WLF561: Landscape Genetics (2 cr)

Spring 2016, Wed 8:30 – 10:30, CNR 25

Instructors: Lisette Waits and Kim Andrews

and online lectures from experts around the world

Course description

This course on *Landscape Genetics* provides a unique opportunity for interdisciplinary training and an overview of the field of landscape genetics. The course is designed for students with an interest in ecology, evolution, conservation/population genetics, landscape ecology and conservation biology. A key objective of landscape genetics is to study how landscape modification and habitat fragmentation affect organism dispersal and gene flow. Landscape genetics requires specialized interdisciplinary skills making intensive use of population genetic and spatial analysis tools. Even when students receive disciplinary training in these areas, educational programs often lack the necessary linkage and synthesis among disciplines.

Landscape Genetics will be taught in an online format linking students, faculty experts and online participants from multiple universities around the world. This gives students the opportunity to learn from international experts and work with peers from outside institutions. The different universities will be linked by webcast and the course will be taught by an international team of faculty including well known experts in landscape ecology and genetics such as: Niko Balkenhol, Sam Cushman, Rodney Dyer, Andrew Eckert, Marie-Josee Fortin, Erin Landguth, Nusha Keyghobadi, Stephanie Manel, Melanie Murphy, Kim Selkoe, Steve Spear, and Helene Wagner. This course unites some of the most active landscape genetics groups in North America and Europe, drawing on the experience of experts both in population genetics and landscape ecology with the goal of providing an integrated overview of approaches for testing the effect of landscape and environmental variables on genetic diversity, gene flow and adaptive variation.

Each class will start with a ~50 minute live web-cast lecture by an expert on the topic followed by discussion in local seminar groups. After breaking out into local course group discussion, a web-based discussion across campuses will wrap up the weekly topic.

Course Learning Objectives

1. Students should increase their understanding of how landscape ecology and population genetics can be integrated to address research questions in landscape genetics.

2. Students should understand how to design a landscape genetics research project.

3. Students should be able to describe a variety of analytical approaches for addressing landscape genetics research questions.

Course Website: Bb learn and access to international course website obtained after completing this survey
https://docs.google.com/forms/d/1AsqSIjdfzGdZWdSb6emvyz_4UHnlRdqSMwGcIfknHR4/viewform
When completing the survey list University of Idaho as your academic institution.

Grading

Class Participation - 25% (complete assigned readings and actively contribute to discussions in person or online)
Lab assignments – 25% (choose any 2)
Other homework assignments - 25% (~ 3)
LG project presentation 25%

Optional Lab (WLF 562 – 1 credit)

Students who sign up for the lab section are expect to do one of two things.

1) Complete 90% of the self-directed R-based lab assignments (there is also a 8am Wed lab review session that Helene Wagner is leading)
2) Participate in a inter-university group project

There will be information about the group project opportunities on the class website and introduced on the first day of class. Approximately two students from each project will be invited to attend the synthesis meeting from May 31-June 5 at Northern Idaho College in Coeur-d'Alene where we will network with experts and other students, discuss projects and work on turning them into manuscripts for publication.

Grading

Lab section for lab assignments
Grade will be based on average of points across all laboratory assignments.

Lab section for student projects
Project Proposal 25%
Project Report 50%
Project Presentation 25%

Class Schedule

Overview section
Week 1 (Jan 13) – Introductions and overview of landscape genetics (Spear)

Theoretical Background section
Week 2 (Jan 20)- Basics of landscape ecology (Cushman)
Week 3 (Jan 27) – Basics of population genetics (Waits)
Week 4 (Feb 3) – Basics of adaptation and quantitative genetics (Eckert)
Week 5 (Feb 10) – Basics of metapopulation dynamics (Keyghobadi)
Week 6 (Feb 17) – Basics of study design (Fortin)
Week 7 (Feb 24) – Basics of spatial data analysis (Wagner)

Advanced Topics Section
Week 8 (Mar 2) – Simulation modeling (Landguth)
Week 9 (Mar 9) – Assignment and clustering methods (Schoville)
Week 10 (Mar 16)– Resistance surface modeling (Cushman, Spear, Keyghobadi)
Week 11 (Mar 23) – Graph theory and network models (Murphy/Dyer)
Week 12 (Mar 30) – Model selection (Goldberg with input from Dyer/Fedy) Week 13 (April 6)– Adaptive landscape genetics (Manel/Eckert)

Empirical Applications Section
Week 14 (April 13) – Plant Studies in LG (Dyer/Eckert)
Week 15 (April 20) – Aquatic systems – Seascape/Riverscape (Selkoe)
Week 16 (April 27) – Terrestrial animal applications and wrap up (Fedy)
Week 17 (May 4) – Group project presentations
Week 18 (Final week) – Project presentations