Wlf 448
Fall 2008

Exam 1
(100 points total)

_____
Student ID Number

Please write your name on the back of the exam.

Multiple Choice: Choose the best answer to each question and circle the letter in front of it. (60 points total, 3 points each)

1. When introducing the class, I talked about the fate of endangered Okaloosa darters in Florida. I showed that we could estimate the probability-of-extinction based on what type of data?
   a. Estimates of survival
   b. Estimates of reproduction
   c. Knowledge of the number of populations
   d. Estimates of abundance through time
   e. a, b, and c

2. Similarly, I discussed important drivers of metapopulation viability for golden-cheeked warblers. The model for this analysis was based on what type of data?
   a. Estimates of survival
   b. Estimates of reproduction
   c. Knowledge of the number of populations
   d. Estimates of abundance through time
   e. a, b, and c

3. Based on the model of Northern Yellowstone elk/wolf interactions presented during the introduction to this course, we should pay particular attention to what variables when determining whether elk populations can persist with wolf predation?
   a. Calf survival
   b. Winter severity
   c. Wildfire frequency
   d. Hunter harvest rates
   e. b and d

4. Who suggested that it is not 'bad' science to keep a theory/hypothesis even if we know it is wrong?
   a. Imre Lakatos
   b. Thomas Khun
   c. Karl Popper
   d. None of the above. It is never o.k. to keep a falsified hypothesis

5. According to the Popperian philosophy of science, we retain a hypothesis
   a. Even if it has been falsified as long as it helps us predict things
   b. If it has not been falsified
   c. With the greatest degree of corroboration
   d. b and c

6. Information theoretic model selection (e.g., AIC) basically follows whose philosophy of science?
   a. John Platt
   b. Imre Lakatos
   c. Karl Popper
   d. None of the above

7. Chip Corsi from Idaho Fish and Game discussed the effects of Lake trout predation on Kokanee salmon. How did IDFG conclude that predation was the reason for the Kokanee population decline?
   a. Interviews with knowledgeable anglers
   b. By looking at correlations between Kokanee and Lake trout population abundances
   c. By estimating Kokanee reproduction and survival
   d. By a controlled experiment with Kokanee and Lake trout in a large tank
   e. None of the above. Predation was not considered the reason for the decline

8. Pete Zager (IDFG) concluded that elk in Idaho constitute several distinct populations based on what?
   a. Estimating survival rates in different parts of the state
   b. Mapping barriers to movement (e.g., large rivers, rugged impassible terrain, etc.)
   c. Using genetic analyses of relatedness
   d. None of the above. They found elk are basically a single homogeneous population

9. Cushing suggested that a fish "stock" should be defined as a group of fish that…
   a. have similar phenotypic expressions (e.g., they look similar)
   b. can successfully interbreed
   c. spend at least some of their life in the same area
   d. spawn in a particular area and, to a substantial degree, do not interbreed with any other such group
   e. None of the above

10. Using Garton's (2002) hierarchical aggregations of individuals, a group that occupies a single patch of habitat where breeding is basically random among individuals constitutes a…
   a. Population
   b. Species
   c. Metapopulation
   d. Subspecies
   e. None of the above

11 Where might you see the term Evolutionary Significant Unit (ESU) used when describing a group of individuals?
   a. The National Marine Fisheries Service (NMFS) for determining if anadromous fish are endangered or threatened
   b. This is a term used to identify all newly discovered species
   c. During one of Dr. Horne's lectures to confuse the students
   d. To define a group of randomly breeding individuals

12. We can use the ecological theory of a species' "niche" (Hutchinson's) to help us identify relationships for determining what?
   a. Whether competition limits population growth
   b. Survival rates of a population
   c. The distribution of a population
   d. The importance of metapopulation dynamics

13. What factor isolates the distribution of Yellowstone cutthroat trout from westslope cutthroat trout?
   a. Dispersal. Yellowstone cutthroat are unable to disperse to areas occupied by westslope cutthroat
   b. Habitat. Yellowstone cutthroat have evolved to live in different environmental conditions than westslope cutthroat
   c. Competition. Westslope cutthroat out-compete Yellowstone cutthroat in areas outside of the Yellowstone River drainage
   d. None of the above. Yellowstone and westslope distributions overlap substantially

14. Which approach to estimating an animal's distribution generally does **not** require gathering empirical data (i.e., occurrence locations)?
   a. "Grid" method
   b. Habitat mapping
   c. Drawing polygons on a map based on knowledge of specialists
   d. Modeling population-environment relationships and then using this model to project the distribution

15. When a model assumes "**demographic** closure", we are assuming that…
    a. Births rates and deaths rates are similar among individuals within a population
    b. The population has very little immigration or emigration
    c. Population abundance changes very little during the study
    d. There are very few births and deaths in the population during the study

16. Which of the following methods for estimating population abundance are often cheap to implement because fishers and hunters can be used to gather the data?
    a. Change-in-ratio
    b. Catch-per-effort
    c. Distance estimation
    d. a and b
    e. b and c

17. Which of the following situations **cannot** be accommodated by K-sample mark-recapture estimate of abundance?
    a. Animals have the same capture probability within a sampling occasion but this probability can be different during each sampling occasion.
    b. Animals have the same initial capture probability (*p*) and all subsequent captures can have a different probability (*c*).
    c. Each animal can have a different capture probability.
    d. None of the above. They can all be accommodated by this method.

