

Adult Basic Education
Science

Biology 1101

Sustainability of Ecosystems

Study Guide

Credit Value: 1

Text: *Science 10*. Ritter, Plumb, et al; Nelson, 2001.

Biology Concentration

Biology 1101

Biology 2101A

Biology 2101B

Biology 2101C

Biology 3101A

Biology 3101B

Biology 3101C

Table of Contents

To the Student	iv
Introduction to Biology 1101	iv
Use of Science Study Guides	v
Recommended Evaluation	vi
Unit 1 - Diversity in Ecosystems	Page 1
Unit 2 - Change and Stability in Ecosystems	Page 4
Unit 3 - Sustaining Terrestrial Ecosystems	Page 7
Unit 4 - Sustaining Aquatic Ecosystems	Page 9

To the Student

I. Introduction to Biology 1101

Biology 1101, *Sustainability of Ecosystems*, is the first course in the Biology concentration of the Adult Basic Education program. It introduces basic ecological concepts and analyzes ecosystems and their sustainability. This course will help you to understand the interrelationships of local ecosystems, our increasing awareness of ecosystems on a global scale, and a need to sustain ecosystems at all levels.

It is recommended that you complete Biology 1101 first, if you are planning to do the remainder of the Biology courses in ABE.

Biology 1101 is equivalent to the Life Science portion of Science 1206 in the current High School program.

There is one required lab for this course (your instructor may ask you to do more lab activities). Let your instructor know in advance that you are getting close to being ready to do the lab. The lab requires a written report that will be used as part of your final mark for the course. In addition, there are several assignments that you will be asked to submit. These will also be used as part of your evaluation for the course.

The text for this course is *Science 10*; Ritter, Plumb, et al; Nelson, 2001.

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.

References and Notes	Work to Submit
<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>You come across three (3) headings in this right hand column.</p> <p>Writing: 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>Laboratory: 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>Assignment: 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>

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: *Science 10*
Chapter 1: Introduction: pages 8-9
Sections 1.1 - 1.12: pages 8 - 44

References and Notes

Referring to pages 10 - 13, write answers for questions 1.1 - 1.5 ▶▶

Work to Submit

Writing:

- 1.1 Define ecosystem.
- 1.2 Briefly explain each of the following terms:
 - (a) producers
 - (b) consumers
 - (c) herbivores
 - (d) carnivores
 - (e) omnivores
 - (f) detritus
 - (g) decomposers
- 1.3 Define habitat.
- 1.4 List 4 possible reasons for the numbers of frogs in Canada.
- 1.5 Complete questions 1 and 2 in “Understanding Concepts”, page 13.

Unit 1 - Diversity in Ecosystems

References and Notes	Work to Submit
<p><i>Referring to pages 14 - 15, write answers for questions 1.6 - 1.7</i> ▶▶</p> <p><i>Referring to pages 16 - 19, write answers for questions 1.8 - 1.9</i> ▶▶</p> <p><i>Referring to pages 22 - 23, write answers for questions 1.10 - 1.13</i> ▶▶</p> <p>Note: <i>The amount of energy captured during photosynthesis is the basis of nearly all life forms on earth.</i></p> <p><i>Referring to page 32 and pages 34 - 39, write answers for questions 1.14 - 1.21</i> ▶▶</p>	<p>Writing:</p> <p>1.6 List and briefly explain the 5 classifications for at-risk species.</p> <p>1.7 Complete question 2 in “Understanding Concepts”, page 15.</p> <p>1.8 Briefly explain the effect of humans on the rate of extinction of species.</p> <p>1.9 Complete question 3(a) and 3(b) in “Understanding Concepts”, page 19.</p> <p>1.10 Define ecology.</p> <p>1.11 Explain the difference between biotic and abiotic factors.</p> <p>1.12 a) Define ecotone. b) Explain how ecotones guard against extinction.</p> <p>1.13 Complete questions 2 - 4 in “Understanding Concepts”, page 23.</p> <p>1.14 Define photosynthesis.</p> <p>1.15 Explain what is meant by trophic level.</p> <p>1.16 Explain the difference between autotroph and heterotroph.</p>

Unit 1 - Diversity in Ecosystems

References and Notes

Note:

The drastically increased rate of human population growth is threatening the ability of ecosystems to sustain themselves. Think of all the evidence that you hear about regularly of strain that is put on ecosystems by the growing human population!

