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Fall 9-1-2000

### WBIO 470.01: Conservation of Wildlife Populations

L. Scott Mills

University of Montana - Missoula, [lscott.mills@umontana.edu](mailto:lscott.mills@umontana.edu)

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**CONSERVATION OF WILDLIFE POPULATIONS  
(WBIO 470)  
FALL SEMESTER 2000**

**Class Time: M, W, F 12:10-1:00 PM  
Forestry 305**

**INSTRUCTOR:**

Dr. L. Scott Mills

Office: For 307

Phone: 243-5552

**Office Hours:** Tuesday 2-4

Wed. 1 - 3

(or by appointment, arranged in advance)

**TEACHING ASSISTANT:**

Roman Biek:

Office : FOR 311

**Office Hours:** Monday, 1-3 p.m. ; Thursdays, 1-3 p.m.

**COURSE OBJECTIVES**

The course will expose you to the scientific basis and practical applications of the study of wildlife population dynamics. Students will learn how to collect and analyze the data necessary to study wildlife populations, and how to assess the factors that affect population growth. We will confront the complexity of interactions in the real world, emphasizing the feedback between biological processes but acknowledging the role of social/political constraints. By the end of the course, students should have the confidence to advance both management and research by effectively using data, models, and the literature to address pressing questions involving the harvest, monitoring, and conservation of wildlife populations.

**READING MATERIALS/TEXTS**

No single textbook is comprehensive enough for our purposes. Required readings will be drawn mostly from Applied Population Ecology by H. R. Akcakaya, et al., and supplemented with readings assembled in a "facpac". **BOTH THE REQUIRED TEXT AND REQUIRED FACPAC ARE AVAILABLE AT THE BOOKSTORE.** An optional text (by N. Gottelli) is also available at the bookstore (see attached syllabus).

Each lecture will draw, in part, from the readings assigned for that lecture, and **you will be responsible for the concepts and principles presented in the readings.** Therefore, students should read the required readings when they are assigned (as opposed to a week-before-the-exam, caffeine-frenzied, doomed-to-failure, last second attempt), and take notes to help understand and remember the reading.

Other readings, required and optional, may be assigned during the course.

**WRITING**

This class fulfills the University’s general education requirement for an upper level writing class, and your careers will depend on your ability to effectively present written documents detailing your observations and activities. Therefore, several written assignments are designed to provide experience in concise, written communication and to inspire the collection of in-depth knowledge of particular subjects. In all cases, papers will be graded with roughly equal emphasis on content/presentation/grammar. Follow the specified formats carefully. In the real world disregarding format instructions will lead to rejected proposals and loss of credibility; in this class it will mean lost points.

All written assignments, should be **DOUBLE SPACED** and typed. **Late papers will be penalized 10% of the maximum per day.**

Also, I have **zero tolerance for plagiarism** (i.e. if you plagiarize you will fail the course). Please see me if you have any questions about what constitutes plagiarism.

**EXAMS**

Because all topics in this course are cumulative, in the sense that they build on each other, all exams will cover materials covered since the start of the course. That is, each exam will be cumulative in practice, although of course the details will emphasize material covered since the last exam.

Please answer exam questions directly and succinctly. Points will be deducted for exam answers that are unreadable or unintelligible, or for extra material that is wrong.

**[Note: No rescheduling of exams except for documented medical emergency]**

**COURSE GRADING**

	<u>Points</u>	<u>Percentage of semester grade</u>
Hour-long exams (2)	90+90=180 points	30%
1 final exam	150	25%
4 homework Assignments	130	22%
Field Notebook from CMR	20	3%
First draft Proposal	40	7%
Peer-review of Proposal	20	3%
Final draft Proposal	60	10%

[600 points total]

\*\* Avenues for extra credit:

- a) + 3 points for 1 page writeups of each of 2 seminars (total of up to 6 pts);
- b) + up to 4 points for a “field notes” that is read on NPR.

