University of Nevada, Reno

Welcome to NRES 470

Applied Population Ecology

Instructor: Kevin Shoemaker
Teaching Assistant Ben Sedinger
Lecture & Discussion: M, W at 10am (50 mins) (NOTE: **please bring your laptop to class**!)
Lab: F at 10am (3 hours)
Classroom (lecture and lab): FA 301
Office hours:
- Shoemaker: Wed from 11 to noon (FA 220E)
- Sedinger: TBD
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Texts

- Gotelli, N. J. (1995). A primer of ecology
- Beyond Connecting the Dots (free download)
- Additional readings from the primary literature will be assigned for discussion periodically.

Software

- InsightMaker- free web-based systems modeling tool(no installation needed)
- R- free statistical programming language
- Program MARK
- MS Excel (hopefully you already have this or equivalent spreadsheet software on your laptop!)

Prerequisites

- BIOL 314 or NRES 217 (Ecology)
- NRES 310 (Wildlife Ecology and Management)

Class description

This class will explore how concepts of population ecology (e.g., covered in BIOL 314) can be used to inform the conservation and management of natural populations and ecosystems. We will emphasize practical approaches to problem-solving in ecology, conservation, and wildlife management via creative application of population ecology theory using simulation models and statistics. Topics will include population viability analysis (PVA), occupancy models, habitat-suitability models, metapopulation models, species co-occurrence models, projecting population response to climate change and more. Laboratory exercises will provide students

with hands-on experience with ecological models and their practical applications in the conservation and management of wild populations.

Learning outcomes

1. Identify the major classes of models used by ecologists (e.g., statistical vs mechanistic, quantitative vs heuristic, stochastic vs deterministic) and explain how and why ecologists use these models.
2. Apply tools such as population viability analysis (PVA), occupancy models, and metapopulation models to address the conservation and management of natural populations.
3. Perform basic statistics, data visualization, simulation modeling and model validation with Excel, the statistical computing language R, and the web-based software, InsightMaker.
4. Critically evaluate the strength of inferences drawn from ecological simulation models using tools such as cross-validation and sensitivity analysis.
5. Explain how species interactions can influence population dynamics (e.g., predictions of species range shifts), and formulate strategies for accounting for species interactions in ecological models.
6. Communicate original research in applied population and community ecology via a professional-style oral presentation.

Grading:

The course grade will be based on the following components:

- Lab exercises (8 total) 20% (80 points)
- Quizzes and participation 10% (40 points)
- Group project 25% (100 points)
- Midterm exam # 1 (date TBD) 10% (40 points)
- Midterm exam # 2 (date TBD) 10% (40 points)
- Final exam (5/11/2018) 25% (100 points)

NOTE: Graduate students enrolled in NRES 670 will have an additional 50 pts used to calculate their grade (see below) of a total of 370 points. Grading scale: A (100 to 93), A- (92 to 90), B+ (89 to 87), B (86 to 83), B- (82 to 80), C+ (79 to 77), C (76 to 73), C- (72 to 70), D+ (69 to 67), D (66 to 63), D- (62 to 60), F (below 60).

Exams:

There will be two midterm exams and a comprehensive final exam. These will consist of multiple-choice, short-answer questions, and essay questions requiring synthesis of ideas and critical thinking. The midterm exam will be cumulative, and based on all information presented up through the week prior to the exam.

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Lectures

Lecture grades will be based primarily on participation and occasional short quizzes. Participation is essential to the learning process (and to our mutual enjoyment of this class). Learning is not a passive process; students are expected to engage with the material in class rather than simply listen and take notes. You should be prepared in class to ask questions, to answer questions posed by other students, and to engage in frequent problem-solving activities (in class).

Labs

Lab exercises will focus on applying concepts and methods introduced in lectures, and will involve real data and problems in wildlife conservation and management wherever possible. Graded lab assignments will involve figures, tables, InsightMaker models and R code (when applicable) and responses to questions in short-answer format. Laboratory write-ups will be due the following lab period, unless otherwise specified.

Final group project

Students will work in groups of ~2-3 to perform a population viability analysis (PVA) to rank conservation or management actions for a species of conservation concern (species of your choice!). Grading will be based on finished products (written and oral presentations) as well as participation and peer evaluations.

Graduate credit (for students enrolled in NRES 670)

Graduate students will be subject to additional expectations in order to receive graduate credit for this course. In particular, graduate students will be expected to develop an original lecture and lead an original lab activity. Graduate students will also be expected to achieve a deeper understanding of the course material, and therefore will be assigned additional readings from the scientific literature and will be expected to participate as leaders in discussions and lab activities.

Make-up policy and late work:

Missed exams and labs cannot be made up, except in the case of emergencies. If you miss a class meeting, it is your responsibility to talk to one of your classmates about what you missed. If you miss a lab meeting, you are still responsible for completing the lab activities and write-up on your own time. You do not need to let me know in advance that you are going to miss class or lab.