Referring to pages 40 -44, write answers for questions 1.22 - 1.23



See your instructor to discuss any additional work that you should complete for this unit.

Work to Submit

Writing:

1.17 Explain what is meant by primary consumer, secondary consumer, tertiary consumer, and top carnivore.

1.18 Explain what is meant by food web.

1.19 Explain how energy is lost as it moves through a food chain.

1.20 What is shown by each of the following:

- (a) pyramid of energy
- (b) pyramid of numbers
- (c) pyramid of biomass

1.21 Complete questions 2, 3, 4, 5, 10, 11, 14 in “Understanding Concepts”, page 39.

- 1.22
- a) Define ecological niche.
 - b) What is the advantage of each organism in an ecosystem having a different niche?

1.23 Describe an example illustrating the problems that can be created when a new species is introduced into an ecosystem.

Unit 2 - Change and Stability in Ecosystems

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

Reading for this unit:	<i>Science 10</i>		
	Chapter 2:	Introduction:	pages 48 - 49
		Section 2.1 - 2.11:	pages 50 - 82
	Chapter 16:	Section 16.2:	pages 625 - 628

References and Notes	Work to Submit
<p>Referring to page 50, write answers for questions 2.1 - 2.2 ▶▶</p> <p>Note: <i>The biosphere (all portions of earth inhabitable by some form of life) contains a finite number of atoms. Thus the necessity for recycling.</i></p> <p>Referring to pages 60 - 65, write answers for questions 2.3 - 2.7 ▶▶</p> <p>Note: <i>Plants need carbon to make organic compounds and these compounds maintain life as we know it. This is what makes the carbon cycle so important.</i></p>	<p>Writing:</p> <p>2.1 Explain the difference between organic and inorganic chemicals and give some examples of each.</p> <p>2.2 Describe 2 processes that break complex organic molecules into simpler molecules.</p> <p>2.3 Explain what happens during photosynthesis and write a word equation for the process.</p> <p>2.4 a) Define cellular respiration and write a word equation for the process. b) Why is oxygen important to living things?</p> <p>2.5 a) Define carbon cycle. b) Draw a diagram to show the carbon cycle.</p> <p>2.6 Briefly describe human impact on the carbon cycle.</p> <p>2.7 Complete questions 1 - 4 in "Understanding Concepts", page 65.</p>

Unit 2 - Change and Stability in Ecosystems

References and Notes	Work to Submit
<p>Note: <i>The carbon cycle is more accurately called the carbon-hydrogen-oxygen cycle, since it involves the recycling of all 3 substances. In this course we will use the term carbon cycle for short.</i></p> <p>Referring to pages 66 - 68, write answers for questions 2.8 - 2.12 ▶▶</p> <p>Note: <i>The rate at which nutrients cycle through an ecosystem is related to the rate of decomposition.</i></p> <p>Referring to pages 625 - 628, write answers for questions 2.13 - 2.15 ▶▶</p>	<p>Writing:</p> <p>2.8 Explain why nitrogen is important to organisms.</p> <p>2.9 Define the nitrogen cycle.</p> <p>2.10 Explain what is meant by nitrogen fixation and explain why it is important.</p> <p>2.11 Explain what is meant by denitrification and explain why it is important.</p> <p>2.12 a) Define nutrient. b) Briefly describe the 2 most important abiotic factors regulating decomposition.</p> <p>2.13 Explain what is meant by the greenhouse effect.</p> <p>2.14 Define ozone and explain its function.</p> <p>2.15 Complete questions 1, 3, 4, 5 in “Understanding Concepts”, page 628.</p>

Unit 2 - Change and Stability in Ecosystems

References and Notes

Referring to pages 74 - 80, write answers for questions 2.16 - 2.19



See your instructor to discuss which “Case Study” and “Exploring an Issue” sections from the text that you should do.

See your instructor to discuss any additional work that you should complete for this unit.

