

Adult Basic Education
Level III Science

Science 3107

Environmental Science I

Study Guide

Credit Value: 1

Text: *Toward A Sustainable Future: Challenges, Changes and Choices.* Department of Education. Province of Newfoundland and Labrador. 2009. ISBN: 978-1-55146-367-4.

Science Courses [General College Profile]

Science 2100A
Science 2100B
Science 2100C
Science 3101
Science 3102
Science 3103
Science 3104
Science 3105
Science 3106
Science 3107
Science 3108



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To the Student

Introduction to Science 3107

This course is intended to introduce you to the key concepts of Environmental Science. This course must be completed first before you can complete **Science 3108: Environmental Science II**. These two ABE Science courses are based on **Environmental Science 3205** offered in Newfoundland and Labrador high schools.

Science 3107: Environmental Science I is divided into three units. The outcomes for this course are given below. By completing the **Required Work**, including the assignments and core labs, in this Study Guide, you will fulfill the outcomes for this course.

The first unit, ***Introduction to Environmental Science***, will cover the following course outcomes:

- 1.01 Understand how the Earth can be compared to a spaceship.
- 1.02 Recognize that the human population growth of Newfoundland and Labrador is in contrast to the global human population growth.
- 1.03 Understand negative consequences of a high human growth rate.
- 1.04 Understand scientific methodologies.
- 1.05 Understand the limitations of science in solving the Earth's environmental problems.
- 1.06 Understand that Environmental Science is a multi-disciplinary field.
- 1.07 Understand the difference between a conservationist and an environmentalist.
- 1.08 Identify producers, primary consumers, secondary consumers, and tertiary consumers on a food web.
- 1.09 Understand how balance is obtained in an ecosystem as represented by a food web.
- 1.10 Understand how the following ethics impact the environment: (i) development ethic, (ii) preservation ethic and (iii) conservation ethic.
- 1.11 Define sustainable development.
- 1.12 Recognize that sustainable development is a concept impossible to achieve.
- 1.13 Understand things that individuals can do to decrease their ecological footprint.
- 1.14 Define precautionary principle.
- 1.15 Understand what is meant by a socially sustainable society.
- 1.16 Recognize the role of legislation in guiding stewardship and sustainability.
- 1.17 Understand the difference between renewable and non-renewable resources.
- 1.18 Understand the responsibility of the Multi Materials Stewardship Board (MMSB) in Newfoundland and Labrador.
- 1.19 Identify the five action items associated with the Waste Management Strategy.
- 1.20 Understand how to correctly dispose of Household Hazardous Wastes.
- 1.21 Define ecosystem.
- 1.22 Define ecoregion.
- 1.23 Understand the purpose of the Ecoregion Classification System.
- 1.24 Define biodiversity.
- 1.25 Understand and recognize biodiversity.

To the Student

- 1.26 Describe the importance of species diversity and genetic diversity in an ecosystem.
- 1.27 Identify reasons why some organisms become species at risk.
- 1.28 Recognize the importance of protecting species.
- 1.29 Distinguish between natural extinctions and anthropogenic extinctions.
- 1.30 Describe the impacts of introduced species.
- 1.31 Recognize the process of classifying an organism as a species at risk.
- 1.32 Identify the COSEWIC listings that categorize species at risk.
- 1.33 Define protected area.
- 1.34 Identify types of protected areas in Newfoundland and Labrador.
- 1.35 Explain the benefits of protected areas.

