

## Course Information

### General Course Information

Course: BIOL 411

Course title: Global Change Biology

Pre-requisites: BIOL 300

Semester and year: Fall 2025

Number of credits: 3

Learning hours: 120

Modality (on campus, blended, or online): On-campus

Classroom accessibility: Accessibility considerations for classrooms/buildings on campus.

### Course Description

This course focusses on the fundamental biology underlying the major global change issues that humanity currently faces. Strong emphasis will be placed on the critical interconnections among issues across hierarchical levels from molecule to biosphere that explain the patterns and mechanisms which have led to our current environmental predicament.

This advanced undergraduate level course will focus on the biology underlying the major global change issues that our civilisation currently faces (e.g. land-use change including deforestation, biodiversity loss, invasive species, climate change, nitrogen pollution, antibiotic resistance...). Strong emphasis will be placed on specifically highlighting the interconnections across hierarchical organisational levels in Biology - from molecule all the way up to biosphere. The course will specifically address the following questions: *What is our current scientific understanding of the specific biology underlying each of the major global change issues? In what ways do these biology-based insights point the way toward potential solutions, and ultimately influence perspectives on our civilisation's future?*

Professor and student-lead seminars will introduce many of the major global change issues as well as a number of conceptual frameworks to understand them and their interactions. Specific concepts will include: Progress trap, Global Planetary Boundaries, Biogeochemical linkage interactions, The Anthropocene, Deep Ecology, Socio-Ecological Stewardship, and Complex Adaptive Systems.

The ultimate aim is to empower students so that they can develop their own perspectives on how to interpret, cope with, and constructively respond to the major global change issues that they will face through the 21<sup>st</sup> century.

Provisional topics outline:

|                                                     |
|-----------------------------------------------------|
| 1. Introduction – conceptual frameworks             |
| 2. Land-use change – patterns, drivers, and impacts |

|                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 3. Carbon Cycle and Climate Change                                                                                                            |
| 4. Antibiotic Resistance and Virus epi/pandemics – rapid evolution of human pathogens                                                         |
| 5. Nitrogen Cycle – too much of a ‘good’ thing                                                                                                |
| 6. Phosphorus Cycle – humanity’s absolute need – peak phosphorus                                                                              |
| 7. Biodiversity – 6 <sup>th</sup> extinction; invasive species                                                                                |
| 8. Freshwater extraction – growing demand, limited supply                                                                                     |
| 9. Ocean acidification – cause, thresholds, and biological impacts                                                                            |
| 10. Atmospheric contaminants – mercury, nitrogen, .....                                                                                       |
| 11. Human population size – the elephant in the room                                                                                          |
| 12. Anthropogenic Electromagnetic Radiation??                                                                                                 |
| 13. Nuclear weapons proliferation??                                                                                                           |
| 14. Success stories: Ozone; Acid rain; ??                                                                                                     |
| 15. Case study: Climate change and other recent perturbations in the Arctic                                                                   |
| 16. Historical perspective – ‘The Short History of Progress’; Progress-traps                                                                  |
| 17. Indigenous and other non-western cultural perspectives on humanity’s relationship with the rest of nature – Perspectives and Implications |
| 18. Emerging perspectives on sustainability: Socio-Ecological Stewardship, Complex Adaptive Systems, Well-being                               |
| 19. Deep Ecology and other Environmental Philosophies                                                                                         |
| 20. What can Biology tell us about our Future?                                                                                                |
| 21. Synthesis                                                                                                                                 |

### Topics

| Week | Module                             | Topic                              |
|------|------------------------------------|------------------------------------|
| 1    | See <a href="#">course webpage</a> | See <a href="#">course webpage</a> |
| 2    | Module name/number                 | Topic                              |
| 3    | Module name/number                 | Topic                              |
| 4    | Module name/number                 | Topic                              |
| 5    | Module name/number                 | Topic                              |
| 6    | Module name/number                 | Topic                              |
| 7    | Module name/number                 | Topic                              |
| 8    | Module name/number                 | Topic                              |
| 9    | Module name/number                 | Topic                              |
| 10   | Module name/number                 | Topic                              |
| 11   | Module name/number                 | Topic                              |
| 12   | Module name/number                 | Topic                              |

### Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Explain and contrast the major global environmental issues that our civilisation faces.
2. Develop and apply an over-arching conceptual framework to identify and organize the principal interactions among major global change issues that ramify their impacts.
3. Describe the patterns and causes of previous civilisations' rises and falls so as to appraise our current global environmental predicament within an historical context.
4. Summarize the impacts of western 'progress'-based, individualist, and capitalist ideologies on humanity's relationship with the rest of the nature, and contrast those with the more holistic ideologies of Indigenous and eastern cultures.
5. Use concepts such as Progress trap, Global Planetary Boundaries, The Anthropocene, Biogeochemical linkage interactions, Deep Ecology, Socio-Ecological Stewardship, and Complex Adaptive Systems to discuss, evaluate, and critique potential solutions for individual global change issues.
6. Identify and analyze the fundamental biological root causes of our civilisation's current environmental predicament, and use that assessment to develop lasting personal solutions for coping with, and constructively responding to, the major global change issues of the 21<sup>st</sup> century.

### **Important University Dates**

Please visit the [Faculty of Arts and Sciences Sessional Dates website](#) for all academic deadlines.

