Primary production, food webs, and communities
- Streams and lakes as social-ecological systems (woven in throughout)

Textbook:

Freshwater Ecology: Concepts and Environmental Applications of Limnology by Walter K. Dodds and Matt R. Whiles



2nd edition is also okay and is available used online for ~\$30; Also on reserve in the library

Assessment:

You will earn your grade based on a combination of:

- Lab reports
- Preparing/leading an exam review session
- Take-home exams with follow-up discussion and corrections
- Aquatic ecosystem project (lit review and presentation on your choice of topic)
- Participation and reflection

See "Grading breakdown" on pg. 5 for more information

Course description and learning outcomes

This course will deepen your knowledge of freshwaters, integrating the physical, chemical, biological, and social aspects of these unique and important ecosystems. Students who engage with the course material will be able to:

- Describe, apply, and understand the limitations of tools and techniques used to measure ecological variables in streams and lakes
- Explain the interactions between physical, chemical, and biological parts of aquatic ecosystems and how they contribute to ecosystem services
- Predict and assess how people's choices and actions may affect and interact with ecological processes in aquatic ecosystems

This course will also deepen skills and knowledge that are transferable beyond ecology. Specifically, students will be able to:

- Correctly and accurately perform laboratory tasks (e.g., pipetting)
- Visualize data and recognize and describe patterns in the data
- Find, use, and cite appropriate evidence

To achieve the course learning outcomes, we will collect, interpret, visualize, and analyze data from water bodies here in West Chester¹ and elsewhere. Data literacy is important in and beyond ecology and environmental science. Remember that the process of knowing things in science depends on collecting and interpreting data. Practicing and deepening these skills is important for better understanding and applying the scientific method, and I promise it will be valuable to you now and in the future!

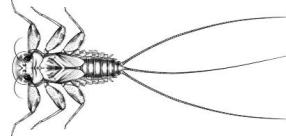
We will rely on diverse viewpoints from a variety of readings and resources, the instructor, and one another. A project with your choice of format will push you to contextualize and effectively communicate your own research on freshwater ecology in a format that serves your goals, skills, and interests. As your instructor, I have put a great deal of thought into the course design and I strive to lead the course using evidence-based techniques and principles. If it is not clear why or how we are doing something, please always feel free to ask!

¹ Please see "Field labs" section on page 6 for important safety information about field work in this course.

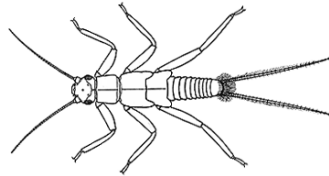
Teams and “jigsaw” work

During the semester, there will be frequent informal “jigsaw” and group work. “Jigsaw” is a learning technique in which teams of students learn a portion of the course material and then teach it to their peers. In our class, you and your team will prepare by reading assigned material before class, briefly meet to touch base and get on the same page in class, and then mix with members of other teams who have prepared different material to share your expertise. Toward the beginning of the semester, you will be assigned to one of three teams:

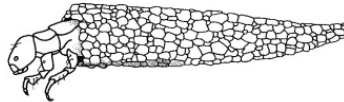
- Team Ephemeroptera (E)²



- Team Plecoptera (P)²



- Team Trichoptera (T)²



You will work with your team to lead a review & synthesis session before one of the three exams and to prepare for discussions and in-class work throughout the semester.

Norms, values, and expectations

In this class, we will be working together to achieve the learning goals described above. We need to collaborate to create a classroom community in which all of us feel safe to learn and share knowledge.

Each of us learn differently. If there are aspects of this course that prevent you from learning or exclude you, please let me know as soon as possible. Together we'll develop strategies to meet both your needs and the requirements of the course.

People of all ethnicities, genders, religions, ages, sexual orientations, disability statuses, socioeconomic backgrounds, immigration statuses, regions, and nationalities are welcomed and safe here.

² Ephemeroptera (mayflies), plecoptera (stoneflies), and trichoptera (caddisflies) are insect orders with aquatic larva and aerial adult phases. Together, these insects are used in bioassessment of stream ecosystems.

