ENSC/GEOG 3106 (Fall) 2025

Aquatic Science and Management

Course Instructor: Jesse Vermaire

Email: jesse.vermaire@carleton.ca

Student Hours: Tuesdays and Thursdays, 10-11 am, Room 4439 Herzberg building (just email for different times)

Brightspace link:
https://brightspace.carleton.ca/d2l/home/372999

Office Location: Room 4439, Herzberg Building

Class Location: TBA

Class Times: Tuesdays and Thursdays, 8:35-9:55 am

Prerequisites: Third year standing or permission of the program director

Preclusions: none

Department/Unit: IEIS/DGES

Topics Covered and Learning Outcomes

This course will cover the fundamentals of aquatic science bringing together the physical, chemical, and biotic aspects of lake, river, and estuary systems including how humans are changing aquatic ecosystems and management techniques for the use and conservation of these resources. Topics covered during the class will include the structures and function of aquatic systems, the dynamics of the pelagic and littoral zones, human impacts and climate and environmental change, and monitoring and management of aquatic ecosystems.

Learning Outcomes:

1. Integrate foundational knowledge in limnology with aquatic ecosystem management.
2. Define established and emerging environmental stressors of aquatic ecosystems.
3. Identify relevant environmental policy related to aquatic ecosystems in Canada
4. Understand the design, implementation, and strengths/weakness of aquatic monitoring programs
5. Evaluate, synthesize, and communicate data on aquatic ecosystems to inform evidence-based management

Topics to be Covered

Week	Date	Topic/Content
1	Sept. 4th	Course introduction, general introduction to aquatic systems
2	Sept 9th and 11th	Distribution and forms of inland waters, physical structure, watersheds as management units
3	Sept. 16th and 18th	Chemical cycles of key elements in aquatic systems
4	Sept. 23rd and 25th	Algae and aquatic plants, primary production, and spatial food-web subsidies
5	Sept. 30th and Oct. 2nd	Zooplankton, food-webs, and trophic cascades
6	Oct. 7th and Oct 9th	Online Assignment and Online quiz (mid-term prep). No in person class this week
7	Oct. 14th Oct. 16th	Mid-term review in class Midterm (in-class on October 16th)
8	Oct. 21st and 23rd	Fall break, no classes
9	Oct. 28th and 30th	Human modification of watersheds lakes, rivers and estuaries
10	Nov. 4th and 6th	Pollution of lakes, rivers, and estuaries
11	Nov. 11th and 13th	Invasive species, climate change, and multiple stressors
12	Nov. 18th and 20th	Watershed monitoring, reference conditions, and paleolimnology,
13	Nov. 25th and 27th	Independent study and project report on the Peace-Athabasca Delta. Dedicate class time to research and online resources will be provided.
14	Dec. 2nd and 4th	Restoration and creation of aquatic habitat Review for Final Exam (last class)

Important dates and deadlines can be found here: https://carleton.ca/registrar/registration/dates/academic-dates/, including class suspension for fall, winter breaks, and statutory holidays.

Assessments

Grade Breakdown

COMPONENT	GRADE VALUE	DATE
PARTICIPATION*	5 %	Throughout course

ASSIGNMENT 1	10 %	September 19th 2025
ASSIGNMENT 2	10 %	October 7th 2025
QUIZ	5%	October 9th 2025
MIDTERM	20 %	October 16th 2025
ASSIGNMENT 3	20 %	November 27th 2025
FINAL EXAM	30 %	December 20th 2025

(**carrying out assigned readings and submitting very short write-ups based on readings)*

Final Grade Approval: Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

Late and Missed Work Policies

Late Work

If you will be late with an assignment or miss the mid-term please reach out to me to make arrangements to submit the work. If you require consideration for an extension to an assignment or exam please complete the *academic considerations form*. If course material is late without reaching out to me to discuss and completing an *academic considerations form* a standard 5% penalty will be applied to the grade.

Missed Work

For Short-term (5 days or less) missed work complete the academic considerations form and reach out to me to let me know your work will be late.

For Longer-term missed work (> 5 days): Please complete the longer-term accommodation form and reach out to me to discuss completing the assignment.

Learning Material(s) and Other Course/Lab-Related Resources

Students are not required to purchase textbooks or other learning materials for this course.

We will primarily be following material in the text book below:

Jones, I.D. and Smol, J.P. 2024. Wetzel's Limnology: lake and river ecosystems, 4th ed. Academic Press.