For Graduate credit: 60 additional points will be attributable to your presentation (see me).

**NOTE: All turned-in assignments, papers, etc. are due by 5:00 PM. For every working day late, I will subtract 10% of the total points that assignment is worth.**

### GENERAL WRITING TIPS (For all written assignments)

Please pay attention to the following; APPROXIMATELY ONE POINT WILL BE DEDUCTED FOR EACH AND EVERY VIOLATION.

- Do not exceed page limits, unless you have specific permission to do so from me (If this is the case, write a note to that effect on your title page, giving the day that I gave you “length override permission”.)
- Font should be 12 point, using Times New Roman or equivalent-sized font. Use 1-inch margins, and DOUBLE-SPACED type. That includes spacing between paragraphs, and Literature Cited. [Real editors will just send back papers that don’t conform to journal rules such as these].
- Include a title page with proposal title, your name, class and instructor name, and date.
- Always include page numbers on every page except the title page! Page 1 is the first page of the introduction.
- Hold papers together with a single staple in the upper left corner.
- Scientific names are underlined or *italicized*.
- Indent paragraphs
- Figures, Tables and Appendices come AFTER the literature cited, and do not count against page limits. Each should be clearly labeled, such that it could stand alone and be meaningful even without the manuscript.
- Work hard at your writing so that you can be proud of it. Although scientific writing is different than other forms, it can still be creative and energetic. Just be sure to be concise, precise, and direct. Don’t try to “sound smart;” just be accurate (for example, I challenge *anyone* to show me a case where the pretentious “utilize” cannot be replaced by the shorter, more direct word: “use”).  
You will be graded, in part, on your English and spelling and style of presentation.
- Talk to me if you have ANY questions about plagiarism; much better to ask now than to fail the course as a result of confusion [plagiarism = failing course]. Remember, recycling an old term paper without a very new angle or approach for this class is tantamount to plagiarism.

## Wildlife Ecology Proposal WBIO 470

The purpose of this project is to give you practical experience in dealing with both the complexity of wildlife research and management, as well as the application of tools and concepts discussed in this class. You will also get practice writing a proposal, a necessary skill in every job related to wildlife biology. Because we all have different interests and strengths, I will allow a wide range of topics to be addressed in your paper.

### **THE PROPOSAL (these guidelines supplement the general guidelines given above)**

As a manager, educator, or wildlife or fisheries biologist you will probably write numerous proposals during your career. Every call for proposals requires strict adherence to format guidelines. So in this exercise you will practice being careful about format (see guidelines, previous page), as well as be exposed to the fine art of developing a scientifically rigorous idea.

Your proposal will develop an original idea for research to address a gap in our understanding of fish and wildlife populations. You will not have to do the research, but the reviewer will evaluate how realistic and well-considered the proposal seems to be. The research should be completed within 1 - 3 years, and cost less than \$50,000 (proposals that are much less than that are certainly encouraged). Your proposal may be a field study, an experiment, a rigorous sampling, a data re-analysis, a modeling exercise, or even a novel literature review. Some sample proposals are on reserve in the library. Note that some of these are real proposals or proposal guidelines, so their formatting guidelines may differ somewhat from guidelines that I have given you. Some of the proposals were turned in by students in WBIO 470!

**Your proposal cannot exceed 6 pages of double-spaced text (not counting budget, Literature Cited, Tables/Figs.** Think of your proposal as an architect's blueprint; although you won't conduct the actual project in this class, your proposal should be complete and clear enough that the building (the research/management project) could actually be built from the blueprint of the proposal. **All proposals should contain the following:** [See also General Writing Tips above].

**1) Title page:** your name, date, class name, University name, instructor name. The title should be short (less than 13 words, with a word defined as >3 letters) but descriptive, informative and unpretentious.

