WILD 5700/7700 – Applied Population Dynamics

Final Project

**Overview**

In this assignment, you will apply knowledge gained in lecture and lab to develop a population model for a species of your choosing. You will then use the model to project population dynamics under two scenarios: one with and one without a management action or environmental change.

You will submit your model and its projections as an Excel file (undergrads) or an R script (graduate students). You will also submit a 2-3 page (single-spaced, 12-point Times New Roman font) paper organized as follows:

1. Introduction
   1. Describe the species and rationale for focusing on it. Explain why it is important to model this species’ population dynamics, and justify your choice of the specific management action or environmental change that you will evaluate. [2 paragraphs]
   2. Summarize the peer-reviewed literature about the species’ life history. What do we know about the factors influencing survival, reproduction, and movement? [2 paragraphs]
   3. Cite a minimum of 3 peer-reviewed publications, such as Ornithology, Ecology, and The Journal of Wildlife Management.
2. Model Description
   1. Describe the model using words and equations [1 paragraph]. The model must include:
      1. Demographic or environmental stochasticity
      2. Age, stage, or spatial structure
      3. You do not have to include density-dependence, but if you don’t, you must explain your rational for excluding it.
   2. Explain how your model differs under the two different scenarios. [1 paragraph]
   3. Justify the modeling decisions you made by explaining why you included some sources of variation but not others. [1 paragraph]
3. Study Design
   1. Explain how you would design a study to estimate the parameters of the model. Make sure you mention something about sample size and sampling methods. [1 paragraph]
   2. Describe the estimation methods you would use (e.g., Kaplan-Meir model, Lincoln-Peterson estimator). List the assumptions of the method and describe how well your study design would allow you to meet those assumptions [1 paragraph]
   3. Graduate students must estimate one or more parameters of their model using R. Explain the estimation method you used [1 paragraph]. If you don’t have data, you can make some up. Come see us for details.
4. Results and Discussion
   1. Summarize your model projections and discuss how much of an effect the management (or environmental change) had on the population. [≥1 paragraph and 1 figure]
   2. Discuss the strengths and weaknesses of your modeling approach and describe how it could be improved [1 paragraph]
5. Literature Cited (see [here](http://wildlife.org/wp-content/uploads/2018/01/TWS-Journal-Guidelines-2018.pdf) for formatting guidelines). Example:
   1. Berryman, A. A. 2004. Limiting factors and population regulation. Oikos 105:667-670.

**Timeline**

Oct 27: First draft due. This should include the Introduction, Model Description, Literature Cited, and the model in Excel or R

Oct 27-Nov 24: Schedule a 10-min meeting with Dr. Chandler to discuss your model

Nov 13: Peer review due

Dec 4: Final paper and model due

**Population Model**

You will construct a model in Excel or R based on your understanding of the species’ ecology. For example, you may decide to include demographic stochasticity, but not environmental stochasticity based on your knowledge of the species, and you could look to the scientific literature for parameter estimates.

You must base your model on one of the models we covered in the first part of the course, but you are encouraged to fine tune the model to include any sources of variation that you think are important. Also, you cannot use a model that is overly simplistic such as a simple geometric growth model. Your model must include stochasticity as well as one of the following: age, stage, or spatial structure. Think hard about whether or not you should include density-dependence. You can model either abundance or occupancy dynamics.

*Examples*

1. An age-based population model for wild pigs that includes demographic stochasticity and density-dependence. Predict future dynamics under a status quo scenario and a scenario in which a management action reduces survival of a particular age class.
2. A metapopulation model for marbled salamanders. Predict dynamics under two future climate scenarios: with and without intense drought.

**Graduate students**

Graduate students must estimate at least one parameter of their population model using one of the R software packages that we covered during the course. For example, you could estimate occupancy using ‘unmarked’, abundance using ‘Distance’, or survival and growth rates using ‘RMark’.

**Peer Review**

You will review two of your classmates’ first drafts and make suggestions for improvement by adding comments to the documents. This will be a “double blind” review in which you do not know the names of your reviewers or the names of the authors of the papers you review.

**Grading**

The final grade will be determined by the first draft (20%), the peer review (10%), the 10-min meeting with Dr. Chandler (10%), and the final draft (60%). If you have questions about scientific writing, try to follow the styles found in journals such as the Journal of Wildlife Management, and feel free to set up a meeting with your TA or me. Additional guidance on scientific writing can be found [here](https://www.warnell.uga.edu/sites/default/files/inline-files/WarnellWritingGuide.pdf).

The body of your paper must be at least 2 pages long, and no longer than 3 pages, not including the Literature Cited section.

Feel free to discuss the assignment with your peers, but make sure that all the writing and modeling is your own. See the syllabus for guidelines about the use of AI.

**Reviewer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Manuscript ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total Score (out of 100): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Scoring:** For each of the bold categories below, assign a whole-number score between 1 and 5 (**5**=Excellent; **4**=Very Good; **3**=Good; **2**=Fair; **1**=Needs substantial improvement). Qualifications that merit a score of 5 are described in the paper description above. Provide comments for each category.

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| **Category** | **Sub-score** | **Weight** | **Weighted sub-score** | **Notes and additional comments** |
| **Introduction**1 | *\_\_\_\_\_* | *x 4* | *\_\_\_\_\_* |  |
| **Model Description**1 | *\_\_\_\_\_* | *x 4* | *\_\_\_\_\_* |  |
| **Population Model in Excel or R**1 | *\_\_\_\_\_* | *x 4* | *\_\_\_\_\_* |  |
| **Study Design** | *\_\_\_\_\_* | *x 3* | *\_\_\_\_\_* |  |
| **Results and Discussion** | *\_\_\_\_\_* | *x 3* | *\_\_\_\_\_* |  |
| **Literature Cited**1 | *\_\_\_\_\_* | *x 1* | *\_\_\_\_\_* |  |
| **Scientific Writing**1 | *\_\_\_\_\_* | *x 1* | *\_\_\_\_\_* |  |

1 To be graded during peer-review.