Image credits: ephemeroptera from Summerlin, Morgan. Flathead Mayfly Larva. <https://www.macroinvertebrates.org/taxa-media/ephemeroptera-larva>. Accessed 27 Jul 2021; plecoptera from CSIRO. “Plecoptera: stoneflies” in *Insects and their allies*. <https://www.ento.csiro.au/education/index.html>. Accessed 27 Jul 2021; trichoptera from Gibb, Timothy. “Insect Identification Techniques” in *Contemporary Insect Diagnostics*. 2015. Academic Press.

What you can expect from me

- Respect
- Constructive feedback on your work
 - You can expect the feedback I give you to help you learn how you can improve your work.
- Timely answers and feedback
 - You can expect a response to your email within one business day.
 - You can expect feedback on work submitted on or before the deadline within one week of the posted deadline.
- Reasonable accommodations
 - Life happens. If you are experiencing a major life disruption, please let the instructor know as soon as you can. We will work together to come up with modifications and accommodations.
 - If you have a disability that requires accommodations, please contact the instructor as early as you can so that I can support your success.
 - For more information, please see the policy section on pg 6.
- Connection to the tools and resources you need
 - One of my roles as instructor is to curate and provide you what you need to learn and be successful.

What I expect of you

- Respect
- Academic integrity
 - Engaging in your work with integrity is vital to your success in this course and in your future. If you cheat, you rob yourself of the opportunity to learn skills and knowledge designed to help you in your coursework and future career.
 - For more information, please see the policy section on pg 6.
- Attendance, preparation, and engagement in class
 - Science is a team endeavor. Not only does your own success depend on you being prepared and engaged, your classmates will rely on you to work with and teach them.
 - If you cannot attend class because of a religious observance or university event, please contact the instructor as soon as possible so we can work together to find a fair alternative. If you have a full schedule of such events, please submit it at the beginning of the semester. If you miss class for whatever reason, remember that you are responsible for meeting the academic requirements of the course.
- Communication
 - I expect you to take an active role in your own learning. Part of this requires you to communicate with me about concerns or problems you have. There are a variety of ways to contact the instructor (email, office hours, phone, after class). Please take advantage of them.

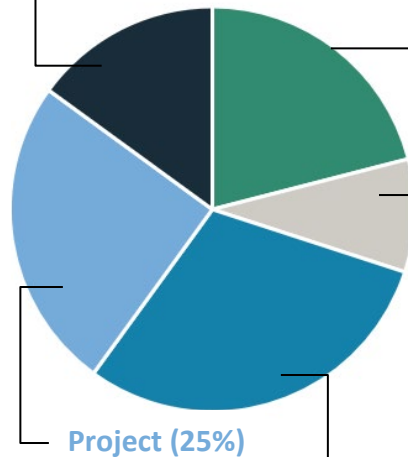
Grading breakdown

You will earn your grade in this course based on the following categories. Additional information and guidance is available in D2L for each of these. Unless otherwise noted, you will submit your work through D2L.

Participation & reflection (15%)

To earn full credit in this course, you should come to class having read and annotated the assigned readings, ready to discuss with and teach your peers. You should engage with the course material both in class and through D2L and should thoughtfully reflect on your learning and approach to class. This category will be assessed based on a syllabus quiz at the start of the semester, thoughtful completion of short reflection assignments, and in-class notecards.

You will use the skills, tools, and knowledge you gain in this course to investigate more deeply and report on your choice of topic in freshwater ecology. Your course project will have a series of “milestones” to help you build your way to the final write up. Your initial submissions for each of these will be graded on completion (i.e., did you submit each of the elements described for that milestone in good faith). You will also receive feedback to help you improve before you submit the final write-up, which will be assessed via a rubric given to you in advance. See more info in D2L.



Lab write ups (21%)

You will complete three lab write ups over the semester. These will include answers to questions that allow you to report what you’ve learned and how you interpret and contextualize your findings, based on work over multiple weeks. Prepare your write up using the word template in D2L and add your typed answers. You may submit up to two updated lab write-ups within one week of their return to you to earn a grade that averages your original and re-write grade.

Exam review session (9%)

Together with your team, you will prepare and lead an in-class review session for one of the three exams.

Exams (30%)

There will be three take-home, open-book exams (10% each) during the semester. You are expected to complete and submit the exam on your own. You will then review the answers with your classmates and have a chance to submit a corrected version. Your final grade for each exam will be an average of these two scores.

More information on each of these parts of the grade is available in D2L. Because of the flexible grading policies and opportunities for formative feedback detailed above, extra credit will not be offered in this course.

