FISH 200

FRESHWATER ECOLOGY & CONSERVATION

Offered: Winter 2023 (tentative)

Course web page: TBA (PW: XXX)
Class hours: Lecture: M, W, F (50 mins) | Lab 1 day a week (110 min)
Prerequisite(s): None
Areas of Knowledge Designation: NW

COURSE INSTRUCTORS

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LABORATORY LEADERS

XXX

DESCRIPTION

Offers students exposure to the complex relationships between freshwater ecosystems and human societies, including topics associated with freshwater biology, management, conservation and sustainability. The first part of the course focuses on establishing key concepts in freshwater ecology, and the second part delves into applied issues involving conservation and management of river, wetland, and lake ecosystems.

Students may enroll in FISH 200 for:
- 3 credits: ONLY the lecture component of the course.
- 5 credits: Lecture component of the course, weekly laboratory exercises and a field trip.

The 5-credit option is required to meet requirements for the Minor in Freshwater Science and Management (pending minor).

COURSE OBJECTIVES

As a result of this course, students will have a strong understanding of the critical linkages between water, the environment, and human society. Course aims include:

- Introduce students to the physical, chemical, and biological processes that structure freshwater ecosystems.
- Explore how human societies (both past and current) benefit from functioning freshwater ecosystems.
- Understand how freshwater ecosystems are being affected by human activities such as climate change, land use practices, transporting invasive species, and contributing to nutrient pollution and how this, in turn, impacts human societies.
- Gain exposure to the concepts and methods used to understand the ecology of freshwaters and implement management practices that promote short-term benefits and long-term sustainability.
- Develop student’s writing and oral skills to effectively communicate issues to a variety of audiences.

**LEARNING OUTCOMES**

Students will develop a broad understanding of the ecology of freshwaters at an introductory level and explore ways that society can reduce their impacts on water resources. At the end of this course students will have gained critical environmental literacy and be able to:

- Demonstrate through short answers and multiple choice testing a basic understanding of the physical, chemical and biological processes important to healthy freshwater ecosystems. The primary information source to students will be in-class lecture and lab discussions, supplemented with additional readings.
- Understand how fresh waters support human societies through ecosystem services, critically assess how human alteration of freshwaters jeopardize those services, and evaluate common tradeoffs associated with human use of fresh waters. Assessment will be through short answers and multiple-choice testing combined with narrative writing and group debate.
- Identify how concepts from the course relate to specific case studies and ongoing management programs. Information will be presented in readings and critical documentaries, and assessment will be through short essay exercises as part of the weekly reviews and blog assignments.

**REQUIRED TEXTBOOK**

There is no required textbook for this course. Instead, we will assign weekly readings primarily from the *Encyclopedia of Inland Waters*. [subject to change]

**ONLINE TOOLS AND DEVICES**

We will use Canvas to disseminate resources for the class (i.e., learning goals for each session, readings, files, etc.). To access materials on the website, you will need your UW NetID and password. Please turn on your Canvas notifications and check your UW email regularly. More information on how to use Canvas [here](#).

Computers/laptops will be required for this class. If you do not have a personal laptop, you can check out one from the Student Technology Loan Program [here](#).

**METHOD OF INSTRUCTION**
Lectures: Class lectures will cover core concepts in freshwater ecology and sustainability, including active learning using break-out group work.

Weekly reviews: To help understanding of the lecture material, each week you will create an overview summary that synthesizes your knowledge of the week’s concepts. This can be done in a pictorial format using flowcharts, diagrams and graphs – not text. Summary sheets are due every Friday at 11:59 pm, and submissions will be in pdf and via Canvas. Example formats are provided on Canvas.

Labs (5-credit only): The lab sessions will comprise a mixture of instruction, independent research and critiques of environmental documentaries and issues, which collectively reinforce the key concepts presented in lecture. Most labs will have a weekly graded assignment that we ask you to submit online. There is no formal lab manual that needs to be purchased for this course. Instead, all of the lab exercises will be available on Canvas. We expect that you will have read the exercise before your lab begins.

Field trips (5-credit only): Each student is required to participate in two one-day field trips. Students enrolled in FISH 200 for three credits will not participate in the field trips. Both field trips meet early Saturday or Sunday morning and return late the same day. There will be a written assignment specific to the trip, which will be due a maximum of two weeks after your trip. You will find out the specifics on these assignments the week of the trip. The field trips will explore the Green-Duwamish River – starting in the mountainous headwaters of the Cascade Mountains, through Howard Hanson Reservoir (trip 1), and finishing in industrialized estuary known as the Duwamish Waterway (trip 2). Green-Duwamish River is a true working riverscape with substantial cultural significance. During these field trips you will hear from experts at WDFW, King County, TNC, City of Seattle, and the Duwamish People. This will be an immersive experience where you spend time in water collecting biological organisms to fully appreciate the diversity of freshwater life and learn about the rich history and ongoing water management and conservation challenges facing the Green-Duwamish River.

