Spring 2-1-2019

# BIOB 480.01: Conservation Genetics

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# BIOB 480 Conservation Genetics

## Instructor information

Instructor: Andrew Whiteley
Meeting times: MW 2:00 – 3:20
Location: LA 204
Office: Bio-Research Building (BRB) 004
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Phone: (406) 243-6334
Office hours: Tuesdays 1-3p or by appointment

## Course description

The objective of this course is to provide the genetic basis for solving biological problems in conservation. Major topics will include (1) the basics of population genetics, with emphasis on the genetics of small populations; (2) the application of molecular genetic techniques to conservation biology; and (3) the consideration of case studies of the application of genetics to conservation problems.

## Learning Outcomes

1. You will understand the types of tools and data sets used in Conservation Genetics
2. You will learn population genetic theory, including:
    a. Genetic drift, natural selection, effective population size, gene flow, and linkage disequilibrium
3. You will learn how to apply that theory to problems in conservation biology, including:
    a. Inbreeding depression
    b. Conservation breeding
    c. Hybridization
    d. Defining units of conservation
    e. Genetic monitoring
    f. Evolutionary adaptation to climate change

## Required textbooks

There is one required text

- *Conservation and the Genetics of Populations; 2nd Edition*, 2012, F. W. Allendorf, G. Luikart, and S. Aitken. Blackwell Publishing.

## Class Resources

We will be using Moodle. Go there for lectures, assignments, announcements, and data sets.

## Computer Activities

Hands-on activities will allow you to become familiar with conservation genetic data sets, various computer programs, and simulations to deepen understanding of basic population genetic theory and links between population genetics in a conservation context. You will work in pairs or groups of three on activities throughout the semester. One member of the pair will need to have a laptop that he/she can regularly bring to class. You will use freely available software or Microsoft Excel. More details about software for these activities will be provided in class.

## Group Presentations

Groups of 2-3 students will prepare a PowerPoint presentation on the conservation and genetics of a particular species or conservation genetics issue based on the current literature. Graduate students will be required to write an accompanying paper on the same topic. Please refer to the separate handout for details about when presentation assignments are due and topics I want you to cover. There will be assignments preparing you for the final draft of the presentation throughout the semester. Presentations should roughly follow the following outline (see the presentation handout for more information, available on Moodle):

1) Introduction to the species
2) Major threats to the species
3) Known genetic issues regarding the species
4) Management implications
5) Your recommendations based on the available genetic information
6) Additional genetic information that would be valuable for conservation of the species

## Grading

| | |
|---|---|
| Midterm I | 15% |
| Midterm II | 15% |
| Final (Comprehensive) | 20% |
| Problem Set I | 10% |
| Problem Set II | 10% |
| Presentations | 20% |
| Activities | 5% |
| Class Participation | 5% |

**Course Schedule: (subject to change; problem sets, exams, and other submitted items are in bold)**

**Week 1 (1/14 – 1/16)**

- Introduction (Chapter 1)
- Phenotypic variation (Chapter 2)
- Chromosomal variation (Chapter 3, Section 3.1)

**Week 2 (1/23) (no class on 1/21)**

- Genetic variation in natural populations – Proteins to Genomics (Chapter 3, Section 3.2 – 3.4)
- **Submit species and concepts for group presentations via Moodle – Due January 23rd by 5pm**

**Week 3 (1/28 – 1/30)**

- Genetic Variation (Chapter 4)
- Introduction to genetic and genomic data sets
- Hardy-Weinberg principle (Chapter 5)
- **Problem Set (PS) 1 handed out (Monday January 28th)**

**Week 4 (2/4 – 2/6)**

- Finish Hardy-Weinberg principle
- Genetic drift/Bottlenecks (Chapter 6, Sections 6.1 – 6.4)
- Genetic drift activity
- **PS1 due (Wednesday February 6th)**
- Hand out practice exam 1