Graduate students have additional responsibilities to successfully complete the course. These take two main forms:

- Twice during the semester, graduate students will choose a topic related to something we've covered in class and prepare a lesson (lecture, activity, etc.) that dives deeper or supplements what we've learned.
- There will be higher expectations for the literature review part of the project for graduate students.

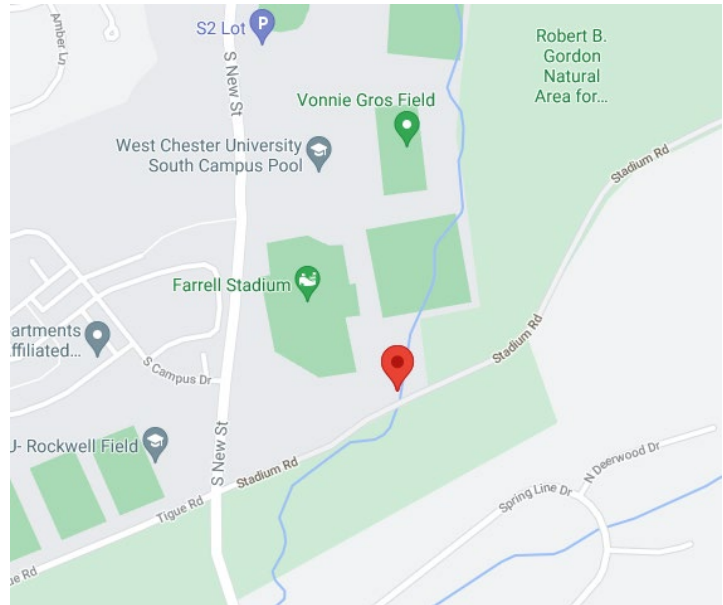
Because of these differences, the grading breakdown is slightly different for graduate students: Project (25%), Lab write-ups (18%), Exams (27%), Participation & reflection (12%), Exam review session (9%), Deeper dives (9%).

Field labs

During the semester, we will have several labs outdoors on WCU's south campus. These are denoted by a double star (**) on the course schedule (pages 11-13). Please note that field labs may have to be rescheduled in the case of dangerous weather. In the case of rescheduling, I will let you know in lecture and will update the schedule accordingly. For field labs, we will take a shuttle or walk together to our field sites – meet in our normal lab classroom.

For your safety in the field, please dress appropriately for the weather. The instructor will bring waterproof boots for you to wear while conducting fieldwork. It is suggested that you wear long pants, even when it's hot. Bring water to drink and consider bringing a snack. If you are allergic to stings from bees or wasps, please bring your EpiPen and alert the instructor. Ticks are common in our area and can transmit diseases to humans – when you return home from the field, please check yourself for ticks.

Be alert and follow instructions to keep yourself and your classmates safe.



Policies

Safety & Health

The safety, health, and well-being of our colleagues and neighbors are our primary concern. We must work together with respect, responsibility, and care for one another mitigate risks to ourselves and those around us.

As part of this course, you will conduct fieldwork. **Dress appropriately for the weather, bring water/snacks, and stay with the group** (see Field Labs section of previous page for additional details). Your instructor will provide high-visibility vests and ask you to wear them when you are working in the field.

If you are facing obstacles that are making it difficult for you to meet your academic goals because of COVID or other health-related reasons, there is a list of resources that

may be helpful on page 11. I'm happy to discuss your options with you and help you find the resources and support you need. You are not alone.

Attendance

I recognize that medical and mental health needs may sometimes prevent you from attending class. Please do not attend class or other on-campus events if you are ill. Instead, email me about your absence as soon as you are able so that we can find appropriate arrangements for you to meet the expectations (e.g., remote participation or an alternative assignment). Please note that participation in group discussions and active learning activities are important aspects of this course, so it is expected you will attend if you are healthy and able.

Flexible due dates and file submissions

The due dates for written work listed in the course schedule below are designed to keep you on track and ensure I will be able to provide you with timely and useful feedback. I recognize that things come up and you may not always be able to submit work on time.

