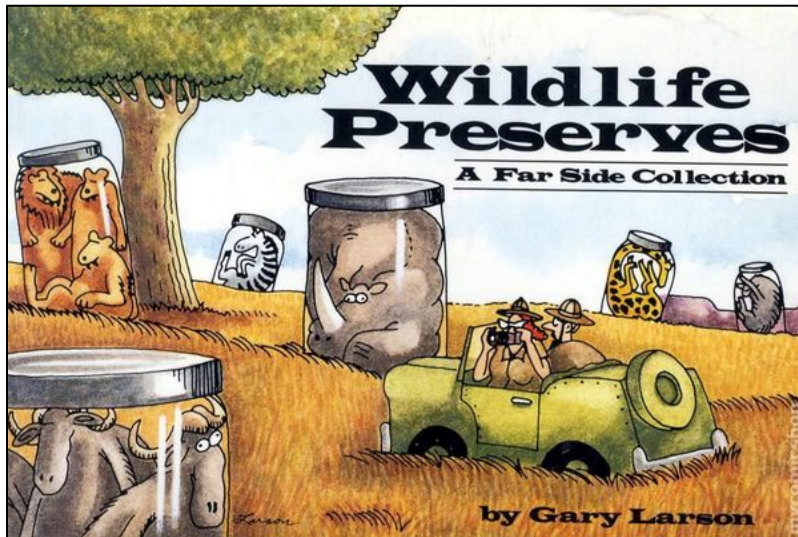# WILD 470: Conservation of Wildlife Populations
Spring Semester 2023

Lecture instructor: Kaitlyn (Kaity) Reintsma, PhD Candidate in Wildlife Biology
Office hours: Thursdays 1-2 pm in FOR 314*
Email: kaitlyn.reintsma@mso.umt.edu**

Lab instructor: Lindsey Barnard, PhD Candidate in Wildlife Biology
Office hours: Fridays 11 am-12 pm in NS 310*
Email: lindsey.barnard@umontana.edu**

Teaching assistant: Elizabeth Painter, PhD Student in Wildlife Biology
Office hours: Tuesdays 1-2 pm in SH 105B*
Email: elizabeth.painter@ umontana.edu**

* or by appointment- in person or over zoom
** with WILD 470 in the subject line

Class meeting times and locations
- Lecture: M/W/F 9:00 – 9:50 am in Stone Hall Room 304
- Lab: M 1:00 – 2:50 in Gallagher Business Building Room 213, bring a laptop or use the available school computers

Course description
By the end of the course students should understand how we measure populations (abundance/density) and demographic rates (birth, death, immigration, emigration), what affects populations, and how we manage/conserve populations. Students will gain proficiency with quantitative methods in population ecology including various types of

population models and several ways to estimate population processes. Additionally, students will demonstrate their understanding of the scientific method and proficiency of scientific writing.

Readings required before each class: *Conservation of Wildlife Populations 2nd Edition* Scott Mills. Ebook available for free through UM Library website (https://www.lib.umt.edu/), additional readings will be assigned and uploaded on Moodle.

Course website: Moodle found through UMOnline (https://umonline.umt.edu/). I will post announcements and some assignments through Moodle. You can also check your current grade on Moodle. The basics of Moodle are taught in a tutorial, "Moodle 101 for Students", on the course Introduction page if you are not familiar with the site.

Required course software: Program R available for free (https://www.r-project.org) and R Studio (https://rstudio.com/products/rstudio/download/#download) is a recommended user interface for R. You may use R on your personal computer or your workstation in the lab.

Tentative Grading

	Grade		*Notes*	*Due date*
Quizzes	10%	40 points	occur in class ~once a week	end of class
Lab assignments	20%	80 points	each lab will have an associated assignment	due 1:01 pm on Mondays (start of next week's lab)
Exam I	15%	60 points		Feb 17
Exam II	15%	60 points		Mar 29
Final Exam	20%	80 points		May 12
Research proposal	20%	80 points	See details in section below	
Annotated Bibliography		10 points		Feb 1
Project Title and Outline		10 points		Feb 22
Draft 1		20 points		Mar 27
Peer review		10 points		Apr 12
Final draft		30 points		May 1
Total	100%	400 points		

Quizzes
During the lecture, I will ask you to write down the answers to questions I pose approximately once a week. After writing your answers I may ask you to discuss what you wrote with your classmates or share your answers with the class. Remember to turn these in before the end of class for points. These will be pass/fail grades.

