

Adult Basic Education  
**Science**

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**Science 2100A**  
**Ecosystems**

**Study Guide**

**Prerequisites:** None

**Credit Value:** 1

**Text:** *Nelson Science 10: Concepts and Connections*; Nelson Thomson Learning; 2002.

**Science Courses [General College Profile]**

**Science 2100A**

Science 2100B

Science 2100C

Science 3101

Science 3102

Science 3103

Science 3104

Science 3105

Science 3106



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## To the Student

### I. Introduction to Science 2100A

This course is intended to help you acquire knowledge about ecosystems that will allow you to become an informed participant and decision maker in the future of the environment.

This course is divided into three units. The first unit, *Diversity in Ecosystems*, will introduce ecological concepts as well as food chains and webs. The idea of biodiversity will be discussed, showing how ecosystems are rich in biotic factors and that biotic factors are linked to abiotic factors. It will emphasize how biodiversity is continuously threatened.

The second unit, *Change and Stability in Ecosystems*, will examine the flow of energy through ecosystems and in doing so, explore food chains and webs in more detail. Important geochemical cycles such as the carbon and nitrogen cycles and their role in shaping ecosystems will be studied. The idea of how humans are affecting and interfering with these cycles and thus interfering with ecosystems through the use of pesticides and activities will be explored.

The third unit, *Populations*, will examine ecological populations. Population growth and its relationship and impact on the environment will be introduced.

This is a 1 credit course and, along with Science 2100B, it is a **pre-requisite for Science 2100C**.

**\*Note:** You cannot receive credit for this course and Biology 1101.

## To the Student



### II. Use of Science Study Guides

Before beginning this course, ensure you have the text and any other resources needed (*see the information in the Introduction to this course for specifics*).

As you work through the Study Guide, you will see that it is divided according to the Units listed in the Table of Contents. When you open a unit it will have the following components:

#### **Reading for this Unit:**

Here you will find the chapters, sections and pages of the text you will use to cover the material for this unit. Skim the sections of the textbook, look at the titles of the sections, scan the figures and read any material in the margins. Once you have this overview of the unit, you are ready to begin. Do not be intimidated by the content. You will work through the text, section by section, gaining knowledge and understanding of the material as you go.

<p><b>References and Notes</b></p> <p>This left hand column guides you through the material to read from the text. Read any highlighted notes that follow the reading instructions. The symbols   direct you to the questions that you should complete when finished a reading assignment..</p>	<p><b>Work to Submit</b></p> <p>You come across three (3) headings in this right hand column.</p> <p><b>Writing:</b> This section comprises your notes for the unit. Here you will find either written questions or references to specific questions or problems from your text. You may want to write out each question followed by the answer. This material should be checked by your instructor before moving on to the next unit. Mathematical problems should have their solutions checked <u>as you go</u>.</p> <p><b>Laboratory:</b> This section indicates if there is a Core Lab that should be completed for the unit. Let the instructor know in advance that you will be ready for the lab. A lab report should be submitted for each Core Lab. Your instructor will provide guidelines as to how s/he wants the report written.</p> <p><b>Assignment:</b> This section indicates if there is an assignment that should be completed for the Unit. The information in the “References and Notes” column will indicate how you obtain the assignment. These assignments frequently relate the science content to technology, society and the environment.</p>
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## To the Student

### III. Recommended Evaluation

Written Notes	10%
Labs/Assignments	20%
Test(s)	20%
Final Exam ( <i>entire course</i> )	<u>50%</u>
	100%

**The overall pass mark for the course is 50%.**





## Unit 1 - Diversity in Ecosystems

To fulfill the objectives of this unit, students should complete the following:

### Reading for this unit:

Unit 1 - Introduction, pages 6 - 7;  
Sections 1.1 - 1.6, pages 8 - 21.

