Course Syllabus Freshwater Ecosystems: Resilience and Responses to Global Change

ECOL/FISH/WASR 4310(L)/6310(L) Fall 2020

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Credit Hours: 4 (3 hours lecture + 3 hours lab per week)

Prerequisites: ECOL/BIOL 3500(L) or ECOL 3505(L) or FANR 3200

Grading: UGA plus/minus A - F grading system

Meeting Times and places. Please note, due to safety concerns, the class and lab will be held primarily online. The discussions will be held during class time on Zoom. Other activities will occur on a M, W, F weekly schedule, with access to materials online. Materials for lab are to be accessed on Mondays and there will be specific dates to complete the assignments.

Lecture: M, W, F- 9:10 -10:00 AM Ecology seminar room if/when possible – otherwise online

Lab: M-1:25 - 4:25 PM online

A culture of caring: We know this is an extremely challenging time for everyone and we will do our best to ensure a stimulating learning experience for you. We realize that everyone is coping with the challenges of social distancing and other covid-related stresses. We want this course to be a great source of growth, achievement, and enjoyment for each of you. Let us know if you need assistance or want to discuss things at any time!

A culture of inclusion: The instructors, teaching assistant, and all students are asked to commit to an "inclusive classroom culture" (in any and all communication). This inclusive classroom culture is defined as the contributions of all students, their families/extended families, and communities feeling valued. It recognizes that every learner is unique and builds on our diversity of languages, cultures, and interests; and identifies and removes any barriers to achievement.

A culture of honesty: As a University of Georgia student, you agreed to abide by the UGA academic honesty policy. UGA Student Honor code: "I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others". A *Culture of Honesty*, the University's policy and procedures for handling cases of suspected dishonesty, can be found at https://honesty.uga.edu/

"Academic honesty" means performing all academic work without plagiarism, cheating, lying, tampering, stealing, receiving unauthorized or illegitimate assistance from any other person, or using any source of information that is not common knowledge without providing proper documentation. Turning in academic work that is not your own is the highest academic violation. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. If you engage in any form of academic dishonesty, you will be subject to the judicial process at UGA in the Office of the Vice President for Instruction. For a description of the consequences of honesty violations, visit https://honesty.uga.edu/Academic-Honesty-Policy/Consequences for Honesty Violations/.

Course Access:

eLearning Commons. The eLearning Commons (eLC) is an online course environment where you can download digital course materials. Your name and email has been added to the eLC course site. You can access eLearningCommons by signing in with your UGA MyID and password. Computer/room Access. A computer lab that holds 15 people with social distancing (Room 138 in the Poultry Sciences building) will be available every Wednesday from 4:15-6:30 for you to work on lab or lecture materials. In addition, the Ecology seminar room (Room 29 in the Ecology building) will be available for your work on M, W, F 9-10 am and Mondays from 1:30-3 pm (not a computer lab, and holds 11 with social distancing). Please let us know if scheduling is necessary to avoid overcrowding.

<u>Course description</u>: This course explores freshwater ecosystems (lakes and streams), their biota, physical and chemical properties, linkages between terrestrial and aquatic ecosystems, and the effects of global change. Students will learn the key research methods in aquatic ecology including sampling techniques, water chemistry analysis, identification of biota, experimental design, data analyses, and written and oral communication skills as part of the laboratory portion of the course.

Course objectives:

- To increase student understanding of the ecological structure and function of freshwater systems. We will accomplish this goal by studying the basic physics, chemistry, and biology of lakes and streams and becoming familiar with many of the techniques used in aquatic ecological research.
- To increase student understanding of current threats to freshwater ecosystems. We will
 accomplish this goal by studying the ways in which freshwater ecosystems are
 potentially degraded using the assigned readings in the text and the peer-reviewed
 literature (see below).
- To learn the skills needed to become a proficient scientific writer and communicator. The
 expectation is that when finished with the course, students will be confident in
 conducting and analyzing freshwater ecological research and be capable of
 communicating the results of their work.

Course Format:

 Lectures: Lectures, quizzes, and activities will cover core topics and correspond to assigned readings. Students are expected to read the assigned book chapters and/or primary literature articles prior to lectures. Readings are focused on a theme for each week.

- **Discussions:** Discussions of the primary literature will explore the topics presented in each paper, as well as critical evaluation of the methods, results, and implications of the studies.
- Lab: Students will learn techniques used in aquatic ecological research. In addition, lab time will be used to prepare and execute class studies, with corresponding data analysis and presentation of results.

Course Requirements:

For lecture, please read the assigned readings before class and review the PowerPoint slides and videos (posted on eLC).

