

**FAS 4932** In-person

**Freshwater Ecology**, 3 credit hours, M W F period 7 (1:55-2:45), MCCC0100

**Prerequisites:** BSC2005 or BSC2010 or equivalent

**Professor:** Dr. Lindsey Reisinger

[lreisinger1@ufl.edu](mailto:lreisinger1@ufl.edu), (352) 294-1355, Dequine Building 113

Office hours via Zoom Monday 10:00 am - 12:00 pm (<https://ufl.zoom.us/j/98700865323>)

**Text:** Dodds, W.K. and M. R. Whiles. 2019. Freshwater ecology: concepts and environmental applications of limnology. 3rd edition. Elsevier, San Diego, CA.

Or

Dodds, W.K. 2002. Freshwater ecology: concepts and environmental applications of limnology. 1st edition. Elsevier, San Diego, CA. (available as an E Book through the UF George A. Smathers Libraries)

Additional papers from the primary literature will be assigned throughout the semester.

### **Course Description:**

This course is designed to provide students with an understanding of the concepts in freshwater ecology that are important for controlling the traits, distribution, and abundance of aquatic organisms. Material will focus on the major groups of organisms found in freshwater habitats, the physical and chemical properties that are important for structuring freshwater communities, and the ecological processes that affect freshwater communities and ecosystems.

The class will be structured as a combination of recorded online lectures, in-person meetings in which students will participate in activities and answer questions focused on class material, and in-person class discussions focused on a scientific paper. Weekly readings will typically consist of a portion of the text from Dodds and Whiles as well as one scientific paper.

### **Student Learning Outcomes:**

At the end of the course, students will be able to:

- Identify the principal physical and chemical aspects of freshwater ecosystems and explain how they structure freshwater communities
- Describe common groups of freshwater organisms and the main ways that they interact with one another
- Explain the major ways in which human activities affect freshwater ecosystems and the organisms that live in them
- Predict the effects of freshwater organisms and ecological processes across a variety of conditions
- Consider the strengths and weaknesses of scientific papers focused on freshwater ecology research and examine how they contribute to broader topics
- Write a critique of a scientific paper and relate it to other primary research papers

### **Graded work:**

A more detailed description and a grading rubric for each assignment will be provided in the class.

### *Exams, quizzes, and In-class activities*

There will be two exams over the course of the semester as well as a final exam. Each exam will be cumulative and cover new material as well as material from earlier in the semester. Later exams contribute more to the grade than early exams. The instructor will provide a set of learning objectives covered by each exam that can be used as a study guide. The in-class activities will provide an opportunity for students to practice answering questions similar to those that will appear on the exams. In addition to exams and in-class activities, there will be a quiz focused on identifying freshwater animals and their ecological roles.

### *Evaluation of scientific literature*

Several assignments are designed to encourage critical evaluation of scientific data and methods in freshwater ecology. Throughout the semester, the class will read and discuss scientific papers. Reading discussions will typically occur once per week on Fridays. Students will answer summary reading questions about the papers that are due prior to class on reading discussion days. These questions are designed to help students summarize the main points of the paper and think critically about the experimental design and strength of the evidence. Students will also write a more in-depth critical review of one scientific paper (4-6 pages double spaced), in which they will summarize the research, analyze the content of the paper, and place the findings into the context of other research.

### *Attendance and Participation*

Class participation is an essential part of the class and is 15% of the grade. Students can participate by attending in-person sessions and answering questions about the material and actively contributing to the discussion in a respectful way. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

- Attendance for group question sessions: Attendance will be taken at each session. You are allowed three “personal days” for the semester, after which each absence that does not meet university criteria for “excused” will result in a two-point deduction from your participation grade.
- Attendance for reading discussions: Reading discussions are required because the discussion is an essential part of understanding and evaluating the scientific paper. Each absence from a reading discussion that does not meet university criteria for “excused” will result in a two-point deduction from your participation grade.
- NOTE: If you have personal issues that prohibit you from joining freely in class discussion, e.g., shyness, language barriers, etc., see the instructor as soon as possible to discuss alternative modes of participation.
- Assignments are expected to be turned in on time. In particular, the reading questions must be turned in on time, prior to the discussion, so that the discussion does not influence the content. Therefore, there will be an automatic deduction of 25% of the grade for any reading assignments if they are turned in late. Late work will not be accepted more than two weeks after its due date or after the final exam.
- Students are expected to take exams and quizzes on the assigned date. If you must miss an exam or quiz on the date it is assigned due to an absence that meets the University criteria for “excused,” please email the instructor as soon as possible to reschedule.

