

## **INTRODUCTION TO ECOLOGY**

1. Define ecology
2. Discuss the hierarchies that are directly relevant to ecological studies.
3. Biosphere, Ecosystem, Community, Species, Populations
4. What do ecologists mean by distribution and abundance?
5. Define and give examples of abiotic and biotic components of ecosystems
6. What is Biogeography?
7. Discuss the components of the atmosphere: Troposphere: Stratosphere: Mesosphere: Thermosphere: Exosphere: Ionosphere:
8. Define Climate. What are the two main components of climate?
9. List various factors that have an affect on climate.
10. What is a biome? Describe briefly each of the biomes discussed in class.
11. What is the difference between an oligotrophic lake and a eutrophic lake?
12. Which biomes are the richest in biodiversity?
13. What kind of biome is the San Francisco Bay Delta? What are the major terrestrial biomes surrounding the Bay?

## **POPULATION ECOLOGY**

1. Define population. What are the main parameters/areas of interest in population ecology?
2. What is abundance? How do we measure this? How do we determine density? Give examples.
3. Describe the various dispersal patterns. In what circumstances do organisms adopt each of the dispersal patterns discussed in class?
4. What are demographics?
5. Define Direct Counts, Quadrates, Mark and recapture. What "other" methods can be used to estimate populations?

6. What kinds of factors affect the overall distribution of populations? (I.e. where they can live and where they can't.)
7. What is an age pyramid? What is a cohort? What does sex ratio refer to?
8. What is a survivorship curve? What kind of information does it give us? What about reproductive tables? Which are more important in studying life histories?
9. Compare and contrast Semelparity (monocarpy) and iteroparity (polycarpy). Give examples of organisms that typify these concepts.
10. List some factors that affect population growth. What is exponential growth? When does it occur?
11. What is K? What happens when a curve/population gets to K?
12. Compare and contrast J-curves and S-curves. When does each occur?
13. What are r and K selected species? Give some characteristics and examples of each.
14. What are density dependant factors that affect populations? Define and give examples.
15. What are density independent factors that affect populations? Define and give examples.
16. Describe passive vs. active dispersion of organisms. Give examples.
17. What factors can determine the geographic range of an organism?
18. What is immigration? Emigration? Migration?
19. What are invasive species? Give examples of invasive species.
20. Describe current human population characteristics.

## **COMMUNITY ECOLOGY**

1. Define community. What do we mean by species richness and relative abundance? How do these affect community structure?
2. What are Dominant species? What is biomass? What are keystone species? Give examples. What are biological engineers? Discuss the example of *Pistaster* sea stars and mussels as they relate to the concept of keystone species.
3. What is a habitat? How is that different from a niche?

4. Describe the competitive exclusion principle and resource partitioning. What is character displacement?
5. What are functional groups or guilds? Give examples.
6. What is a trophic structure? Food chain? Food web?
7. Define symbiosis. List and discuss the various types of interactions discussed in class. Give examples.
8. Why don't herbivores eat all the plants? Why don't predators eat all the prey? Give examples.
9. What is cryptic coloring? Aposematic coloration?
10. What is mimicry? Discuss Mullerian and Batesian mimicry. Give examples.
11. What is parasitism? What is the difference between endo- and ecto-parasite? Give examples.
12. What is pin worm? Type of organism- symptoms- who gets it and how, treatment?
13. What is malaria? Type of organism- symptoms- who gets it and how, treatment?
14. What is ringworm? Type of organism- symptoms- who gets it and how, treatment?
15. What is mutualism ? Give examples.
16. What is commensalism? Give examples.
17. What is co-evolution and how does it relate to symbioses?
18. Give some examples of abiotic factors that contribute to community structure.
19. What is zonation?
20. What is the Intermediate Disturbance Hypothesis? Difference between primary and secondary succession? Give examples of each.

## **ECOSYSTEMS**

1. What is an ecosystem?
2. Describe the two main considerations when studying ecosystems: energy flow and chemical cycling.

