

**Unit 4 Study Guide: Community Ecology**

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A. Communities and Biodiversity

1. What is an ecological community? What two components determine the biodiversity (species diversity) within a community? Be sure to use the proper terms and to define them correctly. Using these two concepts, explain how biodiversity could be lost from a community even if the number of species in the community stayed the same.
2. Ecologists are still a long way from understanding why some communities are more diverse than others. Explain the two general patterns we identified in class. For each pattern, you should be able to state what the pattern is as well as to discuss what ecologists think the causes are.
3. Discuss the Kissimmee River restoration project. What was the river like before flood control? How was flood control achieved? What consequences did that have for the landscape and for biodiversity? Explain those consequences in terms of the patterns you discussed in #2 above. Why was the initial restoration project undertaken? What did it involve? What were the outcomes? Explain those outcomes in terms of the same two processes. What is the long-term restoration goal for this system? What results had been achieved by the end of 2004? Be specific and detailed in your answer.

B. Ecological Interactions

1. Define the four basic types of interactions among species within communities in terms of their fitness consequences to each "partner" in the interaction.
2. Define "interspecific competition." Define "ecological niche." State as many components as you can think of for the ecological niches of a koi living in the oceanography pond, a squirrel living in the willow oaks outside of Rollins Hall, and a crepe myrtle living in the Kaufman Mall.
3. State the principle of competitive exclusion and clearly explain how the concept of the ecological niche relates to interspecific competition.
4. In lecture, I stated that interspecific competition can have several different outcomes, depending on its strength. Name and describe each outcome. Where relevant, give specific examples, including experimental studies demonstrating each. For experimental studies, be sure to explain the basic natural history of the system studied, the specific hypothesis and predictions tested, the methods used, and the results and conclusions. You should also be able to identify dependent and independent variables and, where appropriate, standardized variables.

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5. What kinds of interactions are considered “exploitation”? Describe Janice Moore’s experimental work demonstrating that spiny-headed worms change the behavior of their intermediate hosts in such a way as to increase their transmission to their final hosts. Describe how the parasitic rust we discussed changes the “behavior” of its plant host in such a way as to increase its own reproduction.
6. Why are exotic parasites potentially significant conservation problems? Illustrate your answer using the examples we discussed in class. Be specific and detailed in your answer.
7. Describe the basic kinds of adaptations animals use to defend themselves against their predators, giving specific examples as appropriate. Be sure to be able to distinguish between the two forms of mimicry.
8. Describe the basic kinds of adaptations plants use against their herbivores, giving specific examples as appropriate. What do the chemicals we use to spice our foods (cinnamon, e.g.) and the chemicals we use to kill pests (strychnine, e.g.) have in common?
9. Describe the basic kinds of adaptations animals use to prey on other animals and that herbivores use to “prey” on plants.
10. Explain the statement that exploiters and the organisms they exploit are locked into an evolutionary arms race. Define the term co-evolution and describe it using the examples we discussed in class. Can you think of additional examples from other kinds of interactions (i.e., other than exploitation)?
11. Use the examples of *Pisaster* starfish, the red crabs of Christmas Island, and the sea otter/kelp forest interaction to discuss the ways in which exploitation can affect the habitat structure and biodiversity of a community. Be sure to define the term “keystone predator” and “keystone species”. Must invasive “exploiters” affect keystone species in order to have significant effects on the communities they invade? Justify your answer with specific examples.
12. What is the relationship between exploitation and biological control? Describe the problem and successful biological control of prickly pear cactus (*Opuntia*) in Australia. Why was this program successful? What problems has it caused elsewhere, and why? Are there other examples of this kind of problem?
13. What is commensalism? List and briefly describe/define the 4 types of

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- commensalism, giving examples as appropriate. Are these important interactions for maintaining biodiversity? Justify your answer with specific examples. Can commensal relationships between invasive species cause problems? Justify your answer.
14. What is mutualism? List and briefly define/describe the 3 major types of mutualism, giving examples as appropriate (hint: you should be able to describe each of the examples discussed in class). In detail, describe the mutualistic interactions of plants and mycorrhizal fungi; legumes and nitrogen-fixing bacteria; coral polyps and zooxanthellae; and herbivores and gut symbionts; eukaryotic cells and mitochondria/chloroplasts; and flowering plants and pollinators/dispersers. Using these and other examples, defend the statement that mutualistic interactions are responsible for the structure and function of most terrestrial communities and for much of the biodiversity in marine communities.
  15. Can mutualistic interactions among species contribute to the problems caused by exotic invasive species? Justify your answer with examples from class.
  16. Read section 17.20 in your text. What are lichens? What kind of interaction do they represent? Why are they important ecologically? Read section 17.21 in your text and describe the relationship between leaf-cutter ants and fungi. How should this relationship be classified? Why?
  17. Describe the apparent mutualistic interaction between traditional African (human) honey gatherers and the greater honeyguide. How did Isak test the hypothesis that this was a truly mutualistic interaction? Be sure to identify his specific hypotheses and predictions, the tests he used, and his results/conclusions. Identify independent, dependent, and standardized variables as appropriate.