BIOL 410
Ecology of Lakes and Streams

Winter term (2024)

Calendar description

An in-depth look at the ecology and evolution of freshwater aquatic ecosystems, considering the role of populations, interspecific interactions, and the flow of energy and matter. There will be an emphasis on linking ecological theory with empirical evidence from aquatic systems. Topics will include dispersal and colonization, ecological genetics, resource competition, predator-prey interaction, evolution of life-history strategies, habitat coupling, and biogeochemical cycling. LEARNING HOURS 120 (24L;12S;84P)
RECOMMENDATION BIOL 335/3.0.
PREREQUISITE (BIOL 300/3.0 or *BIOL 302/3.0* or *BIOL 303/3.0*) and a minimum GPA of 2.0 in the Biological Foundations List.

Number of credits: 3.0

Learning objectives

By the end of this course, students will:

- Describe the major anthropogenic impacts on aquatic ecosystems
- Identify the linkages between organisms and material/energy flow within aquatic systems, as well as linkages between aquatic and terrestrial systems.
- Describe the major forms of adaptation in aquatic systems including phenotypic plasticity and evolution.
- Critically evaluate and synthesize the scientific literature about the ecology of lakes and streams to reveal strengths and weakness of published studies.

Learning Hours

Teaching method		Average hours per week	Number of weeks	Total hours
In-class hours	Lecture	2	12	24
	Seminar	1	11	11
	Laboratory			
	Tutorial			
	Practicum			
	Group learning			
	Individual instruction			
Other	On-line			
	Off-campus			
	Private study	7	12	84
Total hours				119

Course Outline

In this course, we will take an in-depth look at the ecology and evolution of freshwater aquatic ecosystems, considering the role of populations, interspecific interactions, and the flow of energy and matter. There will be an emphasis on linking ecological theory with empirical evidence from aquatic systems. Topics will include dispersal and colonization, ecological genetics, resource competition, predator-prey interaction, evolution of life-history strategies, habitat coupling, and, biogeochemical cycling. Most of the examples in class will be based on studies conducted on lakes.
The class will consist of two lectures each week, followed by a discussion session on a related paper from the recent scientific literature. Lecture material will be based on information from the primary literature. Support material will be posted each week. Students are expected to attend lectures and read associated papers each week.

Course schedule

1. Overview of course and aquatic ecosystems
2. Environmental issues: climate change, changes in nutrients and ions
3. Environmental issues: synthetic chemicals, invasive species, multiple stressors
4. Local within lake processes – physiological tolerances
5. Local within lake processes – species interactions
6. Plasticity and evolution
7. Eco-evolutionary dynamics
8. Benthic-pelagic coupling
9. Aquatic-terrestrial linkages

10. Nutrients and carbon
11. Metacommunities and spatial insurance hypothesis
12. Landscapes
13. Cross-scale interactions

Textbooks/readings

Readings from the primary scientific literature will be assigned each week.
Students may want to supplement their knowledge with readings from limnology textbooks:

Jones, I.D. and Smol, J.P (ed.) 2023. Wetzel's Limnology: Lake and river ecosystems – *this is an excellent reference book – has LOTS of detailed information with chapters written by experts in the field. Decent global representation.*

Kalff, J. 2002. Limnology – *although this is at an introductory level, it has good overview material. Lots of Canadian examples, as well as good representation of European limnology. Good place to start.*

Bronmark, C. and L.-A. Hansson. 2005. The Biology of Lakes and Ponds – *this is very introductory and focuses on biology, but very well written and good overview.*

Dodds, W.K. 2002. Freshwater ecology: concepts and environmental applications – *this is written more broadly, but has some good content as well*

Grading Scheme

Weekly assignments: 10*2=20%
Participation in seminar discussions: 10%
Lecture activities: 5%
Team paper: (total 50%)
- Outline with annotated reference list: 10%
- Paper: 25%
- Peer Review: 10%
- Revision: can replace grade for paper (25%)

Nomination of a scientist: 10%
Reflection on team work and activities: 5%

Assignment Submission Policy

To build in flexibility and promote accessibility and inclusion for all students, this course has been designed with built-in grace periods of 3 days where possible.

Weekly assignments should be handed in 3 days before each seminar but have a build-in grace period of 3 days. They **must** be handed in by Wednesday at 8:30 because they will form the basis of discussion in seminars. I will not accept late weekly assignments. In total, there will be 11 assignments, but I will drop one with the lowest grade.

***Late Policy**:* Late assignments beyond the grace period (without long-term Considerations or Accommodations) for the papers will be penalized **5% per day (or part thereof)** that it is late, including weekends, unless arrangements have been made.