For lab, please keep up with assignments on a weekly basis.

Participation policy:

Your participation in Zoom online discussions is required and expected. Please let us know if you have barriers to participating.

See the lab materials on eLC for planned activities and assignments (more detail below).

Evaluation Criteria:	Percent
I. Quizzes & Reading Responses	25
II. Mid-Term Exam I	15
III. Mid-Term Exam II	15
III. Final Exam	15
IV. Lab Activities (details below)	30
Total Possible	100

Description of Graded Assignments:

- **Quizzes**: Unannounced, short quizzes may be given online during lecture, and will test concepts and ideas from the day's assigned readings or previous lectures.
- **Reading responses**: Reading responses consist of your analysis and reflection on assigned primary literature readings. See detailed guidelines to follow.
- **Mid-term exams**: There are two midterm exams. Both will be closed-book exams. The exams will contain a combination of definitions of key terms, and short-answer questions.
- **Final exam**: There will be a closed book final exam held during the final exam week. The exam is cumulative.
- Lab activities: The portion of your grade coming from lab activities will be based on activities, quizzes, 2 lab reports, and a group poster presentation. All lab reports **must** be written individually, not in groups. Your stream study (identifying a question, analyzing data, etc. will be a group endeavor), but the paper you write will be your own. The poster presentation will be done as a group.

Readings:

Reading material consists of a textbook, materials posted to ELC, and selected scientific journal articles. Students are expected to be prepared to discuss the readings assigned for the day.

Paragraph #1: Describe what the paper was about. **Paragraph #2:** Describe your response to the paper. What did you think? Was this a worthwhile study? What did it illuminate for you? How could the approach have been improved? What did it make you more curious about? What did it make you think about in terms of your own experience?

Points for discussion: Write your thoughts down on the themes and contrasts identified in the paper. In addition, list anything else you would like to bring up for discussion. Here are some ideas to get you going:

- How widespread is this issue?
- ➤ I have personally seen/have experience with this have others?
- ➤ I have some ideas on a potential solution to this
- These are barriers to the solution to this
- > This concept also relates to some of these other concepts
- ➤ There are these specific terms I don't understand; I have questions about the ____ method to measure ___.
- ➤ I think other people's awareness could be increased in this way
- ➤ This framework is useful or could be improved in this way

Reminder: On Discussion days, a **Reading Response** is due via a submission folder on eLC <u>BEFORE</u> the discussion class period. Discussion will occur over Zoom during class time.

- **1. Text:** Walter Dodds and Matt Whiles. 2020 *Freshwater Ecology: Concepts and Environmental Applications*, 3rd Edition. Paperback ISBN: 9780128132555. eBook ISBN: 9780128132562. Academic Press. Used copies of the 2nd edition may be available and are likely similar to the 3rd edition.
- **2. Primary literature:** PDFs of assigned papers are posted on eLearning Commons (eLC).

Make-Up Policy: If you have a known conflict with potential assignment, please inform the instructors in writing by e-mail during the first week of class and an alternative due date will be determined, as appropriate. Otherwise, assignments turned in after the due date will be penalized by 10% per day, and will not be accepted more than 7 days after the due date.

Discussion & Reading Response Guidelines:

You are responsible for reading all assigned papers on the syllabus before class. Papers have been selected to provide information associated with either a lecture or discussion. During the semester, there will be **10 paper discussions**, which you need to prepare for prior to class. You are required to read the paper and bring a typed reading response to class, which will be graded.

The reading response should include this information – two main paragraphs- and bulleted points for discussion:

- 1. Your name and an abbreviated literature citation (e.g., Dodds et al. 2004).
- **2.** Paragraph 1. Briefly describe the background/important questions being asked in the paper. What was the hypothesis the authors tested? What conclusions were reached?

- **3.** Paragraph 2. What did you learn? What did you find compelling, insightful or problematic about the paper. What questions did the reading bring up for you?
- **4.** Bulleted discussion points. We will identify themes to guide each discussion. They will be identified in class at least 2 days prior to discussion. Write your bullet points to contribute to those themes.

Pronouns: The pronouns for your instructional team are: Dr. Rosemond (she/her/hers/they/theirs)
Dr. Covich (he/him/his/they/theirs)
Nathan Tomczyk (he/him/his)

Why do we list our pronouns? This is modified from the Ecological Society website: This question is really common for people who identify with the gender that they were assigned at birth ("raised a girl/boy, woman/man"). However, the reasons why are compelling.

Friendly Faces, Professional spaces: When gender-nonconforming, questioning, non-binary, and transgender folks see pronouns used and discussed, it indicates respect for a range in pronouns and diverse identities.