**Week 5 (2/11 – 2/13)**

- Effective population size ($N_e$)/Effective number of breeders ($N_b$)(Chapter 7)
- Effective population size activity

**Week 6 (2/20) (no class on 2/18)**

- **Exam 1 (Monday February 20th)**
- Natural selection (Chapter 8)
- Natural selection activity

**Week 7 (2/25 – 2/27)**

- Natural selection/Population subdivision (Chapter 9)
- Population subdivision activity
- **Submit outline of presentation via Moodle – Due February 27th by 5pm**
- **Handout PS2 (Monday February 25th)**

**Week 8 (3/4– 3/6)**

- Population subdivision/Linkage disequilibrium (Chapter 10)
- Quantitative genetics (Chapter 11)
- **PS2 due Wednesday March 14th in class**
- Hand out practice exam 2

**Week 9 (3/11 – 3/13):**

- Quantitative genetics/Inbreeding depression (Chapter 13)

**Week 10 (3/18 – 3/20)**

- **Exam 2 (Monday March 18th)**
- Demography and Extinction (Chapter 14)

**(3/25 - 3/28) Spring Break, no class**

**Week 11 (4/1 – 4/3)**

- Units of conservation (Ch. 16)
- Hybridization (Chapter 17)
- **Submit draft version of presentation via Moodle – Due Friday April 5th by 5pm**

**Week 12 (4/8 – 4/10)**

- Exploited populations (Chapter 18)
- Conservation breeding (Chapter 19)

**Week 13 (4/15 - 4/17)**

- Invasive species (Chapter 20)
- Climate Change (Chapter 21)

**Week 14 (4/22 – 4/24)**

- **Student Presentations**

**4/29 (Monday of Finals Week) 3:20-5:20p: Final exam** will cover lectures and assignments from the entire semester. **NO EARLY EXAMS WILL BE GIVEN**

## Required assignments and tests

- There will be two exams and a comprehensive final
- There will be two problem sets
- Activities will be assigned throughout the semester, either in class or out of class. Due dates will be provided with the activity
- There will be a final group presentation (and papers for graduate students only)

## Course guidelines and policies

**Student Conduct Code**

*All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. If students are caught cheating or plagiarizing on an assignment, they will get a zero for the assignment. If students are caught cheating on more than one assignment or on an exam, they will fail the course.*

**Attendance**

If you need to miss a class, please get notes from another student, perform the readings, review the notes and then come into my office hours with questions regarding the material.

**Course withdrawal**

Important Dates Restricting Opportunities to Drop a Course Spring 2019:

| Deadline | Description | Date |
|---|---|---|
| To 15th instructional day | Students can drop classes on CyberBear with refund & no "W" on Transcript | January 31 @ 5pm |
| 16th to 45th instructional day | A class drop requires a form with instructor and advisor signature, a $10 fee from registrar's office, student will receive a 'W' on transcript, no refund. | February 1 through March 15 @ 5pm |
| Beginning 46th instructional day | Students are only allowed to drop a class under very limited and unusual circumstances. Not doing well in the class, deciding you are concerned about how the class grade might affect your GPA, deciding you did not want to take the class after all, and similar reasons are not among those limited and unusual circumstances. If you want to drop the class for these sorts of reasons, make sure you do so by the end of the 45th instructional day of the semester. Requests to drop must be signed by the instructor, advisor, and Associate Dean (in that order) and a $10 fee applies. Instructor must indicate whether the individual is Passing or Failing the class at the time of request. | March 16 – April 26 @ 5pm |

**Disability modifications**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

**Grading policy**

Final letter grades will be assigned as follows:

| | | |
|---|---|---|
| A = ≥ 92% | A- = 89-91% | |
| B+ = 87-88% | B = 82-86% | B- =79-81% |
| C+ = 77-78% | C= 72-76% | C- =69-71% |
| D + = 67-68% | D = 63-66% | D = 60-63% |
| F = <60% | | |