

## **FAS 6932**

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

**Prerequisites:** 2 semesters of undergraduate general biology coursework

**Professor:** Dr. Lindsey Reisinger

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(352) 294-1355

Office hours: by appointment

**Text:** Dodds, W.K. and M. R. Whiles. 2010. Freshwater ecology: concepts and environmental applications of limnology. 2nd edition. Elsevier, San Diego, CA.

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

### **Course Description:**

This course is designed to provide students with a comprehensive understanding of key concepts in freshwater ecology. Material will focus on physical and chemical aspects of freshwater ecosystems, major groups of freshwater organisms, and the ecological processes that affect freshwater communities and ecosystems.

The class will be structured as a combination of lectures, discussions, and readings. Weekly readings will typically consist of a portion of the text from Dodds and Whiles as well as one paper from the primary literature. Each student will lead one discussion of the primary literature over a portion of one class and will research and present additional background material on that topic. Students will also lead an online discussion of the primary literature. In addition, each student will write a review of one paper from the primary literature during the semester.

### **Student Learning Outcomes:**

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

- Describe principal physical, chemical, and biotic aspects of freshwater ecosystems
- Explain ecological processes controlling freshwater communities and ecosystems as well as human impacts on these systems
- Examine scientific data and identify the ecological processes that influence the findings
- Critically evaluate scientific literature related to freshwater ecology
- Design effective freshwater ecology experiments
- Successfully present scientific information

### **Examinations/Assignments:**

Assignments will be described in class, and grading rubrics will be provided.

Class participation is an essential part of the class. Students can participate by actively contributing to class discussions and activities.

Once during the semester, students will lead a discussion of the assigned primary literature and prepare a presentation (15 minutes) that expands on the topic.

Students will also write a review of one of the papers from the primary literature, which will be assigned at the beginning of the semester based on student interest in the topic.

To encourage critical evaluation of scientific papers, graduate students will contribute to an online discussion of primary literature prior to class on the days where primary literature will be discussed (typically once per week). 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. Undergraduates will also be able to post on this online discussion forum, but, while graduate students are required to participate in the online discussion, undergraduates will not be required to participate.

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.

**Evaluation of Student Learning:**

Assignment	Percent of Grade
Class participation	10%
Presentation/leading discussion	10%
Review	10%
Online discussion	10%
Exam 1	10%
Exam 2	20%
Final Exam	30%
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:**

Date	Topic	Reading
Aug 22	Course overview/introductions	Chapters 2 and 3
Aug 24	Importance of freshwater ecosystems Physical and chemical properties of water	
Aug 27	Groundwater and the hydrologic cycle	Chapters 4 and 5
Aug 29	Wetland habitats	
Aug 31	Reading discussion 1 (water availability; led by Dr. Reisinger)	
Sept 5	Lakes and reservoirs	Chapter 6 and 7 (pages 107 – 156)
Sept 7	Flowing waters	
Sept 10	Reading discussion 2 (land use)	Chapters 8, 9 and 10
Sept 12	Major groups of freshwater organisms (microbes, plants)	
Sept 14	Major groups of freshwater organisms (animals)	
Sept 17	Dichotomous key exercise	Chapter 11
Sept 19	Evolution and biodiversity of freshwaters	
Sept 21	Biological invasions	
Sept 24	Reading discussion 3 (extinctions, biological invasions)	Chapter 7 (pages 156-165)
Sept 26	<b>Exam 1</b>	
Sept 28	Light, temperature, and stratification	
Oct 1	Oxygen and aquatic chemistry controlling nutrient cycling	Chapters 12 and 13
Oct 3	Carbon	
Oct 5	Reading discussion 4 (browning)	
Oct 8	Nutrients and their cycles	Chapter 14 and 17
Oct 10	Nutrient use and remineralization	
Oct 12	Reading discussion 5 (nutrient pollution, stoichiometry)	
Oct 15	Trophic state and eutrophication	Chapters 16 and 18
Oct 17	Toxic chemicals and pollutants	
Oct 19	Reading discussion 6 (eutrophication, pharmaceuticals)	

Oct 22	Freshwater ecosystem ecology	Chapter 24
Oct 24	Freshwater ecosystem ecology 2	
Oct 26	Reading discussion 7 (biodiversity and ecosystem function)	
Oct 29	<b>Exam 2</b>	Chapter 19
Oct 31	Behavioral interactions: microorganisms and invertebrates	
Nov 5	Interspecies interactions: detritivory, herbivory, omnivory	Chapter 20
Nov 7	Interspecies interactions: predation, parasitism	
Nov 9	Reading discussion 8 (trophic cascades)	
Nov 14	Food webs	Chapter 21
Nov 16	Interspecies interactions 2: facilitation, competition, eco-evolutionary	
Nov 19	Reading discussion 9 (eco-evolutionary dynamics)	
Nov 26	Fish ecology and Fisheries	Chapter 23
Nov 28	Reading discussion 10 (fish ecology)	
Nov 30	Complex community interactions	
Dec 3	Complex community interactions 2	Chapter 22
Dec 5	Reading discussion 11 (regime shifts, metacommunities)	

### Primary Literature

#### Reading discussion 1 (water availability)

Katz, R. A., M. C. Freeman, and K. Tierney. 2015. Evidence of population resistance to extreme low flows in a fluvial-dependent fish species. *Canadian Journal of Fisheries and Aquatic Sciences* 72:1776–1787.

#### 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 (extinctions, biological invasions):

Ricciardi, A., and J. B. Rasmussen. 1999. Extinction rates of North American freshwater fauna. *Conservation Biology* 13:1220–1222.

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.

#### Reading discussion 4 (browning):

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 5 (nutrient pollution, stoichiometry):

Schindler, D. W. 1974. Eutrophication and recovery in experimental lakes: implications for lake management. *Science* 184:897–899.

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.

#### Reading discussion 6 (eutrophication, 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 7 (biodiversity and ecosystem function):

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

#### Reading discussion 8 (trophic cascades):

Carpenter, S. R., J. F. Kitchell, K. L. Cottingham, D. E. Schindler, D. L. Christense, D. M. Post, and N. Voichick. 1996. Chlorophyll variability, nutrient input, and grazing: evidence from whole-lake experiments.

Ecology 77:725–735.

Reading discussion 9 (eco-evolutionary dynamics):

Bassar, R. D., M. C. Marshall, A. López-Sepulcre, E. Zandonà, S. K. Auer, J. Travis, C. M. Pringle, A. S. Flecker, S. A. Thomas, D. F. Fraser, D. N. Reznick, A. Lopez-Sepulcre, E. Zandona, S. K. Auer, J. Travis, C. M. Pringle, A. S. Flecker, S. A. Thomas, D. F. Fraser, and D. N. Reznick. 2010. Local adaptation in Trinidadian guppies alters ecosystem processes. *Proceedings of the National Academy of Sciences of the United States of America* 107:3616–3621.

Reading discussion 10 (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.

Reading discussion 11 (regime shifts, metacommunities):

Howeth, J. G., and M. A. Leibold. 2008. Planktonic dispersal dampens temporal trophic cascades in pond metacommunities. *Ecology Letters* 11:245–257.

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### **Course Evaluation**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

### **University Honesty Policy**

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 Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conducthonor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor of this course.

### **Counseling and Wellness Center**

Contact information for the Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc/>, (352) 392-1575

Contact information for University Police Department:  
(352) 392-1111 or 9-1-1 for emergencies.