

**WBIO540 Research Design with WBIO 595 R Lab
Fall 2017**

Students must be enrolled in both the lecture and the lab

Lecture: Lisa Eby

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Office Hours: Tuesday 2:30-3:30pm and Wednesday 1-2pm or by appointment

R-Lab: Dan Eacker, office hours TBD.

Office: Stone Hall 108; phone: 243-5236; email: daniel.eacker@mso.umt.edu;

This class will meet three times weekly MWF 11:10-12:00 in Stone 217 and the computer lab (WILD 595) will be in Stone Hall 107 Wednesdays 2-4 pm.

Course Objectives:

The lecture will be reviewing scientific methods, critically thinking about questions posed in research, and the approach taken to collect data to answer them. Specifically we will explore issues of scientific inference, examine classic experimental and survey design, explore designs for common wildlife and fisheries questions, and investigate quasi-experiments (impact assessments). Within this class the students will be critically reviewing literature, discussing specific design issues, and practice designing experiments and surveys.

The lab will introduce wildlife biology students to the R statistical analysis environment to enhance learning objectives of lecture. Students will be expected to learn R programming skills, R data management and R graphing functions as well an introduction to statistical analysis in R. Labs will be designed to expose students to elements of research design, including basic probability theory, basic frequentist statistical approaches, sampling design, statistical power, maximum likelihood, generalized linear models and extensions, random effects models

Materials: We have a Moodle page to exchange readings, data sets, and assignments for this class. Let us know if you have any problems using Moodle.

Grading:

Participation (15%): This is a graduate class. Therefore it will be a mix of lectures and discussions. We expect you to come with the assigned readings completed and ready to discuss the topic.

Problem sets & assignments (65%): Throughout the semester, there will be assignments in lecture and lab that will ask you to demonstrate proficiency at R, general statistical concepts, and apply issues that we discuss in class, examine outcomes of different designs, evaluate design considerations, develop sampling or experimental designs for specific problems, and critique designs.

Class project (20%): The project for both lecture and lab will focus around your graduate student project. Through a series of assignments, you will be developing the design of your project, explicitly evaluating your designs strengths, weakness and power. Your work will be presented to the class for feedback at the end of the semester. This assignment counts for both the lecture and lab portion of the class.

Topics:

Scientific method and experimental designs

Key components of experimental design, ethics of ecological field experimentation, & basic designs: factorial designs, blocking, nested designs, & split plots

Introduction to design, population survey designs and estimators

Statistical basis for inference, generalized types of designs including different approaches and estimators for sample surveys: random, stratified, systematic, adaptive sampling

Designs and tools for evaluating populations

Monitoring populations: tradeoff in indices, estimators, and occupancy

Demographic information: Open versus closed models, Necessary requirements for different types of information (abundance, survival, migration) and probability of detection

What can genetics tell you about populations? What are major design decisions?

Tradeoffs in resolution and extent, what to monitor, discussion of optimizing designs under economic and observational constraints, trend detection, debate over surveillance monitoring, and a look at genetic monitoring.

Habitat Selection

Habitat use versus habitat selection and basic designs in habitat selection, matching your question to your design
Issues and solutions in traditional approaches

Impact Assessment

Examination of designs for impact assessment, improving your inference strength

Introduction to Adaptive Management and Structured Decision-Making

What is adaptive management and structured decision-making? Linking science and management: doing management relevant research and linking AM/SDM into the management process.

There will be no class Monday Sept. 4th (Labor Day), November 10th (Veteran's Day) or Wednesday-Friday November 23rd and 24th (Thanksgiving). Tuesday December 12th is the last day of regular classes and the exam period assigned to this class is 8-10am December 18th. Please plan to attend, we will need this time for final presentations.

Assignment 1: *Contact either the editor of a journal that you read (or plan to submit to), a statistician (USFS, MFWP, UM), or a funding program leader for grants. Ask these folks (1) what is the most common problem or issue associated with field research projects for funding or publication? (2) What is the most common flaw in studies that you see? (3) And if journal editor or funding program leader, what is most common reason for a manuscript or grant rejection? Due Sept 11th, please submit through Moodle and be ready to discuss in class.*

Class Schedule:

F (9/1): Class goals and introductions.

Moodle Week 1:

W (9/6): Scientific understanding & strengthening science

Belovsky et al. 2004. Ten suggestions to strengthen the science of ecology. Bioscience 54:345-351.

F (9/8): Distorting the Process of Scientific Inquiry

Hutto R.L. 2012. Distorting the Process of Scientific Inquiry. BioScience 62:707-708.

Moodle Week 2:

M (9/11): Discussion Assignment 1: common mistakes to avoid and developing strong inference in research

W (9/13): History of Research design; *Read two classics: Platt 1964 and Chamberlain 1965*

Review: Concepts for Wildlife Science Chapter 1 in Wildlife Study Design: Morrison et al.2008)

F (9/15): Developing research questions and plans

Developing a Research Plan (Ford Chapter 2)

IMPORTANT DATES

10/16-10/27: Student presentations of project – questions, flowcharts, expected results.

12/7 – Exam: period Student presentation of final projects

Class Attendance Policies

Students are expected to attend all class meetings and complete all assignments for courses in which they are enrolled. Instructors may excuse brief and occasional absences for reasons of illness, injury, family emergency, religious observance or participation in a University sponsored activity. Instructors shall excuse absences for reasons of military service or mandatory public service

Academic Honesty

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](#).

Students with Disabilities Statement

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and Disability Services for Students, which is located in Lommasson Center 154. The University does not permit fundamental alterations of academic standards or retroactive modifications.

Important Dates Restricting Opportunities to Drop a Course Autumn 2017:

Deadline	Description	Date
To 15 th instructional day	Students can drop classes on CyberBear with refund & no “W” on Transcript	Sept 21 = last day
16 th to 45 th 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.	Sept 22 through Nov 2
Beginning 46 th 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 45 th instructional day of the semester. Requests to drop must be signed by the instructor, advisor, and Associate Dean (in that order) so if you pursue this request, leave sufficient time to schedule meetings with each of these individuals (generally this will take at least 3-5 working days). A \$10 fee applies if approved. Instructor must indicate whether the individual is Passing or Failing the class at the time of request.	Nov 3 – Dec 12