Exams: Exams will be take-home and open book and will be completed and submitted online via Canvas. Exams will consist of a series of multiple-choice and short-answer questions. Midterm I: Exam will include questions from all lectures and reading material covered until this point. Midterm II: Exam may include questions from all lectures and reading material covered until this point. The primary focus will be on material covered from the first midterm through to the second. Final Exam: The final will be comprehensive and may include questions from all lectures and reading material covered. Though the primary focus of the final will be on material from the second midterm to the end of the class.

**GRADING**

Grades will be based on the following breakdown:

<table>
<thead>
<tr>
<th>3-credit version:</th>
<th>5-credit version:</th>
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<tr>
<td>Weekly summary sheets: 25%</td>
<td>Weekly summary sheets: 15%</td>
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</tbody>
</table>
● Midterm I: 20%
● Midterm II: 20%
● Final exam: 35%
● Lab assignments: 20%
● Field trip assignment: 10%
● Midterm I: 15%
● Midterm II: 15%
● Final exam: 25%

The course is not graded on a curve. Rather, numeric grades are assigned based on equally spaced bins between the top grade in the course, which is assigned a 4.0, and the minimum passing grade, which is assigned a 0.7. Meeting the passing grade requires a 50% minimum score in each grading category (summary sheets, exams, lab assignments) and 80% completion of assignments. Students must take the final exam in order to receive credit for the course.

LECTURE SCHEDULE
Week 1
● Class introduction
● Freshwater types (watersheds, streams/rivers, lakes, wetlands, springs, groundwater)

Key concepts in freshwater ecology
Week 2
● Streams and rivers: physical factors (hydrology, geomorphology) and chemistry
● Lakes and wetlands: physical factors and chemistry
● Diversity of freshwater life and scales of biological organization (genes, individuals, populations, species, communities, ecosystems)

Week 3
● Key concepts in population and community ecology
● Autotrophs: Phytoplankton, aquatic macrophytes, cyanobacteria
● Heterotrophs: Microbes and the microbial loop (bacteria, fungi, attached algae)

Week 4
● Freshwater invertebrates (natural history, taxonomy, life cycles, traits and functions).
● Freshwater vertebrates (natural history, evolution, functions)
● Riparian vegetation, and interfaces and exchange between land and water

Week 5
● Trophic relationships and food webs
● Biological interactions I: Predation, herbivore
● Biological interactions II: Competition, parasitism, mutualism

Week 6
● Ecosystem processes: nutrient dynamics (principles, transport and transformation, primary production, biogeochemical cycles)
● Cross-ecosystem linkages of upland watersheds, wetlands, river networks, lakes, and estuaries
• Freshwater biogeography (principles, patterns, processes)

**Freshwater conservation: challenges and solutions**

Week 7
• Acid rain, brownification and greening
• Pollution, contaminants and algal blooms
• Land conversion and habitat loss/modification

Week 8
• Climate change
• Invasive species
• Dams and others (disease, salinization, forest fires, light and noise, etc …)

**Freshwater management and sustainability**

Week 9
• Freshwater sustainability (water demands, conflict, stewardship)
• Principles of freshwater conservation and restoration
• Freshwater ecosystem services

Week 10
• Challenges to sustainable freshwater fisheries
• Challenges to sustainable hydropower
• Challenges to sustainable freshwater ecosystems

**LAB SCHEDULE**

Week 1
Class introduction including study tips and expectations.

Week 2
Landscapes and riverscapes lab: Use maps and software to identify boundaries and hydrography of a catchment. Quantify geophysical attributes of a watershed such as stream order, drainage density, mean predicted discharge, and lake/wetland/riparian extent. Students will conduct a data analysis and complete a short answer worksheet.

Week 3
Documentary I: You will view XXX documentary, followed by discussion, and submission of a short blog entry. The purpose of this and subsequent documentary viewings is to introduce you to new perspectives and broaden your thinking about freshwater-related issues. Be sure to take notes during the film as it will be very helpful for the discussion. Your written blog is not about regurgitating the film contents; rather try to integrate concepts from lectures and develop your own interpretation of freshwater topics addressed. Proficiencies gained by students include narrative writing skills, increased aptitude in public speaking, and critically analyze media and identify fake information.
Week 4
Macroinvertebrate Lab: Identification of common PNW macroinvertebrates organized by functional feeding groups. Calculation of index of biological integrity using King County small streams data. Students will conduct a data analysis and complete a short answer worksheet.

Week 5
Fish lab: Identification of common PNW freshwater fishes organized by resource acquisition and habitat traits. Students will conduct a data analysis and complete a short answer worksheet.

Week 6
Preparation for field trip to the Green-Duwamish River, including reviewing field sampling protocols, logistics, etc.

