

BIOL 335
Limnology and Aquatic Ecology
Fall Term (2026)
On Campus

Course Description: Physical, chemical and biological aspects of freshwater lakes. Emphasis will be on morphometry, light and temperature, water chemistry, ecological and physiological requirements, composition and interaction of algal and invertebrate populations, fish interactions, eutrophication, acid rain, other forms of pollution, and climatic and other environmental change.

Prerequisite: CHEM 112/6.0 or by permission of instructor.

Recommended: BIOL 200/3.0, BIOL 201/3.0, OR BIOL 202/3.0.

Compulsory Field Trip: estimated cost \$75.

Office Hours	After class or by appointment
TA Contact Information	See OnQ

Limnology and Aquatic Ecology:

Limnology is the study of inland waters (lakes, rivers, streams, wetlands, etc.) and covers a variety of disciplines, such as geological, physical, chemical, and biological aspects of freshwater environments. Though a 3.0-unit course cannot examine all facets of limnology in depth, we will present an overview emphasizing fundamental interactions and processes. Inland waters only represent a small fraction of the water on Earth; though it plays an essential and pivotal role in our lives.

This course is facilitated with Teaching Assistants (TAs) and facilitates interactions between fellow students in the labs and on our full-day excursion to the Queen's University Biological Station (QUBS). To optimize your learning, please be prepared for your classes, labs, and field trip (questions are encouraged).

Please read the syllabus guidelines.

Learning Objectives:

Limnology, the study of inland waters, is an inherently interdisciplinary subject. The overall goal of this course is to provide you with a basic understanding of the physical, chemical, and biological processes in freshwater, as well as an appreciation of the impact of human activities on these waterbodies, and solutions to pressing problems in aquatic ecology.

Specifically, the course objectives are as follows:

- A) Explain and effectively communicate how basic principles and concepts associated with the physical, chemical, and biological aspects of limnology can be applied to understand lake ecosystems;
- B) Understand, recognize, and describe contributions from the disciplines of physics, chemistry, biology, geography, environmental studies and engineering to the understanding of limnological systems;

- C) Use limnological techniques to collect, analyse, and interpret physical, chemical, and biological data;
- D) Conduct, analyse, and interpret the laboratory exercises to gain understanding of limnological concepts, and gain experience in the writing of clear, concise and integrated reports;
- E) Apply limnological concepts and critical thinking to demonstrate an integrated understanding of the roles of physical, chemical, and biological characteristics in the structure and function of aquatic communities (at all trophic levels from microbes to fish), in lakes and ponds from the Arctic to the tropics; and
- F) Describe, understand, logically predict, and clearly communicate the impact of a variety of human activities (e.g., watershed disturbances, mining, industrial activities) on aquatic ecosystems and environmental health, and formulate appropriate remediation techniques.

Structure of the Course:

This course is organized using a 12-week schedule. Each week contains all the required resources including readings, copies of the lectures, associated links, and materials for activities you are to complete as part of this course.

In teaching this course, we will adapt the approach used in most standard texts and organized into four overarching themes;

- (1) *Physical Limnology*: physical characteristics of lakes and their interaction with light, heat, and geographic location;
- (2) *Chemical Limnology*: chemistry and limiting nutrients;
- (3) *Aquatic Ecology*: building on the physical and chemical fundamentals, we demonstrate links with biology and biological change over time; and
- (4) *Integrative Limnology*: we will use several integrative examples to show how lakes are impacted by both natural and anthropogenic activities, and why an understanding of environmental and ecological change is important to manage the biodiversity and ecosystem services that are provided by inland waters.

Lecture topics that will be included in this course are listed below.

- Introduction to Limnology and Aquatic Ecology
- *Physical Limnology*: ~4 lectures (lake morphometry; light in lakes; heat in lakes; water movements).
- *Chemical Limnology*: ~6 lectures (oxygen; salinity; carbon; nitrogen; phosphorus; sulfur & silica).
- *Aquatic Ecology*: ~6 lectures (phytoplankton and primary production; zooplankton; fish and trophic interactions).
- *Integrative Limnology*: ~13 lectures (paleolimnology; acidification; shallow lakes and alternate equilibria; lake remediation; saline lakes; Arctic and Antarctic lakes; tropical lakes; surprises in limnology).

Course materials will be presented using three approaches: formal lectures, laboratories, and a compulsory field trip to QUBS on Lake Opinicon. Although there is some overlap in the material that will be presented using these approaches, they and the associated reports and exams serve to reinforce the important concepts related to the learning outcomes of this course.

