**Population Ecology Study Guide**

* To be filled out while viewing the lecture (parts 1 and 2) and read the assigned text.

**Part 1: Size Growth, and Regulation**

1. In your own words define the following:
   1. Population
   2. Habitat
   3. Biotic factors
   4. Abiotic factors
2. Consider the following description: In a Sea Kelp Bed there are a variety of types of species present, including sea otters, several species of kelp and other aquatic plants, and sea urchins, just to name a few. Sea otters are considered a keystone species. This means that the health of the various species that live here and the habitat itself are utterly dependent upon the health of the sea otter populations. Sea otter populations are dwindling due to overfishing in the regions they live. The main food source for sea urchins is the kelp that extends through the water column. Sea otters are distributed throughout the northern Pacific Ocean and are restricted to coastal regions because they collect their food (mostly crabs, clams, mussels, and sea urchins) from the ocean floor. Sea otters spend much of their time in water that can be as cold as -4°F. A group of otters is called a “raft,” probably because they spend much of their time floating on their backs. From this description:
   1. List as many biotic factors you can identify:
   2. List as many abiotic factors you can identify:
3. Biotic Potential is defined as: The maximum rate at which the population could increase, assuming \_\_\_\_\_\_\_\_\_\_\_ conditions. E.g. having adequate food, space & access to mates. Why do you think biotic potential is rarely achieved?
4. Can you think of some limiting factors that might prohibit a population from achieving its biotic potential?
5. Factors that increase population size:

>

>

Factors that decrease population size:

>

>

1. Explain, in your own words, what “r” represents.
2. What is the difference between growth rate (r) and population growth (G)?
3. Write out the equation in the space below for the

Population Growth = ( ) x ( )

1. Example:
   1. Population of mice = 2000 total size
   2. 1000 mice born every month
   3. 200 mice die every month
   4. Birth rate =
   5. Death Rate =
   6. Growth Rate =
   7. Population size after 1 month =
   8. 2 months =
   9. 3 months =
   10. 4 months =
   11. 5 months =
   12. 6 months =
   13. Graph it (Don’t forget the appropriate axes labels!):
2. To maintain exponential growth, \_\_\_\_\_\_\_\_\_ must remain constant,

and there can be no \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ present in the environment.

A population experiencing exponential growth is achieving their \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Mathematically, how does exponential growth differ from logistic growth?
2. What is carrying capacity?
3. When is a population considered stable?
4. If a population overshoots its carrying capacity, the environment can be damaged. Explain what can happen to populations in the following scenarios:

> Extreme damage

> High damage

> Low damage

1. If 150 sea urchins live in a tide pool that is 200 m2, what is the density of the sea urchin population?
2. In your own words, explain what environmental resistance means.
3. Define density dependent factors and provide as many examples as you can think of.
4. Observe the graph of the predator/prey interaction cycle.
   1. What can be said happens to the predator population when:

- The prey population is high:

- The prey population is low:

* 1. Which is the first population to experience growth in each cycle, the predator or the prey?

1. Define density independent factors and provide as many examples as you can think of.
2. Hypothetically, if humans were to bulldoze an area of prairie to build a shopping mall, wiping out the plant and animal populations in that area, would this be considered to be density dependent or independent factor. Circle your guess.
3. What are some ways humans manipulate and side step normal controls that usually influence carrying capacity?
4. Using your textbook resource, explain why even though the United States is a developed country, it is also considered the fastest growing population of any developed country.
5. What is the global growth rate in 2008? Hint: refer to figure 26-21.
6. Stages in Demographic Transition Model
   1. Describe the following aspects of a country in the Pre-Industrial stage:
      1. Birth Rate:
      2. Death Rate:
      3. Population size:
      4. Population growth:
   2. Describe the following aspects of a country in the Transitional stage:
      1. Birth Rate:
      2. Death Rate:
      3. Population size:
      4. Population growth:
   3. Describe the following aspects of a country in the Industrial stage:
      1. Birth Rate:
      2. Death Rate:
      3. Population size:
      4. Population growth:
   4. Describe the following aspects of a country in the Post-Industrial stage:
      1. Birth Rate:
      2. Death Rate:
      3. Population size:
      4. Population growth:
7. Replacement Level Fertility is defined as:
   1. Why is RLF usually considered 2.1 instead of 2.0?
   2. How does RLF differ from natural rate of increase (AKA growth rate)?

**Part 2: Distribution and Life History Patterns**

1. Sketch an age structure diagram of a developing nation in the transitional phase of development. Label and describe the age structure diagram, and include all of the important aspects of the diagram: Reproductive phases, gender, and growth pattern (i.e. is it growing rapidly, shrinking or maintaining equilibrium?)
2. For the following descriptions, predict what type of distribution pattern each population might have:
   1. A flock of sea gulls nesting on a secluded cliff: There is intense competition for nesting sites and food resources. The flock migrates to the same cliff each winter seeking a milder climate to hatch their young.
   2. Trees in a grass prairie land: individuals are spread throughout the grassland at random by the wind, and individuals rarely compete for resources such as nutrients dissolved in the soil.
   3. A pride of lions: These animals exhibit a complex social structure, including sharing offspring rearing duties and hunting responsibilities
3. Draw out the three different life history patterns in the space below. Give examples.

Late Loss – High Youth Survival

Example: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Constant Loss

Example: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Early Loss – Low youth survival

Example: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which curve most likely represent species that participate in parental care?
2. Which curve suggests that that older you are the more likely you are to survive?
3. Which curve most likely represents species that are most susceptible to influences like disease and predation throughout their entire life span?
4. Which curve most likely represent species that produce lots of offspring in one reproductive event?
5. Discuss some ways that knowing how a population is distributed through the habitat can be used to develop a conservation strategy.
6. How about survivorship curves? How can they be used to save vulnerable species?