Research proposal
Each student is required to prepare a research proposal on a topic of his or her choice related to wildlife population ecology. The proposal should include six sections: an abstract (≤250 words), introduction to the topic, hypotheses and predictions, research methods, expected products and literature cited in Journal of Wildlife Management style. The length of the proposal including all sections is a minimum of 8 pages and a maximum of 10 (including literature cited), double-spaced with 12-point Times New Roman font. You will go through all the traditional steps to creating a real research proposal, including research (i.e., annotated bibliography), developing an outline, and multiple drafts with peer review. Each assignment will have a detailed rubric available on Moodle.

Plagiarism
Plagiarism will not be tolerated. Be sure you recognize the difference between *plagiarism*—"submitting someone else's text as one's own" with the intent to avoid doing original work— and *misuse of sources*—"carelessly or inadequately citing ideas and words borrowed from another source".

Late Work
Quizzes will not be accepted after the end of class. All other assignments may be turned in after their due date, but an additional 10% will be deducted from the grade. After 5 days no credit will be given for that assignment.

Grace periods
I understand that life happens and that difficult situations can arise during the school year. Please feel free to email or talk with Kaity concerning exams or project-related assignments and Lindsey for lab assignments about due date extensions, which will be given on a case-by-case basis.

Grading mistakes
Assignments will be graded within two weeks of being turned in. We are all humans and will likely make grading mistakes at some point. Please check your Moodle grades regularly and report grading issues to the appropriate person (i.e., Kaity for quizzes, exams, and projects, Lindsey for lab work) within two weeks of receiving a grade for the possibility of getting points back.

Lecture Schedule - *subject to change*

Date	Lecture Topic	Reading(s) & Notes
Mon, Jan 16	**No class** – Martin Luther King Jr. Day	No lab this week
Wed, Jan 18	**Introduction to Wildlife Conservation** Learning Objective: By the end of the class students should be familiar with the syllabus including assignments, grading, and course content.	Syllabus
Fri, Jan 20	**The Big Picture** Learning Objective: By the end of class, students should have a basic understanding of population processes including age structure, species accumulation curves, and extinction rates.	Ch. 1
Mon, Jan 23	**Reliable Knowledge: Part 1, Study Design and Hypotheses** Learning Objective: By the end of the lesson, students will understand the difference between standard deviation, standard error and variance, and be able to describe the three rules of study design.	Ch. 2
Wed, Jan 25	**Reliable Knowledge: Part 2, Comparing Hypotheses** Learning Objective: By the end of the lesson students will be able to recognize and explain the difference between Bayesian and frequentist statistics and draw a figure illustrating the principle of parsimony.	Ch. 2 & 3
Fri, Jan 27	**Guest speaker: Dr. Mike Mitchell** Philosophy of science	Sells et al. 2018
Mon, Jan 30	**Estimating Vital Rates, Methods for estimating Abundance** Learning Objective: Students will be able to explain the difference between Type I and Type II error. Students will be able to describe the Principle of Parsimony and draw a figure illustrating this principle.	Ch. 4
Wed, Feb 1	**Estimating Abundance: Mark-recapture**	Ch. 4