Labs: This course is composed of 4 labs and the one-day compulsory field trip. Always come prepared to labs (i.e., read and understand the Lab Manual and supplementary materials posted before the lab). Lab attendance is compulsory at your designated lab section which is one of the following three times:

Please show up to your assigned lab in Week 2 for an introduction to the labs, safety information, and to be divided into groups for the Tuesday and Wednesday lab sections (there is only one group Wednesday section). Lab groups will attend lab section, typically, every other week. There are five total lab sessions. We will also collect field trip day preferences and dietary restrictions.

One-Day Field Trip: This course includes a compulsory one-day field trip to the Queen's University Biological Station (QUBS).

The bus will arrive on Barrie Street at the north end of the Biosciences Complex by 7:20 am. We will leave at 7:30 sharp and will return by approximately 6 pm the same day. As indicated in the course description, the cost of the field trip will be \$75. This cost will cover transportation to and from QUBS, user fees, and lunch. Please reach out to the course instructors if there is an issue with the cost of the trip. The field trip will occur rain or shine. We suggest that you check the weather and bring appropriate attire (hiking boots/close toed shoes that you don't mind getting dirty/wet, pants, sweatshirt, rain gear). If you do not have access to proper rain gear (e.g., coats, boots), please feel free to contact the Queen's Outdoor Field Experience Initiative run by the biology graduate students (queens.field.initiative@gmail.com or Instagram: [@queens_outdoor](https://www.instagram.com/queens_outdoor)).

There is a strong practical component to this course beginning with the field trip where you will receive an introduction to physical, chemical, and biological sampling techniques, and activities involving the identification of living plankton and invertebrates. Preserved specimens will be collected for use in our labs, but experience of sampling and identifying live organisms cannot be recreated in the lab, thus attending the one-day field trip is crucial. The material covered on the field trip will also form part of the Lab Exam.

Important Dates & Locations:

Date	Note
September 1	Fall Term Starts
September 8	Classes Start
September 9	BIOL 335 First Class
September 14	BIOL 335 First Week of Labs
September 21	Last date to drop Fall Term with full tuition fee credit.
September 30	National Day of Truth and Reconciliation (classes will not be held).
October 8	BIOL 335 Midterm (in class)
October 12	Thanksgiving Day (classes will not be held).
October 13-16	Fall Term Reading Week.
November 11	Remembrance Day Service (classes cancelled 10:30 – 11:30 am).
December 1	Lab Exam
December 8	Fall Term classes end.
December 31	Fall Term ends.

For other important university dates during the Fall Term, please read the Faculty of Arts and Sciences sessional dates: [Queen's University Sessional Dates 2026](#)

Course Materials (Textbooks/Reading):

The textbook for this course Wetzel's Limnology: Lake and River Ecosystems (2023) – this text is available as an ebook from the Queen's Library ([Wetzel's Limnology | ScienceDirect \(queensu.ca\)](#)). This is an updated version of the classic limnology text by Wetzel (2021) - Limnology: Lake and River Ecosystems (3rd edition). This is a comprehensive account of limnology, and a great reference. Please note that there are chapter content summaries of the important points at the end of each chapter. However, you are only responsible for material covered in the class, labs, or field weekend.

Jones, I.D. and Smol, J.P. [Editors]. 2024. Wetzel's Limnology: Lake and River Ecosystems. 4th Edition. Elsevier, Oxford. 1088 pp.

We will also post several scientific journal articles relevant to the material presented in the course which will be linked to the library via the BIOL335 OnQ website.

Course Assessments:

Academic Component	Weight
Assignment 1 (Lab 1): Lake Models & Thermal Stratification	10%
Midterm Exam (written in lecture)	20%
Assignment 2 (Lab 3): Long-Term Changes in Aquatic Ecosystems	15%
Lab Exam	15%
Final Exam (written in exam period)	40%

Assignment Submission Policy:

One of the skills you are expected to master during your university education is to clearly and concisely communicate knowledge gained. Two written assignments are part of this course (Lab 1 and Lab 3). As 25% of your final mark will be dependent on them, you should spend considerable time in preparing concise, clear, and correct reports. These reports should be written as papers. The format of the papers will be detailed in your lab. Your reports will be due exactly two weeks after your lab (14 days), there is no grace period allotted given the considerable length of time to complete the report, unless otherwise stated. To be explicit, if your Lab occurs on Sept 22, your lab report is due by Oct 6 (11:59 pm). As such, short-term academic considerations are built into the assignments. Submission of assignments after the due date will be reduced by 10%/day.

