University of Nevada, Reno

Welcome to NRES 470

Applied Population Ecology

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Office hours:
- Shoemaker: Tuesdays from 1 to 3pm (FA 220E)
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Course Meeting Times

Lecture & Discussion: T, Th at 9:30am (50 mins) (NOTE: please bring your laptop to class!)
Lab: F at 11am (3 hours)
Office hours Tues from 1 to 3pm

- Lectures will be held in **OB 203**
- Labs will be held in the NRES computer lab (**FA 234**)

Texts

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

Software

- InsightMaker- free web-based systems modeling tool
- R- free statistical programming language
- Program MARK
- MS Excel (hopefully you already have this or equivalent spreadsheet software on your computer!)

Prerequisites

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

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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), site-occupancy models, habitat suitability models, metapopulation models, species co-occurrence models, projecting biodiversity response to climate change and more. Laboratory exercises will provide students with hands-on experience with ecological models and their practical applications.

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), site-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 and the statistical computing language â€œRâ€•.
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 predictions of species range shifts and the biodiversity response to global change, and formulate strategies for accounting for species interactions in ecological models.
6. Communicate original research in applied population and community ecology via a professional oral presentation.

Grading:

The course grade will be based on the following components:

Lab exercises (8 total) 25% (80 pts)
Final group project 25% (80 pts)
Midterm exam # 1 (date TBD) 12.5% (40 pts)
Midterm exam # 2 (date TBD) 12.5% (40 pts)
Final exam (date TBD) 25% (80 pts)
(Total 320 points)

NOTE: Graduate students enrolled in 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 occasional group 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 ~3-4 people 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 those enrolled in NRES670)

Graduate students will be subject to additional expectations in order to receive graduate credit for this course. In particular, graduate student final group projects are expected to be more in-depth than undergraduate group projects. To this end, graduate student presentations will be longer, and project write-ups will be expected to be of publication-quality (and formatted in the style of an appropriate journal). 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.

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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.

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.

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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 .â€•

Class protocol

All electronic devices are to be turned off during class unless the instructor gives advance permission.

Tentative Schedule

Becuase this is the first time this course is being taught, this schedule is highly subject to change!!! Please check for updates frequently!

Week	Dates	Topic	Text.Readings
Week 1	1/24/2017	LECTURE 1: Course overview; Intro to systems thinking	Gotelli Chapter 1
	1/26/2017	LECTURE 2: Exponential growth; a taxonomy of models	BCTD Chapter 1
	1/27/2017	LAB: Introduction to population modeling in Excel, InsightMaker, and R	
Week 2	1/31/2017	LECTURE 1: Density-dependent growth;	Gotelli Chapter 2
	2/2/2017	LECTURE 2: Age-structured populations	BCTD Chapter 2 (skim)
	2/3/2017	LAB: More advanced population modeling with InsightMaker	
Week 3	2/7/2017	LECTURE 1: Parameter estimation	Amstrup et al. Chap. 1
	2/9/2017	LECTURE 2: Data needs for population ecology: capture-recapture	Cooch and White Chaps 1,2
	2/10/2017	LAB: Estimate survival with open-population capture-recapture (program MARK)	
Week 4	2/14/2017	LECTURE 1: Capture-recapture analysis (continued)	Cooch and White Chaps 3,4

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	2/16/2017	LECTURE 2: Population Viability Analysis	
	2/17/2017	LAB: Estimate survival with open-population capture-recapture (program MARK) (continued)	
Week 5	2/21/2017	LECTURE 1: Population Viability Analysis (continued)	Brook et al. 2006
	2/23/2017	LECTURE 2: MIDTERM #1	Beissinger and Westphal 1998
	2/24/2017	LAB: PVA: Construct density-regulated, stochastic population model in InsightMaker	
Week 6	2/28/2017	LECTURE 1: Detecting density dependence in natural populations	Regan et al 2002
	3/2/2017	LECTURE 2: Assessing model performance and handling model uncertainty (e.g., sensitivity analysis, cross-validation)	Akçakaya et al 2005
	3/3/2017	LAB: PVA lab (continued): scenario testing, sensitivity analysis	
Week 7	3/7/2017	LECTURE 1: Mitigating threats to populations: "declining population paradigm"	Gotelli Chapter 4
	3/9/2017	LECTURE 2: Metapopulations	Caughley 1988
	3/10/2017	LAB: Metapopulation modeling in InsightMaker	
Week 8	3/14/2017	LECTURE 1: Data needs for population ecology: Presence-absence data, presence-only data.	Mackenzie 2005
	3/16/2017	LECTURE 2: Site-occupancy models	Knapp et al. 2003
	3/17/2017	LAB: Metapopulation modeling in InsightMaker (continued)	
Week 9	3/21/2017	LECTURE 1: Modeling habitat suitability: species distribution models	Elith and Leathwick. 2009
	3/23/2017	LECTURE 2: Modeling habitat: defining patches and populations	Larson et al. 2004
	3/24/2017	LAB: Species Distribution Modeling in R. Defining habitat.	
Week 10	3/28/2017	LECTURE 1: Estimating and modeling dispersal processes	Frair et al 2008

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	3/30/2017	LECTURE 2: MIDTERM #2	Trakhtenbrot et al. 2005
	3/31/2017	LAB: Species Distribution Modeling in R. Defining habitat (continued). Cross-validation	
Week 11	4/4/2017	LECTURE 1: Estimating and modeling dispersal processes (continued)	Stearns 1992 Chapters 1,2
	4/6/2017	LECTURE 2: The evolutionary context: life-history theory.	
	4/7/2017	LAB: Group projects- getting started	
Week 12	4/11/2017	LECTURE 1: Species interactions: prey-predator models, competition models,	Gotelli Chapters 5,6
	4/13/2017	LECTURE 2: Commensalism, mutualism, Parasite-host and disease-host interactions	Nichols et al. (2010)
	4/14/2017	LAB: Modeling disease spread impacts on spatially explicit populations:agent-based models	
Week 13	4/18/2017	LECTURE 1: Modeling disease spread in wildlife populations	Shoemaker et al. 2014
	4/20/2017	LECTURE 2: Invasive species, reintroductions, assisted colonization	Hoegh-Goldberg et al 2008
	4/21/2017	LAB: Group projects	
Week 14	4/25/2017	LECTURE 1: Case study: assessing the species-level impact of climate change	Pearson and Dawson (2003)
	4/27/2017	LECTURE 2: Case study: assessing the species-level impact of climate change	Keith et al (2008)
	4/28/2017	LAB: Group projects	
Week 15	5/2/2017	LECTURE 1: Student presentations	
	5/4/2017	LECTURE 2: Student presentations	
	5/5/2017	LAB: Student presentations / review for final	
Week 16	TBD	FINAL EXAM	