Work to Submit

Writing:

- 2.16 a) List and explain the 4 factors that affect population size.
b) Write the formula for population growth based on these 4 factors.
- 2.17 Explain what is meant by biotic potential.
- 2.18 a) Explain what is meant by limiting factor.
b) Explain the difference between density-dependent and density-independent factors and give examples of each.
- 2.19 Explain what is meant by carrying capacity.

Assignment:

2.20 Complete one or more of the following “Case Study” and/or “Exploring the Issue” sections from your text:

- Comparing Ecosystems, page 28.
- Pesticides, page 52.
- Effects of Deforestation on Recycling, page 72.
- Should We Use Pesticides to Control Pests?, page 81.
- The Great Lakes, page 140.
- Managing Fish Populations, page 150.
- How many Potatoes are Enough?, page 112.

Unit 3 - Sustaining Terrestrial Ecosystems

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

Reading for this unit: *Science 10*
Chapter 3: Introduction: pages 86-87
Sections 3.1 - 3.12: pages 88 - 120

References and Notes	Work to Submit
<p><i>Referring to pages 88 - 93, write answers for questions 3.1 - 3.3</i> ▶▶</p> <p><i>Referring to pages 97 - 99, write answers for questions 3.4 - 3.5</i> ▶▶</p> <p><i>Referring to pages 97 - 99, write answers for questions 3.6 - 3.8</i> ▶▶</p>	<p>Writing:</p> <p>3.1 Define biome.</p> <p>3.2 a) Name the 4 terrestrial biomes found in Canada. b) Describe the biotic and abiotic characteristics of each biome.</p> <p>3.3 Complete questions 1, 2, 3, 7, 8 in “Understanding Concepts”, page 93.</p> <p>3.4 a) Name the 4 layers that soil can be divided into and briefly describe each layer. b) Draw a diagram to show the layers of soil.</p> <p>3.5 a) Explain what is meant by percolation and leaching. b) Explain how leaching affects soil fertility.</p> <p>3.6 Define acid precipitation.</p> <p>3.7 Describe some of the causes of acid precipitation.</p> <p>3.8 Describe some of the effects of acid rain.</p>

Unit 3 - Sustaining Terrestrial Ecosystems

References and Notes

Referring to pages 102 - 105, complete a laboratory investigation. ▶▶

See your instructor to discuss how you will report on the investigation.

See your instructor to discuss any additional work that you should complete for this unit.

Work to Submit

Laboratory:

3.9 Complete either Investigation 3.5 or 3.6.

Unit 4 - Sustaining Aquatic Ecosystems

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

Reading for this unit: *Science 10*
Chapter 4: Introduction: pages 124 - 125
Sections 4.1 - 4.10: pages 126 - 153

References and Notes

Referring to pages 126 - 131, write answers for questions 4.1 - 4.7



Note:

Aquatic (water) ecosystems include both freshwater and marine (salt water).

Plankton exist in both fresh and salt water.

Referring to pages 132 - 135, write answers for questions 4.8 - 4.9



Work to Submit

Writing:

- 4.1 List several abiotic factors of aquatic ecosystems.
- 4.2 Name and briefly describe the three zones of a lake.
- 4.3 Define plankton.
- 4.4
 - a) Name and briefly describe the two kinds of lakes.
 - b) How are nutrient levels different in each kind of lake?
- 4.5 Define eutrophication.
- 4.6 Explain why ice floats on lakes instead of sinking to the bottom.
- 4.7 Briefly describe the changes that occur in Canadian lakes through the 4 seasons.
- 4.8 Define water pollution.
- 4.9 Name the categories of water pollutants, a possible source for each, and effects that each might have on the aquatic ecosystem.

Unit 4 - Sustaining Aquatic Ecosystems

References and Notes

Referring to pages 146 - 147, write answers for questions 4.10 - 4.12



Referring to pages 148 - 153, complete the assignment

(Consult with your instructor to discuss exactly what is expected of you for the assignment.)

See your instructor to discuss any additional work that you should complete for this unit.

Work to Submit

Writing:

4.10 What is the major abiotic factor that makes marine ecosystems different from freshwater ecosystems?

4.11 Name and briefly describe the 2 major zones of the marine aquatic ecosystem.

4.12 Name and briefly describe the major divisions of the coastal zone.

Assignment:

4.13 Complete the assigned work for Sections 4.8 and / or 4.9 and/or 4.10 of the text.