Grading Method:

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's University Official Grade Conversion Scale:

Letter Grade	Grade Points	Percentage Conversion
A+	4.3	90 - 100
A	4.0	85 - 89.9
A -	3.7	80 - 84.9
B +	3.3	77 - 79.9
B	3.0	73 - 76.9

B -	2.7	70 – 72.9
C +	2.3	67 – 69.9
C	2.0	63 – 66.9
C -	1.7	60 – 62.9
D +	1.3	57 – 59.9
D	1.0	53 – 56.9
D -	0.7	50 – 52.9
F	0.0	0 – 49.9

Proctored Exams:

Once the exam schedule has been finalized, the final exam date will be posted on your SOLUS account. The exam dates for each term are listed on the Faculty of Arts and Science webpage under [Important Dates](#). Student exam schedules for the Fall Term are posted on SOLUS immediately prior to Thanksgiving and on the Friday before Reading Week for the Fall Term. Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel/holiday plans or flight reservations. For information regarding what is considered extenuating circumstances and qualifications for Academic Consideration, please visit the [Faculty of Arts and Science's Academic Considerations & Accommodations](#) webpage.

Communication & Questions:

The university communicates with students via Queen's email. Please check your e-mail regularly to ensure you do not miss important information related to your course.

Questions regarding lab material (and the associated assignments) should be directed to your Teaching Assistant (TA). Normally, your TA will be available in your regularly scheduled lab slot. However, if questions arise outside of scheduled lab time, you may contact them via e-mail (see OnQ). Note: TAs are not obligated to respond to e-mails outside of working hours (e.g., before 9 am, after 5 pm, and weekends) and may take up to 48 hours to respond.

Any reoccurring questions or concerns that we learn of will be addressed on the OnQ page for this course as a course announcement.

For any questions on the lecture components of this course, please feel free to contact course instructors before/after lecture or schedule an appointment for office hours via e-mail.

Course Feedback:

At various points during the course, you may be asked to take part in a variety of feedback activities, such as surveys and questionnaires. This feedback enables the teaching team to improve the course. All surveys are anonymous and are directly related to activities, assessments, and other course material.

Notice of Recording:

Synchronous (live) classes may be delivered in this course through Zoom and/or Teams, video conferencing platforms supported by the University. Steps have been taken by the University to configure these platforms in a secure manner. Classes will be recorded with video and audio (and, in some cases, transcription) and will be made available to students in the course for

the duration of the term. The recordings may capture your name, image or voice through the video and audio recordings. By attending these live classes, you are consenting to the collection of this information for the purposes of administering the class and associated coursework. If you are concerned about the collection of your name and other personal information in the class, please contact the course instructor to identify possible alternatives.

To learn more about how your personal information is collected, used and disclosed by Queen's University, please see the [Notice of Collection, Use and Disclosure of Personal Information](#).

Copyright of Course Material:

Course materials created by the course instructors, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructors. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructors' course materials or to provide an instructors' course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructors' express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.

Policies:

Queen's Policy Statement on Academic Integrity: Queen's University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge, and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Queen's students, faculty, administrators and staff therefore all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.

The following statements from "The Fundamental Values of Academic Integrity" (2nd edition), developed by the International Center for Academic Integrity (ICAI), contextualize these values and qualities:

Honesty: Academic communities of integrity advance the quest for truth and knowledge through intellectual and personal honesty in learning, teaching, research, and service.

Trust: Academic communities of integrity both foster and rely upon climates of mutual trust. Climates of trust encourage and support the free exchange of ideas which in turn allows scholarly inquiry to reach its fullest potential.

Fairness: Academic communities of integrity establish clear and transparent expectations, standards, and practices to support fairness in the interactions of students, faculty, and administrators.

Respect: Academic communities of integrity value the interactive, cooperative, participatory nature of learning. They honour, value, and consider diverse opinions and ideas.

Responsibility: Academic communities of integrity rest upon foundations of personal accountability coupled with the willingness of individuals and groups to lead by example, uphold mutually agreed-upon standards, and take action when they encounter wrongdoing.

Courage: To develop and sustain communities of integrity, it takes more than simply believing in the fundamental values. Translating the values from talking points into action - standing up for them in the face of pressure and adversity - requires determination, commitment, and courage.

