

ESM 474/574 Fish Ecology and Conservation

Description: This course is designed as a mixed undergraduate/graduate course. It provides a multidisciplinary focus on major ecological issues related to fish conservation, with a strong emphasis on grounding ecological concepts in real-life case studies. The course incorporates (1) lectures on major topics in fish ecology and (2) class discussions of papers elucidating those concepts and/or relating them to fish conservation issues in systems such as Pacific salmon in the Columbia River and others. The course is specifically designed to build a basic foundation of ecological literacy relative to fish conservation and management, emphasizing knowledge and conceptual skills that will strengthen students beyond their time in class and university.

Pre-requisites: ESM 221 or equivalent

Course Objectives

Students will be expected to exhibit an advanced level of the following objectives:

- vi. Demonstrate information literacy (s01)
- vii. Developing complex research questions (s02)
- viii. Synthesize ideas and literature in a written fashion (c01)
- ix. Deliver a clear and effective oral presentation (c03)
- x. Communicate ideas clearly and advance learning through discussion (c06)

Outline

Area	Week	Topic	Assignment
Background and fish biology	Week 1	Introduction	
		Phenotype, feeding	
	Week 2	Temperature and bioenergetics	
		Reproduction and life history	
	Week 3	Migration and dispersal	
Fish ecology		Niche concepts (Quiz)	Topic for bibliography
	Week 4	Biotic interactions	
		Issues of scale and metapopulations	
	Week 5	Community ecology	Topic for literature review
		Midterm	
	Week 6	Food webs	
Environmental stressors & conservation		Disease and pollution	
	Week 7	Harvest (Quiz)	
		Disturbance / hydropower / hydrologic alteration	Bibliography

	Week 8	Invasive species	
		Hatcheries and aquaculture / genetic issues	Reaction paper
	Week 9	Columbia River salmon issues (Quiz)	
		Conservation approaches	
	Week 10	Ethics of exploitation and intervention	Literature review
		Review and perspectives	
	Week 11	Final exam	

Text: Ross, S.T. 2013. Ecology of North American Freshwater Fishes. University of California Press

Readings:

Angermeier, P. L. and M. R. Winston. (1998). Local vs. regional influences on local diversity in stream fish communities of Virginia. *Ecology*79:911-927.

Fausch, K. D., C. E. Torgersen, C. V. Baxter, and H. W. Li. (2002). Landscapes to riverscapes: bridging the gap between research and conservation of stream fishes. *Bioscience*52:483-498.

Flecker A.S. and B.W. Taylor. 2004. Tropical fishes as biological bulldozers: density effects on resource heterogeneity and species diversity. *Ecology* 85:2267-2278.

Moyle, P. B. and M. P. Marchetti. (2006). Predicting invasion success: freshwater fishes in California as a model. *Bioscience*56:515-524.

Olden, J. D., N. L. Poff, and K. R. Bestgen. (2006). Life-history strategies predict fish invasions and extirpations in the Colorado River Basin. *Ecological Monographs* 76:25-40.

Shuter, B. J. and J. R. Post. (1990). Climate, population viability, and the zoogeography of temperate fishes. *Transactions of the American Fisheries Society* 119:314-336.

Werner, E. E. and D. J. Hall. 1976. Niche shifts in sunfishes: experimental evidence and significance. *Science* 191:404-406.

Grade Breakdown:

- Midterm 100 points
- Quizzes (3) 50
- Reaction paper * 50
- Final exam ** 100
- Annotated bibliography *** 50
- Class participation 50
- Literature review**** 100
- **Total 500 points**

* The reaction paper will be a “reaction” to a paper assigned in class, in response to questions provided. Students may work together in discussing the questions, if desired, but must be responsible for their own work in the final product. Undergraduate students = 1 page, Graduate students = 2 pages

** The final exam will be based on questions provided to students in advance, to provide ample time for good thinking and serious responses. These questions will not have single “right” answers but will require students to synthesize information provided in class in appropriate and creative ways, as a test of literacy in the subject matter. Graduate students will have to complete additional questions.

*** The annotated bibliography should reference papers from the literature that describe empirical studies that present data to address a question that the student is interested to explore. This question should be clearly stated in the beginning and each reference should be annotated to describe how the data presented in the paper address your question. Introduce your question briefly at the beginning of the bibliography, present your annotated papers with standard reference format, and at the end summarize briefly what you learned—it may be that you learn there is a single answer to your question or it may be that you learn that your question is not so simple to answer. **Please do not include papers that present conceptual or theoretical models that address your question, or papers that present simulated or modeled data to address your question.** While these kinds of papers are valuable sources of information and references, your bibliography should only include papers that present empirical data. Please do not hesitate to contact me if you have questions about whether a paper is appropriate to include in your bibliography. Undergraduate students = 10 papers, Graduate students = 15 papers

**** Students will write a literature review (with references from the primary literature) on a topic of their choice pertaining to the effects of environmental stressors on fishes. Topic must be approved by instructor on Week 5. The due date for the literature review is Week 10. Undergraduate students = 6 pages, 10 papers; Graduate students = 8 pages, 15 papers