From campus you should be able to access this text book for free
https://www.sciencedirect.com/book/9780128227015/wetzels-limnology

If you want to do extra reading some excellent relevant texts are:

Kalff, J. 2002. Limnology: inland water ecosystems. Prentice-Hall, Inc.

Smol, JP. 2008. Pollution of lakes and rivers: a paleoenvironmental perspective, 2nd ed. Blackwell Publishing.

Scheffer, M. 2004. Ecology of shallow lakes. Kluwer Academic Publishers.

Allan, JD and Castillo, MM. 2008. Stream ecology: structure and function of running waters, 2nd ed. Springer.

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (https://students.carleton.ca/course-outline/).

Statement on Chat GPT/Generative AI usage

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy.

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and

Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Assignment details

Assignment 1: Graphing and interpretation of limnological data (10%)

The purpose of this assignment is to graph and interpret a temperature and oxygen profile versus water depth in a lake. Students will be given data to produce a graph and interpret the results in the context of aquatic ecosystems. Both the graph and a written document interpreting the graph will be handed in (<100 words). More details for the interpretation of the results will be included in the assignment handout.

Assignment 1 marking Scheme: /10

Graph /4

Are the values graphed correctly (2 points)

Proper axes labels (1 point)

Title and legend for the graph (1 point)

Written interpretation /6

Is the interpretation correct (5 points)

Clearly written (1 point)

Assignment 2: Mini-presentation (Limnologist) (10%)

The goal of this assignment is for you to learn about and summarize the main research contributions of a scientist working in the field of limnology or aquatic ecology.

Assignment:

Select a scientist working in the fields of limnology or aquatic ecology and use an academic search engine or citation index (*e.g.* google scholar, Web of Science, Scopus) to learn about their work. Think about the following questions to help you frame your mini-review: 1) In what years was the scientist actively publishing?, 2) what institution were they affiliated with?, 3) Where did their research take place (e.g. in the lab or in the field? If in the field what was the geographical location of most of their studies)?, 4) What was (were) their major contribution(s) to the study of limnology? 5) What are some of their most highly cited work? 6) Why did you select this scientist, what was it about their work that interested you? Read at least two peer-reviewed publication from the

scientist you selected and use these publications to help with you presentation and cite them somewhere in your presentation

This assignment should be kept brief and to the point (i.e. < 5 minutes presentation) but should accurately summarize the questions posed in the paragraph above. You will record this presentation and submit it as an audio or video clip. Feel free to get creative with this. You can use the tools you want to make this recording and feel free to use AI if it helps.

Assignment 2 marking scheme: /10

Clearly explains the scientist they picked and why they selected this scientist /2

Explains the academic history of the scientist /3

Clearly explains the scientist's contribution to our understanding of limnology /4

Presentation was clear and concise (<5 min) /1

Assignment 3: Case study on the Peace-Athabasca Delta (20%)

For this assignment I would like you to produce a 7-10 page document (including a cover page and references) outlining the challenges faced by the Peace-Athabasca Delta (PAD) and recommendations on what Canada should do to prevent Wood Buffalo National Park from being listed as a World Heritage in Danger.

Specifically, I would like you to:

1) Describe the physical and human geography of the PAD. What is the PAD and where is it located, what is special or unique about the PAD, what is special about the biology of the PAD, and what Nations of people call this place home.

2) Describe what environmental changes are occurring in the PAD and how this is affecting the landscape and the biology of the PAD.

3) Describe how the environmental changes are impacting the people and way of life in the PAD.

4) Describe what is driving the environmental changes occurring in the PAD. What do we know to date and can you think of any important question that remain unanswered about what is driving environmental changes in the PAD?

5) Finally, provide some recommendations to the Government of Canada about what can be done to conserve the PAD and reduce the likelihood that Wood Buffalo National Park will be listed as a UNESCO World Heritage in Danger Site. Note that I do not expect you to have all the answers here, this is a complex issue and if it was easy to solve it would already be solved.

Include figures, pictures, and maps in your report as you see fit to support your statements, just cite them in the figure caption and reference list.

Assignment 3 marking Scheme: /20

Background material on the PAD. Physical description of the environmental conditions of the PAD and how they are changing /7

Discussion of the people and communities that live in the PAD and how their traditional way of life depends on the environment of the PAD and how environmental changes are altering their way of life. Discussion of how other organizations depend on the PAD and their roles and responsibilities. /7

Scientific analysis of how the PAD is changing and a summary and interpretation of the scientific evidence describing why these ecological changes are occurring. What, if anything, can be done to conserve the environment of the PAD? /4

Proper formatting /2

Proper sentence structure Referencing style Spelling & Grammar