



RNR 321: Ecological Surveys and Sampling (3 units)

Course Description:

General principles for quantifying attributes of natural resources in ways that facilitate good conservation, restoration, and management outcomes. Fundamentals of sampling design, field surveys, data collection, and data analysis, with emphasis on methods for plant and animal populations. Explore how sampling designs and approaches affect the quality of data and scope of inference that result from a study.

Course Prerequisites:

MATH 163 or MATH 263, AREC 239, SBS 200, PSY 230, or equivalent

Instructors:

Main Instructor

Ellen Bledsoe, PhD (she/her; they/them)
Assistant Professor of Practice in Data Science
School of Natural Resources and the Environment
Office: ENR2 N257
Email: ebledsoe@email.arizona.edu

Office Hours

Tuesdays 1-2:30 pm and by appointment

Office hours are times I set aside weekly specifically to meet with students about course material (or whatever else you need to chat about). You are not imposing or wasting my time! Please come talk to me if you have any questions, concerns, etc.

I'll be holding office hours exclusively via Zoom this semester unless otherwise stated.

Zoom: <https://arizona.zoom.us/j/87605224417>

Teaching Assistant

Allie Lalor
MS Student, School of Natural Resources and the Environment
Office: ENR2 N270 DD (central cubicle)

Email: allielalor@email.arizona.edu

Office Hours

Mondays 10-11 am (in person) and by appointment (Zoom)
ENR2 N572

Course Details

Classrooms and Meeting Times

Lecture

Mondays, Wednesdays from 11:00-11:50 am
ENR2 Bldg., Room S210
Zoom: <https://arizona.zoom.us/j/86984700221>

Lab

Mondays from 2:00-4:50 pm
ENR2 Bldg., Room N250
Zoom: <https://arizona.zoom.us/j/81002845376>

Course Format

Lectures, small group activities, experiential learning

Course Objectives

During this course, students will

- 1) Describe the principles of scientific investigation, sampling, and statistical summary in ecology
- 2) Evaluate appropriate sampling and surveying methods for different ecological investigations
- 3) Analyze various sampling approaches and the circumstances where they are best applied
- 4) Assess the role of doubt in data informed decision making

Student Learning Outcomes

By the end of this course, students will

- 1) Define, differentiate, and explain the nature and application of modern analytical methods for handling and using data as it relates to real-world scenarios;
- 2) Associate, examine, and compare how to infer meaning and insight from data through written, visual, and verbal communication to both experts and non-experts;

- 3) Summarize, implement, and appraise data analytics as they relate to addressing real-world challenges;
- 4) Practice, manage, and design a personal toolbox of data analytic skills useful for discipline specific courses and careers

Course Schedule

This course will be taught in the following five modules, or sections. Specific deadlines can be found on the **ReadMe First** page on D2L.

Module 1: Making the Unknown Knowable (Jan. 12 - Feb. 2)

How do we describe data? How do we summarize data effectively? What introduces bias in sampling and what can we do about it?

Week	Dates	Topic(s)
1	Jan 12	Welcome to RNR 321!
2	Jan 19 (no class Jan17)	Intro to Sampling in Ecology
3	Jan 24, 26	Summarizing Data
4	Jan 31, Feb 2	Sampling & Survey Basics 101; Quiz 1

Module 2: Data, Meet Computer (Feb. 7 - Feb. 23)

Introduction to computer science for ecologists. What is the importance of reproducibility in scientific research and how can computing improve it?

Week	Dates	Topic(s)
5	Feb 7, 9	Reproducibility in Research; Introduction to R
6	Feb 14, 16	Introduction to R
7	Feb 21, 23	Data Visualization; Quiz 2

Module 3: Detection Probabilities (Feb. 28 - Mar. 23)

When we sample, we are getting a subset of a population. How do we characterize how well we are able to detect individuals when they are actually there?

Week	Dates	Topic(s)
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8	Feb 28, Mar 2	Stratified and Systematic Sampling
-	Mar 7-Mar 13	SPRING BREAK
9	Mar 14, 16	Detection Probability
10	Mar 21, 23	Detection Probability; Quiz 3

Module 4: Characterizing Biological Populations (Mar. 28 - Apr. 13)

How do we determine whether a species is present or absent in a particular location?

