

Instructors:

Lisa Eby, BRB 103, email: lisa.eby@umontana.edu

Office Hours: Eby Mondays 11:30am-12:30pm & Wednesdays 1:00 – 2:00pm or by appointment

T.A.: Andrew Lahr BRB 112, andrew.lahr@umontana.edu; 3-5pm Thursday

**We are not always on email, please plan for a 24 hour response time.

Class information and approach:

The lecture material will be communicated with a mix of taped lectures, formative exercises and quizzes, as well as face to face discussions and activities. I am hopeful that this mix will allow us to accommodate remote needs as they arise while having some face-to-face times for discussion and exercises as well as face to face lab activities. Please know that we are in a novel and ever-changing landscape so even with the best laid plans, we will have to be adaptive and flexible as we move forward. The most important thing that you can do is stay on top of the work and communicate effectively about any questions or any issues as they arise.

As we move into this semester, please recognize the semester has been shortened (so we can end before Thanksgiving). I will be meeting with the full class once a week (based on class room sizes and physical distancing requirements, class will be split in ½ for face to face time), but we are required to have the same hours of work to earn your credit hours. Specifically, I will divide the class into two groups to attend F2F one day a week (or zoom meeting time depending on remote requests). I am certain that this is achievable if we do more of a flipped classroom style with taped lectures and using class time for questions, discussion, and applying concepts. This will require you to complete work as requested so you can be prepared for class. Please come to the assigned class time with the taped lectures viewed and any required reading completed. As we move forward on this uncertain semester, I will do my best to be clear on expectations, but it will be your responsibility to check Moodle and your UM email account regularly. Even though the readings go into more detail, please know that the expectations are that you understand the material at the level of the lectures and in class activities. Read chapters and papers for examples, applications, generalizations, and principles. Questions based on ***lectures, discussions, and focal questions from reading material*** will appear on the exams.

Statement on safety:

I expect that students, TAs, and I will follow all UM safety protocols (including disinfecting their workspace and equipment, using hand sanitizers, and using masks properly for all inside and outside class activities). Please contact DSS if you need to request an accommodation to be completely remote for the semester or for any safety protocol modification you may need (*depending on the needs we may or may not be able to accommodate the modification without requesting that you complete the class remotely*). **If students decide not to follow all safety protocols, I will immediately adjust our F2F activities and transition towards full remote learning for the entire class.**

This is for your safety, the TA's safety, as well as mine to minimize any risk of transmission of COVID. Please know that this is not an accusation of you or your behavior in any way. I do worry about transmission in all directions as I have two children in school where transmission may occur, secondary contacts of asymptomatic people will likely occur for all of us whether through work, socializing, or school. Working to reduce transmission increases the probability that we all stay healthy, are able to maintain all face-to-face activities planned, and the better the class will be for all. That said, I will be prepared to have all assignments able to be completed remotely (for example, we are planning that all labs will use class data for the lab write-ups), so if you are feeling sick or have been exposed, please follow the UM Policy. Please let me know and I will either excuse you or allow you to make up any participation

points or any points from face-to-face activities. If you feel uncomfortable with any proposed activity or as UM cases increase, please reach out and we can accommodate more remote learning through the rest of the semester. Again, this is a novel and ever-changing landscape so mutual respect, honest and early communication, and flexibility is needed for us to have a successful semester. ***That being said – I cannot wait to start talking about how cool fish are!***

Class Readings and material:

We will be using Moodle for class (BIOO 340.01). See the syllabus for the reading schedule and moodle for the pdfs. Go there for readings, class data sets, assignments, and announcements. All required readings will be available on moodle. Useful texts include: (1) Moyle and Cech, *Fishes: An Introduction to Ichthyology*. Fifth Edition. (2) Holton, C.J. and H.E. Johnson.2003. *Field Guide to Montana Fishes*. 3rd Edition. Montana Fish, Wildlife, and Parks Helena, MT. or online at <http://fieldguide.mt.gov/>. Read chapters and papers for examples, applications, generalizations, and principles.

