Biology 130 – Introductory Ecology
Midterm Review

Below I have listed the topics from the first portion of the course that I consider important. We have discussed the topics of greatest import and my exam will focus on that material. Do not ignore the book as it gives examples that will help conceptually to understand the various topics. Although the exam is not written, I would expect the bulk of the exam to be short answer essay. I may also ask you to interpret graphs and explain the meaning of various lines (these will be things you have already seen). I may ask you to qualitatively explain the meanings of formulae. I will not be able to address all of the questions I have specified below, but if you know the material listed below, you should do well on the exam.

Define the term ecology. Know the component parts and the importance of the relationships among the components.

What is meant by the statement - **The natural world is dynamic, but it is also stable and self-replenishing.** Please note the hand-out of the slide from lecture 1.

There is little doubt that the natural world is experiencing extinctions at an alarming rate, on the order of the mass extinctions of the past. But when we look at the estimates for the levels of extinctions, there are large discrepancies among estimated rates. Why? What does this tell about the importance of ecology?

Natural selection is a powerful force shaping the characteristics of a population. In order for selection to work on a character, what must be true of that feature? *(The answer to that question is – It must be determined, at least in part genetically.)* What are some of the random features that populations experience?

You should have an understanding of the hypothesis proposed by Charles Darwin – Evolution by Natural Selection. That is, **you should know the overall observations and conclusions derived from these observations**. I will not ask you to specifically provide the logical sequence of observations and inferences, but an overall understanding is essential.

Distinguish between proximate and ultimate causes for observed phenomena.

You should have a feel for the importance of both osmoregulation and thermoregulation for the survival of the organism. You should also be familiar with specific examples of organisms and how they maintain hydromineral balance. And, know specific examples of organisms that thermoregulate. That is, if I ask you to give me an example of an aquatic osmoregulator, you should be able to describe the physical features of this habitat and the way the organisms cope with these pressures; physiologically, behaviorally, and morphologically.

There are several other components of the physical environment that are important to life on earth. These include the general climatic factors (know the main ones), substrate types, and topography.

The factors you identified above (climatic and/or abiotic factors) typically determine the major vegetation types in a given region. How do we define these on a broad scale? Know several different terrestrial and aquatic biomes and some general features of each. Know the potential effects of topography (slope, exposure, elevation). How could substrate influence the biotic component of a region? **Please note that you should at least know some of the more distinctive biomes, such as the desert, tropical rain forest, temperate forest, intertidal and pelagic open ocean.**

What is a population? Why is the study of populations so important to evolutionary ecology?

What are the three patterns for the dispersion of individuals in space? What might lead to these patterns?

Why is genetic variability important for the population?

How can we estimate the population size in a given area (that is, if you can catch something!)? Know the simple formula.

There are three ways to evaluate age structure in populations. Know at least one and how this information might be used to derive predictions about the population.

Be able to describe at least two types of information we can derive from life tables.

Be able to plot graphically the general patterns of survivorship in natural populations. What does each of the curves suggest? Know examples of organisms of each type.

What is ***r*** in words and mathematically?

Be able to recognize the equation for exponential growth rate $\left(\frac{dN}{dt}\right)$. Be able to graph this equation. Is this realistic? Who was Thomas Malthus?

What is the environmental resistance to growth? Be able to recognize the rate formula for logistic growth and the shape of the graph for this equation.

What happens to the shape of the curve when we change r? K? or N?

Know density-dependent versus density-independent population regulation. Know what it means and examples of each.

What do we mean by r and K selected species? Know some general features associated with these strategies as Type I or III survivorship, density dependence, etc.

What factors may come into play in the process of population regulation? For example, environmental stochasticity?

From a graph, be able to interpret the lines and what we can and cannot say about the results regarding population fluctuations.

What sorts of features might contribute to the existence of fluctuations in population size (e.g. ***r***, recruitment, the time delay, age structure)? Know at least two and be able to briefly describe the contributions of each feature.

What are metapopulations? What features in the environment might lead to this pattern? With geographically structured populations, what two factors determine the number of occupied patches?

List and describe one feature of the distribution of patches that contribute to the number of patches that are occupied. What is the rescue effect?

Why are small populations more likely to go extinct? Be able to name and describe two potential factors that may influence extinction rates. Can subdivided populations ever be beneficial to the inhabitants?