### **2) Introduction/Literature Review**

The introduction presents the purpose of the study and places it in the context of what is already known about the topic (a literature review). Here you set the stage in a precise and concise way. Be sure to include any background information about the species or system that is necessary to understand the study at hand. Conversely, don't include extraneous information that is not directly relevant to the rest of the report. Remember, the key here is to convince the reader that the study or analysis is worth doing, and that you know enough to do it!

**3) Objectives:** Here, in one to three concise sentences, you should state your objectives (or, alternatively, state specific hypotheses or questions you will address).

#### 4) Methods

The “meat” of the proposal. Many studies are dead on arrival because the investigator did not think when designing the approach. Here you present assumptions and probable statistical approaches. Include times, places, dates, equipment, etc. Include also mathematical models or statistical tests that you will use. Describe the study area if this is a study that you will do in a particular place. Even if your project is conceptual and not experimental, you must still be specific about what you will be doing. **There must be enough detail that someone else could repeat the study.**

#### 5) Significance

Now that you have placed your idea in a larger context, and told the reader what you will be doing, state clearly the significance of this project for the field of wildlife biology. In a sense this section summarizes your proposal, emphasizing the most pertinent points about why this project is important and why you are well qualified and able to do the work.

#### 6) Budget [MAXIMUM ALLOWABLE BUDGET: \$50,000]

Itemize projected expenses as much as possible [don't irritate reviewers by slapping down a random number without support; JUSTIFY your needs!] If the study is expected to last multiple years, include information for each year, as well as total figures. Remember to include salary, equipment, travel, and lodging. I realize that budgets in proposals are probably new for you, but it is one you will do a lot in many jobs.

#### 7) Literature Cited. [No limit; not included in 6 pages of proposal].

a) Cite the source for all information that you did not figure out personally. Use **EXACTLY the citation format of Conservation Biology, which is readily available in the library.** Note how multiple citations are ordered in the text, and the specific differences in the way that journal articles, books, or articles in books are presented in the Literature Cited section. Notice the indentation. Do not be sloppy about your Literature Cited section. Double check your citation against the original, verifying every letter, every initial, every comma. I will be harsh in grading papers with missing, improperly formatted, or incomplete citations.

b) You should have personally perused every citation that you cite. It is bad form, and intellectually dishonest, to read a paper, then cite references that they cite without checking it out yourself. If you cannot get hold of the original source, use this: (Jones 1980, cited in Smith 1990). **In the Literature Cited, put an asterisk (\*) by those sources that you did not read yourself.** This is not done in the real world, but it is an important step to remind you and me that this is a “second hand” citation, and so does not count as one of your required number of citations.

c) About Personal Communications: These should be used sparingly, if at all. Appropriate uses might include cases when the statement is incredibly cutting edge (e.g. a legislative quote on the Endangered Species Act) or unique to that person (i.e. the person who was responsible for deciding how many black-footed ferrets should get released).

ALMOST NEVER will I accept a “Pers. Comm.” attributable to a professor’s lecture. If a prof told you something, ask him/her for the source; don’t just accept it, and expect me to accept your blithe acceptance! The format for a personal communication should be (Pers. Comm., A. Einstein, Princeton University, Princeton, NJ). [this goes just after the relevant material in the text; it is NOT included in Lit. Cited].

d) About non-scientific articles: similar to Pers. Comm. You are writing a scientific-based paper, applying rigorous professional standards. Although Militiamen Today may have an opinion on grizzly bear reintroduction, you should not use that article to argue that grizzlies will increase quickly to numbers that will threaten humanity. **With rare exceptions, WEB sources should be treated as non-scientific sources.**

e) **Include at least 10 articles or books cited in your Literature Cited, including at least 6 peer-reviewed journal articles.** Become familiar with the journals most closely associated with your topics. Use Current Contents and the Journal indices to help you find materials (i.e. don’t rely solely on laser searches).

### **8) Tables and Figures and Appendices (see guidelines above). [No limit]**

Every Table and figure should be neat, should have a caption explaining it, and should be able to be understood by itself (without reference to text).

