

**FAS 6932** online

**Freshwater Ecology**, 3 credit hours

**Prerequisites:** none

**Professor:** Dr. Lindsey Reisinger

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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 and asynchronous online group discussions. Weekly readings will typically consist of a portion of the text from Dodds and Whiles as well as one scientific paper. There will also typically be two types of online discussions each week, one focused on review questions and one focused on a scientific paper. On the review questions board, the instructor will post questions designed to help students review and apply the course material. On the scientific paper board, students will discuss the assigned scientific paper for the week.

**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
- Produce a presentation that critically evaluates a freshwater ecology paper of your choosing
- Propose new experiments to build on existing knowledge in the field of freshwater ecology

**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. Graduate students will answer an additional essay question on each exam that focuses on drawing connections among the scientific papers and other course content or proposing new experiments to build on existing knowledge. The instructor will

provide a set of learning objectives covered by each exam that can be used as a study guide. The online 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 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 scientific papers and post about the papers in an asynchronous online discussion. Prior to posting in the online discussion, students will turn in answers to reading questions. These questions are designed to help students to think critically about the strengths and weaknesses of the research and suggest new methods that could be used to improve our knowledge of the topic. Graduate students will also create a presentation that expands on one of the weekly discussion topics. This will be a conference-style presentation that focuses on a scientific paper (chosen by the student) that is related to the scientific paper we will discuss in class.

*Attendance and Participation*

Class participation is an essential part of the class and is 15% of the grade. Students can participate by contributing regularly to the review questions board and online discussions for the scientific papers. A rubric for contributing to online discussions will be provided.

*Submitting Assignments*

Assignments are expected to be turned in on time. In particular, the reading questions must be turned in on time, prior to the online 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.

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/>

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%
Presentation	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 Aug 24 – 26	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 Aug 29 – Sept 2	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 Sept 5 – 9	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 Sept 12 – 16	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 Sept 19 – 23	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 Sept 26 – 30	Wednesday Sept 28	<b>Exam 1</b>
	Topics	Freshwater animals
	Readings/Works	Dodds and Whiles chapter 10 (chapter 9 in 1 <sup>st</sup> edition)
Week 7 Oct 3 – 7	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*
Week 8 Oct 10 – 14	Monday Oct 10	<b>Freshwater animals quiz</b>
	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 Oct 17 – 21	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 Oct 24 – 28	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 Oct 31 – Nov 4	Wednesday Nov 2	<b>Exam 2</b>
	Topics	Pharmaceuticals
	Readings/Works	Rosi et al. 2018*
Week 12 Nov 7 – 11	Topics	Chemicals and pollutants
	Readings/Works	Dodds and Whiles chapter 16 (chapter 14 in 1 <sup>st</sup> edition) Cardinale 2011*
Week 13 Nov 14 - 18	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*

\*answer reading questions for these papers

Schedule of Class Topics		
Week 14 (Thanksgiving)	Topics	Microbes: behavior and interactions
	Readings/Works	Dodds and Whiles chapter 19 (chapter 18 in 1 <sup>st</sup> edition)
Week 15 Nov 28 – Dec 2	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 Dec 5 – 7	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>

\*answer 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. Wojewodzic, 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](mailto:helpdesk@ufl.edu) 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](#).