### *Submitting Assignments*

Assignments will be submitted online on the UF Canvas E-Learning site. A computer with internet connection is required. The UF Canvas E-Learning site can be accessed at <http://elearning.ufl.edu/> using your Gatorlink account. Please contact the computing help desk with questions <https://helpdesk.ufl.edu/>. You can find the recorded lectures, readings, and assignments for each week in the Modules section.

**Evaluation of Student Learning:** [Click here to see the university grades and grading policies](#)

Assignment	Percent of Grade
Quiz	5%
Group question participation	5%
Reading discussion participation	10%
Summary reading questions	10%
Critical review writing assignment	15%
Exam 1	10%
Exam 2	20%
Final Exam	25%
TOTAL	100%

A 94-100%; A- 90-93;  
 B+ 86-89; B 83-85; B- 80-82;  
 C+ 76-79; C 73-75; C- 70-72;  
 D+ 66-69; D 63-65; D- 60-62;  
 E <60%

Schedule of Class Topics		
Week 1	Topics	The importance of freshwater ecosystems Physical and chemical properties of water and the influence of water properties on aquatic organisms
	Readings/Works	Dodds and Whiles chapters 1 and 2 Dodds and Whiles appendix: experimental design in aquatic ecology
Week 2	Monday August 29	Synchronous activity: course introduction
	Wednesday August 31	Synchronous activity: group questions
	Friday Sept 2	Synchronous activity: reading discussion 1 (water availability)
	Topics	Movement of light, heat, and chemicals in water The hydrologic cycle, groundwater, and its connection to surface water
	Readings/Works	Dodds and Whiles chapters 3 and 4 Meijer et al. 2021*
Week 3 (Labor Day)	Wednesday Sept 7	Synchronous activity: group questions
	Friday Sept 9	Synchronous activity: reading discussion 2 (land use)
	Topics	Wetland habitats, adaptations of wetland organisms, human impacts on wetland ecosystems Flowing waters, human impacts on flowing water ecosystems
	Readings/Works	Dodds and Whiles chapters 5 and 6 (chapter 5 in 1 <sup>st</sup> edition) Moore and Palmer 2005*
Week 4	Wednesday Sept 14	Synchronous activity: group questions
	Friday Sept 16	Synchronous activity: reading discussion 3 (dissolved organic carbon)
	Topics	Lakes and reservoirs, lake formation processes and biodiversity, stratification
	Readings/Works	Dodds and Whiles chapter 7 (chapter 6 in 1 <sup>st</sup> edition) Craig et al. 2015*
Week 5	Wednesday Sept 21	Synchronous activity: group questions
	Friday Sept 23	Synchronous activity: live freshwater organisms
	Topics	Classification of freshwater organisms Freshwater microbes
	Readings/Works	Dodds and Whiles chapters 8 and 9 (chapters 7 and 8 in 1 <sup>st</sup> edition)
Week 6	Monday Sept 26	Synchronous activity: exam review
	Wednesday Sept 28	<b>Exam 1</b>
	Friday Sept 30	Synchronous activity: group questions
	Topics	Freshwater animals
Week 7	Readings/Works	Dodds and Whiles chapter 10 (chapter 9 in 1 <sup>st</sup> edition)
	Wednesday Oct 5	Synchronous activity: group questions
	Friday Oct 7	Synchronous activity: reading discussion 4 (climate change)
	Topics	Chemicals in freshwater ecosystems, drivers of dissolved oxygen concentrations including photosynthesis and respiration Carbon cycling, leaf litter breakdown
Readings/Works	Dodds and Whiles chapters 12 and 13 (chapters 11 and 12 in 1 <sup>st</sup> edition) Climate change podcast Low-Decarie et al. 2015*	

