



BIOL*3060 Populations, Communities & Ecosystems

Winter 2020

Section(s): C01

College of Biological Science

Credit Weight: 0.50

Version 2.00 - January 02, 2020

1 Course Details

1.1 Calendar Description

This course will explore advanced topics in ecology, building on the foundation provided by BIOL*2060. The course material will be organized around common mechanisms that link ecological processes across levels of organization, such as organism function, species interactions, spatial connectivity and energetic transfers across trophic levels. Emphasis will be on testing ecological theory with quantitative analysis of empirical data, thereby gaining greater depth of understanding of ecological processes at the population, community and ecosystem scales. Through the examination of case studies, students will apply ecological knowledge and quantitative analysis to problem solving in areas such as resource management, conservation of populations and communities, and predicting biosphere responses to climate change.

Pre-Requisites: 10.00 credits including BIOL*2060, (1 of GEOG*2460, STAT*2040, STAT*2060, STAT*2230)

1.2 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.3 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor: Kevin S. McCann
Email: ksmccann@uoguelph.ca
Telephone: +1-519-824-4120 x56861
Office: SC1 2472

Course Co-ordinator: Dori McCombe
Email: dori.mccombe@uoguelph.ca
Telephone: +1-519-824-4120 x58379
Office: SSC 1444

3 Learning Resources

There is no required textbook for this course. You will not be able to master the learning objectives and lecture content of this course unless you fully understand the basic concepts taught in BIOL2060. At the beginning of each module in this course, we will provide a brief review of the concepts we expect you to already know from your previous coursework. If you do not believe that you have mastered these concepts, we recommend that you revisit your notes from BIOL2060 or read the appropriate sections of the electronic textbook that was required in BIOL2060. There are many alternative ways that you can acquire this basic information (other general ecology textbooks, additional readings). In all cases, it is up to you to critically evaluate your understanding of the basic concepts we outline at the beginning of each module, and brush up on knowledge of these concepts if required.

3.1 Required Resources

Courselink (Website)

<https://courselink.uoguelph.ca>

BIOL3060 will make use of the University of Guelph Courselink website, including lectures and reading material. Please check regularly as this will be where we post the most current information and deadlines.

3.2 Required Resources

Regularly, we will distribute additional resources as pdfs on Courselink. This material will include primary literature and case studies that support lecture or tutorial content. It is your responsibility to read and fully understand the material in these pdfs prior to class.

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Identify and evaluate the validity of ecological theories that explain the distribution and abundance of species and the functioning of communities and ecosystems.
2. Identify the common mechanisms that influence population and community dynamics and ecosystem function.

3. Evaluate how ecological processes at one level of organization influence processes at other levels of organization.
 4. Utilize quantitative methods to project the dynamics of populations, communities and ecosystems.
 5. Evaluate hypotheses about mechanisms responsible for the dynamics of populations, the assembly of communities and the functioning of ecosystems using inferential statistical analyses.
 6. Work collaboratively and apply ecological science to formulate solutions to specific conservation and management problems.
 7. Communicate the results of research findings to peers in written documents and oral presentations.
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5 Teaching and Learning Activities

5.1 Course Content

- The emphasis will be on experiential skill development through hypothesis testing, interpretation of quantitative results, and the use of quantitative methods to increase ecological knowledge and solve conservation and management problems.
- Because of the emphasis on experiential learning, the major topics will be organized around specific questions at each level of ecological organization. The four units described below are examples of the questions that will be addressed using lectures, guided class discussions, and tutorial/lab exercises. However, in BIOL3060 we will be highlighting research questions that integrate across these levels of biological hierarchy. Specific content in each unit may be subject to change.
- Unit 1. Environmental physiology of organisms and allometry:
What are the mechanisms by which organisms sense and respond to environmental change? Students will integrate information on the key resources structuring organismal ecology in terrestrial and aquatic ecosystems, and how biological scaling of traits can improve our understanding of both ecological and evolutionary questions.
- Unit 2. Causes of variation in population abundance and spatial distribution:
How can the causes of population dynamics be analyzed? Students will learn to interpret ecological models in terms that form testable hypotheses/predictions for empirical results. Students will see that energy, or ecosystem level processes, can be used to integrate results across the ecological hierarchy from population level dynamics, to consumer-resource dynamics all the way to whole food webs.