Objectives of class:

This class explores the biology of fishes, the most diverse group of vertebrates. The areas treated include morphological, physiological, and behavioral adaptations of fishes to their aquatic environments, as well as aspects of population, community, and applied ecology. We will be discussing both freshwater and marine fishes with an emphasis placed on freshwater fishes native to Montana in lab.

Grading:

Midterm I	15%
Midterm II	15%
Final (Comprehensive, synthetic, take home)	10%
Infographic presentation, presentation exam time	10%
Class participation formative exercises/quizzes and discussion	20%
Lab grade (quizzes & lab assignments)	30%

Infographics Presentation: Presentations will typically be done by a small group of ~3 students working together. For the presentation, students will describe a fisheries management issue and potential solutions drawn from fish biology and ecology. You must choose a case study that has not been discussed extensively in class. Essentially, we want students to delve into the conservation and management problem, present the issue concisely and clearly using peer-reviewed references, and potential solutions. This assignment will allow students to practice researching what is known about an issue and species and see how people are applying knowledge to novel situations. In addition, student will learn how to distill information into an infographic and practice public speaking. A statement of group membership and a proposed topic is due by **October 1st**, an outline for the infographics (including sections, key pieces of information with references) is due by **October 13th**, draft infographics turned in by **November 10th**. Presentations will be required to be loaded onto moodle and presented in class to the group during the final's exam time. If you are struggling with a topic, please contact me. I expect to check-in with each group briefly during the semester as questions arise. The presentation of the infographic will have a time limit of 8 minutes with 2 minutes for questions.

Class Policy:

For the field and lab data, collection will be done by teams. The lab reports will use a bigger data set typically composing several years of class data which will be posted on Moodle. Students are free to discuss results (interacting and learning from each other is encouraged, but all assignments must be prepared individually. *All written material, calculations, and graphs to be submitted and graded in must be your own work (answers must be in your own words).* ***All assignments must be submitted on time; penalties will be 5% of grade each day late unless other arrangements have been made. Please contact us ASAP as issues arise.***

Missing class: If you need to miss class, please let us know. Also, please review the notes/lectures provided, perform the readings, and then reach out to us with questions regarding the material. If you need to miss a lab, we may or may not be able to accommodate you into another other lab section that week. Permission needs to be granted before the lab period, please do not just show up to a different lab section. Depending on room restrictions and material constraints accommodation may or may not be possible. That said, lab reports will be completed with the online data set provided.

Class presentation will be presented during the final exam period: Thursday November 19th from 10:10-12:10. Per UM policy – please plan to be available for this exam time. Depending on the situation, we may rotate sections or we will be over Zoom.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. If students are caught cheating or plagiarizing on an assignment, they will get a zero for the assignment. If students are caught cheating on more than one assignment or on an exam, they will fail the course. In both cases information will be passed on to the Dean and the Vice Provost of Academic Affairs for further review.

Date	Lecture Topic and Readings
8/20	Introduction to class & Diversity of aquatic environments and fish
8/25 – 8/27	Locomotion and Respiration Readings: <i>Reference Material: Moyle and Cech Chapter 2 section 2.7-2.9 & Chapter 3</i> <u>Peer Review Reading (locomotion):</u> Starrs, T., Starrs, D., Lintermans, M., & Fulton, C. J. (2017). Assessing upstream invasion risk in alien freshwater fishes based on intrinsic variations in swimming speed performance. <i>Ecology of Freshwater Fish</i> , 26(1), 75-86.
9/1 – 9/3	Circulation and Buoyancy Readings: <i>Reference Material: Moyle and Cech Chapters 4 & 5.1</i>
9/8– 9/10	Thermal regulation and Osmotic and Ionic regulation Readings: <i>Reference Material: Moyle and Cech Chapter 5.2 & 6</i> <u>Peer Review Reading (thermal regulation):</u> Selong, et al. 2001. Effect of temperature on growth and survival of bull trout, with application of an improved method for determining thermal tolerances in fishes. <i>Transactions of the American Fisheries Society</i> 130: 1026-1037.
9/15 – 9/17	Feeding and Energetics Readings: <i>Reference Material: Moyle and Cech Chapter 7.1 & 7.3 and Chapters 9.5</i> <u>Peer Review Reading (energetics):</u> Rosenfeld, J.S. and S. Boss. 2001. Fitness consequences of habitat use for juvenile cutthroat trout: energetic costs and benefits in pools and riffles. <i>Canadian Journal of Fisheries and Aquatic Sciences</i> 58:585-593.
9/22 – 9/24	Growth and Sensory Systems Readings: <i>Reference Material: Moyle and Cech Chapter 10</i>