\*answer summary reading questions for these papers

Schedule of Class Topics		
Week 8	Monday Oct 10	<b>Freshwater animals quiz</b>
	Wednesday Oct 12	Synchronous activity: group questions
	Friday Oct 14	Synchronous activity: reading discussion 5 (nutrient pollution, stoichiometry)
	Topics	Nutrients and their cycles Nutrient use and remineralization by aquatic organisms
	Readings/Works	Dodds and Whiles chapters 14 and 17 (chapters 13 and 16 in 1 <sup>st</sup> edition) Schindler 1974 Elser et al. 2010*
Week 9	Wednesday Oct 19	Synchronous activity: group questions
	Friday Oct 21	Synchronous activity: reading discussion 6 (eco-evolutionary dynamics)
	Topics	Freshwater plants Evolution and biodiversity
	Readings/Works	Dodds and Whiles chapter 11 (chapter 10 in 1 <sup>st</sup> edition) Pond plants video with Dr. Cichra Ricciardi & Rasmussen 1999 Palkovacs et al. 2009*
Week 10	Wednesday Oct 26	Synchronous activity: reading discussion 7 (extinctions, biological invasions)
	Friday Oct 28	<b>Summary and scientific journal articles for critical review assignment due</b>
	Topics	Biological invasions Ecosystem ecology
	Readings/Works	Dodds and Whiles chapter 24 (chapter 22 in 1 <sup>st</sup> edition) Wilson et al. 2004*
Week 11	Monday Oct 31	Synchronous activity: exam review
	Wednesday Nov 2	<b>Exam 2</b>
	Friday Nov 4	Synchronous activity: reading discussion 8 (pharmaceuticals)
	Topics	Pharmaceuticals
	Readings/Works	Rosi et al. 2018*
Week 12 (Veterans Day)	Monday Nov 7	Synchronous activity: group questions
	Wednesday Nov 9	Synchronous activity: reading discussion 9 (biodiversity and ecosystem function)
	Topics	Chemicals and pollutants
	Readings/Works	Dodds and Whiles chapter 16 (chapter 14 in 1 <sup>st</sup> edition) Cardinale 2011*
Week 13	Wednesday Nov 16	Synchronous activity: group questions
	Friday Nov 18	Synchronous activity: reading discussion 10 (trophic cascades) <b>Critical review writing assignment due</b>
	Topics	Trophic state and eutrophication Predation and trophic cascades
	Readings/Works	Dodds and Whiles chapters 18 and 20 (chapters 17 and 19 in 1 <sup>st</sup> edition) Post et al. 2008*
Week 14 (Thanksgiving)	Monday Nov 21	Synchronous activity: group questions
	Topics	Microbes: behavior and interactions
	Readings/Works	Dodds and Whiles chapter 19 (chapter 18 in 1 <sup>st</sup> edition)
Week 15	Wednesday Nov 30	Synchronous activity: group questions
	Friday Dec 2	Synchronous activity: reading discussion 11 (fish ecology)
	Topics	Parasitism, competition, and mutualism Fish ecology and fisheries
	Readings/Works	Dodds and Whiles chapters 21 and 23 (chapters 20 and 21 in 1 <sup>st</sup> edition) Sass et al. 2006*
Week 16	Monday Dec 5	Synchronous activity: group questions
	Wednesday Dec 7	Synchronous activity: final exam review
	Topics	Complex community interactions
	Readings/Works	Dodds and Whiles chapter 22 (this chapter is absent from 1 <sup>st</sup> edition)
Exam Week	Wednesday Dec 14	<b>Final Exam</b> 10 am – 12 pm

\*answer summary reading questions for these papers

## Primary Literature

### Reading discussion 1 (water availability)

Meijer, C. G., H. J. Warburton, and A. R. McIntosh. 2021. Disentangling the multiple effects of stream drying and riparian canopy cover on the trophic ecology of a highly threatened fish. *Freshwater Biology* 66:102-113.

### Reading discussion 2 (land use):

Moore, A. A., and M. A. Palmer. 2005. Invertebrate biodiversity in agricultural and urban headwater streams: implications for conservation and management. *Ecological Applications* 15:1169–1177.

