EEB 2208 (Introduction to Conservation Biology)

Sample Test Questions: Lectures 10-13

In each case, the letter A indicates that the statement is correct, and a B indicates that it is not. I have included some notes (in red) to explain my thinking when designing each question.

Climate change has been predicted to cause many changes in the future. For which of the following things, is there already good evidence?

1. Growing season lengths have declined. **B**
2. Net primary production by plants in the Amazon Basin has declined. **B**
3. Sea-levels are rising faster than IPCC reports have predicted. **A**
4. Arctic permafrost is spreading. **B**
5. Many species have shifted their geographic ranges to the north. **A**

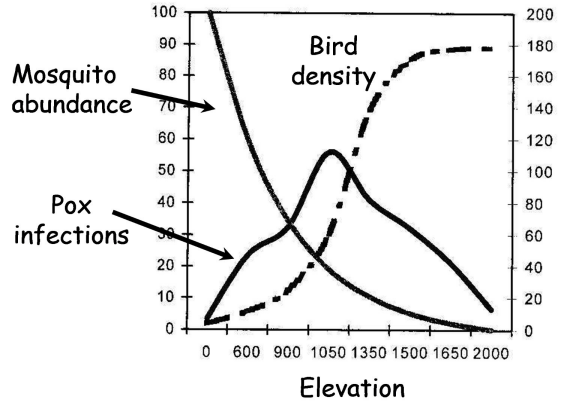
These are simply changes I talked about in the lecture. For questions like this, even if you do not remember what was said in class, you can often work the right answer out if you think it through carefully. E.g., if the climate is getting warmer, then it is likely that growing seasons will be longer (because most plants grow better when it is warm), that plant production will increase (for the same reason), that things that are frozen (like permafrost) will shrink, and that species will move north (because more northern places will warm up and become more like southern areas; at least in the northern hemisphere). In this question, I considered those 4 parts to be pretty easy. The final part (Q3) requires more specific knowledge and was included to help identify someone who has above-average knowledge of the material.

One of the best studies to examine the characteristics of successful invading species involved birds introduced to New Zealand. In this study, what were the best predictors of invasion success?

6. The number of individuals released. **A**
7. Reproductive rates. **B**
8. The number of potential competitors. **B**
9. Life spans. **B**
10. The number of introduction attempts. **A**

In lecture, I presented a number of general factors that have been associated with invasion success. I then presented the New Zealand example, saying that it was one of the best and that it found that most of those general factors were not actually important (suggesting, perhaps, that they have been identified due to spurious correlation). Q6 and Q10 give the things that are unambiguously important – collectively referred to as "propagule pressure". This set of questions tests whether you can differentiate between general patterns that seem to make sense, and may even be correct in some cases, and specific knowledge that derives from important case studies. This question also relates to ideas discussed in the "use of statistics" lecture.

The figure below describes factors relating to the incidence of avian pox in Hawaii, where it is an introduced disease that is transmitted to birds by mosquitoes. Which of the following statements about the figure are true?



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11. This figure shows that birds are uncommon in the lowlands. **A**
12. This figure shows that birds can effectively control introduced mosquito populations. **B**
13. This figure suggests that pox infections are highest where the mosquito vector is most common. **B**
14. This figure shows that pox infections are more common than mosquitoes at mid-elevations. **B**
15. This figure suggests that high elevations provide a refuge where birds are safe from disease. **A**

This is not a figure I have shown you in class, but all of the information you need to answer the questions is available. Q11 and Q13 simply involve reading information off the graph. Q15 requires a little interpretation, but since you know that mosquitoes and pox are both required for birds to get the disease (given in the question), and that these are both low in the uplands, where bird densities are high (from the graph), the inference in Q15 makes sense. Q12 is harder because it is possible that the low densities of mosquitoes at high elevations arises because birds control mosquito numbers, but the figure certainly doesn't show that this is the case. Given that the question tells you that mosquitoes transmit a disease that affects birds, it is more likely that the correct interpretation is that the high abundance of mosquitoes helps to reduce bird numbers in the lowlands. Finally, Q14 is wrong simply because you have no way of judging which is more common – because the axes are not labeled so you do not know which axis refers to which line, nor what any of the units are.

Which of the following statements about global change are accurate?

16. In parts of the world over 75% of river water is already allocated to human use. **A**
17. Atmospheric carbon dioxide concentrations are at their lowest point in 400,000 years. **B**
18. Global precipitation is likely to increase, and areas suffering water stress are expected to grow. **A**
19. Per capita food production has steadily decreased over the past few decades. **B**
20. Increased air-travel by humans is likely to increase the spread of disease organisms. **A**

Mostly these questions all relate to straightforward factual information that I talked about. Q18 is the hardest part because it tests whether you understand that, although climate may change in one direction (wetter) on average, spatial variation means that it can also change in the other direction (drier) in some places.

Which of these conservation actions would be considered representative of the declining population paradigm?

21. Translocating northern quolls to an island where they will be safe from invasive species that threaten them. **B**
22. Reducing the spread of invasive species. **A**
23. Developing a land protection strategy that helps to keep common species common. **A**
24. Captive breeding California condors. **B**
25. Implementing sustainable harvest management for waterfowl. **A**

This set of questions tests whether you understand the main conceptual difference between the two paradigms put forward in Caughley's classic paper. These specific conservation actions are not things that I have talked about in detail in class (though I did mention the quoll example in the invasive species chapter). But, if you understand the difference between Caughley's two paradigms, then you should recognize that very interventionist conservation actions focused on the last individuals of a rare species relate to the small population paradigm, while those focused on maintaining populations of multiple species over broad areas before they get to be very small relate to the declining population paradigm.

Why is it difficult to use observational field studies to determine the MVP for a species?

26. Because it is impossible to estimate the amount of environmental stochasticity. **B**
27. Because it typically takes a long time. **A**
28. Because estimating MVP requires that you track multiple populations. **A**
29. Because the data are difficult, or impossible, to gather. **A**
30. Because many people view it as unethical to let a population decline without doing something. **A**

This set of questions relates to the bighorn sheep example, which is one of the very rare cases where there are long data sets for multiple species (Q27-29). Q26 is wrong because it is not impossible to estimate environmental stochasticity – it usually does require a long of data though. Q30 also relates to the need for large data sets, but addresses a consequence of this – when species are rare/declining, conservation decisions often need to be made in the short term to ensure that a species does not go extinct. Thus, even if you could conduct a long-term field study, it is often not practical/appropriate to do so.

31. Describe three broad categories of ecosystem service, as described by the Millenium Ecosystem Assessment, and give an example of each. (6 points)
See notes for Lecture 12. 1 point for each category named, 1 point for each valid example.

32. Give a <u>specific</u> example of each of the following things. (3 points)

Invasive species: Lots of examples could have been used here – e.g., see notes for Lecture 10.
Greenhouse gas: Carbon dioxide is the most obvious answer, but there are others (e.g., methane, nitrous oxide).
Biological control: Two that I talked about in class are the introduction of mongoose to Hawaii to control rats (which failed) and the introduction of *Cactoblastis* moths to Australia to control prickly pear cactus (which succeeded). I would have accepted any other valid examples though.

33. In what ways do the small and declining population paradigms differ? (5 points)
See notes for Lecture 13. For 5 points I would have expected most of the information given in my notes – i.e., 1 point each for defining the paradigms, and 1 point for each of 3 distinct differences (e.g., development of theory, types of species that the approach focuses on, how good we are at addressing problems, etc.).