Peer Review Reading (linking growth and energetics): Ruzychki et al. 2003. Effects of an introduced lake trout on native cutthroat trout in Yellowstone Lake. *Ecological Applications* 13:23-37.

- 9/29 – 10/1 Sensory Systems and Communication
Readings:
Reference Material: Moyle and Cech Chapter 11.5
Peer Review Reading (sensory systems): Radford et al. 2014 Acoustic communication in a noisy world: can fish compete with anthropogenic noise? *Behavioral Ecology*.
Peer Review Reading (communication): Vander Sluijs, I., S.M. Gray, M.C.P. Amorim, I. Barber, U. Candolin, A.P. Hendry, R. Krahe, and others. Communication in troubled waters: responses of fish communication systems to changing environments. *Evol. Ecol.*
- 10/6 – 10/8 Behavior and Breeding
Readings:
Reference Material: Moyle and Cech Chapter 11.1-11.5 and 9.1-9.3
- 10/13 – 10/15 Reproduction and Life Histories
Readings:
Reference Material: Moyle and Cech Chapter 9.6-9.8
Peer Review Reading: Rowe and Hutchings.2003. Mating systems and the conservation of commercially exploited marine fish. *Trends in Ecology and Evolution* 18:567-572.
- 10/20 – 10/22 Life History and Population Ecology
Readings:
Peer Review Reading (life history): Conover et al. 2005. Darwinian fisheries science. *Canadian Journal of Fisheries and Aquatic Sciences* 62:730-737.
Peer Review Reading (population ecology): Berkeley et al. 2004. Fisheries Sustainability via protection of age structure and spatial distribution of fish populations. *Fisheries* 29:23-32.
Peer Review Reading (population ecology): Schindler et al. 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465:609-615.
- 10/27 – 10/29 Species Interactions
Readings:
Reference Material: Moyle and Cech Ch 27
Peer Review Reading: Marcogliese, D.J. 2004. Parasites: small players with crucial roles in the ecological theater. *Ecohealth* 1:151-164.
- 11/3 – 11/5 11/3 no class and Community Ecology
Readings:
Reference Material: Moyle and Cech Chapter 28.1-28.6
Peer Review Reading: Jackson, D.A. P.R. Peres-Neto, and J.D. Olden. 2001. What controls who is where in freshwater fish communities- the roles of biotic, abiotic, and spatial factors. *Canadian Journal of Fisheries and Aquatic Sciences* 58:157-170.
- 11/10– 11/12 Fish in an Ecosystem Context and Holiday
Readings:
Reference Material: Moyle and Cech Chapter 28.1-28.7
Peer Review Reading: Wipfli and Baxter 2010. Linking Ecosystems, food webs, and subsidies in salmonid watersheds *Fisheries* 35:373-387
- 11/17 Class Wrap Up
- 11/19 Exam Week: Thursday November 19th 10:10 to 12:10. Student Presentations