References and Notes	Work to Submit
<p><i>Refer to the information below and answer question 1.1</i> ▶▶</p> <p><b>Note:</b> <i>Ecosystem</i> is a term used to describe the relationships among the many species living in an area and their relationships with the non-living components of the environment.</p> <p><i>Refer to pages 6 - 7 to write an answer for question 1.2</i> ▶▶</p> <p><i>Refer to pages 8 - 10 to write answers for questions 1.3 - 1.4</i> ▶▶</p>	<p><b>Writing:</b></p> <p>1.1 Define ecosystem.</p> <p>1.2 Describe the factors that contribute to changes in ecosystems.</p> <p>1.3 Define the following terms and, using the <i>frog food chain</i>, give an example of each:</p> <ul style="list-style-type: none"><li>i) food chain</li><li>ii) producer</li><li>iii) consumer</li><li>iv) herbivore</li><li>v) carnivore</li><li>vi) decomposer</li></ul> <p>1.4 Using frogs as an example, describe 4 possible reasons why living things are disappearing.</p>

## Unit 1 - Diversity in Ecosystems

References and Notes	Work to Submit
<p><i>Refer to pages 12 - 13, including Table 1, to write answers for questions 1.5 - 1.6</i> [▶▶]</p> <p><i>Refer to pages 14 - 15 to write answers for questions 1.7 - 1.9</i> [▶▶]</p> <p><b>Note:</b> In general, <b>biotic factors</b> refer to the <b>living</b> environment and include all other organisms that interact with an organism. Biotic factors can include decomposing plant and animal materials, disease, predator/prey interactions, and competition. <b>Abiotic factors</b> are <b>non-living</b> factors that affect life. They can include temperature, oxygen, sunlight, water and soil nutrients.</p> <p><i>See your instructor to get a copy of Assignment 1, the assignment for this unit</i> [▶▶]</p> <p><b>Note:</b> The mark you get on the assignment will be used to help determine your final mark for the course.</p> <p><b>Note:</b> This is the end of Unit 1. You should check with your instructor to see if there is review work or any other additional work for this unit.</p>	<p><b>Writing:</b></p> <p>1.5 Explain what is meant by describing a species as ‘at-risk’.</p> <p>1.6 Complete questions 1 - 4 in ‘Understanding Concepts’ on page 13.</p> <p>1.7 Define ecology.</p> <p>1.8 Define each of the following terms:</p> <ul style="list-style-type: none"><li>i) biotic factors</li><li>ii) abiotic factors</li><li>iii) population</li><li>iv) community</li></ul> <p>1.9 Complete questions 3 and 4 in ‘Understanding Concepts’ on page 15.</p> <p><b>Assignment:</b></p> <p>Complete Assignment 1 as outlined by your instructor and pass it in for marking.</p>

## Unit 2 - Change and Stability in Ecosystems

To fulfill the objectives of this unit, students should complete the following:

### Reading for this unit:

Unit 1 - Sections 1.7 - 1.11, pages 22 - 37.

### References and Notes

Refer to pages 22 - 25 to write answers for questions 2.1 - 2.8



**Note:** Remember that all living things need energy. Energy passes through an ecosystem by passing through members of a food chain. Remember that the original source of energy for all food chains is the sun.

**Note:** Energy is measured in joules. 1000 joules (J) = 1 kilojoule (kJ)

### Work to Submit

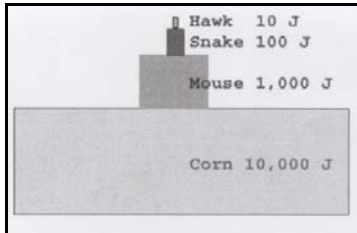
#### Writing:

- 2.1 a) Explain what is meant by trophic level.  
b) What organisms are in the first trophic level?
- 2.2 a) Define primary consumers.  
b) In which trophic level would you find primary consumers?
- 2.3 a) Define secondary consumers.  
b) In which trophic level would you find secondary consumers?
- 2.4 a) Define food web.  
b) Explain the difference between a food chain and a food web.
- 2.5 Explain what happens to the energy that does not get transferred from one trophic level to another.
- 2.6 What does an energy pyramid represent?

## Unit 2 - Change and Stability in Ecosystems

### References and Notes

*Note: Here's an example of an energy pyramid:*



Write an answer for question 2.9 by referring to the note below  
▶▶

*Note: Carbon, oxygen, hydrogen and nitrogen make up the vast majority of living tissue. These four elements are recycled between : living organisms and the soil, water, and atmosphere. If recycling of these materials did not occur, life could not exist.*

Refer to pages 26 - 29 to write answers for questions 2.10 - 2.13 ▶▶



*Note: The sugar (glucose) that is produced in photosynthesis forms the basic substance that is transferred through food chains.*

### Work to Submit



- 2.7 Using the following information for the amount of energy at each trophic level of a simple food chain in the ocean, draw an energy pyramid: algae 4200 kJ; zooplankton 420 kJ; cod 42 kJ; seals 4kJ.
- 2.8 Explain how humans have changed the flow of energy in ecosystems.
- 2.9 What are the main 4 elements common to all living things?
- 2.10 Explain the difference between organic and inorganic materials.
- 2.11 a) Define photosynthesis.  
b) Define cellular respiration.
- 2.12 Explain why photosynthesis and cellular respiration are considered complementary processes.
- 2.13 a) Briefly describe the carbon cycle.  
b) Draw a diagram to represent the carbon cycle.
- 2.14 Briefly describe how humans have affected the carbon cycle.

