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WBIO 470.01: Conservation of Wildlife Populations

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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 rejection of the paper or proposal, 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

Although the details of exams will emphasize material covered since the last exam, the topics in this course build on each other, so all exams could include materials covered throughout the course. 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

	Points	<u>Percentage of semester grade</u>
Hour-long exam #1	90	15
Hour-long exam #2	90	15
1 final exam	150	25
3 homework Assignments	145	24
Field Notebook from CMR	10	2
First draft Proposal	40	7
Peer-review of Proposal	15	2
Final draft Proposal (includes letter to reviewers)	60	10

[600 points total]

** Avenues for extra credit (All of these are due by the last class in the semester):

- 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: 50 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. [Real editors will just send back papers that don't conform to journal rules such as these].

- 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.
- 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.
- Use quotations only when the words of the original author are needed for special emphasis or to make a point, or where they are so perfect that they say it all. Be sure to give exact page number for quotations. And another reminder, don't plagiarize (using another's words or thoughts without acknowledgement).
- 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 Population 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. Talk to me about your ideas.

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. The formatting guidelines of papers on reserve may differ somewhat from guidelines that I have given you.

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 [Do not exceed 2 pages; 2 pts off if you do]

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!

Also, note that the next section is the Objectives. Remember that the Introduction should prepare us for what the objectives will be.

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 you will confront this task 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 the most recent year 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 above!) 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.

APPENDIX A gives details on conducting the peer review.

THE FINAL DRAFT and RESPONSE TO REVIEWERS

When you turn in the final draft, you will 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. I won’t specify a format for the letter, except to say that it should be a professional letter addressed to me. 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, with the final draft of the paper include: a) the first draft (marked-up) [-5 points if you don’t turn this in]; b) the response to the reviewers (2 copies – I’ll give one copy to the reviewer); c) the final draft.

How I’ll grade your FINAL proposal (this includes both your re-write and comment to reviewers: ½ of the grade (30 of 60 points) will be based on your professional cover letter describing how you addressed each reviewer’s point, and on the percentage of reviewer points adequately addressed in your revision. “Adequately addressed” means that you either made the suggested change or successfully rebutted the reviewer’s arguments. The other 30 points will be based on my evaluation of style and content of the final proposal.

APPENDIX A

Guidelines on Conducting the Peer Review of Research Proposals WBIO 470 – Mills

These are guidelines on how to do the peer review of your fellow student's research proposal. The purpose of having you peer review another person's paper is twofold. First, it gives you practice in the important skill of evaluating someone else's work in an honest and constructive manner. Honesty is important : if the work is good say it is good, if it is bad say it is bad. However, even though you will be anonymous in your identity you should still be professional and constructive. Cheap shots behind a wall of anonymity are cowardly and inexcusable.

The second objective is to help you think about your own writing. The knowledge of how your proposal will be reviewed will give you insights into preparation of your own proposal.

As a general guide for both writing and reviewing proposals: you cannot go wrong by purchasing and using the CBE Style Manual (Council of Biology Editors). The 1983 edition is fine, and probably a lot cheaper than the 1995 edition. Also useful is : Ratti, J. T., and L. M. Smith. 1998. Manuscript guidelines for the Journal of Wildlife Management. Journal of Wildlife Management 62(1, Supplement): 1-36. As I mentioned in the syllabus, I also have a great book on writing for biology on reserve for this class (Jan A. Pechenik, [A Short Guide to Writing About Biology](#))

TWO COPIES OF THE PROPOSAL WILL BE SUBMITTED BY EACH PERSON.

I will assign (randomly) 2 of your peers to anonymously review your proposal. Reviewers will have 1 week to review the proposal. I will grade these reviews, and will also comment on each proposal. Authors must address the comments of the 2 reviewers in their final draft.

How I'll grade your peer review:

- **Comments on Technical Style (5 points)** : Make written comments in pencil directly on the manuscript to correct grammar and improve the technical writing style. This includes unnecessary passive voice, and excess verbiage.
- **Comments on Content (10 points):** You will write 1-2 pages of single-spaced typewritten comments to the author, following the format of the following example.