Lab Schedule

<u>Week of:</u>	<u>Topic</u>	<u>Readings and Assignments</u>
8/25	Working with Fisheries Data ^C	<i>Analyzing Fisheries Data Assignment (1)</i>
9/1	Field Lab on Capture Techniques ^C (Where: meet by river)	<i>Active and Passive Capture Techniques Assignment (2)</i>
9/8	Fragmenting the landscape: Applying fish swimming capacity to a landscape ^C (Where: TBD)	<i>Nislow et al. 2011. Variation in local abundance and species richness of stream fishes in relation to dispersal barriers: implications for management and conservation. Freshwater Biology 56:2135-2144. Assignment (3)</i>
9/15	Anatomy and Functional Morphology of Fishes ^C Where: HS 204	Moyle and Cech: Chapter 2.2: p. 15-26 <i>Functional Feeding Morphology Assignment (4)</i>
9/22	Age and Growth ^C Where: HS 204	<i>Maceina et al 2007. Current Status and Review of Freshwater Fish Aging Procedures... Fisheries 32:329-340 Assignment (5)</i>
9/29	Bioenergetics ^C Where: HS 117	<i>Bioenergetics Assignment (6)</i>
10/6	Field Lab – Electrofishing ^C Where: meet by river.	<i>Electrofishing and Population Estimation Assignment (7)</i>
10/13	Zoogeography & Fish Families Where: HS 204	<i>Rahel, F.J. 2000. Homogenization of fish faunas across the United States. Science 288:854-856</i>
10/20	ID – Fishes of Montana Lab Quiz 1 – Fish Families Where: HS 204	
10/27	ID – Fishes of Montana Lab Quiz 2 - Fishes of MT Where: HS 204	
11/5 & 11/10	ID – Fishes of Montana Lab Quiz 3 - Fishes of MT Worksheet for Section 4 Where: HS 204	

Snorkeling (Assignment 8) – snorkeling assignment, please sign up for separate time with Lisa during one of the September times. I will need to soak equipment between groups to ensure sanitization.

Field Labs: For field labs, please dress for the weather and be ready to get wet. Even though we will have waders to use in class, we cannot guarantee that you will return clean and dry. If you have to go to class or work after lab please bring extra clothes those days.

Computer Labs: Typically meet in the Biology computer lab HS Room 114

When are lab reports due? We are combining the data from the entire class (as indicated by a ☺) for field labs. Data will be posted by Friday at noon on the class Moodle page. In this case, lab reports are due Thursday by 5pm. This ensures everyone has equal time to complete the assignment.

More about course policies and class expectations

Cell phones and mini-computers: Please turn off or silence electronic devices during class, unless laptops are being used for notes or an in-class exercise. We expect you NOT to be texting, browsing, or checking e-mail during class. *If you need to engage with your electronic device, please leave the classroom as it is distracting and disrespectful to the instructor and other students.*

Attendance: Attendance is expected and contributes to the “Class participation” portion of your course grade. Absences are not excused unless you have extenuating circumstances and have contacted an instructor.

Classroom environment: Students at University of Montana are diverse in many ways, including race, gender, age, religion, preparedness, and mobility. Please help create a respectful learning environment by honoring all student contributions and expressing your views in ways that do not diminish other students’ perspectives.

Disability modification: Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and [UM’s Disability Services for Students Office](#), which is located in Lommasson Center 154 (406.243.2243). The University does not permit fundamental alterations of academic standards or retroactive modifications. We will work with you and Disability Services to provide an appropriate and reasonable modification.

Academic honesty, plagiarism, and student conduct: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the [Student Conduct Code](#).

- Academic dishonesty of any form is unacceptable and will be taken seriously by the instructor, the College of Forestry and Conservation, and the University of Montana. This includes plagiarism, when you copy materials from other sources without citing the source or copy someone's work, and cheating, copying material from other students during tests or quizzes. In both cases, you will fail the assignment/exam and the information will be passed on to the Dean and the Vice Provost of Academic Affairs. It is your responsibility to be familiar with, and adhere to, the [University’s definition of plagiarism](#).

Course withdrawal deadlines: Please be aware of the deadlines <http://www.umt.edu/registrar/calendar.php>