#### **Here’s how proposals will be graded:**

50% for “style”: includes formatting errors (see syllabus!) and general writing style / presentation (the -1 marks will not necessarily add up to style points off).

50% for “content” : how well-developed, how fundable?

### **THE PEER REVIEW**

I will use a random number generator to assign each proposal to someone else in the class. You will do an *anonymous* peer review of the proposal you receive. Remember, the best reviews are those that are honest yet constructive as possible. Do not feel obliged to sugar coat the review, but do not be a nasty person hiding behind anonymity either. You will be evaluating the proposal on the criteria that you paid attention to in your own proposal, including the “big 3”: a) whether the project is important (merit); b) what information will result from the work (originality), and c) how the money will be spent (accountability). I will grade your peer review.

I will be giving you more details on the Peer review soon.

### **THE FINAL DRAFT**

When you turn in the final draft, you should also include a “RESPONSE TO THE REVIEWERS” letter of up to 3 double-spaced pages. Here you respond to my comments/criticisms, as well as that of your peer-reviewer. Say what you changed in your proposal, or, if you disagree with the reviewers, why you believe a suggestion was in error. This is a real-world step that is critical to writing manuscripts, proposals, or project reports. Your grade in the final draft will be based on how well you respond to reviewer comments/suggestions. Also, include the original draft of your paper. So, you should include: a) the first draft (marked-up) [-5 points if you don’t turn this in]; b) the response to the reviewers; c) the final draft.

**Conservation of Wildlife Populations -- WBIO470**  
**COURSE OUTLINE AND REQUIRED READINGS**  
**FALL SEMESTER, 2000**

**Instructor : Dr. L. Scott Mills**

**READINGS**

-- Required Textbook: Applied Population Ecology, by Akcakaya, Burgman, and Ginzburg. 1999. Sinauer Publishers

-- Required FACPAC (at the bookstore).

-- Optional Text : A Primer of Ecology, by N. J. Gotelli. 1998. Sinauer Associates.

The readings below are required, except where noted as "optional." All readings are in the required textbook (Akcakaya et al.), the required FacPac, or the optional text (by Gotelli).

[NOTE: Unless noted otherwise, pages given below are inclusive (example: Text 3-10 means read in your text from the start of page 3 to the end of page 10)]

**DATE**

Part I: Conservation Context and How to Estimate Demographic Components

**September**

- |      |    |   |
|------|----|---|
|      | 6  | Introduction<br>[Text xi, 1-8(middle)]  |
|      | 8  | Historical extinctions : The "background rate"<br>[Text 215-220]  |
| mon. | 11 | Current extinctions and biodiversity<br>[Pimm 1995<br>Pimentel et al. 1997]   |
|      | 13 | Study design & Hypothesis Testing: How do we know what we know?<br>[Nichols 1991]   |
|      | 15 | Avoiding Bias and Gaining Power<br>[Also: field trip planning]<br>[Text 241-247;<br>Taylor and Gerrodette 1993] *note: although I promise that in 1.5 months<br>you will understand all of this, for now don't get hung up or freaked out by the math]. |
| mon. | 18 | Estimating abundance : overview and line transect.<br>[ Lancia et al. 1994 Pp 215-221]<br><b>ASSIGNMENT 1: LINE TRANSECT for estimating abundance.</b>  |
|      | 20 | Ferrets and prairie dogs as an applied population ecology case study<br>[Ferret readings (3) in FacPac]   |