### Reading discussion 3 (dissolved organic carbon):

Craig, N., S. E. Jones, B. C. Weidel, and C. T. Solomon. 2015. Habitat, not resource availability, limits consumer production in lake ecosystems. *Limnology and Oceanography* 60:2079-2089.

### Reading discussion 4 (climate change):

Low-Decarie, E., G. Bell, and G. F. Fussmann. 2015. CO<sub>2</sub> alters community composition and response to nutrient enrichment of freshwater phytoplankton. *Oecologia* 177:875-883.

### Reading discussion 5 (nutrient pollution, stoichiometry):

Elser, J. J., A. L. Peace, M. Kyle, M. Wojewodzc, M. L. McCrackin, T. Andersen, and D. O. Hessen. 2010. Atmospheric nitrogen deposition is associated with elevated phosphorus limitation of lake zooplankton. *Ecology Letters* 13:1256–1261.

Schindler, D. W. 1974. Eutrophication and recovery in experimental lakes: implications for lake management. *Science* 184:897–899. (additional reading – not the focus of the discussion)

### Reading discussion 6 (eco-evolutionary dynamics):

Palkovacs, E.P., M. C. Marshall, B. A. Lamphere, B. R. Lynch, D. J. Weese, D. F. Fraser, D. N. Reznick, C. M. Pringle, and M. T. Kinnison. 2009. Experimental evaluation of evolution and coevolution as agents of ecosystem change in Trinidadian streams. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364:1617-1628.

### Reading discussion 7 (extinctions, biological invasions):

Wilson, K. A., J. J. Magnuson, D. M. Lodge, A. M. Hill, T. K. Kratz, W. L. Perry, and T. V. Willis. 2004. A long-term rusty crayfish (*Orconectes rusticus*) invasion: dispersal patterns and community change in a north temperate lake. *Canadian Journal of Fisheries and Aquatic Sciences* 61:2255–2266.

Ricciardi, A., and J. B. Rasmussen. 1999. Extinction rates of North American freshwater fauna. *Conservation Biology* 13:1220–1222. (additional reading – not the focus of the discussion)

### Reading discussion 8 (pharmaceuticals):

Rosi, E. J., H. A. Bechtold, D. Snow, M. Rojas, A. J. Reisinger, and J. J. Kelly. 2018. Urban stream microbial communities show resistance to pharmaceutical exposure. *Ecosphere* 9:e02041.

### Reading discussion 9 (biodiversity and ecosystem function):

Cardinale, B. J. 2011. Biodiversity improves water quality through niche partitioning. *Nature* 472:86–91.

### Reading discussion 10 (trophic cascades):

Post, D. M., E. P. Palkovacs, E. G. Schielke and S. I. Dodson. 2008. Intraspecific variation in a predator affects community structure and cascading trophic interactions. *Ecology* 89:2019-2032.

### Reading discussion 11 (fish ecology):

Sass, G. G., J. F. Kitchell, S. R. Carpenter, T. R. Hrabik, A. E. Marburg, and M. G. Turner. 2006. Fish community and food web responses to a whole-lake removal of coarse woody habitat. *Fisheries* 31:321–330.

## Accommodations for students with disabilities

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. [Click here to get started with the Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

## Online Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>

## Academic Honesty

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. [Click here to read the Conduct Code](#). If you have any questions or concerns, please consult with the instructor in this class.

## Campus Resources

### Health and Wellness

*U Matter, We Care:* If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or [visit the U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.

*Counseling and Wellness Center:* [Visit the Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.

*Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).

*University Police Department:* [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).

*UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

*GatorWell Health Promotion Services:* For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, [visit the GatorWell website](#) or call 352-273-4450.

### Academic Resources

*E-learning technical support:* Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

*Career Connections Center:* Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

*Library Support:* Various ways to receive assistance with respect to using the libraries or finding resources.

*Teaching Center:* Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

*Writing Studio*: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

*Student Complaints On-Campus*: [Visit the Student Honor Code and Student Conduct Code webpage](#) for more information.

*On-Line Students Complaints*: [View the Distance Learning Student Complaint Process](#).