NRES 488
DYNAMICS AND MANAGEMENT OF WILDLIFE POPULATIONS

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Lecture: M,W 9:00-9:50 AM
105 KRC
Lab: M 2:00-5:00 PM 234 FA
STUDENT RESPONSIBILITY

STUDENT BACKGROUND
Course objective: This course is intended to provide students with the basic tools for the modeling, analysis and management of wildlife populations. The course will involve modeling of populations and estimation of key parameters such as abundance, survival and breeding probability. Students will experience the philosophy underlying scientific management, and interpretation and decision-making in the face of uncertainty existing in ecological systems of interest to managers.
Grading:

Undergraduates:

Homework 10%
Midterm I (take home) 20%
Team project 40%
Final Examination 30%
Projects are intended to provide a real and practical introduction to analysis, decision making and professional presentation in wildlife and conservation biology to students in their last year at UNR.
GENERAL SCHEDULE

First 2 weeks Philosophy, Statistical issues

Next 6 weeks Estimation (pop. Size, survival, nest success, etc.)

Next 3 weeks Population modeling

Next 3 weeks Distance methods, work sessions
WHY IS THIS CLASS IMPORTANT?
DESSERT TORTOISE

- DISPERSAL
- POP SIZE
- SURVIVAL
EFFECTS OF TRANSMISSION LINES ON SAGE GROUSE

NEST SUCCESS → SURVIVAL → POP SIZE

Eagle and sage grouse images are shown on the left.
In this class we will be focusing on a number of approaches to monitoring animal populations, understanding their dynamics and management.

Management is often referred to as an art, which reflects the need to make decisions in the absence of complete information and understanding regulatory processes.

I contend that many managers have been insufficiently trained to understand how to improve their understanding of the systems they manage so they increase the amount of art and reduce the amount of science underlying their management.
It is important that you leave this class with an appreciation for the process of improving the scientific basis for management in addition to the set of tools you will acquire.

This is a critical issue because sound management depends on continuously improving our understanding of the systems we manage.
Biologists charged with protecting endangered species are caught in a battle over water rights; a critical National Academy of Sciences report has exposed them to heavy fire

‘Combat Biology’ on the Klamath

KLAMATH FALLS, OREGON—As a cold February night settles in, Rip Shively wades into the icy waters of Upper Klamath Lake near the Oregon-California border and hauls ashore a squirming, meter-long fish. The fish, netted as it prepared to spawn, is an endangered male Lost River sucker. Shively, a fisheries biologist at the U.S. Geological Survey (USGS), scans the fish with a wand. Similar tests on a dozen earlier catches produced no response, but this time the wand beeps, indicating that the fish had been caught previously and tagged. Based on its size, Shively judges the sucker to be more than 15 years old, and from the tag’s location on the fish’s back, he surmises that it was tagged in 1995. That means it lived through three massive fish die-offs that hit the lake in 1995, 1996, and 1997. “She’s beautiful,” he says. “A real survivor.”

Shively and colleagues at USGS and other government agencies, universities, and Indian tribes are racing to study the suckers and endangered coho salmon that swim the Klamath River below the lake. Their work guides federal plans to prevent the fishes’ extinction. Federal wildlife managers used the scientists’ preliminary research to recommend limiting the withdrawal of irrigation water from the lake in 2001 to minimize the impact of a regional drought on the endangered fish. But a report issued last year by the National Academy of Sciences (NAS) has cast a cloud over much of
RELATIONSHIP BETWEEN BAND RECOVERY RATES AND SURVIVAL RATES FOR MALLARDS

![Graph showing the relationship between band recovery rates and survival rates for mallards. The x-axis represents recovery rates ranging from 0.02 to 0.09, while the y-axis represents survival rates ranging from 0.50 to 0.80. Different colors and markers represent adult males, immature males, adult females, and immature females.]
MORTALITY PER 100,000 FROM CORONARY HEART DISEASE VERSUS NUMBER OF RADIO AND TV LICENSES IN BRITAIN
TV-RADIO LICENSES AND MORTALITY RATES FROM CORONARY HEART DISEASE IN BRITAIN THROUGH TIME

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<th>YEAR</th>
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<th>YEAR</th>
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This little case is an example of the axiom that correlation is not causation.

Using correlation to make an inference is an example of using induction. Induction is necessary to improving decision making because over time if we find a relationship between two factors over many situations, we eventually accept that a relationship between the two factors exists. We must be especially careful about drawing inferences about the relationships between two variables based on only a small number of correlational studies.
WNC discuss the logic of causation in detail because identification of causation is essential for effective management.

Necessary Causation: If an effect occurs (e.g., high nest success) then the cause (e.g., low predator number) must have preceded it with certainty. Low predator number, however does not guarantee high nest success.

Sufficient Causation: If a cause occurs (e.g., survival declines) the effect (e.g. population decline [all else being equal]) must occur. Absence of a decline in survival, however, doesn’t necessarily tell us anything about population decline.
There is a natural linkage between the ideas of necessary and sufficient causation and the conduct of experiments to improve our understanding of cause and effect.

We examine the presence of some effect (e.g. plant growth) in response to the application of a treatment (nitrogen) or a control (no N).

If growth (effect) occurs in response to fertilizer then we say fertilizer is sufficient for plant growth. If we get no growth in the control, we say that fertilizer is necessary for growth.
Substantial confusion exists about how we improve understanding of causation to improve management.

Our focus this semester will be on developing tools for understanding population dynamics of animals; but it is critical that you keep in mind standards of evidence for making inferences about management actions for wildlife.

Use of the tools you will acquire this semester will only be truly meaningful if you are constantly asking yourself what is the critical piece of information you need to be an effective manager and what is the appropriate method for getting that information.