Freedom to Express Or Not: Please note that some people may choose not to list or say their pronouns. Those options are respected too. If we normalize the use of pronouns in nametags, email signatures, and the like, then we'll be able to immediately identify how people want to be addressed. We'll make a better culture for future generations.

		LECTURE WEEKLY SCHEDULE AND TOPICS		
We	eek/Date	Торіс	Reading	
	Physical and chemical dynamics of freshwater ecosystems			
	Aug. 21	Introduction Why is this course important to you and others? Review the syllabus	Ch. 1, Poff & Matthews 2013 Baron et al. 2002 Sullivan et al. 2020	
1	Aug. 24 Aug. 26 Aug. 28	Lecture 1: Physical properties of water, hydrology, water cycle Lecture 2: Lakes: Origins, physical, chemical and ecological connections –density stratification Discussion: Lake Oglethorpe case study	Ch. 2, 3, 4 Ch. 7 Porter et al. 1996	
2	Aug. 31 Sep. 2 Sep. 4	Lecture 3: Lakes & reservoirs: origins, basin morphology, lake level change, succession, drought impacts. Lecture 4: Aquatic chemistry: Influences of oxygen, nutrient cycling Discussion: Global change effects in lakes	Ch. 7, Ch. 12 Leech et al. 2018	
3	Sep. 7 Sep. 9 Sep. 11	No class: Labor Day Holiday! Lecture 5: Aquatic chemistry: Carbon cycle Lecture 6: Aquatic chemistry: Nutrient cycles	Ch. 13 Ch. 14	
		Biodiversity and function of aquatic ecosystems		
4	Sep. 14 Sep. 16 Sep. 18	Lecture 7: Primary producers in freshwater ecosystems (algae, phytoplankton) Lecture 8: Heterotrophic microorganisms (bacteria and fungi) Discussion: How do global lakes respond to climate change?	Ch. 14 Ch. 8, 9 Moore et al. 2009	
5	Sep. 21 Sep. 23 Sep. 25	Lecture 9: Invertebrate consumers in lakes (zooplankton) Lecture 10: Vertebrate consumers in lakes (fish) Discussion: How can we stop cyanobacteria taking over the world?	Ch. 10 Brooks & Dodson 1965 Ch. 20 Paerl & Barnard 2020	

	Biodiversity and Biocomplexity of Species Relationships				
6	Sep. 28 Sep. 30 Oct. 2	Lecture 11: Biodiversity and plant-animal interactions, Lecture 12: Biodiversity and lake community composition Lecture 13: Lake food webs, and ecological functions	Ch. 20, 21, 22 Cartwright et al. 2020 Ch. 11		
7	Oct. 5 Oct. 7 Oct. 9	Lecture 14: EcoHydrology: groundwater, springs, & wetlands Discussion: Cross habitat comparisons: lakes, reservoirs, wetlands Midterm Exam I	Ch. 4, 5 Cantonati et al. 2020		

	Effects of stressors on freshwater ecosystems from the bottom up!			
8	Oct. 12	Lecture 15: Stream impairment, conservation from the bottom up	Kominoski & Rosemond 2012	
	Oct. 14	Lecture 16: Overview lecture on pollutants, Mercury	Ch. 16	
	Oct. 16	Lecture 17: Organic pollutants and endocrine disruption	Cii. 10	
	Oct. 19	Discussion: Freshwater salinization	Kaushal et. al.	
9	Oct. 21	Lecture 18: Overview on Urbanization, multiple stressors	Wenger et al.	
	Oct. 23	Discussion: Urbanization in ACC	Sterling et al. 2016	
Whole ecosystems, food webs, species traits				
10	Oct. 26	Lecture 19: Global change effects on ecosystem functions, Nutrient pollution in streams	Palmer and Febria 2012	
	Oct. 28	Lecture 20: Fish ecology. Dr. Mary Freeman	Ch. 23	
	Oct. 30	No Class – Fall Break!		