You may submit written assignments (reflections, lab write-ups, and project milestones) up to 72 hours (3 days) after the listed due date, no questions asked. After this grace period, 10% of the potential score will be deducted per day, such that assignments more than 13 days late will receive a score of 0. Additional extensions may be granted on a case-by-case basis, but only if you **communicate with me before the end of the grace period.**

Unless specified otherwise, all work should be **submitted in D2L as a PDF or word document.** Other file types will not be accepted.

Exceptions to the flexible due date policy:

1. Take-home exams must be submitted by the listed due date in order for students to participate in the post-exam in-class review and receive the grading average benefit (i.e., the exam grade for on-time exams will be an average of the grade before and after in-class review and corrections). If you do not submit before the in-class review, you will not be eligible to participate in the in-class review and will not have the opportunity to submit a corrected exam. Please note that it is a violation of the academic integrity policy to discuss the exam questions with other students before you have submitted. Exam revisions must be submitted by the posted deadline.
2. In some cases, your peers depend on your work (e.g., exam review, jigsaws and other in-class participatory activities). In these cases, late work cannot be accepted. However, fair alternatives can be discussed provided you contact the instructor before the date of the activity.

Statements common to all WCU syllabi

Academic & personal integrity

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity at West Chester University of PA, students are encouraged to refer to the [Department Undergraduate Handbook](#), the [Undergraduate Catalog](#), the [Ram's Eye View](#), and the University website at www.wcupa.edu.

Students with disabilities

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at <https://www.wcupa.edu/universityCollege/ossd/>. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

University excused absences policy

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

Reporting incidents of sexual violence

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student

who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University Protection of Minors Policy. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at:

<https://www.wcupa.edu/admin/diversityEquityInclusion/sexualMisconduct/default.aspx>

Inclusive learning environment & anti-racist statement

Diversity, equity, and inclusion are central to West Chester University's mission as reflected in our Mission Statement, Values Statement, Vision Statement and Strategic Plan: Pathways to Student Success. We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's Office for Diversity, Equity, and Inclusion (ODEI), DEI committees within departments or colleges, the student ombudsperson, and centers on campus committed to doing this work (e.g., Dowdy Multicultural Center, Center for Women and Gender Equity, and the Center for Trans and Queer Advocacy).

Guidance on how to report incidents of discrimination and harassment is available at the University's Office of Diversity, Equity and Inclusion.

Emergency preparedness

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

Email policy

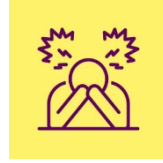
It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

Resources

WCU has resources available to help you be happy, healthy, and successful.



If you or someone you know has been a victim of sexual misconduct, there are [several resources available](#) to help.



If you are struggling with mental health, there are confidential [counseling and psychological services](#) available.



[Student Health Services](#) are available for a wide range of clinical care, with in-person and telehealth appointments.



The [Office of Services for Students with Disabilities](#) can help provide resources to ensure equity and accessibility in the classroom, housing, etc.



The [Learning Assistance & Resource Center](#) provides tutoring, coaching, workshops, and other resources to help you achieve academic success.



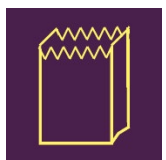
WCU's [Writing Center](#) can help you with writing, editing, and using citations in your written work.



The [WCU student Ombuds](#) can help you make informed decisions and handle conflicts in a variety of issues and concerns.



The [Center for Trans and Queer Advocacy](#) is here to make WCU a place where people with trans and queer identities are safe and supported.



For students facing financial difficulties, [the Resource Pantry](#) helps provide food, clothing, school supplies, and other resources.



The [Dowdy Multicultural Center](#) provides a safe space for and promotes the success of Students of Color.



Find additional resources in the [Rams' Guide to Success](#)

Course schedule

This schedule is a living document and will be updated throughout the semester – the newest version will be available on D2L and you will be notified of updates.

Things you should read or prepare before class will be posted in D2L – please review them well before the lecture for which they are listed!

