Welcome to NRES 470

Applied Population Ecology

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Course Meeting Times
Lecture & Discussion: T, Th at 10:30am (50 mins) (NOTE:)
- please bring your laptop to class!

Lab: F at 1pm (3 hours)
- Lectures and Labs will be held in **FA 337**
- Bring your laptops and power cords (I will provide power strips and extension cords)

Office hours:
- **Shoemaker**: Thursdays at 11:30am (1 hour) (FA 220E)
- **Miles**: TBD (FA 235)

Texts
- Gotelli, N. J. A primer of ecology (3rd edition or higher)
- 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 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), habitat-suitability models, metapopulation models, species interaction models, threats to population viability, wildlife population management 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
Students will be able to:

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) 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 sensitivity analysis.
5. Explain how species interactions can influence population dynamics (e.g., predictions of species range shifts).
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 (7 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.

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 in-class problem-solving activities.

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. Whenever possible, please let me know in advance if you are going to miss class or lab.

Top Hat

We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.

You can visit the Top Hat Overview (https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

An email invitation will be sent to you by email, but if don't receive this email, you can register by simply visiting our course website: https://app.tophat.com/e/767873 [Note: our Course Join Code is 767873]

Top Hat may require a paid subscription, and a full breakdown of all subscription options available can be found here: www.tophat.com/pricing.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491

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 University'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 .

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).

Schedule
NOTE: Please check for updates frequently!

Week	Dates	Topic	Text.Readings	Notes
Week 1	1/22/2019	LECTURE 1: Course overview; Intro to Systems Thinking	Gotelli Chapter 1	**TWS NV Chapter science symposium!**
	1/24/2019	LECTURE 2: Intro to Population Ecology; Exponential growth	BCTD Chapter 1	
	1/25/2019	LAB: Introduction to population modeling in Excel, InsightMaker, and R		
Week 2	1/29/2019	LECTURE 1: Thomas Malthus		
	1/31/2019	LECTURE 2: Density-dependent growth	Gotelli Chapter 2	
	2/1/2019	LAB: Density-dependent populations in InsightMaker; maximum sustainable yield (MSY) and more		

Week	Dates	Topic	Text.Readings	Notes
Week 3	2/5/2019	LECTURE 1: Density-dependent growth	BCTD Chapter 2 (skim)	**Away TWS**
	2/7/2019	LECTURE 1: Passenger pigeon/Allee Effect		**Away TWS**
	2/8/2019	NO LAB (instructor is away)		**Away TWS/MA**
Week 4	2/12/2019	LECTURE 1: Age-structured populations	Gotelli Chapter 3	
	2/14/2019	LECTURE 2: Age-structured populations		
	2/15/2019	LAB: Age-structured populations and stochasticity in InsightMaker		
Week 5	2/19/2019	LECTURE 1: Matrix population models	Heppell 1998	
	2/21/2019	LECTURE 2: MIDTERM #1		
	2/22/2019	LAB: Matrix population models in R and InsightMaker		
Week 6	2/26/2019	LECTURE 1: Matrix population models		
	2/28/2019	LECTURE 2: Final projects etc.		
	3/1/2019	LAB: Matrix models & work on group PVA projects (proposals due)		
Week 7	3/5/2019	LECTURE 1: Stochasticity and Uncertainty	Regan 2002	
	3/7/2019	LECTURE 2: Small population paradigm	Beissinger and Westphal 1998	
	3/8/2019	LAB: Stochasticity and uncertainty		
Week 8	3/12/2019	LECTURE 1: Individual based models	BCTD Chapter 10	
	3/14/2019	LECTURE 2: Individual based models /Declining pop. Paradigm		
	3/15/2019	LAB: Work on group PVA projects		
Week 9	3/19/2019	SPRING BREAK		
	3/21/2019	"		
	3/22/2019	"		
Week 10	3/26/2019	LECTURE 1: Declining population paradigm	Caughley 1988	
	3/28/2019	LECTURE 2: Population Viability Analysis (PVA)		
	3/29/2019	LAB: Final projects (PVA models due next week)		
Week 11	4/2/2019	LECTURE 1: Metapopulations	Gotelli Chapter 4	

Week	Dates	Topic	Text.Readings	Notes
	4/4/2019	LECTURE 2: Source-sink dynamics	Optional: Griffin et al	
	4/5/2019	LAB: Metapopulation modeling in InsightMaker (PVA models due)		
Week 12	4/9/2019	LECTURE 1: Parameter estimation!	Amstrup et al Chapter 1	**Away: SERDP IPR**
	4/11/2019	LECTURE 2: MIDTERM #2		**Away: SERDP IPR**
	4/12/2019	LAB: Parameter estimation: mark-recapture data		
Week 13	4/16/2019	LECTURE 1: Galapagos case study	Optional: Gibbs et all 2014	
	4/18/2019	LECTURE 2: Galapagos case study		
	4/19/2019	LAB: Peer review / Work on group PVA projects		
Week 14	4/23/2019	LECTURE 1: Species interactions: competition!	Gotelli Chapter 5	
	4/25/2019	LECTURE 2: Species interactions: competition! (draft papers due)		
	4/26/2019	LAB: STUDENT PRESENTATIONS		
Week 15	4/30/2019	LECTURE 1: Species interactions: competition!		
	5/2/2019	LECTURE 2: Predator-prey	Gotelli Chapter 6	
	5/3/2019	LAB: STUDENT PRESENTATIONS		
Week 16	5/7/2019	LECTURE 1: final class review (and any remaining student presentation)		
Week 17	5/14/2019	FINAL EXAM (9:50 to 11:50am)		
	5/15/2019	**FINAL PAPERS DUE (last day of finals)**		