Welcome to NRES 470/670

Applied Population Ecology

Instructor: Kevin Shoemaker

Teaching Assistants

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Course Meeting Times

- **Lecture & Discussion**: M, W at 10am (50 mins)
- **Lab**: F at 1pm (2 hrs 45 mins)
    - Lectures and Labs will be online (due to the ongoing pandemic)
- **Office hours**:
    - Shoemaker: Wednesdays at 11am (1 hour) (online)
    - Goldman: TBD (online)

Texts

- Gotelli, N. J. 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
- 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 professional-style oral and written presentations.

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 (5/8/2020) 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 (cumulative) final exam. These will consist of multiple-choice, short-answer questions, and essay questions requiring synthesis of ideas and critical thinking. The midterm and final exams 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 short Top Hat 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 ~4 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 related to their lecture. 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 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/648264
Note: our Course Join Code is 648264

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.

Course Schedule
NOTE: please check the website frequently, as this schedule is subject to change.

Week	Dates	Topic	Readings
Week 1	1/25/2021	LECTURE: Course overview; Intro to Systems Thinking	BCTD Chapter 1
	1/27/2021	LECTURE: Intro to Population Ecology; Exponential growth	Gotelli Chapter 1
	1/29/2021	LAB 1: Introduction to population modeling in Excel, InsightMaker, and R	Gotelli Chapter 1

Week 2	2/1/2021	LECTURE: Malthus and exponential growth	
	2/3/2021	LECTURE: Density-dependent growth	Gotelli Chapter 2
	2/5/2021	LAB 1 (cont'd)	
Week 3	2/8/2021	LECTURE: Density-dependent growth	Gotelli Chapter 2
	2/10/2021	LECTURE: Passenger pigeon/Allee Effect	
	2/12/2021	LAB 2: Density-dependent populations in InsightMaker; maximum sustainable yield (MSY) and more	BCTD Chapter 2 (skim)
Week 4	2/15/2021	NO CLASS: President's Day	
	2/17/2021	LECTURE: Age-structured populations	Gotelli Chapter 3
	2/19/2021	LAB 3: Age-structured populations in Excel and InsightMaker	
Week 5	2/22/2021	LECTURE: Matrix population models	Heppell 1998
	2/24/2021	LECTURE: Matrix population models	Gotelli Chapter 3
	2/26/2021	Work on PVA proposals	
Week 6	3/1/2021	LECTURE: Matrix population models	Gotelli Chapter 3
	3/3/2021	LECTURE: Stochasticity and uncertainty	Regan 2002
	3/5/2021	LAB 4: Matrix population models in R and InsightMaker	
Week 7	3/8/2021	LECTURE: Stochasticity and uncertainty	
	3/10/2021	NO CLASS: READING DAY	
	3/12/2021	PVA proposals (proposals due)	
Week 8	3/15/2021	MIDTERM #1	
	3/17/2021	LECTURE: Stochasticity and uncertainty	
	3/19/2021	Work on group PVA projects (proposal meetings)	
Week 9	3/22/2021	LECTURE: Small population paradigm	Caughley 1994
	3/24/2021	NO CLASS (No Instruction Day)	
	3/26/2021	LAB 5: Stochasticity and uncertainty	
Week 10	3/29/2021	LECTURE: Declining population paradigm	Caughley 1994
	3/31/2021	LECTURE: PVA!	Beissinger and Westphal 1998
	4/2/2021	Final projects (PVA models due next week)	

Week 11	4/5/2021	LECTURE: Metapopulations	Gotelli Chapter 4
	4/7/2021	LECTURE: Source-sink dynamics	Griffin et al
	4/9/2021	LAB 6: Metapopulation modeling in InsightMaker (PVA models due)	
Week 12	4/12/2021	LECTURE: Parameter estimation	Amstrup et al Chapter 1
	4/14/2021	LECTURE: MIDTERM #2	
	4/16/2021	LAB 7 (optional): Parameter estimation: mark-recapture data	
Week 13	4/19/2021	LECTURE: Species interactions: competition	Gotelli Chapter 5
	4/21/2021	NO CLASS: READING DAY	
	4/23/2021	LAB: STUDENT PRESENTATIONS AND PEER REVIEW	
Week 14	4/26/2021	LECTURE: Species interactions: competition	
	4/28/2021	LECTURE: Species interactions: predator-prey (final project: complete drafts due)	Gotelli Chapter 6
	4/30/2021	LAB: STUDENT PRESENTATIONS	
Week 15	5/3/2021	LECTURE: Final Class Review	
	5/5/2021	NO CLASS: Prep Day	
	5/7/2021	FINAL EXAM (9:50 to 11:50am)	
Week 16	5/12/2021	FINAL PAPERS DUE (last day of finals)	

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.

Statement on COVID-19 Training Policies
Students must complete and follow all guidelines as stated in the Student COVID-19 Training modules, or any other trainings or directives provided by the University.

Statement on COVID-19 Face Coverings
In response to COVID-19, and in alignment with State of Nevada Governor Executive Orders, Roadmap to Recovery for Nevada plans, Nevada System of Higher Education directives, the University of Nevada President directives, and local, state, and national health official guidelines face coverings are required at all times while on campus, except when alone in a private office. This includes the classroom, laboratory, studio, creative space, or any type of in-person instructional activity, and public spaces.
A "face covering" is defined as a "covering that fully covers a person's nose and mouth, including without limitation, cloth face mask, surgical mask, towels, scarves, and bandanas" (State of Nevada Emergency Directive 024).
Students that cannot wear a face covering due to a medical condition or disability, or who are unable to remove a mask without assistance may seek an accommodation through the Disability Resource Center.

Statement on COVID-19 Social Distancing:
Face coverings are not a substitute for social distancing. Students shall observe current social distancing guidelines where possible in accordance with the Phase we are in while in the classroom, laboratory, studio, creative space (hereafter referred to as instructional space) setting and in public spaces. Students should avoid congregating around instructional space entrances before or after class sessions. If the instructional space has designated entrance and exit doors students are required to use them. Students should exit the instructional space immediately after the end of instruction to help ensure social distancing and allow for the persons attending the next scheduled class session to enter.

Statement on COVID-19 Disinfecting Your Learning Space
Disinfecting supplies are provided for you to disinfect your learning space. You may also use your own disinfecting supplies.

Statement on COVID-19, COVID-19 Like Symptoms, and Contact with Someone Testing Positive for COVID-19
Students must conduct daily health checks in accordance with CDC guidelines. Students testing positive for COVID 19, exhibiting COVID 19 symptoms or who have been in direct contact with someone testing positive for COVID 19 will not be allowed to attend in-person instructional activities and must leave the

venue immediately. Students should contact the Student Health Center or their health care provider to receive care and who can provide the latest direction on quarantine and self-isolation. Contact your instructor immediately to make instructional and learning arrangements.

Statement on Failure to Comply with Policy (including as outlined in this Syllabus) or Directives of a University Employee

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. “Disruptive behavior” is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.