Major theme	Week	Date	What's due?	Lecture topic	Lab activity (** = field lab)	
Watersheds and water movement	1	Monday 28-Aug-23	Everyone: complete the pre-class survey (D2L) Syllabus quiz in-class	How this class works and why we are here		
		Wednesday 30-Aug-23	Everyone: Answer questions about your team's paper (listed in D2L) (Wk 1 reflection due Friday)	Watersheds and water budgets	Lab 1: Watersheds	
	2	Monday 4-Sep-23	<i>No class - Labor Day</i>			
		Wednesday 6-Sep-23	Everyone: Answer pre-lab questions for lab 2A (in the lab document on D2L) (Wk 2 reflection due Friday)	Measuring flow	(no lab)	
	3	Monday 11-Sep-23	--	Flow regimes		
		Wednesday 13-Sep-23	Everyone: Answer pre-lab questions for lab 2B (in the lab document on D2L) (Wk 3 reflection due Friday)	Geomorphology	**Lab 2A: Measuring flow**	
	4	Monday 18-Sep-23	Everyone: Answer questions about your team's paper (listed in D2L)	Changing flow regimes: urban flow, impoundments		

Major theme	Week	Date	What's due?	Lecture topic	Lab activity (** = field lab)
Watersheds and water movement	4	Wednesday 20-Sep-23	Team E: prepare for Exam 1 review and synthesis (Everyone: Wk 4 reflection due Friday)	Review and synthesis session	Lab 3A: Leaf decomposition part 1 (making leaf packs and hypotheses) PLUS Introduction and beginning of projects
	5	Monday 25-Sep-23	Everyone: Take home exam 1	In-class review of exam 1	
Light, heat, and dissolved oxygen in freshwaters	5	Wednesday 27-Sep-23	--	Thermal stratification and mixing in lakes	**Lab 4A: Bugs Part 1 PLUS Lab3B: deploying leaf packs**
	6	Monday 2-Oct-23	Everyone: Project Milestone 1 – proposals	Light and temperature regimes in streams	
		Wednesday 4-Oct-23	--	Dissolved oxygen in freshwaters	Lab 2B: Calculating flow and exploring flow regimes
		Monday 9-Oct-23	Grad students: Deeper dives	Grad student Deeper Dives	
	7	Wednesday 11-Oct-23	Everyone: Lab 2 write-up	Mid-semester check in	**Lab 5A: Water sampling for nutrients**
	8	Monday 16-Oct-23	<i>No class – Fall break</i>		
Wednesday 18-Oct-23		--	OM and C cycling	Lab 4B: Identifying bugs	
Nutrients, organic matter, and contaminants	9	Monday 23-Oct-23	Everyone: Project Milestone 2 – annotated bibliography	Nutrients: spirals & transformation	
		Wednesday 25-Oct-23	--	Human alteration of nutrient cycles	Lab 5B: measuring nutrient concentrations
	10	Monday 30-Oct-23	--	Emerging contaminants	

Major theme	Week	Date	What's due?	Lecture topic	Lab activity (** = field lab)
Exam includes light, heat, and oxygen plus nutrients, organic matter, and contaminants	10	Wednesday 1-Nov-23	Team P: materials for Exam 2 review and synthesis (Everyone: Wk 5-10 reflection due Friday)	Review and synthesis	Lab 3B: weighing leaf packs and analyzing data
	11	Monday 6-Nov-23	Everyone: Take home exam 2	In class review of exam 2	
Wednesday 8-Nov-23		--	Primary production and ecosystem respiration	Lab 6A: Primary production part 1	
Aquatic primary production and food webs	12	Monday 13-Nov-23	Everyone: Lab 3 write-up	Insects and functional feeding groups	
		Wednesday 15-Nov-23	--	Fish	Lab 6B: Primary production part 2
	13	Monday 20-Nov-23	Everyone: Project Milestone 3 – literature review draft	Trophic interactions in aquatic systems	
		Wednesday 22-Nov-23	<i>No class – Thanksgiving break</i>		
Finding connections and wrapping up	14	Monday 27-Nov-23	--	Unifying theories: the RCC, SES, metabolic ecology	
		Wednesday 29-Nov-23	Everyone: Lab 6 write up & Project Milestone 4 - Study design (<i>submit by 12:30 pm!</i>)	Extending the RCC	Peer review of projects
	15	Monday 4-Dec-23	Grad students: Deeper dives	Grad student Deeper dives	
		Wednesday 6-Dec-23	Team T: materials for Exam 3 review and synthesis (Everyone: Wk 5-10 reflection due Friday)	Review and synthesis	(Lab buffer date)
	16	Monday 11-Dec-23	Everyone: Take home exam 3	In class review of exam 3	
(Final Exam period)		Friday 15-Dec-23 10:30-12:30	Everyone: Project Milestone 5	Project presentations	