Week	Dates	Topic(s)
11	Mar 28, 30	Distance Sampling (Density)
12	Apr 4, 6	Occupancy (Presence-Absence)
13	Apr 11, 13	Occupancy; Quiz 4

Module 5: Population Abundances and Characterizing Communities (Apr. 18 - May 4)

If we want to know how many individuals there are in a population, how do we sample? How about how many species are present? How do we determine biodiversity?

Week	Dates	Topic(s)
14	Apr 18, 20	Mark-Recapture
15	Apr 25, 27	Removal Methods
16	May 2, 4	Species Diversity; Quiz 5

Evaluation and Grading

Each module has the following activities: 2 assignments, 2 chats, 1 discussion, and 1 quiz; collectively, each module is worth 100 points.

Evaluation

Activity	Value
Quizzes (5 x 30 points)	150
Assignments (10 x 25 points)	250

Discussions (5 x 10 points)	50
Chats (10 x 5 points)	50
<u>Total</u>	<u>500 pts</u>

Grades

<u>Score</u>		<u>Grade</u>
90-100%	(450-500 points)	A
80-89%	(400-449 points)	B
70-79%	(350-399 points)	C
60-69%	(300-349 points)	D
0-59%	Below 300 points	E

Graded Activities and Examinations

The due dates for activities are firm. You are highly encouraged to complete and turn in your assignments and activities early to avoid possible computer issues at the time of the due date. If there is an unforeseen computer or system error at the time of the due assignment students may alternately email the assignment to the instructor to avoid a late penalty.

Do your best to respect due dates; it helps those of us who are grading your assignments to allocate our time appropriately. However, unforeseen circumstances happen! If you need an extension, please ask. I would rather you turn in better work a day or two late than shoddy work at the deadline because something happened in your life beyond your control. If you have not asked for an extension, late work will be penalized by 5% total points per day until the highest percentage you can earn is 60%.

There is no attendance policy. There are multiple ways for students to engage with each other and the instructor in lectures and outside of lectures.

Incomplete grades will be given only in special circumstances as outlined in university policy as stated in the University of Arizona General Catalog (<http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete>)

Assignments:

There are 10 assignments for this course. These assignments will be based on course and lab content and involve applying or testing skills that have to do with the course that we have practiced in labs. As such, most assignments will be fairly data-heavy.

Rubrics for assignments will be posted in D2L. The two assignments per module are both due before the next module starts (AKA before the first class of the next module). Students are responsible for making sure their files open correctly after submitting them; any files that are corrupt or in the wrong format will be counted as late (minus 5% total points per day) until an acceptable file is submitted.

Discussions and Chats:

Discussions and chats are asynchronous, online ways for us to communicate with each other about course materials and assignments. They are due before the next module starts (AKA before the first class of the next module). There are 5 discussion assignments in this course and 10 chats. Discussions and chats can both be accessed by clicking on the discussion link in the upper blue banner of the course site or in the appropriate module folder on D2L.

- Discussions dive deeper into course material, facts, and collective and personal experiences. They can be written, verbal, or graphical depending on the questions posed. They are directed toward a professional audience.
- Chats are a quicker, more direct form of communication designed to facilitate community building and sharing of ideas. They are directed toward a social (e.g., friends) audience.

Grading of discussions and chats will use the following rubric: 1 point for a clear topic sentence, 2 points for use of course materials in your replies to the topic (if relevant), and 2 points for two meaningful responses to other posts (points are worth double for discussions). Full rubrics are posted on D2L in **ReadMe First**. All students are expected to commit to being involved in the discussions by reading and responding to your own and other people's posts with meaningful, professional content created to help fellow classmates.

Quizzes:

There will be 5 online quizzes given during the course of the term, each on the last day of each module. The quizzes will be taken via D2L but taken during class time. They are open notes and open book. Due to this open format, the quizzes will hold only a moderate weight in your class points. Each quiz will be available for 1 attempt. Exam schedule is available above and on D2L in **ReadMe First**.

NOTE: If for any reason the system has an error or outage while you are taking a quiz, please email the instructor so they can verify your login time with D2L and reset your quiz. Don't panic, we can fix this.

Course Policies

Course Communication:

Depending on how you are taking this class, class meetings will vary from face to face to entirely online. You are responsible for participating in these lectures and learning the material presented regardless of format. Interactions outside of face-to-face class time will take place via Brightspace Desire To Learn (D2L; <http://d2l.arizona.edu>). Please check the course D2L site daily for any announcements related to this course. Students should anticipate spending **135 hours** (3 unit course) on activities related to this course. These hours break down as follows: 50 hours on lectures, reading materials, and videos; 20 hours in lab not working on assignments; 50 hours on assignments and activities; 5 hours on quizzes; 10 hours on communication with the instructor and other students.

