

## **Biology 204 Final Exam Study Guide Spring 2003**

NOTE: Study guides 1 and 2 are also relevant for material from earlier in the quarter, though we don't reproduce them here.

### **Chapter 50 – Lecture 15, Ecology Introduction**

What are the four general types of ecology that we considered in class? What types of questions are asked in each? What is a population? a community? an ecosystem? What factors affect the distribution of organisms? Be able to give examples of these factors and describe how they might affect various organisms. What is a biome? Describe how climate influences the location of biomes. Why does average temperature vary on different parts of the globe? Rainfall? What is a microclimate? How might microclimates affect species dispersal? What are the main terrestrial biomes and what are their general characteristics? Aquatic biomes? What causes the seasons?

### **Chapter 52 – Lecture 16, Population Ecology**

Describe some characteristics that populations have that individual organisms do not. Describe and give examples of the three main distribution patterns. What is a life history table? How is it constructed? What information can we get from it? Describe and give examples of the three main survivorship curves. How might reproduction and survival affect each other? What are the two reproductive strategies? What types of organisms use each? What are the tradeoffs for each? Describe exponential growth. Be able to use the exponential growth equation to calculate population size. How does the exponential growth curve change with different  $r_{max}$ ? What does growth look like if  $r$  is negative? if  $r$  is zero? Describe logistic growth. What is a carrying capacity? Be able to use the logistic growth equation to calculate population size. What is the difference between  $r$ -selection and  $K$ -selection? Understand density-dependent and density-independent characteristics that affect population growth. Give examples of each. How do population-limiting factors work together to cause cyclic growth in some populations (think snowshoe hares and lynx here)? Does the human population show exponential or logistic growth? What are some reasons for this type of growth? What is an age-structure pyramid and what information does it give us? How is an ecological footprint calculated (in general terms)? What are some conclusions that can be drawn from the ecological footprints of various nations?

### **Chapter 53**

#### **Lecture 17, Community Ecology I**

What is an ecological community? How do the individualistic and interactive hypotheses of community structure differ from one another and what types of data support which model? What are the different community interactions we discussed? How are they similar and how different? How might each act as an evolutionary force affecting the fitness of individual organisms? (What is Darwinian fitness?) How might each be involved in regulating population growth of a particular species (see above)? How does Gause's competitive exclusion principle relate to the idea of a niche – both realized and fundamental (see below)? What different types of interactions are encompassed in the broad definition of "predation"? How do these interactions differ from one another and how are they similar? The book describes a number of adaptations of predators and prey, particularly regarding coloration (e.g., crypsis, aposematic coloration, mimicry). What are they and what benefits might they convey? How does mutualism differ from symbiosis? What three criteria are useful for categorizing different types of mutualisms and what are some examples of each type of mutualism? Can you think of any others from the organisms we've studied over the last quarter? What's the difference between species richness and species evenness and how are these two concepts used to describe the diversity of a community? What is meant by "trophic levels" and what factors might affect the number of trophic levels in a community? How do trophic levels relate to food webs?

#### **Lecture 18, Community Ecology II**

What is a dominant species in a community? Why might that species be dominant? Describe and give an example of how a keystone predator controls community structure. What is a fundamental niche compared to a realized niche? How might facilitative community interactions change the size of a realized niche compared to a fundamental niche? Describe bottom-up control of community structure. How might

the upper trophic levels change if a bottom level was manipulated? Describe top-down control of community structure. Describe the chain of events that would occur if one of the upper trophic levels were manipulated. How does disturbance influence community structure? What is the difference between primary and secondary ecological succession? Describe examples of each. How does species richness change over a polar-equatorial gradient? Why? How does species richness change with area? Why? Using MacArthur and Wilson's island biogeography theory, describe how the number of species present on an island affects immigration and extinction rates. What is the equilibrium number of species? How does the equilibrium number of species differ on large islands compared to small islands? Why? How does the equilibrium number of species differ on near islands compared to far islands? Why? What other factors could influence the equilibrium number of species on an island?

#### **Chapter 54 - Lecture 19, Ecosystem Ecology**

What is an ecosystem? Why is it that materials cycle within ecosystems but energy flows through ecosystems? Who are the primary decomposers and how is it that they provide a critical link in ecosystems? How does this relate to the fungal lifestyle of being an absorptive heterotroph? What is meant by primary production? How does production differ from biomass? We talked in class mostly about photoautotrophs, but chemoautotrophs are important in some instances as well. What types of organisms are most likely to be photoautotrophic and which are most likely to be chemoautotrophic (i.e., what domain, kingdom or phylum)? How does GPP differ from NPP and which is most relevant to whole ecosystem energy budgets? What factors control primary productivity in different ecosystem types (e.g., aquatic vs. terrestrial) and how does this differ depending on scale? What are secondary production, production efficiency, and trophic efficiency? How do they depend on one another and how are they related to food chains and food webs? What is the difference between trophic pyramids based on energy, biomass, and numbers of individuals? Could you ever have an inverted trophic pyramid? If so, why, and for which type(s) of pyramid? How do trophic pyramids relate to population sizes of top predators and how is this relevant for both conservation of endangered species and human carrying capacity? What is bioaccumulation, and how does it relate to trophic pyramids?

How does carbon cycling differ from energy flow? What processes are the major flows in the carbon cycle? By what activities and in what direction are humans changing the atmospheric pool of carbon? What consequences does this have for global climate? Is the antarctic ozone hole caused by elevated CO<sub>2</sub> and global warming? If not, what is it caused by? We didn't get a chance to cover the nitrogen and phosphorus cycles in class, so you will not be held responsible for the details of this material, except for the following general questions related to the reading the Powerpoint from lecture 19. What are the major inputs of available nitrogen into ecosystems? Is this sufficient to support plant growth on a yearly basis? If not, what does? How does decomposition determine rates of nutrient cycling (for N and P) in natural ecosystems? How have human changes to the N and P cycles affected eutrophication in aquatic ecosystems?

**Chapter 55 – Conservation Biology: we're skipping this entirely.**