Again, comments here will vary. But ask yourself, at a minimum: did the author pose a clearly stated (and answerable!) question, and/or did they propose to test an explicit hypothesis? Did they sufficiently answer the "so what" question. How creative is their approach? How useful will their findings be? Do they convince you that they know enough about the topic to actually *do* the project? Do they propose wise use of the dollars that they are requesting? These are just a few things to consider.

Sample Peer Review:

Last name Of Author(not Reviewer). The role of overfishing in decline of the arctic tern.

This paper clearly described the state of knowledge of this species, and did an excellent job of pointing out that all population studies of this species have failed to consider how populations are linked via immigration and emigration. You did an especially thorough search of South American journals for information on the winter range. [You MUST include exactly 2 sentences of honest praise for the paper. No matter how bad it is, remember that (a) someone with feelings spent a lot of time on this, and (b) you can find something to praise in their effort. Failure to include this will cost 2 points. Going past 2 sentences of praise will also cost 2 points]. I have made suggestions directly on the manuscript for improving its technical style; in particular, make an effort to delete each sentence that repeats a previously-stated and avoid use of passive voice (as in cases marked P1 through P5). [Do not spend >2 sentences to address grammar and style issues. I am more interested in your evaluation of the scientific merit of the paper than in your comments on grammar]. In addition I have the following comments on the paper's content: [The rest of your review MUST deal with CONTENT, not STYLE. Always number your comments (lose 2 points for not numbering); the author must explicitly address each of your comments, by number, in their revision.]

1. Your discussion should acknowledge and discuss other factors that can contribute to the seasonal changes that you expect in animal behavior. As the paper now reads, you only consider the reproductive cycle. But there are also seasonal patterns in food quality, food quantity, energy needs, and weather -- aren't these also relevant to your observed patterns? Aren't they to some extent confounded with the reproductive cycle?
 2. Page 5: Please discuss the "2 potential negative impacts" of these long autumn movements (energy cost and risk of predation by bobcats): specifically, relative to normal daily energy expense, how much more does it cost a female tern to take 2 or 3 trips of 1-4 km each fall? Is it really very much? Perhaps if she is unable to feed on those days, the energy cost (in terms of meals foregone) would be significant and you could mention that. With respect to bobcat predation, I question whether bobcats are significant predators on adult female terns; Boulay (1992), which you cite to support this idea, described predation on nestlings only. I'm not arguing that these impacts are trivial, but you do need better arguments. [These comments illustrate (a) desired level of detail, (b) direct conversational style, (c) that criticism must be specific and constructive.]
- Your Name if you choose [You choose whether or not to reveal your identity. I will preserve your right to remain anonymous].

Conservation of Wildlife Populations -- WBIO470
COURSE OUTLINE AND REQUIRED READINGS
FALL SEMESTER, 2001

Instructor : Dr. L. S. 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. 2001. 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

- | | |
|---------|---|
| 5 | Introduction
[Text xi, 1-8(middle)] |
| 7 | What is the “natural” rate of extinction?
[Text 215-220] |
| mon. 10 | How many species are there, and what is the <i>current</i> rate of extinction?
[Pimm 1995
Pimentel et al. 1997] |
| 12 | How do we know what we know? : Study design & Hypothesis Testing
[Nichols 1991] |
| 14 | How do we know what we know? Avoiding Bias and Gaining Power
[Also: field trip planning]
[Text 241-247;
Taylor and Gerrodette 1993]_*note: although I promise that in 1.5 months you will understand all of this, for now don't get hung up or freaked out by the math]. |
| mon. 17 | How do we estimate abundance? : overview and line transect sampling.
[Lancia et al. 1994 Pp 215-221]
ASSIGNMENT 1: ESTIMATING ABUNDANCE. |
| 19 | Ferrets and prairie dogs as an applied population ecology case study |

