



# BIOL\*4110 Ecological Methods

Fall 2022

Section(s): 01

Department of Integrative Biology

Credit Weight: 1.00

Version 1.00 - September 07, 2022

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## 1 Course Details

### 1.1 Calendar Description

This course will examine the theoretical and practical aspects of research methods in ecology. Emphasis will be placed on experimental design, sampling, population estimation, statistical inference, and characteristics of producers and consumers. Students will participate in research projects of their own design, and will gain experience in preparing research proposals, research papers and posters, and making oral presentations.

**Pre-Requisites:** BIOL\*3010, BIOL\*3060, (STAT\*2040 or STAT\*2230)  
**Restrictions:** Restricted to students in BSCH.WBC and Ecology majors/minors

### 1.2 Course Description

In this course you will examine the theoretical and practical aspects of ecological research. Emphasis will be placed on experimental design, sampling, taxon identification population estimation, statistical inference, data visualisation and scientific writing.

You will design and conduct a research project and in doing so gain experience in preparing a proposal, a research paper, poster, and oral presentation. In F19, the research projects will be coordinated around the natural areas on the University of Guelph campus.

### 1.3 Timetable

LEC Tues, Thur 01:00PM - 02:20PM SCIE, Room 2306

LAB Thur 02:30PM - 05:20PM SCIE, Room 2306

### 1.4 Final Exam

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

information.

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## 2 Instructional Support

### 2.1 Instructional Support Team

**Instructor:** Andrew MacDougall  
**Email:** amacdo02@uoguelph.ca  
**Telephone:** 519-824-44120 x 56570  
**Office:** SSC 2459

**Lab Co-ordinator:** Carole Ann Lacroix  
**Email:** botcal@uoguelph.ca  
**Telephone:** +1-519-824-4120 x58581  
**Office:** SSC 2505

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## 3 Learning Resources

### 3.1 Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/pdffiles/calendar.pdf>

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program.

<http://www.bsc.uoguelph.ca/index.shtml> or

<https://www.uoguelph.ca/uaic/programcounsellorshttps>

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.

<http://www.learningcommons.uoguelph.ca/http://www.learningcommons.uoguelph.ca/>

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. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinichttps>
- 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.

If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/csd/>

## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

1. Appreciated the diversity, beauty, intricacies and opportunities involved in conducting ecological research, employing one of the most novel and growing fields in the discipline of environmental sciences: "big data" science using the vast reservoir of published databases from around the globe and easily available online.
2. Design a self-guided research question and project at the level necessary for a fourth-year research project within the constraints imposed by the course (one semester, available resources etc).
3. Apply the scientific method to current ecology problems and evaluate the evidence for an ecological mechanism that demonstrates the use of logic, an evaluation of the literature, incorporation of information on multiple perspectives, and statistical analyses of data.
4. Generate, interpret and develop comfort with abiotic and biotic inventory techniques.
5. To efficiently conduct and record all the steps in Goals 1 and 2 to obtain unbiased

and sufficient abiotic and biotic data.

6. Accurately and effectively this scientific process to a range of audiences, in graphic, oral and written form
  7. To appreciate the unpredictable nature of big data science and have the opportunity to employ problem solving and improvisation.
  8. To develop a level of comfort with the complexity and uncertainty inherent in ecological science
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## 5 Teaching and Learning Activities

### 5.1 Lecture

**Topics:**

Welcome to the class!

We look to offer an engaging and exciting course, with one core goal: provide a meaningful research experience exploring cutting edge questions on the major issues of global change.☒

Your research will model one of the fastest growing disciplines in ecology: the synthesis of "big data". The skills developed here - critical analysis, writing, statistics, oral presentation - will provide valuable research experience, building off of all your previous courses in Ecology and related areas of study.☒

The most important thing we will be emphasizing among all of your acquired skills will be critical analysis: demonstrating your ability to test fundamental processes in ecological systems, how those processes are shaped by aspects of global change, identifying two or more hypotheses that might explain your core research question (e.g., is diversity loss correlated more with broad scale climate change (hypothesis 1) or local habitat loss (hypothesis 2), designing basic analytical approaches to test those hypotheses, and interpreting

the outcomes of your tests. The primary focus in an end-of-term group paper (four of you per group).