3. Define Autotrophs, heterotrophs, primary producers, primary consumers, secondary consumers, tertiary consumers, detritivores.
4. Define primary productivity, Gross primary productivity (GPP), Net primary productivity (NPP) and standing crop biomass.
5. Discuss factors affecting primary productivity: MAP, MAT, light, latitude, nutrients, etc.
6. Where are the three highest and lowest terrestrial primary productivity on Earth? Why? What about in the oceans?
7. What is secondary production? What is production efficiency? Do all animals have the same production efficiencies? Explain?
8. What is trophic efficiency? What is the typical range?
9. Which two groups of organisms are the dominant decomposers? Which decompose mostly plant material and which decompose mostly animal remains?
10. Define decomposition. What are some of the factors that affect decomposition rate?
11. What happens to the elements, molecules, ions after decomposition? In other words, what function is served by decomposition in the environment?
12. In what order do biological molecules get decomposed? In other words, which one breaks down first and which ones take longer to break down?
13. What is lignin? Describe the unique issues with lignin decomposition. What role does oxygen availability play in the decomposition of lignin?
14. Define Mineralization, immobilization, Incorporation?
15. What is retranslocation? What do we mean by element mobility? Give examples of elements with high or very high mobility.
16. Describe the litterbag method of determining decomposition rates.
17. How do diurnal temperature changes affect decomposer organisms?
18. What type of climate generally favors decomposition? In which climate would you be most likely to find a carcass of a long-extinct animal with very little decomposition?
19. What are the main factors that affect decomposition rates in aquatic environments?
20. Describe the carbon cycle including reservoirs and the major natural processes that transform carbon from one form to another. What do organisms need carbon for? In what form do plants use carbon?

21. What factors are involved in the excessive Carbon dioxide levels in the atmosphere? What is the result of having excess carbon dioxide in the atmosphere? List a few of the major green-house gasses. Where do they come from?
22. Describe the nitrogen cycle including reservoirs and the major natural processes that transform nitrogen from one form to another. What form of nitrogen make up 78% of air? What forms are usable by plants? What process has to occur for this transformation to take place? What do organisms use nitrogen for?
23. Describe the phosphorous cycle including reservoirs and the major natural processes that transform phosphorous from one form to another. What do organisms use phosphorous for?
24. What is eutrification? What is the source? What elements are involved?

### **CONSERVATION ECOLOGY**

1. What is the main focus of conservation biology?
2. What are the aspects of biodiversity that are important to conservation biologists?
3. What are biodiversity hotspots? Where do they tend to be located?
4. Discuss the debate between the intrinsic value of nature and the utilitarian value of nature. Discuss the contributions of Muir, Pinchot and Leopold to this issue.
5. What do we mean by ecosystem services? List some examples.
6. What is biophilia? Give examples of this behavior.
7. What is extinction? What is extirpation? What is the background rate of extinction?
8. What are mass extinctions and how many have occurred in the past few hundred thousand years?
9. What is the current rate of extinction? How does this compare to the background rate?
10. What is an endangered/threatened species? How many species are considered threatened or endangered?
11. Give some examples of some local organisms that are threatened or endangered. What is the major factor in these organisms being endangered?

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12. What is a Minimum viable population?

13. What does HIPPO stand for?
14. What is Fragmentation? How does it negatively impact ecosystems? What are edge effects?
15. What are introduced species/diseases? How do they usually get into new habitats? Why are they so often invasive? What are some of the negative consequences of invasive species?
16. Give some examples of organisms that are endangered due to overharvesting or exploitation. What is by-catch? What is "bush-meat"? Give some examples of organisms that have gone extinct due to these problems.
17. What role does pollution play in extinction/endangerment? What is Bioaccumulation?
18. What is DDT? When was it banned? Discuss the effects of DDT on bird eggs. Is it still used? For what?
19. How does climate change affect biodiversity? What is Coral reef bleaching? What is the relationship between climate change and polar bear extirpations, emigration, endangerment?
20. Describe some of the various legislations that have had positive effects on climate, pollution, etc.
21. What are some of the methods used by conservation biologists?
22. What is the endangered species act? Why is it controversial?
23. What is captive breeding? Give an example of a success using this method. Give an example of a failure.
24. What are the main considerations when designing reserves to protect biodiversity?
25. What is an umbrella species?
26. Discuss size, connectivity, borders, stop-overs, transitional borders, grassy waterways and Riparian buffers zones.
27. What is bioremediation? What is Acid mine drainage? What are superfund sites?
28. What is sustainable development? Why is it hard to get "buy-in" from developing and undeveloped countries? What is the "washing-machine line"?