- 22 LEAVE FOR TRIP at NOON outside Forestry building
- mon. 25 Estimating abundance : mark-recapture  
[Lancia et al. 1994: 230 (bottom) – 253].
- 27 Estimating survival  
[Readings from Previous]  
**ASSIGNMENT 2: MARK-RECAPTURE for estimating abundance.**
- 29 Estimating reproduction directly  
[O'Donoghue 1994]
- Part II: Population Processes: The Basis of Applied Management
- October**
- mon. 2 Putting demographic estimates together  
[Readings from Previous]
- 4 **EXAM 1**
- 6 Exponential population Growth  
[Text 8-31 (Exercises will not be turned in, but are useful for exam preparation!);  
Optional: Gotelli Chapter 1]
- mon. 9 Stochasticity: a 5-dollar word for bounce in population size  
[Text Chapter 2(Exercises are optional; also, we'll return to topics of 2.3.3 and 2.5.1, so just skim them for now)]
- 11 More on causes and consequences of population bounce  
[Readings from Previous;  
also reread Taylor and Gerrodette (should be much clearer now)]
- 13 Density dependence  
[Text Chapter 3]
- mon. 16 Sex ratio and age structure: their importance and use  
[Text 105-113, 127-136]
- 18 Population dynamics revealed by Leslie Matrices  
[Text Section 4.4 and 4.5 (p. 113-127) and 4.7.2 (pp. 136-142)]  
optional: Gotelli 61-80]
- 20 Stage-based matrices  
[Text Section 5.1 – 5.5 (pp. 157-168), section 5.7 (pp. 171-174)]  
**PROPOSAL FIRST DRAFT DUE**
- mon. 23 Sensitivity analysis: Figuring out the importance of different vital rates  
[Text Sect. 5.6 (168-171); Mills and Lindberg 2000]
- ASSIGNMENT #3: MATRICES AND SENSITIVITY ANALYSIS**

- 25 Population dynamics overview  
[Fisher et al. 2000]
- 27 Predation : Effects on the eaters and eaten  
[Messier 1994]  
Optional Gotelli Chapter 6
- mon. 30 Predation II  
[Conroy and Kremenetz 1990 (pages 512-513 are optional)]

Part III: Addressing Problems With Small and Declining Populations

**NOVEMBER**

- 1 Why do genetic issues matter in wildlife population ecology: the case of the National Bison Range bighorn.  
[Lacy 1997]
- 3 Measuring genetic variation  
[Awise et al. 1995 (just skim bottom p. 184-middle p. 196)]
- mon. 6 Genetics and forest fragmentation  
[Mills and Tallmon 1999]
- 8 Placing genetic, deterministic, and stochastic factors in perspective  
[Lande 1988; Mills 1996]
- 10 HOLIDAY
- mon. 13 Spacing in populations : home range, territory, and dispersal  
[Katnik et al. 1994]
- 15 **Exam #2**
- 17 Spacing in populations : metapopulation dynamics  
[Text Chapter 6]
- mon. 20 Risk assessment and viability analysis  
[Text Chapter 7 (minus 215-220, which you've already read)]
- 22, 24 **Thanksgiving Vacation**
- mon. 27 Population Viability Analysis as a way of *synthesizing* lots of factors  
[Readings from above]  
**ASSIGNMENT #4: POPULATION VIABILITY ANALYSIS**
- 29 PVA at the metapopulation level: a help in reserve design]  
[readings from previous]

**December**

- 1 Treating Conservation problems : Reintroduction and translocation  
[Ferret readings and discussion]

- mon. 4 Treating Conservation Problems : Indicators, keystones, and ecosystems  
[ Paine 1995]

Section IV: Harvestable Populations

- 6 Harvest I : Approaches and pitfalls  
[Williams et al. 1996, Dayton 1998]
- 8 Harvest II : Approaches and pitfalls  
[Text Section 8.4 (pp 254-259); Review text exercise 8.2]  
**FINAL PROPOSAL AND RESPONSE TO EDITOR DUE**
- mon. 11 Harvest wrap up / COURSE EVALUATION  
13 Graduate Student Presentations  
15 Conclusions/Final Thoughts  
[Soulé 1986  
Pister 1994]

