SYLLABUS

FORS201 – Forest Biometrics
University of Montana
Autumn 2023

About the course

Forest Biometrics focuses on the development and application of statistical methods to advance the ecological sciences and the stewardship of forest resources. Biometrics is fundamental to the design and analysis of silvicultural field experiments, of ecological surveys, and of observational studies of environmental impacts – all activities central the theory and practice of forestry and natural resources conservation. Forest ecologists and environmental scientists, for example, need rigorously-designed field studies to test and expand scientific theories relating to plant community dynamics, fuels treatment effectiveness, or climate change impacts. Foresters and natural resource managers likewise need accurate, data-driven depictions of the ecological resources they manage, and of how they may be impacted by management and conservation practices under consideration.

This course will introduce you to modern empirical methods for forestry and the natural resource sciences, and will give you a grounding in the concepts and techniques used for data collection, data analysis, probabilistic reasoning, and inferential statistics. You'll have the opportunity to apply statistical methods – ranging in scope from descriptive graphical and quantitative analyses to formal probabilistic assessments and regression models – to real-world problems. You'll also build and apply critical thinking skills as they relate to data-driven inferences in scientific and management applications.

Course learning outcomes

By the end of this course you will:

1. Recognize the ubiquity and importance of variation in natural systems and the consequent need for statistical reasoning.
2. Be able to effectively summarize data to characterize central tendency, variation, relationships and other important distributional features of natural resource data.
3. Appreciate the role of randomization in data collection and statistical inference.
4. Understand the concept of sampling distributions, and the utility of the Central Limit Theorem.
5. Be familiar with probability distributions commonly used in statistical inference.
6. Apply appropriate statistical methods to characterize uncertainty, to measure evidence in support of hypotheses, and to make quantitative predictions.

Course prerequisites

This is not a mathematics course but you will apply mathematical concepts and equations. Thus a mathematics course at or above the level of M115 (Probability and Linear Math) is required.

Instructors

Professor David Affleck
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- Mondays 2:30 – 3:30 pm
- by appointment

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Office hours TBD

Course format

Lecture meetings will take place Mondays, Wednesdays, and Fridays in the Social Sciences building room 352. Lectures will focus on statistical concepts and principles. Course materials, online activities/readings/videos, assignments, and announcements will be posted on the FORS201 Moodle website accessible from moodle.umt.edu. To be successful in the course you'll want to attend the in-person lecture sessions and stay current with the online materials.

Lab meetings will take place in the Stone Hall computer labs (Stone Hall rooms 106 & 107):

Monday lab section 1 (CRN 71467) M 10:00 – 11:50 am Stone Hall 106	Wednesday lab section 3 (CRN 74435) W 11:00 am – 12:50 pm Stone Hall 106
Monday lab section 2 (CRN 74434) M 11:00 am – 1:50 pm Stone Hall 107	Wednesday lab section 4 (CRN 71468) W 12:00 – 1:50 pm Stone Hall 107

The labs consist of assignments focusing on applications of the material introduced in lectures and in online activities. They involve data analysis, problem solving, and computing exercises. New lab assignments will be accessible at the start of each lab period and due before the subsequent lab (i.e. in one week's time), unless otherwise noted. Group work is strongly encouraged in labs but every student must submit their own work.

Materials

There is no required textbook for the course, but links will be provided to further reading, interactive simulations, and additional exercises from the Online Learning Initiative (OLI) "Statistical Reasoning" resources and activities. These web-based materials are freely accessible and can be accessed with or without signing up for an OLI account. They can also be accessed across a range of devices and browsers.

Assessment

The course uses three types of assessments:

1. Repeatable online quizzes posted continuously throughout the semester
2. Laboratory assignments posted each week
3. Non-repeatable unit exams (3 in total)

The online quizzes make up 10% of the final grade, the laboratory assignments 50%, and the unit exams will cover the remaining 40%. The quizzes and exams will draw on material covered in class and in labs. Traditional letter grades will be assigned based on the combined percentage grade:

A	≥ 80%
B	79-70%
C	69-60%
D	59-50%
F	<50%

Note that the class is offered for traditional letter grade only.

Miscellanea

Per university policy, all electronic communication associated with the course must be sent to University of Montana email accounts. Ensure that your umconnect.umt.edu email is properly configured and active!

All course activities are governed by the Student Conduct Code, which embodies the ideals of academic honesty, integrity, human rights, and mutual respect. 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.

The University of Montana assures equal access to instruction. If you anticipate or experience barriers based on disability, please contact the Office for Disability Equity (ODE) at 406-243-2243 or ode@umontana.edu. As your instructor, I will work with you and the ODE to seek effective accommodation, and you are welcome to contact me privately if you wish.

Preliminary course outline

Week	Topics and important dates
Aug 28	Course overview; structure of data and classification of variables; tabular & graphical analysis of categorical variables
Sept 4	Analysis of quantitative variables: histograms; measuring central tendency • Monday is Labor Day – no lecture or lab meeting on Monday, Sept. 4
Sept 11	Characterizing variation: interquartile range and standard deviation • Sept. 18 is the last day that courses can be dropped on Cyberbear with a refund
Sept 18	Ranks, percentiles, standardizations, and standard scores
Sept 25	Bivariate relationships: visualizing, characterizing, and quantifying strength
Oct 2	Linear regression: finding the line of best fit for description and estimation.
Oct 9	Sampling principles and sampling designs: random, systematic, stratified
Oct 16	Study design: Comparative experiments and observational studies
Oct 23	Introduction to probability and random variables
Oct 30	The normal or Gaussian distributions • Dropping fall classes after Sept. 18 but before Oct. 30 requires instructor and advisor approvals; you will receive a 'W' on your transcript and no refund. After Oct. 30, classes can be dropped only under limited and unusual circumstances and will require approvals from instructor, advisor, and Associate Dean.
Nov 6	Sampling distributions and the Central Limit Theorem • Friday is Veterans' Day (observed) – no lecture meeting on Friday, Nov. 10
Nov 13	Introduction to interval estimation; confidence intervals for population proportions and means
Nov 20	Introduction to significance testing: mechanics, test statistics, critical values and p-values • Thanksgiving break Nov 22-24; no lecture or lab meetings on these days
Nov 27	Significance tests of population proportions
Dec 4	Significance tests of population means and advanced topics (tests of independence, regression inference, ANOVA); course review • Classes end on Dec 8
Dec 11	Exam week - no classes or lab meetings this week • Last unit exam on Monday, December 11th

Preliminary Lab Schedule (check Moodle for latest updates)

Lab	Topic	Monday lab group	Wednesday lab group
1	Introduction to Microsoft Excel (and the computer labs)	Aug 28	Aug 30
2	Describing and interpreting data distributions	Sept 11	Sept 6
3	Quantifying distributional features	Sept 18	Sept 20
4	Creating and interpreting scatterplots and correlation	Sept 25	Sept 27
5	Linear regression	Oct 2	Oct 4
6	Data collection	Oct 16	Oct 18
7	Probability	Oct 23	Oct 25
8	Working with the normal distributions	Oct 30	Nov 1
9	Sampling distributions & central limit theorem	Nov 6	Nov 8
10	Confidence intervals	Nov 13	Nov 15
11	Significance testing	Dec 4	Dec 6