

# Independent Study Unit

You will be covering the **Population Dynamics** unit in the form of an Independent Study Unit (ISU). This package contains a total of three worksheets; you will need to submit one each week for evaluation. The due dates are given below.

- **Part I July 12th 2011**
- **Part II July 19th 2011**
- **Part III July 26th 2011**

The textbook provided (Nelson Biology 12) gives you a comprehensive resource. However, you may need to do additional research to answer the questions fully. You are allowed to copy and paste diagrams/photos from the web provided the references are indicated and cited properly. At the end of all the answers, provide a bibliography. Please ensure your answers are typed or very neatly written.

Each set of questions will be evaluated on the following rubric. The ISU accounts for 8% of your final grade.

	100-80%	79-70%	69-60%	59-50%
	4	3	2	1
<b>Knowledge</b>	Student answers all questions thoroughly and correctly and shows an excellent understanding of the topic. 10      9      8	Student answers most questions and shows a good understanding of the topic. 7.5      7	Students accurately answered some of questions but there are many elements missing or incorrect. 6.5      6	Student has not answered many of the questions or does not show comprehension of the topic. 5.5      5
<b>Communication</b>	Concepts were explained with a high degree of clarity. Error free. Typed/neatly written. Easy to read. 10      9      8	Concepts were communicated clearly. There are few a grammatical errors. 7.5      7	Student shows understanding but has difficulty answering questions thoroughly and fluently. 6.5      6	Poor communication has taken away from the learning that has taken place. Lots of grammatical errors. 5.5      5
<b>Research</b>	Student has conducted external research where necessary and has presented a thorough, well-informed report. A bibliography is included with the appropriate format (MLA or APA). 5      4	Student has conducted external research and has shown a good effort to make connections. A bibliography is included without the appropriate format. 3.5	Student has not conducted appropriate external research and has mainly reported answers coming from one source. A bibliography is not included. 3	Student did little external research, no bibliography included. 2.5

**/25 MARKS**

# SBI4U POPULATION DYNAMICS - PART I

Read pages 650-658 and 671-675 in your textbook and then answer the following questions.

## Characteristics of Populations

1.
  - a) In order to study populations, scientists need to be able to describe a population. What are THREE different measurements that scientists use to describe populations
  - b) Define the terms "population size" and "population density." How do these two terms differ from one another?
  - c) An area measuring 1000 ha (1 hectare = 10,000 m<sup>2</sup>) has 200 wolves in it. What is the size of this population? What is the density of this population?
  - d) Table 1 on page 651 presents the population densities for a number of species. The statement is made "small organisms usually have higher population densities than larger organisms". What are TWO different reasons why you might expect this to be true? (R)
  
2.
  - a) What is the difference between "crude density" and "ecological density?"
  - b) Why is this distinction (i.e., crude versus ecological density) necessary? Which of these two measures of density is typically higher?
  
3. What is meant by the term "population dispersion?"
  
4.
  - a) Describe what is meant by a "clumped dispersion pattern." Include a diagram with your description. Provide an example of this type of dispersion pattern from nature.
  - b) Describe what is meant by a "uniform dispersion pattern." Include a diagram with your description. Provide an example of this type of dispersion pattern from nature.
  - c) Describe what is meant by a "random dispersion pattern." Include a diagram with your description. Provide an example of this type of dispersion pattern from nature.
  - d) What ultimately determines what type of dispersion pattern a species exhibit in an area?
  - e) Which type of dispersion pattern is rarest in nature? Why do you think that this is the case?

# SBI4U POPULATION DYNAMICS - PART II

Read pages 660-669 in your textbook and then answer the following questions.

## Measuring and Modeling Population Change

1.
  - a) Explain what is meant by the term “environment”.
  - b) Describe some biotic resources that may be limited in an ecosystem at any one time.
  - c) Describe some abiotic resources that may be limited in an ecosystem at any one time
  
2.
  - a) What is meant by the term “carrying capacity of a population”?
  - b) Is the carrying capacity the same for all species? for all populations of the same species? Discuss.
  - c) What sorts of things determine the carrying capacity of an ecosystem?
  - d) In general, what happens to the resources of an ecosystem as a population increases in size?
  
3.
  - a) Define the term “population dynamics”.
  - b) What are two means/methods by which a population can increase in size?
  - c) What are two means/methods by which a population can decrease in size?
  - d) Define each of the following terms: natality, mortality, emigration, and immigration.
  
4.
  - a) What is meant by the term “fecundity”?
  - b) Do all species show the same fecundity? Provide examples of species with a high fecundity. Provide examples of species with a low fecundity.
  - c) Compare the reproductive strategies of a short-lived species such as a starfish and a long-lived species such as a hippopotamus.
  
5. What are THREE different patterns in “survivorship” that species exhibit?  
For each pattern
  - a) use a graph/figure to illustrate the pattern,
  - b) describe characteristics of species that show that pattern, and
  - c) provide an example of a species that exhibits that pattern
  
6. How does the number of offspring that are produced by an individual typically compare with the fecundity of that individual? What sorts of factors create this discrepancy (i.e. limit reproductive potential)?
  
  
7.
  - a) What is the formula that is used to determine “population growth” or “population change”?
  - b) A population of 2000 seals produces 950 young in one year. In the same period of time, 150 seals die. If 50 seals leave the population to join another population, and 30 seals join the population under study, what is the “population change” of the population under study?
  - c) What is an “open population”?
  - d) What is a closed population?
  - e) Which type of a population (i.e., open versus closed) is the most common? What are some examples of closed populations?
  - f) What is meant by the term “biotic potential”?

# SBI4U POPULATION DYNAMICS - PART III

Read pages 671-675 in your textbook and then answer the following questions.

## Factors Affecting Population Change

1.
  - a) What is a density dependent factor?
  - b) List THREE different density dependent factors.
  - c) How did Charles Darwin use the concept of density dependent factors in his Theory of Evolution?
  
2.
  - a) Distinguish between intraspecific competition and interspecific competition. [
  - b) What are some of the potential consequences to the population as the density of that population increases?
  
3.
  - a) What is predation?
  - b) How does predation operate as a density dependent factor?
  - c) How does disease operate as a density dependent factor?
  - d) What is the "Allee effect"?
  - e) Why is the passenger pigeon argued to be an example of the "Allee effect"?
  - f) What is meant by the term "minimum viable population size"?
  
4.
  - a) What is a density independent factor?
  - b) What are TWO (supposedly) examples of density independent factors? Provide specific examples.
  - c) What is meant by the term "biomagnification"?
  - d) Why are top level carnivores so susceptible to such things as pesticide use?
  - e) What is a "limiting factor"?
  - f) What typically happens when a population surpasses the carrying capacity of the environment?
  - g) Why do population biologists monitor natural fluctuations in such things as the size and density of populations?
  - h) Answer questions #3 and 5 from section 14.3 questions on page 675.