

Biology 9438B: Topics in Landscape Genetics

(A Distributed Graduate Seminar)

Department of Biology

Western University

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Course description:

This course in *Landscape Genetics* provides a unique opportunity for interdisciplinary training and international collaboration. The course caters to students of both evolutionary biology, particularly population/evolutionary genetics, and ecology, particularly landscape ecology, spatial ecology and conservation. This course represents the local implementation of a *Distributed Graduate Seminar in Landscape Genetics* that will be held concurrently at several universities internationally. More information about the Distributed Graduate Seminar can be found here:

<https://sites.google.com/site/landscapegeneticscourse/> (note: if you are participating via this local course offering at Western do NOT need to fill out the registration form on the website)

A key objective of landscape genetics is to study how landscape modification and habitat fragmentation affect dispersal and gene flow of organisms across the landscape. Landscape genetics is highly interdisciplinary and makes use of spatial analysis tools such as remote sensing, GIS software and spatial statistics that have not historically been a component of training programs for population geneticists.

This distributed graduate seminar unites some of the most active landscape genetics groups around the world, drawing on the experience of experts in both population genetics and landscape ecology to provide an integrated overview of approaches for testing the effect of landscape pattern on dispersal, gene flow, and genetic diversity. Each seminar session will start with a live web-cast lecture delivered by an expert in the week's topic (one hour), followed by a local group discussion and then a plenary web-based discussion (one hour total for discussion).

Practical experience applying various methods to selected cases studies will be provided through student activities involving data analysis in R and interpretation of sample output.

Students from different universities (and countries) may engage in group projects (participation is optional, see below). Each project, under the direction of a faculty leader, focuses on a different research question in landscape genetics, typically using simulated data and/or existing data provided by the group leader. The goal is for each group project to eventually lead to a scientific publication (many group projects from previous years have been published). Contingent upon funding, selected students from participating universities will be invited to the synthesis meeting (tentatively to be held in Wyoming in late spring or summer of 2024). Here, we will synthesize results of the group projects, and focus on propelling projects toward publication.

Readings:

You will be required to read 1 or 2 book chapters or papers (reviews, case studies) in preparation for each weekly seminar meeting.

Textbook:

'Landscape Genetics: Concepts, Methods, Applications'. 2016. Edited by Niko Balkenhol, Sam Cushman, Andrew Storfer and Lisette Waits. Wiley Blackwell.

Course dates and meeting times:

We will meet every Wednesday from 11:30am to 1:30pm in person (location TBA, to be confirmed in January).

The course will begin on Jan. 10th, 2024 and at Western we will meet officially until April 3rd, 2024. However, the web-cast lectures and discussions with other universities continue for an additional four weeks (until May 1st). Attendance at these last four sessions is optional for Western students but is encouraged, particularly for any students that are participating in group projects (and especially if they will be attending the synthesis meeting).

Course topics and tentative schedule (subject to change):

Date	Topic
	<i>Overview Section</i>
Week 1 (Jan. 10)	Introduction and overview of landscape genetics
	<i>Theoretical Background Section</i>
Week 2 (Jan. 17)	Basics of population genetics
Week 3 (Jan. 24)	Basics of study design
Week 4 (Jan. 31)	Basics of metapopulation dynamics
Week 5 (Feb. 7)	Basics of landscape ecology
Week 6 (Feb. 14)	Basics of adaptation and quantitative genetics
Week 7 (Feb. 21)	Basics of spatial data analysis
	<i>Advanced Topics Section</i>
Week 8 (Feb. 28)	Simulation modeling
Week 9 (Mar. 6)	Assignment and clustering methods
Week 10 (Mar. 13)	Resistance surface modeling
Week 11 (Mar. 20)	Adaptive landscape genetics
Week 12 (Mar. 27)	Model selection
Week 13 (Apr. 3)	Graph theory and network models
	<i>Empirical Applications Section (Attendance Optional)</i>
Week 14 (Apr. 10)	Plant Studies in landscape genetics
Week 15 (Apr. 17)	Aquatic systems – Seascape/Riverscape genetics
Week 16 (Apr. 24)	Group project presentations
Week 17 (May 1)	Bringing it all together

Assessment:

Two alternative assessment options are offered:

- Option 1: Elect not to participate in student group project
 - o Your mark will be based on (1) participation in weekly seminars (55%), (2) write-up of five student activities or labs (TBA, 9% each)
- Option 2: Participate in student project group across universities

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- Your mark will be based on (1) participation in weekly seminars (55%), (2) the written research plan for your group project (10%; due date TBA, likely late Jan. or early Feb.), (3) your final group presentation (10%; April 29th), and (4) your final group report (25%; due date TBA – likely early to mid-May). For each component of the group work, your mark will also be based on your level of contribution to the group.
- Students who participate in a group project have the opportunity to continue the project to collaborate on a manuscript aimed for publication. This is not a credit requirement and will not be included in your course grade.

Scholastic Offences: All students are expected to know, understand, and follow the codes of conduct regarding scholastic offences. A detailed description of scholastic offences, including the policies and procedures, may be found under the Scholastic Offence Policy in the Western Academic Calendar and in the University Senate Handbook (http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf.) Please review this information and ask the instructor if you have any questions about how it applies to this course.