18. Which of the following does **not** correctly characterize the Jolly-Seber method for estimating animal abundance?
    a. It is based on animals being uniquely marked and recaptured on many subsequent occasions
    b. Animals have the same capture probability within a sampling occasion but this probability can be different for each sampling occasion.
    c. The population is assumed to have demographic closure over the entire time period that animals are captured and recaptured
    d. It can also be used to estimate survival
    e. None of the above. All statements correctly characterize this method.

19. Which of the following does **not** correctly characterize the sightability method (e.g., *Aerial Survey*) for estimating animal abundance?
    a. It is based on an initial study in which a known population of animals is surveyed and a model of probability of detection is constructed
    b. The model developed in the initial study is then used to correct counts from future surveys using the probability of detection
    c. The relationships between model variables and the probability of detection must remain constant for all subsequent surveys
    d. None of the above. All statements correctly characterize this method.

20. Which of the following best characterizes a 'population index'?
    a. There is a constant proportion that relates the value of the index to the actual number of animals
    b. It is a method for obtaining an unbiased estimate of population abundance
    c. Population indices cannot be based on indirect counts of animal signs (e.g., pellet counts, redd counts) indicating animal presence or activity
    d. Valid population indices do not assume a linear relationship between the value of the index and the actual number of animals

True/False: (22 points total, 2 points each)

1. _____ When identifying a population, it is unnecessary to look at demographic rates because if the individuals are closely related and occupy the same area, then they should be considered a single population. **False**

2. _____ We should **not** assume that the factors that limit the distribution of a population at a local scale are the same factors that limit the geographic distribution of that species. **True**

3. _____ Logistic regression is a common technique to develop population-environment relationships for mapping a species distribution. **True**

4. _____ A practical difference between the Lincoln-Petersen estimator and the K-sample mark-recapture estimator of abundance is that individuals do not have to be uniquely marked with Lincoln-Petersen whereas they do with K-sample mark-recapture. **True**

5. _____ We should not be concerned that different models in K-sample mark-recapture can have dramatically different numbers of parameters that have to be estimated. Goodness-of-fit tests tell us all we need to know about model selection. **False**

6. _____ In Dr. Mills' introductory chapter *The Big Picture*, he used human population ecology to illustrate basic ecological principles. **True**

7. _____ In Dr. Mills' chapter on *Designing Studies and Interpreting Data*, he discussed the importance of ethical conduct among biologists. **True**

8. _____ In the article by Hobbs and Hilborn (2006), they argued that information theoretic approaches and Bayesian approaches to model selection are essentially the same thing. **False**

9. _____ In that same article (Hobbs and Hilborn 2006), they argued that *Akaike weights* can be useful for identifying the best model out of a set of competing models. **True**

10. _____ While you are taking this test, I am in Hawaii with a group of researchers and managers trying to figure out how the population of endangered Akepa are doing (not really, it's 5:30 in the morning there!). A debate may ensue that population estimates based on distance methods are biased if bird behavior changes to make them more observable. If you were at the meeting, you would tell them that as long as the probability of detection at distance = 0 is 1, then increased detectability does not affect the estimate. **True**

11. _____ Taking a "random sample" is always preferable to other sampling schemes because it produces unbiased estimates. **False**

Short Answer: Briefly answer the following questions. (18 total points)

1. What is the basic/fundamental equation that almost all methods we discussed for estimating abundance are based on? Please use symbols and define each symbol with appropriate text describing what is represented by the symbol. (8 points)

$N = \frac{C}{\beta}$ (2 points. Symbols can be different but they have to be defined correctly)

N = Estimated population size (2 points)
C = Number counted or observed (2 points)
β = Probability or proportion of individuals counted or observed (2 points)

2. Describe how you would identify **different** populations (as defined in Garton's 2002 hierarchy) of a species of interest to you. Be thorough, cover all the characteristics that we use to identify populations, and remember the collection of populations would make up a *metapopulation* (6 points).

Should mention (1) geography – separated by expanses of non-habitat (2 points)
(2) genetics – relatively low rates of dispersal among populations produces genetic differentiation (2 points)
(3) demographics – low correlations in demographic rates between populations (2 points)

3. We often assume that habitats that contain a high density of animals are 'good quality' habitats. Explain why this might be a mistake according to B. Van Horne's (1983) influential paper. (4 points)

Habitat quality should be defined in terms of survival and reproduction as well as density. Areas with high density often have poor survival or reproductive rates due to seasonally changing habitat conditions, temporal unpredictability in habitat conditions, social dominance (territoriality), etc. Areas with high density but low survival and reproduction should not be considered high quality habitats.