

SYLLABUS: Field Ecology and Evolution of Ontario Ecosystems

Instructors

Peter Kotanen and Marc Johnson

Overview and Course Goals

This special topics graduate course is targeted at first and second year graduate students seeking to bridge natural history, theoretical and experimental ecology, and evolutionary biology. The course will involve an intensive two week field course, in which the instructors and graduate students will travel along a latitudinal gradient encompassing four locations from northern Ontario to the most southern ecosystems of Canada.

The objective of the field course is to promote the skills students will require to make natural history observations, and to use these observations to motivate conceptually interesting experiments and theory in ecology and evolutionary biology. We will achieve these objectives while meeting four specific goals.

- 1) Students will learn about the diversity of major ecosystems in Ontario, from the boreal forest to the Carolinian zone. Students will study the taxonomic diversity, observe and characterize ecological interactions, and study ecosystem patterns and processes along a broad latitudinal gradient.
- 2) Students will participate in faculty-led discussions of how to identify and approach questions that present good opportunities for field-based projects, and characteristics of successful and scientifically important studies designed to address such questions, as well as commonly encountered pitfalls.
- 3) Students will be asked to generate tractable hypotheses and questions based on their natural history observations. Simple experiments and data collection also will be performed to allow students to conduct preliminary tests of their hypotheses.
- 4) Students will learn how to build on their natural history observations, hypotheses and data collection by writing and presenting a concise NSERC-type research proposal based on their work during the field course.

Learning outcomes

By the end of the course students are expected to achieve the following learning outcomes.

- 1) Competence in identifying representative plants, animals and fungi using taxonomic keys and other aids.
- 2) Ability to generate testable hypotheses.
- 3) Skill at recording observations of ecological interactions observed in nature.
- 4) Experience in generating a research proposal based on their observations and hypotheses.

Assignments and Grading

The assignments for the course will be designed to evaluate whether students are achieving the expected learning outcomes. Specifically, students' final grades will be comprised of five components.

- 1) **Field note book** (15% of final grade) Students will be expected to keep a detailed notebook recording their observations and scientific ideas. These notebooks will be evaluated for accuracy, completeness, and detail, including information regarding the dates and locations of observations.
- 2) **Short reports** (20% of final grade = 4 reports, each worth 5%) At each of four focal locations located along a latitudinal gradient, students will be expected to generate a testable research hypothesis and research plan. In one page, they will be required to articulate: i) an original natural history observation that they made; ii) the conceptual importance of this observation to ecology or evolution, iii) a hypothesis or research question based on this observation, and iv) a brief description of an experiment or theoretical model they could use to address their hypothesis. Evening discussions during the field course will be based around critically evaluating students' observations and ideas.
- 3) **Natural history quizzes** (20% of final grade = 4 quizzes, each worth 5%) At each of the four focal locations of the course, students will be expected to complete a natural history quiz. These natural history quizzes will be conducted at the end of the classes' stay at each location, and will be designed to test students' knowledge and abilities at identifying species and interpreting the nature of ecological interactions and the functional significance of specific traits and behaviors observed. Students will have access to their notebooks, identification keys, and standard textbooks during these tests.
- 4) **Final presentation** (15% of final grade) Students will orally present to the class a 15-minute preliminary version of a research proposal that further develops one of the ideas they proposed in their short reports. This proposal will act as an oral version of an NSERC "Notification of Intent to Apply", and will briefly describe the scientific problem and the natural history observations that led to it, the research questions and/or hypotheses proposed to test the resulting hypothesis, the basic research approach, and suggested reviewers. These presentations will be held two weeks after the field component of the course.
- 5) **Final Proposal** (30% of final grade) Students will complete a 5 page referenced proposal modelled after an NSERC Discovery Grant application that further develops the idea described in their final presentation. The final proposal will also include a detailed experimental / theoretical plan that that can be used to address the questions asked. This proposal will be due two months after the field component of the course.

Location and Course Structure

First course offering: August 2014

Duration: 11 days in the field plus 1 day for presentations in September.

Capacity: 10 students, but more may be accommodated depending on demand and funding

Course Schedule

Monday 18 August: Travel to Esker Lakes Provincial Park (Boreal Forest)

Tuesday 19 August: Esker Lakes Provincial Park (Boreal Forest)

Wednesday 20 August: Quiz; travel to Algonquin Provincial Park (Canadian Shield Mixed Forest)

Thursday 21 August: Algonquin Provincial Park (Canadian Shield Mixed Forest)

Friday 22 August: Algonquin Provincial Park (Canadian Shield Mixed Forest)

Saturday 23 August: Quiz; travel to Koffler Scientific Reserve (Great Lakes Lowlands Mixed Forest)

Sunday 24 August: Koffler Scientific Reserve (Great Lakes Lowlands Mixed Forest)

Monday 25 August: Koffler Scientific Reserve (Great Lakes Lowlands Mixed Forest)

Tuesday 26 August: Quiz; travel to Long Point Waterfowl Research (Carolinian forest)

Wednesday 27 August: Long Point Waterfowl Research (Carolinian forest; Tallgrass Prairie)

Thursday 28 August: Long Point Waterfowl Research (Long Point wetlands; bird banding)

Friday 29 August: Quiz; return to Toronto

Friday 12 September: Presentations

Friday October 31: Final report due.