Students are responsible for familiarizing themselves with and adhering to the Senate [regulations](#) concerning academic integrity, along with [Faculty or School](#) specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

Class Attendance: Your presence and participation in class contributes to the knowledge and skills that you will develop throughout this course. Your teaching team expect that you attend class regularly, participate in class conversations and learning activities. These types of activities provide active engagement, promote a deeper understanding of the course content, and contribute to your success in this course.

Academic Support: All undergraduate students face new learning and writing challenges as they progress through university: essays and reports become more complex; effectively incorporating research into writing becomes more important; the types of assignments become more diverse; managing your time and developing the skills you need to read and think critically gets more challenging. I encourage students to contact Student Academic Success Services (SASS). SASS offers many different ways to receive support:

- Free online or in-person [appointments](#) to get personalized support on writing and academic skills from expert staff and trained peers.
- [Workshops](#) and [drop-in programs](#). SASS' [Events Calendar lists events coming soon](#).
- [Online resources](#) that provide strategies for academic skills and writing development at university.
- If English is not your first language, SASS has specific resources for [English as Additional Language students](#), including weekly programs and EAL academic skills appointments. You can meet on an ongoing basis with an EAL consultant to work on your academic writing, speaking, listening, and reading skills.

Accommodations: Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support the removal of those barriers, please visit the [QSAS website](#) to learn more about academic accommodations or start the registration process with QSAS by clicking **Access Ventus** button at [Ventus | Accessibility Services | Queen's \(queensu.ca\)](#)

Ventus is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office and other support services in the process to request, assess, and implement academic accommodations.

To learn more, go to: [Ventus Support](#)

Academic Considerations for Students in Extenuating Circumstances:

Inclusion: The teaching team is committed and continues to promote and develop an inclusive climate that recognizes and respects equal dignity and worth of all persons. This climate is created and maintained by a university-wide commitment to and understanding of educational equity, supported by policies, programs, curricula, practices that promote safe and full participation of all members. Our department has embraced these initiatives, and we continue to develop and integrate principles of Equity Diversity Inclusion (EDI) and ways of knowing throughout our department. We are happy to discuss our ongoing initiatives and welcome constructive feedback.

As many of you are aware, our previous Chancellor at Queen's was the late Honorable Murray Sinclair, an Anishinaabe and member of the Peguis First Nation, a legal scholar, judge, a Commissioner of the Truth and Reconciliation Commission (TRC), a former Senator, and the General Counsel of an Indigenous law firm. At a recent convocation, he spoke elegantly about the TRC, and the steps to promote reconciliation between Canada and the Indigenous peoples. One of the 94 recommendations of the TRC was the importance of land acknowledgements. As part of this syllabus, we are happy to provide a land acknowledgement as part of this syllabus: *Queen's University is situated on the traditional Anishinaabe and Haudenosaunee territory. We are grateful to be able to live, learn, teach, and play on these lands, forming respectful relationships with ancestors of the original occupants of these lands.*

Netiquette: University is a place to share, question, and challenge ideas. Each student brings a different set of lived experiences. You can help to create a safer, more respectful classroom community for learners by following these guidelines:

Here is a list of netiquette guidelines. Please read them carefully and use them to guide your communication in this course and beyond.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's ok to disagree with ideas, but do not make personal attacks.
7. Be open to being challenged or confronted on your ideas and to challenging others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

Name/Pronoun: If you wish to change how your name appears in OnQ and/or on class lists, please follow these steps. You may also use this process to add your pronouns to the appearance of your name.

1. Log into SOLUS.
2. Click on Personal Information tab.
3. Click on the Names tab
4. Click on the Add New Name tab
5. Choose Preferred from the Name Type drop down menu
6. Enter the name you would like to appear in OnQ and/or on class lists.
7. Click Save.

Please allow 24 to 48 hours for your name to be registered within the system. If you have further questions or concerns, please contact ITS at Queen's University

Fostering Accessibility: All of us have a shared responsibility for fostering accessibility and promoting meaningful inclusion of those with disabilities. The [Accessibility Hub](#) at Queen's University's Human Rights & Equity Office offer a host of [tutorials](#) that provide us all with practical tips for:

- Creating accessible documents, e.g., to submit to your teaching team or share with peers in peer feedback activities/in a presentation.
- E-mails, e.g., while communicating with group members or your teaching team.
- Meeting practices, e.g., in tutorials/labs/seminars or virtual meetings.

Turn-It-In Statement: This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarized text in this course. Data from submissions is also collected and analysed by Turnitin for detecting Artificial Intelligence ([AI](#))-generated text. These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

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