**FINAL EXAM:**

**Tuesday December 19, 8 – 10 am**

## FacPac Readings

**Conservation of Wildlife Populations : WBIO 470****Dr. Mills -- Fall 1999**

**Note: These readings *supplement* the text [Akçakaya et al. 1997]**  
**[READINGS ARE LISTED IN THE ORDER THAT YOU WILL READ THEM]**

- Pimm, S. L., G. J. Russell, J. L. Gittleman, and T. M. Brooks. 1995. The future of biodiversity. *Science* 269:347-370.
- Pimentel, D., C. Wilson, et al. 1997. Economic and environmental benefits of biodiversity. *Bioscience* 47:747-757.
- Nichols, J. D. 1991. Science, population ecology, and the management of the American black duck. *Journal of Wildlife Management*. 55:790-799.
- Taylor, B. L., and T. Gerrodette. 1993. The uses of statistical power in conservation biology: The vaquita and northern spotted owl. *Conservation Biology* 7:489-500.
- Lancia, R. A., J. D. Nichols, and K. H. Pollock. 1994. Estimating the number of animals in wildlife populations. Pages 215-253 in *Research and Management Techniques for Wildlife and Habitats*. Fifth ed. The Wildlife Society, Bethesda, MD.
- NOTE: Pages 220-230 are OPTIONAL.**

## 3 Ferret readings

- O'Donoghue, M. 1994. Early survival of juvenile snowshoe hares. *Ecology* 75:1582-1592.
- Mills, L. S., and M. Lindberg. 2000. Sensitivity Analysis to Evaluate the Consequences of Conservation Actions. S. R. Beissinger and D. R. McCullough, editors. *Population Viability Analysis*. University of Chicago Press.
- Fisher, D. O., S. D. Hoyle, and S. P. Blomberg. 2000. Population dynamics and survival of an endangered wallaby: a comparison of four methods. *Ecological Applications* 10:901-910.
- Messier, F. 1994. Ungulate population models with predation: a case study with the North American moose. *Ecology* 75:478-488.
- Conroy, M. J., and D. G. Krementz. 1990. A review of the evidence for the effects of hunting on American Black Duck populations. *Transactions of the 55<sup>th</sup> N. A. Wildlife and Natural Resources Conference*. 55:501-517.

- Lacy, R. C. 1997. Importance of genetic variation to the viability of mammalian populations. *Journal of Mammalogy* 78:3230-335.
- Avise, J. C., S. M. Haig, O. A. Ryder, M. Lynch, and C. J. Geyer. 1995. Descriptive genetic studies: applications in population management and conservation biology. Pages 183-244 in Ballou, J. D., M. Gilpin, and T. J. Foose, eds. *Population Management for Survival and Recovery*. Columbia University Press, New York.
- Mills, L. S. and D. Tallmon. 1999. Genetic issues in forest fragmentation. In *Forest Fragmentation: Wildlife and Management Implications*.
- Lande, R. 1988. Genetics and demography in biological conservation. *Science* 241:1455-1460.
- Mills, L. S. 1996. Cheetah extinction: genetics or extrinsic factors? *Letter to Conservation Biology* 10:315.
- Katnik, D. D., et al. 1994. Spatial relations in a harvested population of marten in Maine. *Journal of Wildlife Management*. 58:600-607.
- Paine, R. T. 1995. A conversation on refining the concept of keystone species. *Conservation Biology* 9:962-964.
- Dayton, P. K. 1998. Reversal of the burden of proof in fisheries management. *Science* 279:821-822.
- Williams, B. K., F. A. Johnson, and K. Wilkens. 1996. Uncertainty and the adaptive management of waterfowl harvests. *Journal of Wildlife Management* 60:223-232.
- Pister, E. P. 1994. The importance of value systems in management. Pages 340-341 in Meffe, G. K., and C. R. Carroll, eds. *Principles of Conservation Biology*. Sinauer Associates, Sunderland, MA.
- Soulé, M. E. 1986. Conservation biology and the "real world". Pages 1-12 in Soulé, M. E., editor, *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates, Sunderland, MA.