	Learning Objective: By the end of the lesson students will be able to implement the Lincoln-Peterson equation and for closed populations and identify assumptions in mark-recapture studies. **Annotated Bibliography Due**	
Fri, Feb 3	**Survival and Reproduction** Learning Objective: By the end of the lesson students will be able to calculate survival probability using a Kaplan-Meier survival model, and list other methods scientists use to estimate survival. Writing center presentation & proposal Guidelines and discussion.	Ch. 4; Read the "Proposal Assignment Details" document on Moodle
Mon, Feb 6	**Population Trends and Exponential Growth: Part 1** Learning Objective: Students will understand the difference between continuous and discrete geometric growth rates and how they can be connected and be able to write equations for both types of growth.	Ch. 5; Grenier et al. 2007
Wed, Feb 8	**Exponential Growth: Part 2** Learning Objective: Students will be able to calculate doubling time of a population and recognize the consequences of different r and lambda values on population growth.	Ch. 5
Fri, Feb 10	**Stage Structured Populations: Part 1** Learning Objective: Students will be able to construct a stage structured population matrix and explain how to determine the stable stage distribution and SSD growth rate.	Ch. 6
Mon, Feb 13	Exam Review! Come with Questions!	
Wed, Feb 15	**Guest speaker: Dr. Paul Lukacs** Stage-structured population example	TBD
Fri, Feb 17	**EXAM 1**	
Mon, Feb 20	**No class** – President's Day	
Wed, Feb 22	**Stage Structured Populations: Part 2**	Ch. 6

	Learning Objective: The concepts of transient dynamics and reproductive value in the context of population dynamics will be introduced. Student will be able to explain how the two are related. **Project Title and Outline Due**	
Fri, Feb 24	**Sensitivity Analyses** Learning Objective: By the end of class students will be able to explain the difference between sensitivity and elasticity in matrix projection models and describe ways we can model stochasticity.	Ch. 6
Mon, Feb 27	**Density Dependence: Part 1** Learning Objective: By the end of the lecture, students will understand how carrying capacity is determined, be able to identify all parts of the logistic growth equation.	Ch. 7
Wed, Mar 1	**Density Dependence: Part 2** Learning Objective: By the end of class students will be able to identify how changes in r impact population dynamics, and be able to describe positive density dependence. **Guest speaker: Nelle Jenkins**	Ch. 7
Fri, Mar 3	**Guest speaker: TBD**	TBD
Mon, Mar 6	**Predation: Part 1** Learning Objective: By the end of the lesson students will be able to calculate predation rate, and explain the difference between Type 2 and Type 3 functional responses to predation.	Ch. 8
Wed, Mar 8	**Predation: Part 2** Learning Objective: At the end of the lesson students will be able to define compensatory vs. additive predation mortality and offer three reasons why predation does not necessarily reduce prey numbers.	Ch. 8
Fri, Mar 10	**Guest speaker: Dr. Chad Bishop** Predation example	Bishop et al. 2009 and Hurley et al. 2011
Mon, Mar 13	**Genetic Drift and Inbreeding**	Ch. 9

	Learning Objectives: By the end of lecture students should comprehend the four processes that shape genetic variation in a population and understand how genetic drift and inbreeding can affect population dynamics and/or vital rates.	
Wed, Mar 15	**Population Connectivity** Learning Objective: Students will learn how habitat fragmentation is connected to dispersal and identify methods to quantify dispersal both through physical tracking and genetic methods.	Ch. 10
Fri, Mar 17	**Guest speaker: TBD**	TBD
Mon, Mar 20	NO CLASS – Spring break	
Wed, Mar 22	NO CLASS – Spring break	
Fri, Mar 24	NO CLASS – Spring break	
Mon, Mar 27	Exam Review! Come with Questions! **Draft 1 Due:** Bring a hard copy to class!	
Wed, Mar 29	**EXAM 2**	
Fri, Mar 31	**Source, sinks, and ecological traps** Learning Objective: Students will be able to identify differences between source and sink habitats and provide examples of ecological traps and refugia.	Ch. 10
Mon, Apr 3	**Climate Change Effects: Part 1** Learning Objectives: By the end of class, students will be able to give examples of both the direct and indirect effects of climate change.	
Wed, Apr 5	**Climate Change Effect: Part 2** Learning Objectives: Students will be able to explain why population variability interacts with climate change predictions, and hopefully feel more optimistic about our future.	
Fri, Apr 7	**Guest speaker: Dr. Scott Mills**	TBD
Mon, Apr 10	**Extinction and PVAs: Part 1**	Ch. 12