- [Ferret readings (3) in FacPac]
- 21 LEAVE FOR TRIP TO CMR WILDLIFE REFUGE (site of ferret reintroduction) at **NOON** outside Forestry building
- mon. 24 How do we estimate abundance?: mark-recapture
[Lancia et al. 1994: 230 (bottom) – 253].
- 26 How well do individuals survive: survival estimation
[Readings from Previous]
- 28 How do we estimate reproduction?
[O’Donoghue 1994]
- October**
- mon. 1 Putting birth and death rates together
[Readings from Previous]
- Part II: Population Processes: The Basis of Applied Management
- 3 How long until a population doubles (or halves) in size? Exponential population Growth
[Text 8-31 (Exercises will not be turned in, but are useful for exam preparation!); Optional: Gotelli Chapter 1]
- 5 **EXAM 1**
- mon. 8 How does stochasticity (a 5-dollar word for bounce in population size) affect population growth?
[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)]
- 10 More on causes and consequences of population bounce
[Readings from Previous]
- 12 How is population growth affected by density of animals?
[Text Chapter 3]
- mon. 15 Babies grow up: When does sex ratio and age structure matter?
[Text 105-113, 127-136]
- 17 How can matrix math help us understand population dynamics?
[Text Section 4.4 and 4.5 (p. 113-127) and 4.7.2 (pp. 136-142)]
optional: Gotelli 61-80]
- 19 Matrix math and population dynamics continued (Stage-based matrices)
[Text Section 5.1 – 5.5 (pp. 157-168), section 5.7 (pp. 171-174)]
[also reread Taylor and Gerrodette (should be much clearer now)]
- PROPOSAL FIRST DRAFT DUE**
- mon. 22 Which birth or death rates are most “important” for research or management?: Sensitivity analysis
[Text Sect. 5.6 (168-171); Mills and Lindberg 2000]

ASSIGNMENT #2: MATRICES AND SENSITIVITY ANALYSIS

- 24 Population dynamics overview
[Fisher et al. 2000]
- 26 If we hunt wolves, will the number of moose increase?: Predation
[Messier 1994]
Optional Gotelli Chapter 6
- mon. 29 Does human hunting decrease abundance of game animals? Predation II
[Conroy and Kremenetz 1990 (pages 512-513 are optional)]

Part III: Addressing Problems With Small and Declining Populations

- 31 Why/when/how do genetic issues matter in wildlife population ecology
[Lacy 1997]
- NOVEMBER**
- 2 How do we measure genetic variation?
[Awise et al. 1995 (just skim bottom p. 184-middle p. 196)]
- mon. 5 Genetics and forest fragmentation
[Mills and Tallmon 1999]
- 7 Placing genetic, deterministic, and stochastic factors in perspective
[Lande 1988; Mills 1996]
- 9 **Exam #2**
- 12 **HOLIDAY**
- 14 Spacing in populations : home range, territory, and dispersal
[Katnik et al. 1994]
- 16 Spacing in populations : metapopulation dynamics
[Text Chapter 6]
- mon. 19 How can models help us evaluate risk?: Population Viability Analysis.
[Text Chapter 7 (minus 215-220, which you've already read)]
- 21, 23 **Thanksgiving Vacation**
- mon. 26 Population Viability Analysis as a way of *synthesizing* lots of factors
[Readings from above]
ASSIGNMENT #3: POPULATION VIABILITY ANALYSIS
- 28 How can PVA at the metapopulation level help design reserves?
[readings from previous]

- 30 Treating Conservation problems : Reintroduction and translocation
[Ferret readings and discussion]
- December**
- mon. 3 Can certain species act as “surrogates” for ecosystem health?: Indicators,
keystones, and umbrellas species
[Paine 1995]
- Section IV: Harvestable Populations
- 5 Harvest I : Approaches and pitfalls
[Williams et al. 1996, Dayton 1998]
- 7 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. 10 Harvest wrap up / COURSE EVALUATION
- 12 Graduate Student Presentations
- 14 Conclusions/Final Thoughts
[Soulé 1986
Pister 1994]

FINAL EXAM:**Friday December 21, 8 – 10 am**

FacPac Readings

Conservation of Wildlife Populations : WBIO 470 Dr. Mills -- Fall 2001

**Note: These readings *supplement* the text [Applied Population Ecology]
[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.
- 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.
- Mills, L. S., and M. Lindberg. 2001. Sensitivity Analysis to Evaluate the Consequences of Conservation Actions. S. R. Beissinger and D. R. McCullough, editors. *Population Viability Analysis*. University of Chicago Press. [**will be handed out**]
- 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. Krentz. 1990. A review of the evidence for the effects of hunting on American Black Duck populations. *Transactions of the 55th 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.
- 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.
- Kotliar, N. B. 2001. Application of the new keystone-species concept to prairie dogs: how well does it work? *Conservation Biology* 14:1715-1721.
- 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.