Specifically, we will see that the conditions that alters stability, biomass relationships and trophic cascades can be well understood from an energetic perspective.

How does local and regional variation in ecological conditions and resources influence the spatial distribution of organisms? Organisms must find ways to meet their physiological and ecological requirements in a highly heterogeneous world. Students will develop a clearer understanding of underlying sources of variation in fitness constraints (climatic conditions, resource use in relation to resource abundance, and quality) and a variety of behavioral strategies (foraging, home range use, social systems, movement patterns) that provide adaptive ways to cope with these constraints. Lab exercises will focus on evaluating behavioral decision-making.

How does spatial connectivity among populations (meta-populations) influence projections of population dynamics? In the final phase of the population unit, students will expand on the quantitative framework established in UNITS 2A-C to consider how migration among sub-populations influences population dynamics in a case study.

- Unit 3. Explanations for the abundance, number and identity of species in communities:

What are the causes of species composition at the level of the community, the region and the continent? Students will explore species inventory data across different spatial scales to test hypotheses about how species pools and larger scales influence community composition at local scales.

Which processes are the strongest determinants of species co-existence within communities? Students will explore how competitive, consumer-resource and mutualistic interactions determine whether species are able to persist or go extinct within communities. Students will apply the quantitative models developed in UNIT 2 to predict when species are likely to co-exist, and when they are likely to be regulated by the abundance of their food sources or their consumers.

How does spatial connectivity among communities influence projections of community composition? Like populations, aggregations of species exist as meta-communities, with migrants travelling between communities. Students will explore how this connectivity influences species composition, again building on the quantitative foundations explored in UNITS 3A and 3B.

- Unit 4. Regulation of nutrient cycling and energy flows within ecosystems and scaling from genes-to-ecosystems:

How does species composition influence the ecosystem processes such as nutrient cycling and energy flow? The aggregation of species in space and time has consequences for ecosystems because nutrients and energy are transferred

through consumer-resource interactions. Students will explore hypotheses for a relationship between species diversity, food web structure, and ecosystem function, and test predictions from these hypotheses with data in associated lab exercises. We also will explore several examples of studies that are attempting to scale across levels of biological function from genes to ecosystems.

6 Assessments

6.1 Assessment Details

Assignments (20%)

Date: Periodically

Learning Outcome: 1, 2, 3, 4, 5

Throughout that semester we will assign you small assignments in order to move you toward a project paper.

Final Paper/Project (20%)

Due: Fri, Mar 20

Learning Outcome: 4, 5, 6, 7

See Courselink and lecture notes for details.

Midterm Exam (30%)

Date: February 26th in class

Learning Outcome: 1, 2, 3, 5

Cumulative Final Exam (30%)

Date: April 20th 19:00-21:00 h

Learning Outcome: 1, 2, 3, 5

6.2 Important Dates

Deadlines will be posted on Courselink and also will be discussed during lecture. Be sure to attend lectures regularly or you may miss important updates to the curriculum.

7 Course Statements

7.1 Late or Missed Assessments

- Late assignments will be penalized 10% for each 24 hour period except Assignment 1 as it is a Pass/Fail.
- If you miss the midterm exam due to illness or for other reasons officially recognized by the university, your final grade will be reweighted towards the final exam. In the case

of missed final exam, a term paper (typed, 8-12 pages text not including references, double-spaced, 12 point font) will be assigned on a mutually-agreed topic closely linked to the course content. We will not offer makeup exams in this class.

8 College of Biological Science Statements

8.1 Wellness

If you are struggling with personal or health issues:

- Counselling Services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
- Student Health Services is located on campus and is available to provide medical attention.
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.
<http://www.selfregulationskills.ca/>

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as

possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