Wed, Apr 12	**Extinction and PVAs: Part 2** **Reviewer comments due**	Ch. 12
Fri, Apr 14	**Focal Species**	Ch. 13
Mon, Apr 17	**Sustainable Harvest: Part 1**	Ch. 14
Wed, Apr 19	**Sustainable Harvest: Part 2**	
Fri, Apr 21	**Endangered Species**	No lab this week
Mon, Apr 24	**Adaptive Management**	
Wed, Apr 26	**Economics of Wildlife Management**	
Fri, Apr 28	**Policy Design**	
Mon, May 1	**Guest speaker: Dr. Sarah Sells** **Final Research Proposal Due:** Bring a hard copy to class!	Reading TBD; No lab this week
Wed, May 3	**Final Wrap Up Lecture**	
Fri, May 5	Exam Review! Come with questions! Final Exam is cumulative.	
Fri, May 12 @ 10:10 am – 12:10 pm	**FINAL EXAM** may be incorporated into class time based on class feedback	

Lab Schedule - *subject to change*

Mon, Jan 16	**No lab – Martin Luther King Jr. Day**
Mon, Jan 23	Lab 1: Introduction to R: Biodiversity and Humans
Mon, Jan 30	Lab 2: Understanding Uncertainty
Mon, Feb 6	Lab 3: Hypotheses and Predictions
Mon, Feb 13	Lab 4: Mark-recapture
Mon, Feb 20	**No lab – President's Day**
Mon, Feb 27	Lab 5: Exponential Growth
Mon, Mar 6	Lab 6: Stage Structured Populations

Mon, Mar 13	Lab 7: Methods Review
Mon, Mar 20	**No lab – Spring break**
Mon, Mar 27	Lab 8: Density Dependence
Mon, Apr 3	Lab 9: Peer Review
Mon, Apr 10	Lab 10: Genetic Drift, Extinction, and Genetic Rescue
Mon, Apr 17	Lab 11: Small Populations—Channel Island Foxes
Mon, Apr 24	Lab 12: Stakeholder debate, White Tailed Deer Policy
Mon, May 1	**No lab**

The Writing Center: The Writing and Public Speaking Center provides one-on-one tutoring to students at all levels and at any time in the writing process. Visit now. Visit often. We're ready when you are. www.umt.edu/writingcenter.

UM POLICIES AND GUIDELINES

Grading option: This class is offered for traditional letter grade only.

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 (or see link: https://www.umt.edu/student-affairs/community-standards/default.php).

Cultural leave: Cultural or ceremonial leave allows excused absences for cultural, religious, and ceremonial purposes to meet the student's customs and traditions or to participate in related activities. To receive an authorized absence for a cultural, religious, or ceremonial event the student or their advisor (proxy) must submit a formal written request to the instructor. This must include a brief description with inclusive dates of the cultural event or ceremony and the importance of the student's attendance or participation. Authorization for the absence is subject to approval by the instructor. Appeals may be made to the Chair, Dean, or Provost. The excused absence or leave may not exceed five academic calendar days- not including weekends or holidays. Students

remain responsible for completion or make-up of assignments as defined in the syllabus, at the discretion of the instructor.

Mental health: College students often experience issues that may interfere with academic success such as academic stress, sleep problems, juggling responsibilities, life events, relationship concerns, or feelings of anxiety, hopelessness, or depression. If you or a friend is struggling, we strongly encourage you to seek support. Helpful, effective resources are available on campus.

- If you are struggling with this class, please visit during office hours or contact me by email.
- Check in with your academic advisor if you are struggling in multiple classes, unsure whether you are making the most of your time at the University of Montana.
- Reach out for Support-Curry Health Center Counseling-to make a counseling appointment call 406-243-4712 or email mary.rust@mso.umt.edu.
- If you feel that you would benefit from general wellness skills to support your overall stress, reach out to Curry Health Center Wellness: 406-243-2809.
- If you are experiencing a mental health crisis and seeking immediate help, call 911, go to the nearest hospital emergency room or call Campus Safety at 406-243-4000.
- If you have experienced sexual assault, relationship violence, bullying, intimidation, or discrimination contact Student Advocacy Resource Center (SARC): 406-243-4429; 24-hour support line: 406-243-6559.