Class Attendance

Your presence and participation in class contributes to the knowledge and skills that you will develop throughout this course. I 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.

Grading Method

• In this course, some components will be graded using numerical percentage marks. Other components will receive letter grades, which for purposes of calculating your course average will be translated into numerical equivalents using the Faculty of Arts and Science Letter Grade

Assignment Mark	Numerical value for calculation of final mark
A+	93
A	87
A-	82
B+	78
B	75
B-	72
C+	68
C	65
C-	62
D+	58
D	55
D-	52
F48 (F+)	48
F24 (F)	24
F0 (0)	0

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84

B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

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:

1. **Honesty** Academic communities of integrity advance the quest for truth and knowledge through intellectual and personal honesty in learning, teaching, research, and service.
2. **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.
3. **Fairness** Academic communities of integrity establish clear and transparent expectations, standards, and practices to support fairness in the interactions of students, faculty, and administrators.
4. **Respect** Academic communities of integrity value the interactive, cooperative, participatory nature of learning. They honor, value, and consider diverse opinions and ideas.

5. **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.
6. **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.

Generative Artificial Intelligence (AI) Tools : Not permitted

Using generative AI writing tools such as ChatGPT in your submitted work is not permitted in this class. This type of use constitutes a Departure from Academic Integrity.

Original work, completed wholly by you, is expected to be submitted in this course. The use of an artificial intelligence tool like ChatGPT is not permitted.

Accommodations for Disabilities

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: https://www.queensu.ca/ventus-support/students/visual-guide-ventus-students

Copyright

Important University Dates

Please visit the Faculty of Arts and Sciences Sessional Dates website for all academic deadlines.

Land Acknowledgement

Queen's University occupies traditional Anishinaabe and Haudenosaunee territory. To acknowledge this traditional territory is to recognize its longer history, one predating the establishment of the earliest European colonies. It is also to acknowledge this territory's significance for the Indigenous Peoples who lived, and continue to live, upon it and whose practices and spiritualties are tied to the land and continue to develop in relationship to the territory and its other inhabitants today. Indigenous communities in Kingston/Katarokwi continue to reflect the area's Anishinaabe and Haudenosaunee roots. There is also a significant Métis community and First Peoples from other Nations across Turtle Island present here today. To read more about the history of the land, see the Queen's Encyclopedia and to learn more about land acknowledgements, see the Office of Indigenous Initiatives.

Equity and Inclusion

Equity and diversity are vital to the Queen's academic mission and standards of excellence. I acknowledge that there are direct, indirect, and systemic discrimination within our institutional structures, policies, and practices. In this class, I will work to promote an anti-discriminatory, anti-racist, and accountable environment where everyone feels welcome and valued. Every member of the class is expected to follow Queen's Student Code of Conduct and everyone in the Biology Department (students, TAs, faculty, staff) are expected to abide by the Departmental Code of Conduct.

Code of Conduct

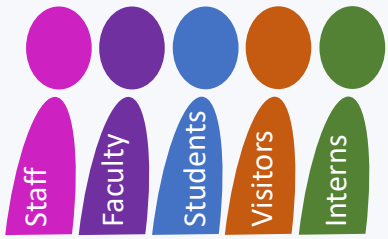
Department of Biology

Why do we need a code of conduct?

To ensure a **safe**, **welcoming** and productive environment.

To **empower** individuals to **report** discriminatory, harassing, or disrespectful behavior.

Who is it for?



What is harassment?

Unwelcome or offensive verbal, visual, or physical contact. Sexual harassment is unwelcome, unsolicited, and unreciprocated sexual advances, requests for sexual favors, and other verbal or physical conduct or gestures of a sexual nature.

What is discrimination?

Treating someone differently on the basis of age, physical appearance, body size, employment, ethnicity, gender identity and expression, individual lifestyle, marital status, national origin, physical or cognitive ability, political affiliation, sexual orientation, race, religion, or culture.

Don't

- Harass, sexually harass, bully, or discriminate
- Intimidate, threaten, or put down others
- Use inappropriate sexual, nude, or discriminatory images.
- Use physical, written, or verbal abuse
- Photograph or record people without permission
- Destroy, dismantle, deface, or steal Queen's property

Do

- Treat everyone with **respect** and **dignity**
- **Critique ideas** not individuals
- Be **courteous** and **professional** in all communication
- Value a **diversity** of views and opinions
- Be **considerate** and **collaborative**
- **Respect** rules, policies, and property of 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,
- emails, e.g., while communicating with group members or your teaching team, and
- meeting practices (e.g., in tutorials/labs/seminars or virtual meetings.

Name/Pronoun

If, for whatever reason, 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.