

FAS 4932

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

Prerequisites: 2 semesters of general biology coursework

Professor: Dr. Lindsey Reisinger
lreisinger1@ufl.edu
(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 an 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 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

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.

Students will 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.

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.

To encourage critical evaluation of scientific papers, students will answer summary reading questions that will be due at the beginning of class on days that include a discussion of the primary literature (typically once per week).

Students can also participate in an online discussion of the readings that will be led by the graduate students prior to class. Contribution to the online discussion is optional. 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.

Evaluation of Student Learning:

| Assignment | Percent of Grade |
|---------------------------|------------------|
| Class participation | 15% |
| Review | 15% |
| Exam 1 | 10% |
| Exam 2 | 20% |
| Final Exam | 30% |
| Summary Reading Questions | 10% |
| 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 | Exam 1 | |
| 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 | Exam 2 | Chapter 19 |
| Oct 31 | Behavioral interactions: microorganisms and invertebrates | |
| Nov 5 | Interspecies interactions: detritivory, herbivory, omnivory | Chapter 20 |

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| Nov 7 Nov 9 | Interspecies interactions: predation, parasitism Reading discussion 8 (trophic cascades) | |
| Nov 14 Nov 16 | Food webs Interspecies interactions 2: facilitation, competition, eco-evolutionary | Chapter 21 |
| Nov 19 | Reading discussion 9 (eco-evolutionary dynamics) | |
| Nov 26 Nov 28 Nov 30 | Fish ecology and Fisheries Reading discussion 10 (fish ecology) Complex community interactions | Chapter 23 |
| Dec 3 Dec 5 | Complex community interactions 2 Reading discussion 11 (regime shifts, metacommunities) | Chapter 22 |

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/) 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.