Students with disabilities: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

COVID resources
- Curry Health Center is offering COVID-19 vaccines to anyone who would like one.
- Curry Health Center offers free COVID-19 testing to UM students.
- If you have COVID symptoms, please get a COVID test at Curry Health Center. To assist with contact tracing, please sign the self-disclosure form so that if you test positive, Curry can share this information with the health department and the University.

- If you test positive for COVID, you will be required to self- isolate, per Missoula City/County Health Department protocol. Please let me know so I can help you to receive materials and keep up with the class.
- If you need to attend class remotely, please take advantage of these <u>resources for online and remote students</u>.

Course withdrawal deadlines: More information can be found at **https://www.umt.edu/registrar/calendar/spring.php**.

Dates	Description
January 17, 2023	**Spring classes begin** Class <u>waitlists</u> expire; instructors may grant <u>digital registration overrides</u> at their discretion.
January 20, 2023	<u>Residency reclassification</u> questionnaires for Spring 2023 due, though they can be accepted up to the 15th class day. Earlier submission is encouraged to allow time for review and correction or to turn in missing documents. Residency reclassifications may affect tuition and fee assessment.
January 25, 2023 (by 5:00 p.m.)	**Spring Class Day 7:** Last day for students to add classes via CyberBear without consent of instructor.
January 26 – February 6, 2023	Instructors must issue <u>digital registration overrides</u> in CyberBear to approve any Spring class adds. • Departments may continue to enter registration overrides via Banner

February 6, 2023 (by 5:00 p.m.)	**Spring Class Day 15:** • **Last day to drop individual Spring classes on CyberBear with no "W"; refunds where applicable** • Last day to [withdraw](#) from Spring (drop all courses) with no "W"s; partial refunds where applicable – see Withdrawal Policy below. • Last day to add Spring classes with registration override on CyberBear. • Last day to change Spring credits in variable credit courses & switch grade mode in CyberBear. • Last day to change Spring grading option to or from audit. Last day to buy or refuse UM's student health insurance coverage.
February 6, 2023 (after 5:00 p.m.)	• Any student not registered for at least one course (on schedule in CyberBear) must submit a [Late Enrollment Form](#). Requests are not guaranteed approval.
February 7 – March 28, 2023 (by 5:00 p.m.)	**Through Spring Class Day 45:** • Spring course adds & drops require instructor's & advisor's approval using the [Course Add/Change/Drop link](#) in CyberBear. $10 fee applies per add or drop. • A 'W' will appear on the transcript for dropped classes. No refunds. Students can change variable credit amounts and grading options (except audit) on eligible courses using the [Course Add/Change/Drop link](#) in CyberBear.

February 21, 2023	Summer 2023 course registration opens for all students and continues throughout the start of summer courses. No advising PIN required. Visit [UM's summer site](#) for details.
February 21, 2023	Autumn 2023 advising for [priority registration](#) begins.
February 22, 2023	• Last day to submit a [Late Enrollment Form](#). Requests are not guaranteed approval. Payment must be arranged with Student Accounts by this date.
March 27 - April 7, 2023	Autumn 2023 priority registration begins for continuing students according to class standing. See [priority registration page](#) for the registration timetable. Advising PIN required for undergraduate students.
March 29 - May 5, 2023 (by 5 p.m.)	After Spring Class Day 45: • Adds require instructor's & advisor's approval using the [Course Add/Change/Drop link](#). $10 fee applies. • Drops require instructor's, advisor's, & Dean's approval via [Course Add/Change/Drop link](#). $10 fee applies. • A 'WP' or 'WF' will appear on the transcript for dropped classes. No refunds. Students can change variable credit amounts, or change grading options, (except audit) using the [Course/Add/Change Drop link](#) in CyberBear.
May 5, 2023	**Last day of Spring instruction**

Last day to withdraw from Spring semester (drop all classes) by **5:00 p.m.**