Week 7
The Columbia River is constantly changing – snow melts and floodplains fill, organisms move from one place to another, and as the seasons pass, the water warms and cools, populations of migratory salmon fish appear and disappear, and plants sprout, grow, and die. We are all accustomed to regular, seasonally changes, but what long-term, larger and less-predictable shifts in freshwater ecosystems? This lab will involve a hands-on, inquiry-based investigation of physical and biological data collected over recent decades, and address questions related to salmon fisheries, endangered species conservation, changing hydrology and the impacts of climate change, invasive species, and water management practices both today and in the future. Proficiencies gained by students include basic data management and visualization skills, and writing and communication skills.

Week 8
Documentary II: You will view XXX documentary, write a short blog entry and actively participate in the discussion.

Week 9
Debate: You will actively participate in a scientific debate among your classmates regarding a freshwater sustainability issue. The purpose of the topic debate is to introduce you to new perspectives and broaden your thinking about water-related issues. You will integrate concepts in the assigned readings and previous lectures to develop your point-of-view and craft a well-articulated argument. Proficiencies gained by students include knowledge synthesis, oral communication skills, and the ability to accept criticism and work well under pressure.

Week 10
Final exam review session

POLICIES

Conduct
The University of Washington Student Conduct Code (WAC 478-121) defines prohibited academic and behavioral conduct and describes how the University holds students accountable as they pursue their academic goals. Allegations of misconduct by students may be referred to the appropriate campus office for investigation and resolution. More information can be found [here](#).

**Academic Integrity**
The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you’re uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have.

Acts of academic misconduct may include but are not limited to:
- **Cheating**: unauthorized assistance in person and/or online for assignments, quizzes, tests or exams, using another student’s work without permission and instructor authorization, allowing anyone to take a course, assignment or exam for you without instructor authorization.
- **Falsification**: intentional use of falsified data, information or records.
- **Plagiarism**: representing the work of others as your own without giving appropriate credit to the original author(s).
- **Unauthorized collaboration**: working with each other on assignments without permission.
- **Engaging in behavior prohibited by an instructor**.
- **Multiple submissions of the same work in different courses without instructor permission**.
- **Deliberately damaging or destroying student work to gain advantage**.
- **Unauthorized recording, and/or subsequent dissemination of instructional content**.

Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by (include information for specific campus offices). Students found to have engaged in academic misconduct may receive a zero on the assignment (or another possible outcome).

**Religious Accommodations**
Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy ([https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/)). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form ([https://registrar.washington.edu/students/religious-accommodations-request/](https://registrar.washington.edu/students/religious-accommodations-request/)).

**Access and Accommodations**
Your experience in this class is important. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. Full participation in this course requires the following types of engagement:
Lectures: The ability to attend tri-weekly lectures of 50 minutes with >50 other students. The ability to collaborate in teams; includes worksheets, short discussions of data, the ability to talk in public.

Labs: The ability to manipulate lab equipment; includes repetitive motions, use of microscopes and standing for 3 hours. The ability to manipulate and dissect live and preserved specimens. The ability to spend 3 hours in computer labs to analyze data. The ability to collaborate in teams; includes 10–15-minute data presentations and discussions.

Field trips: The ability to manipulate equipment; includes repetitive motions, and standing for extended periods of time regardless the weather condition and the time of the day. The ability to collaboratively collect, analyze and interpret data and primary literature; involves computer work, creating text, uploading assignments.

Exams: The ability to answer a set of multiple choice and short-answer questions designed to be completed within 50 or 90 minutes on Canvas.

If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS here.

**Excused Absence from Class**
Students are expected to attend class and to participate in all graded activities, including midterms and final examinations. A student who is anticipating being absent from class due to a Religious Accommodation activity needs to complete the Religious Accommodations request process by the second Friday of the quarter. Students who anticipate missing class due to attendance at academic conferences or field trips, or participation in university-sponsored activities should provide a written notice to the instructor ahead of the absence. The instructor will determine if the graded activity or exam can be rescheduled or if there is equivalent work that can be done as an equivalent, as determined by the instructor.

**Face Coverings in the Classroom**
The health and safety of the University of Washington community are the institution’s priorities. Please review and adhere to the [UW COVID Face Covering Policy](https://uwwww.carinet investigates)/

**Medical Excuse Notes**
Students are expected to attend class and to participate in all graded activities, including midterms and final examinations. To protect student privacy and the integrity of the academic experience, students will not be required to provide a medical excuse note to justify an absence from class due to illness. A student absence from any graded class activity or examination due to
illness must request, in writing, to take a rescheduled examination or perform work judged by the instructor to be the equivalent. Students are responsible for taking any number of examinations for which they are scheduled on a given day and may not request an adjustment for this reason alone.

**Safety**
Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus’s team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

**Sex- and Gender-based Violence and Harassment**
UW, through numerous policies, prohibits sex- and gender-based violence and harassment, and we expect students, faculty, and staff to act professionally and respectfully in all work, learning, and research environments. For support, resources, and reporting options related to sex- and gender-based violence or harassment, visit UW Title IX’s webpage, specifically the Know Your Rights & Resources guide.