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Students with Disabilities

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

Statement on Academic Dishonesty

Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Plagiarism is using the ideas or words of another person without giving credit to the original source; this includes copying another student in class. Always cite the source of your information. This includes copying or paraphrasing from a book, journal, or unpublished material without giving credit to the author(s), and submitting a term paper that was used in another course. Academic dishonesty will not be tolerated and penalties can include filing a final grade of "F"; reducing the student's final course grade one or two full grade points; awarding a failing mark on the coursework in question; or requiring the student to retake or resubmit the coursework. For more details, see the University of Nevada, Reno General Catalog.

Statement on Audio and Video Recording

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Statement for Academic Success Services

Your student fees cover usage of the University Math Center [(775) 784-4433], University Tutoring Center [(775) 784-6801], and [University Writing Center (775) 784-6030]. These centers support your classroom learning; it is your responsibility to take advantage of their services.

This is a safe space

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the Universityâ€™s Equal Opportunity & Title IX Office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit: http://www.unr.edu/equal-opportunity-title-ix

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Class protocol

All mobile electronic devices are to be turned off during class unless the instructor gives advance permission (but laptop computers will be used in class regularly).

Tentative Schedule

This schedule is highly subject to change!!! Please check the website for updates frequently!

Week	Dates	Topic	Readings
Week 1	1/22/2018	LECTURE 1: Course overview; Intro to Systems Thinking	Gotelli Chapter 1
	1/24/2018	LECTURE 2: Intro to Population Ecology; Exponential growth	BCTD Chapter 1
	1/26/2018	LAB: Introduction to population modeling in Excel, InsightMaker, and R	
Week 2	1/29/2018	LECTURE 1: Thomas Malthus; Density-dependent growth	Gotelli Chapter 2
	1/31/2018	LECTURE 2: Density-dependent growth	BCTD Chapter 2 (skim)
	2/2/2018	LAB: Density-dependent populations in InsightMaker; maximum sustainable yield (MSY) and more	
Week 3	2/5/2018	LECTURE 1: Passenger pigeon/Allee Effect	Gotelli Chapter 3
	2/7/2018	LECTURE 2: Age-structured populations	
	2/9/2018	LAB: Age-structured populations and stochasticity in InsightMaker	
Week 4	2/12/2018	LECTURE 1: Final projects; Matrix population models	Heppell 1998
	2/14/2018	LECTURE 2: Matrix population models	
	2/16/2018	LAB: Matrix population models in R and InsightMaker	
Week 5	2/19/2018	PRESIDENT'S DAY (no class)	
	2/21/2018	LECTURE 2: MIDTERM #1	Lande 1992
	2/23/2018	LAB: Work on group PVA projects	
Week 6	2/26/2018	LECTURE 1: Stochasticity and Uncertainty	Regan 2002
	2/28/2018	LECTURE 2: Small population paradigm	Beissinger and Westphal 1998
	3/2/2018	LAB: Stochasticity and uncertainty	
Week 7	3/5/2018	LECTURE 1: Individual based models	BCTD Chapter 10
	3/7/2018	LECTURE 2: Declining population paradigm	Caughley 1988
	3/9/2018	LAB: Work on group PVA projects	
Week 8	3/12/2018	LECTURE 1: Declining population paradigm	

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	3/14/2018	LECTURE 2: Population Viability Analysis (PVA)	
	3/16/2018	LAB: Metapopulation modeling in InsightMaker	
Week 9	3/19/2018	SPRING BREAK	
	3/21/2018	"	
	3/23/2018	"	
Week 10	3/26/2018	LECTURE 1: Metapopulations	Gotelli Chapter 4
	3/28/2018	LECTURE 2: Source-sink dynamics	Optional: Griffin et al
	3/30/2018	LAB: Final projects (PVA models due next monday)	
Week 11	4/2/2018	LECTURE 1: Parameter estimation!	Amstrup et al Chapter 1
	4/4/2018	LECTURE 2: MIDTERM #2	
	4/6/2018	LAB: Parameter estimation: mark-recapture data	
Week 12	4/9/2018	LECTURE 1: Galapagos case study (guest lecture: Elizabeth Hunter)	Optional: Gibbs et all 2014
	4/11/2018	LECTURE 2: Galapagos case study (guest lecture: Elizabeth Hunter)	
	4/13/2018	LAB: Work on group PVA projects	
Week 13	4/16/2018	LECTURE 1: Species interactions: competition!	Gotelli Chapter 5
	4/18/2018	LECTURE 2: Species interactions: competition!	
	4/20/2018	LAB: Work on group PVA projects	
Week 14	4/23/2018	LECTURE 1: Species interactions: competition!	
	4/25/2018	LECTURE 2: Case study: desert mule deer management	
	4/27/2018	LAB: Case study: led by graduate students? (FINAL PAPER DRAFT DUE)	
Week 15	4/30/2018	LECTURE 1: Predator-prey	Gotelli Chapter 6
	5/2/2018	LECTURE 2: Predator-prey	
	5/4/2018	LAB: STUDENT PRESENTATIONS	
Week 16	5/7/2018	LECTURE 1: final class review	