Your group paper will use original data to test an important question in modern day ecology. That question could center on climate change, endangered species, the effectiveness of protected areas, challenges balancing biodiversity protection and resource extraction, links between biodiversity and ecosystem function, and so. Each group will come up with their question at the start of class, with the help of me and Colin Bonner (your TA).

Your question will be the focus on your research efforts for the term, centered on four stages: 1. Written research proposal and associated presentation (mid September), 2. Progress update (end of September – presentation ONLY, no written document), 3. Literature review/meta-analysis (late October- presentation ONLY, no written document although the final paper WILL REQUIRE written aspects of your meta-analysis), and 4. Written final report and associated presentation (start of December).

Each of the four group members will present one 12+3 minute talk per term on one of these stages (four presentations per group, one presentation per person for the term). By 12+3 we mean 12 minutes of presentation, followed by three minutes of questions – it's the standard format for most academic conferences.

Your data will come from the 100s of datasets published globally, from the IUCN's database on endangered species to the Ecological Society of America's "data papers". These are original data, freely available, that will form the basis of all of your work. Formerly in BIOL 4110, you would design your own experiment and collect your own data. Here, you will rely on data gathered by others globally, on a question that

interests you and your group members. You will come up with your own hypotheses to test using those data, The types of "big data" available are almost endless. Ideally – start here: <https://ecologicaldata.org/find-data>

Here are some other suggestions:

The IUCN

<https://www.iucnredlist.org/resources/spatial-data-download>

Long-term Canadian data on climate:

[https://climate.weather.gc.ca/index\\_e.html](https://climate.weather.gc.ca/index_e.html)

Data from the US Long-term ecological research (LTER) program: <https://lternet.edu/using-lter-data/>

Global plant traits: <https://www.try-db.org/TryWeb/Home.php>

Arctic plant traits:

<https://onlinelibrary.wiley.com/doi/full/10.1111/geb.12821>

<https://www.journals.elsevier.com/data-in-brief>, which gives 314 results when searching for 'ecology' :

[https://www-sciencedirect-](https://www-sciencedirect-com.subzero.lib.uoguelph.ca/search?q=ecology&pub=Data%20in%20)

[com.subzero.lib.uoguelph.ca/search?q=ecology&pub=Data%20in%20](https://www-sciencedirect-com.subzero.lib.uoguelph.ca/search?q=ecology&pub=Data%20in%20)

a link to UK based centre for ecology & hydrology that has 1000+ available datasets :

<https://catalogue.ceh.ac.uk/eidc/documents>

Here's an example: <https://esajournals-onlinelibrary-wiley-com.subzero.lib.uoguelph.ca/doi/full/10.1002/ecy.2785>

ATLANTIC MAMMALS : a data set of assemblages of medium- and large-sized mammals of the Atlantic Forest of South America

Biodiversity inventories contain important information about species richness, community structure, and composition, and are the first step in developing any conservation and mitigation strategies. The Atlantic Forest of South America is home to around 334 species of small-, medium-, and large-sized mammals, and is currently restricted to less than 12% of its original cover. Here, we present the ATLANTIC MAMMALS, an open data set on information on medium- and large-sized mammal assemblages in the Atlantic Forest of Brazil, Paraguay, and Argentina. A total of 129 studies were compiled, including published and in press peer-reviewed papers, book chapters, theses and unpublished data. We mapped 244 assemblages, eight orders, 63 genera, and 94 species (24 of which are classified as threatened by the IUCN Red List) distributed in 128 protected and 116 unprotected areas. Species richness of the mammalian assemblages varied from 1 to 39 species (mean 15). The most recorded species in the entire biome was *Dasyopus novemcinctus*, followed by *Cerdocyon thous* and *Procyon cancrivorus*. These data can be useful in support of macroecological studies and conservation planning strategies. Please cite this data paper when the data are used in publications. We also request that researchers and teachers inform us of how they are using the data.