## Unit 2 - Change and Stability in Ecosystems

### References and Notes

Write an answer for question 2.15 by referring to the note below  

**Note:** Nitrogen is very important to life on earth. It is necessary for the formation of proteins. Most of the living tissue in animals is protein. The chemical processes that occur within the bodies of living things are all controlled by special proteins called enzymes. Nitrogen is an essential element in genetic material (DNA). Nitrogen is also a nutrient required by plants.

Refer to pages 30 - 31 to write answers for questions 2.16 - 2.21  

**Note:** Remember that nitrogen fixation and denitrification are opposites of each other. **Nitrogen fixation** takes nitrogen gas from the atmosphere and **denitrification** puts it back.

### Work to Submit

#### Writing:

- 2.15 Why is nitrogen important to life on earth?
- 2.16 a) What is nitrogen fixation?  
b) Why is nitrogen fixation important?
- 2.17 What are nitrogen fixing bacteria? Where are they found?
- 2.18 What is denitrification?
- 2.19 How do animals get nitrogen?
- 2.20 a) Briefly describe the nitrogen cycle.  
b) Draw a diagram to represent the nitrogen cycle.
- 2.21 Explain the importance of decomposers in the nitrogen cycle.

## Unit 2 - Change and Stability in Ecosystems

### References and Notes

Refer to pages 32 - 33 to write answers for questions 2.22 - 2.23  
▶▶

See your instructor to get a copy of Assignment 2, the assignment for this unit ▶▶

**Note:** The mark you get on the assignment will be used to help determine your final mark for the course.

**Note:** This is the end of Unit 2. You should check with your instructor to see if there is review work or any other additional work for this unit

### Work to Submit

#### Writing:

- 2.22 What are fertilizers?
- 2.23 Briefly describe the benefits and risks of fertilizer use.

#### Assignment:

Complete Assignment 2 as outlined by your instructor and pass it in for marking.

## Unit 3 - Population Ecology

To fulfill the objectives of this unit, students should complete the following:

### Reading for this unit:

Unit 1 - Sections 1.2 - 1.11, pages 38 - 41.

#### References and Notes

Refer to page 38 to write answers for questions 3.1 - 3.3



**Note:** Look carefully at Figure 1 on page 38 to see how the human population has grown, especially in the last 500 years.

Read **Population Histograms** on page 39 and study **Figure 2**. Then complete question 3.4



Refer to pages 39 - 41 to write answers for questions 3.5 - 3.9



**Note:** Don't forget to study the information provided in the Tables and Figures when you are answering the questions.



#### Work to Submit

##### Writing:

- 3.1 Define population. (You can use the glossary.)
- 3.2 Name and briefly explain the four factors that affect population size.
- 3.3
  - a) Explain the difference between an open and a closed population.
  - b) Is the human global population open or closed?
- 3.4
  - a) What is indicated by a histogram with a wide base?
  - b) What is indicated by a histogram that is narrower in the middle?
  - c) What is indicated by a histogram with few changes?
- 3.5
  - a) Explain what is meant by biotic potential.
  - b) Name and briefly explain the 4 factors that determine the biotic potential of a population.
- 3.6
  - a) Define limiting factor.
  - b) Give 2 examples of biotic and 2 examples of abiotic limiting factors.

## Unit 3 - Population Ecology

### References and Notes

See your instructor to get a copy of Assignment 3, the assignment for this unit  

**Note:** The mark you get on the assignment will be used to help determine your final mark for the course.

**Note:** This is the end of Unit 3. You should check with your instructor to see if there is review work or any other additional work for this unit.

### Work to Submit

#### Writing:

- 3.7 a) Define carrying capacity.  
b) What does carrying capacity depend on?
- 3.8 Explain the difference between density-dependent factors and density-independent factors and give 3 examples of each.

#### Assignment:

Complete Assignment 3 as outlined by your instructor and pass it in for marking.