	Nov. 2		Ch 17 10
11	Nov. 2	Lecture 21. Stoichiometry, TERs, CNR, Nutrient use and	Ch. 17, 19
		remineralization Lecture 22. Feeding ecology, stream food webs, predation	Ch. 20
	Nov. 4	Lecture 22. Feeding ecology, stream rood webs, predation	Kennedy et al.
	Nov. 6	Discussion: Macroinvertebrate traits drive survival and distribution	2016
		Biodiversity loss and global change	
12	Nov. 9	Lecture 23: Extinction risks	Ch. 22, Strayer and Dudgeon 2010
	Nov. 11	Discussion: Bending the curve on extinction	2010
			Ticker et al. 2019
	Nov. 13	Midterm II	
E	cosystem	n functions and global change, putting freshwater systems b	pack together
13	Nov. 16	Lecture 24: Secondary production	Ch. 24, Patrick et al. 2019
	Nov. 18	Lecture 25: Carbon ecosystem functions	Hotchkiss et al.
	Nov. 20	Lecture 26: Nutrient ecosystem functions	2015 Hobbie et al. 2017
14	Nov. 23	Discussion: Connectivity and WOTUS	Wohl et al. 2017
	Nov. 25	No class: Thanksgiving	
	Nov. 27	No class: Thanksgiving	
	Nov. 30	Lecture 27: Non-linear responses to change	
15	Dec. 2	Lecture 28: Policy- putting it back together	Dent et al. 2002
			Riverwebs-
16	Dec. 4	Lecture 29: Green infrastructure	online video
16	Dec. 7	Lecture 30: Restoration of freshwater ecosystems, dam removal	TBD
	Dec. 9	Semester review	
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^{**} Final Exam: Wednesday, December 11, 8 - 11 a.m. **

Syllabus Disclaimer:

The course syllabus is a general plan for the course; deviations may be necessary. In the event that the schedule or assignments change, the instructors will announce the changes on the eLC.

Lab Format and details

Out of consideration for the health our students and the broader UGA and Athens community we are going to be conducting Freshwater Ecosystem Lab online this fall. We will cover the same material, and learning objectives as the in person lab would have. Because the course is online the distinction between activities which we would have done in class vs. out of class is blurred and there will be weeks where you are working on course projects AND doing additional assignments which would have been in class activities. In transitioning this lab to online learning we have tried to be mindful of your workload, but some weeks will definitely require more work than others. Lab assignments and quizzes will be due at **5:00 pm on Friday of the lab week**, the TA will have material for the week posted to ELC by Friday of the week before so you have a full week to complete your assignments.

Virtual student hours/ communication with your lab TA

Your lab TA will hold virtual students hours twice a week, **from 1:30-2:30 on Mondays**, **and from 3:00-4:00 on Fridays**. Please don't hesitate to drop in if you have any questions about the course or material, or if you are struggling with one of the quizzes. The zoom link for office hours will be the same all fall and is https://zoom.us/my/ecol4310. Outside of scheduled office hours I am happy to schedule other times to meet. Generally, students can expect email replies from me within 24 hours during the normal work week, I typically don't check my email in the evening or on the weekend. My email is **Nathan.tomczyk25@uga.edu.**

Lab Assignments Overview

We will provide additional details and rubrics for each of these assignments, but for now, here is an overview of the graded portions of the lab. During the semester we will build towards two major projects which focus on lakes and streams respectively.

Quizzes:

<u>Goal:</u> Students will learn how to calculate various metrics related to freshwater ecosystem health and learn to identify some of the important organisms in freshwater ecosystems.

<u>Assignment:</u> These will replace some of the in class activities which we would have done. They have been designed to provide students with instant feedback on their mastery of material. We will allow an unlimited number of attempts on these assignments so that students can continue to work with the material until they understand it.

Lake-based assignments:

<u>Goal:</u> Students will learn the tools and skills needed to write a scientific-style report and gain practice writing such a report.

<u>Assignment:</u> You will write a scientific-style report about our lake study. Early in the semester, we will break the paper into smaller assignments to help you learn the nuts and bolts of each major section. Each assignment will provide for quick feedback on your writing content and style. You will then edit your assignments and merge them into a full report.

Stream-based assignments:

<u>Goal:</u> Students will develop and test hypotheses about the structure and function of Athens streams and will effectively communicate their findings in a scientific-style report.

<u>Assignment:</u> The TA will collect data from streams in and around Athens, including streams on the UGA campus. The TA will combine the data we collect with long-term data collected by others to test hypotheses. Each student will report his or her group's findings by writing a scientific report.

Stream project oral presentations:

<u>Goal:</u> Students will gain experience communicating scientific findings to a diverse audience.

<u>Assignment:</u> Each group will give a poster presentation based on their stream project during the last lab meeting of the semester. Rather than a 'conference-style' presentation to fellow academics, your presentation should aim to *educate*, *inform*, and *motivate* stakeholders and decision makers in Athens-Clarke County and local groups like the Lake Oglethorpe Organization.

Lab Evaluation Criteria

The lab portion of this course accounts for **30% of your overall grade** for the entire course, and has a total of 300 points. Below is a breakdown of the evaluation for lab assignments.