Required Texts, Readings, and Videos:

Students will not have to purchase additional texts, readings, or videos for this course. All material will be available on D2L as open source material (AKA free).

Required Materials:

Students are highly encouraged to have their own computer. Many of the in class activities will involve a computer and many of the online interactions are too complex for a smartphone. Students without access to a laptop or equivalent computational resources should contact the instructor immediately to arrange one to borrow for the entire semester.

Course Behavior Policy:

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

University Policies

University Land Acknowledgement Statement

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

Absence and Course Participation Policy:

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available [here](#). The [UA policy](#) regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable. Absences [preapproved by the UA Dean of Students](#) (or dean's designee) will be honored.

Make-Up Policy for Late Enrollment:

Students who enroll late for this course should contact the instructor immediately to negotiate a schedule to complete missed activities and assignments.

Threatening Behavior Policy:

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations:

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the *Disability Resource Center* (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

Code of Academic Integrity:

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

University standards for plagiarism will apply to grading. The UA Student Code of Conduct states: "All forms of student academic dishonesty, including but not limited to cheating, fabrication, facilitating academic dishonesty, and plagiarism, are prohibited."

"Plagiarism" means representing the words or ideas of another as one's own. Check out U Arizona Libraries quick guide to help you discern between plagiarism and not plagiarism (<http://new.library.arizona.edu/research/citing/plagiarism>).

Any written assignment found to be previously or concurrently submitted for evaluation in another course will receive a failing grade. We use software which checks your work against a database. It's really easy for any instructor to figure out if your writing is actually someone else's, we mean ridiculously easy. **Please use your own words.**

Students are advised that all notes, lectures, study guides, and other course materials disseminated by the instructor to the students, whether in class or online, are original materials and as such reflect intellectual property of the instructor or author of those works. All readings, study guides, lecture notes, and handouts are intended for individual use by the student, not for commercial gain. Students may not distribute or reproduce these materials for commercial purposes without the express written consent of the instructor and university. Students who sell or distribute these materials for any use other than their own are in violation of the University's Intellectual Property Policy (available at http://www.ott.arizona.edu/uploads/ip_policy.pdf). Violations of the instructor's copyright may result in course sanctions and violate the Code of Academic Integrity.

UA Non-Discrimination and Anti-Harassment Policy:

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Discrimination includes any form of unequal treatment such as denial of opportunities, harassment, and violence. Violence includes sex-based violence such as rape, sexual assault, unwanted touching, stalking, dating/interpersonal violence, and sexual exploitation.

If you experience discrimination by faculty or staff, you are encouraged (but not required) to report the incident to the Office of Institutional Equity (520-621-9449). If you experience discrimination by another undergraduate, graduate, or professional student, please feel free to report the incident to the Dean of Students (520-621-7057).

Learn more about your rights and options at <http://equity.arizona.edu> or call 520-621-9449 or email equity@email.arizona.edu. Students may also contact the Oasis Program (520-626-2051), the Tucson Rape Crisis Center (520-327-1171) and Campus Health Counseling and Psych Services (520-621-3334) as confidential resources for advocacy and other support related to power-based personal violence such as rape and sexual assault.

Confidentiality of Student Records:

Students should know the federal regulations regarding the privacy of their academic records <http://www.registrar.arizona.edu/ferpa/default.htm>

Additional Resources for Students:

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Campus Health

<http://www.health.arizona.edu/>

Campus Health provides quality medical and mental health care services through virtual and in-person care.

Phone: 520-621-9202

Counseling and Psych Services (CAPS)

<https://health.arizona.edu/counseling-psych-services>

CAPS provides mental health care, including short-term counseling services.

Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program

<http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.

Email: DOS-deanofstudents@email.arizona.edu

Phone: 520-621-7057

Survivor Advocacy Program

<https://survivoradvocacy.arizona.edu/>

The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.

Email: survivoradvocacy@email.arizona.edu

Phone: 520-621-5767

Campus Pantry

campuspantry.arizona.edu/

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website for open times.

Subject to Change Statement:

Information contained in the course syllabus, other than the grade policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.