As the authors state in this abstract, you can test macroecological questions, on issue such as species distribution or species co-existence. For example, are large mammalian assemblages or the most abundant species associated with certain habitat features such as

forest type, forest area, or regional temperature? Again, we will focus on developing your question in the first day of class, after which you will seek out the best data sets. That sets you up for the rest of the term.☒

Course evaluation will derive for each of you in four ways: 1. your individual presentation on behalf of your group, 2. your group-based submission of written materials during the term (e.g., proposal, literature review, progress report), 3. group dynamic including attendance, and 4. final research paper. Please consult the posted course outline (below) for more specific details on this and other features of the course.

See you in September!

Professor MacDougall

**First class:**

- Thursday, September 8

**Research proposal presentation:**

- Thursday, September 22

**Research proposal due:**



- Tuesday, September 27

Research progress seminar:

- Thursday, October 13

Literature review seminar:

- Thursday, November 10

Research seminar:

- Thursday, December 1

Final research report due:

- Friday, December 2

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## 6 Assessments

### 6.1 Assessment Details

#### **Written Research Proposal (15%)**

**Date:** Tue, Sep 27

**Learning Outcome:** 2, 2, 3, 3, 6, 6, 8, 8

Group work, adjusted by individual contribution as assessed by group members.

#### **Participation (10%)**

**Learning Outcome:** 5, 7, 8

10%

#### **Written Final Research Report (50%)**

**Date:** Fri, Dec 2

**Learning Outcome:** 2, 3, 4, 5, 6, 7, 8

Group work, adjusted by individual contribution as assessed by group members.

### **Oral Presentation (25%)**

**Learning Outcome:** 3, 6, 8

Per student, one oral presentation of either proposal, research progress, meta-analysis, final research.

See 'Important Dates' - there will be four presentations per term by each group, with each group member taking a turn

20%

## **7 Course Statements**

### **7.1 Course Content**

Traditional lectures for this course will be used infrequently to introduce discussions regarding field safety, experimental design, statistics, principles of visualisation and scientific writing. Because it is a 1.0-credit course, students should expect to invest at least an additional 14h/wk. Beyond the irregular lectures, scheduled class times are devoted to discussions and exercises supporting inquiry-based learning. Specifically, groups of students will develop and carry out a semester-long ecological study involving collection and analysis of original data, and scientific report writing.

### **7.2 Release and indemnification form**

Students must understand the distribution of responsibilities when fieldwork is carried out. The University seeks to provide opportunities for an optimum training and educational experience, but it is the student's responsibility to effectively and safely exploit this opportunity. To this end, we (1) append to the course outline a list the kinds of field settings that might be encountered, and the attendant risks involved with these settings, as well as mandatory behaviours that will better ensure that field exercises are conducted safely; and (2) require students to fill out, sign and hand in at the first class, a Release and Indemnification Form (RIF), as a written agreement on your part to follow the behaviours and accept the responsibility for any deviations from them. Failure to hand in the RIF at the first class meeting will result in suspension of permission to conduct fieldwork until the form is handed in. The RIF will be available in class on the first day, and on Courselink thereafter.

### **7.3 Final Work**

The last assignment is considered 'final work' in the course. Consistent with University policy, missed final work will result automatically in submission of a final grade of INC

in the course, and the case referred to the Academic Review Sub-Committee. If the Sub-Committee receives documentation to warrant it, and if the completed term work comprises at least 65% of the final grade (that is, no term work was missed), the instructors will recommend a grade prorated on the basis of completed term work. If the Sub-Committee awards a deferred condition or privilege, the deferred condition or privilege will be to complete the final assignment. To the extent that non-participation could be considered obstruction and interference to learning by other students in the group, penalties may also be in order under University policy with regard to academic misconduct (see below).

## 7.4 Grading

Indicate all course policies regarding in-semester tests and assignment submissions, including time and place for submission of assignments and explicit penalties for late submissions.

# 8 Department of Integrative Biology Statements

## 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

## 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

## 8.3 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. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- 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/>

## 8.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar. (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

## 8.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

# 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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

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>

## 9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 9.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

## 9.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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