## **Inclusion**

### **Land Acknowledgement**

*Let us acknowledge that 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 spiritualities 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, Diversity, and Inclusivity Statement**

*Queen's University recognizes that the values of equity and diversity are vital to and in harmony with its educational mission and standards of excellence. It acknowledges that direct, indirect, and systemic discrimination exists within our institutional structures, policies, and practices and in our community. These take many forms and work to differentially advantage and disadvantage persons across social*

*identities such as race, ethnicity, disability, gender identity, sexual orientation, faith, and socioeconomic status, among other examples. In this class I will work to promote an anti-discriminatory, anti-racist and accountable environment where everyone feels welcome. Every member of this class is asked to show respect for every other member.*

### **Building a Classroom Community**

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

- Make a personal commitment to learn about, understand, and support your peers.
- Assume the best of others and expect the best of them.
- Recognize and value the experiences, abilities, and knowledge each person brings to the course.
- Acknowledge the impact of oppression on other people's lives and make sure your words and tone are respectful and inclusive.
- Encourage others to develop and share their ideas.
- Pay close attention to what your peers say/write before you respond. Think through and re-read what you have written before you post online or send your comments to others.
- Be open to having your ideas challenged and challenge others with the intent of facilitating growth.
- Look for opportunities to agree with one another, building on and intentionally referencing peers' thoughts and ideas; disagree with ideas without making personal attacks, demeaning, or embarrassing others.

### **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.

## Course Materials & Technologies

### Required Course Textbooks

No individual textbook is available that would cover the scope of the course's content. Selected published papers (from international peer-reviewed science journals such as [Global Change Biology](#)) and book chapters chosen by the prof and by the students will be posted on the onQ system and referenced on the course web site (<https://www.queensu.ca/terrestrial-ecosystem-ecology/teaching/biol-411-global-change-biology/biol-411-global-change-biology-fall-2025>).

### Copyright of Course Material

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's 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.

## Communication

### Questions about the Course and Contacting the Teaching Team

Who should students contact with what types of questions, and how?

### Queen's Email

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

### 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.

## Assessments

### Weighting and Alignment with Course Learning Outcomes (CLOs)

| Assessment                                                             | Alignment with CLOs           | Weighting |
|------------------------------------------------------------------------|-------------------------------|-----------|
| Active participation in discussions (questions, comments, suggestions) | 1,2,3,4,5,6                   | 15%       |
| Seminar written questions                                              | 1,2,3,4,5,6                   | 20%       |
| Group seminar presentation                                             | 1,2,5,6                       | 25%       |
| Final synthesis exercise                                               | 1,6                           | 40%       |
| Assessment 5.                                                          | Course Learning Outcome #(s). | X%.       |
| Assessment 6.                                                          | Course Learning Outcome #(s). | X%.       |
| Total                                                                  |                               | 100%      |

## Policies

### 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 will attend ALL classes, 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 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>

### **Academic Consideration for Students in Extenuating Circumstances**

Academic Consideration is a process for the University community to provide a compassionate response to assist students experiencing unforeseen, short-term extenuating circumstances that may impact or impede a student's ability to complete their academics. This may include but is not limited to,

- Short term Physical or Mental Illness or Injury (stomach flu, anxiety/depression, mononucleosis, concussion, broken bones, surgery, medical treatments, etc.)
- Traumatic Event/Confidential (Bereavement, serious injury, illness or required treatment for a significant other/family member or a traumatic event such as divorce, sexual assault, social injustice, etc.)
- Requirements by Law or Public Health Authorities (court dates, jury duty, requirements to isolate, etc.)
- Significant Event (varsity athletic event, distinguished event, serving in the Reserve Forces, etc.)

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances. For more information, please see the [Senate Policy on Academic Consideration for Students in Extenuating Circumstances](#).

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. For more information, undergraduate students in the Faculty of Arts and Sciences should consult the Faculty's webpage on [Academic Consideration in Extenuating Circumstances](#) and submit a request via the [Academic Consideration Request Portal](#). Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

Students are encouraged to submit requests as soon as the need becomes apparent and to contact their instructor and/or course coordinator as soon as possible once academic consideration has been granted. Any delay in contact may limit the options available for academic consideration.

For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, please see the Faculty of Arts and Science's [Academic Consideration website](#). ASO courses include links to information on **Academic Consideration** on your **Course Homepage** in onQ.

Please see the Teaching Team page for contact information for your instructor and TA(s), where relevant.

### **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.

#### **Syllabus statements for Generative Artificial Intelligence (AI) Tools (select one of the following)**

**This course is intended to help you learn to think for yourself.** Hence, *using generative AI tools such as ChatGPT etcetera in the preparation of your submitted work is **NOT PERMITTED** in this class. Any use of AI in this course constitutes a Departure from Academic Integrity.*

Queen's [Student Academic Success Services](#) (SASS) offers a self-directed, online academic integrity module which we encourage all students to take which will help with:

- Understanding the nature of the academic integrity departure



- Understanding the expectations of and role of sources in scholarly writing
- Integrating sources into your writing (paraphrasing, quoting, summarizing)
- Understanding when and how to cite your sources
- Managing your time effectively to avoid the need for shortcuts
- Taking effective notes to ensure accuracy of source material and correct attribution

## Turnitin Statement

This course may make 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 analyzed 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.

Please read Turnitin's [Privacy Policy](#), [Acceptable Use Policy](#) and [End-User License Agreement](#), which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes.

For further information about how you can exercise control over cookies, see [Turnitin's Privacy Policy](#).

Turnitin may provide other services that are not connected to the purpose for which Queen's University has engaged Turnitin. Your independent use of Turnitin's other services is subject solely to Turnitin's Terms of Service and Privacy Policy, and Queen's University has no liability for any independent interaction you choose to have with Turnitin.

*Portions of this document have been adapted, with permission, from the University of Toronto Centre for Teaching Support and Innovation tip sheet "[Turnitin: An Electronic Resource to Deter Plagiarism](#)".*