- Lab quizzes. 25% of lab grade.
 - There will be 10 quizzes (12 points each) over the semester. Quizzes will be due the week of lab an unlimited number of attempts.
- Lake project assignments: 25% of lab grade
 - o Citations assignment: 7.5 points
 - Hypothesis assignment: 7.5 points
 - o Introduction: 15 points
 - o Results/Discussion: 15 points
 - o Final mini paper and response to comments: 30 points
- Stream-project assignments: 30% lab grade
 - Hypotheses: 7.5 points
 - o Group contracts: 7.5 points
 - Draft and peer review: 15 points
 - Final paper and response to comments: 30 points
 - Poster presentation: 30 points
- Additional Assignments: 20% of lab grade
 - o Lab questionnaire: 12 points
 - Scientific writing assignment: 12 points
 - o Data analysis worksheet: 12 points
 - o Graph of phosphorous across depths: 12 points
 - o Graph of chlorophyll-a across depths: 12 points

Assignments turned in after the due date will be penalized by 10% per day, and will not be accepted more than 7 days after the due date.

END OF COURSE CONTENT

UGA Information

Academic Coaching

You can obtain assistance with time management, test and performance anxiety, note taking, motivation, text comprehension, test preparation, and other barriers to success at UGA. Link for the Office of Academic Enhancement.

FERPA Notice

The Federal Family Educational Rights and Privacy Act (FERPA) grants students certain information privacy rights. To comply with FERPA, all communication that refers to individual students must be through a secure medium (UGAMail or eLC) or in person. Instructors are not allowed to respond to messages that refer to individual students or student progress in the course through non-UGA accounts, phone calls, or other types of electronic media. For details, please visit https://apps.reg.uga.edu/FERPA.

Accommodations for Disabilities

If you require a disability-required accommodation, it is essential that you register with the Disability Resource Center (Clark Howell Hall; https://drc.uga.edu; 706-542-8719 [voice]; 706-542-8778 [TTY]) and notify us of your eligibility for accommodations. We can then plan how best to coordinate your accommodations. Please note that accommodations cannot be provided retroactively.

Mental Health and Wellness Resources

- If you, or someone you know, needs assistance, please contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit https://sco.uga.edu. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services.
- UGA has several resources for a student seeking mental health services (https://www.uhs.uga.edu/bewelluga/bewelluga) or crisis support (https://www.uhs.uga.edu/info/emergencies).
- If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (https://www.uhs.uga.edu/bewelluga/bewelluga) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center.

Coronavirus Information

Face Coverings:

The University of Georgia requires all faculty, staff, students and visitors to wear an appropriate face covering while inside campus facilities/buildings where six feet social distancing may not always be possible. Face covering use is in addition to and is not a substitute for social distancing. Anyone not using a face covering when required will be asked to wear one or must leave the area. Reasonable accommodations may be made for those who are unable to wear a

face covering for documented health reasons. Students seeking an accommodation related to face coverings should contact Disability Services at https://drc.uga.edu/.

DawgCheck:

Please perform a quick symptom check each weekday on DawgCheck—on the UGA app or website—whether you feel sick or not. It will help health providers monitor the health situation on campus: https://dawgcheck.uga.edu/

What do I do if I have symptoms?

Students showing symptoms should self-isolate and schedule an appointment with the University Health Center by calling 706-542-1162 (Monday-Friday, 8 a.m.-5 p.m.).

Please DO NOT walk-in. For emergencies and after-hours care, see https://www.uhs.uga.edu/info/emergencies.

What do I do if I am notified that I have been exposed?

Students who learn they have been directly exposed to COVID-19 but are not showing symptoms should self-quarantine for 14 days consistent with Department of Public Health (DPH) and Centers for Disease Control and Prevention (CDC) guidelines. Please correspond with your instructor via email, with a cc: to Student Care & Outreach at sco@uga.edu, to coordinate continuing your coursework while self-quarantined. If you develop symptoms, you should contact the University Health Center to make an appointment to be tested. You should continue to monitor your symptoms daily on DawgCheck.

How do I get a test?

Students who are demonstrating symptoms of COVID-19 should call the University Health Center. UHC is offering testing by appointment for students; appointments may be booked by calling 706-542-1162.

UGA will also be recruiting asymptomatic students to participate in surveillance tests. Students living in residence halls, Greek housing and off-campus apartment complexes are encouraged to participate.

What do I do if I test positive?

Any student with a positive COVID-19 test is <u>required</u> to report the test in DawgCheck and should self-isolate immediately. Students should not attend classes in-person until the isolation period is completed. Once you report the positive test through DawgCheck, UGA Student Care and Outreach will follow up with you.