To the Student

The second unit, ***Recreation and the Environment***, will cover the following course outcomes:

- 2.01 Define wilderness.
- 2.02 List values associated with wilderness.
- 2.03 Identify traditional and non-traditional outdoor recreational activities popular in Newfoundland and Labrador.
- 2.04 Recognize some growing environmental concerns related to tourism in Newfoundland and Labrador.
- 2.05 Understand what is meant by sustainable tourism and why it is a valuable approach to both conservation and tourism.
- 2.06 Understand how access to the interior of Newfoundland and Labrador has expanded over the years.
- 2.07 Understand how access roads can affect the environment.
- 2.08 Identify negative environmental impacts caused by ATV use in Newfoundland and Labrador.
- 2.09 Identify the negative environmental impacts of two-stroke engines.
- 2.10 Understand the environmental impact of using outboard engines.
- 2.11 Understand the environmental impact of using personal watercrafts.
- 2.12 Understand the environmental impact of snowmobile use.
- 2.13 Understand the effects of soil compaction.
- 2.14 Understand ways to reduce recreational impacts on soils.
- 2.15 Understand how game populations are managed.
- 2.16 Recognize the role of hunters, fishers and trappers in conservation.
- 2.17 Understand the role of the provincial Inland Fish and Wildlife Division in managing the big-game population in Newfoundland and Labrador.
- 2.18 Identify the goals of big-game management.
- 2.19 Identify the coyote's main source of food in Newfoundland and Labrador.
- 2.20 Define fish habitat and identify its three components.
- 2.21 Identify some pressures on the recreational fishery in Newfoundland and Labrador.

To the Student

The third unit, ***Water Use and the Environment***, will cover the following course outcomes:

- 3.01 Compare fresh water and salt water in relation to quantity and quality.
- 3.02 Describe the water/hydrological cycle.
- 3.03 Understand the pressure on water resources caused by pollution and contamination.
- 3.04 Define watershed and identify the five drainage basins in Canada.
- 3.05 Understand why wetlands are considered important for the health of the environment.
- 3.06 List the types of wetlands found in Newfoundland and Labrador.
- 3.07 Understand the four major types of water-quality indicators used by Environment Canada laboratories.
- 3.08 Understand the Real Time Water Quality (RTWQ) Network in Newfoundland and Labrador.
- 3.09 Understand how forestry operations affect water quality and aquatic habitat.
- 3.10 Understand how road construction and maintenance affect fresh water resources.
- 3.11 Understand the impact of mining activity on fresh water resources.
- 3.12 Understand the potential environmental impacts of large-scale hydroelectric development.
- 3.13 Understand how urbanization influences the amount of water entering surrounding rivers.
- 3.14 List the main sources of drinking water in Newfoundland and Labrador.
- 3.15 List common pathogens found in drinking water.
- 3.16 Understand why communities are sometimes subject to a boil water advisory.
- 3.17 List the main components of the multi-barrier approach for ensuring drinking water quality.
- 3.18 List and briefly describe the different types of treatment systems used to remove different types of chemical and physical contaminants from drinking water.
- 3.19 Understand the advantages and disadvantages of adding different states of chlorine to a water system.
- 3.20 Understand why Newfoundland and Labrador does not allow people to use community water sources for recreational activities.

To the Student

Use of Science Study Guides

Before beginning this course, ensure you have the text(s) and any other resources needed.

Your Study Guide is organized as follows:

Required Work	Suggested Resources/Notes
<p>The left-hand column guides you through the material you must complete in order to successfully complete the course. You will see three headings in this left-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.</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 “Suggested Resources/Notes” column will indicate any additional information you need to complete the assignment. These assignments frequently relate the science content to a practical application.</p>	<p>This right-hand column provides you with information on the resources needed for the course. It also draws your attention to assignments and core labs that will be evaluated as part of your final course mark. Other notes may be included here such as helpful suggestions, safety precautions, etc.</p>

The textbook for this course is listed on the cover page of this Study Guide. It can also be found in its entirety online at:

<http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/science/highschool.html#envsci3205>.

You are required to complete all work listed in this Study Guide, including the assignments and core labs, in order to receive a passing grade for **Science 3107: Environmental Science I**. Your instructor is able to substitute any of the assignments and/or core labs with an alternative at his/her discretion.

To the Student

Recommended Evaluation

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

The overall pass mark for the course is 50%.

Note: The evaluation scheme recommended above is presented as a suggestion. Institutions/instructors may choose an alternate evaluation scheme in order to meet the individual needs of adult learners.

Unit 1: Introduction to Environmental Science

Required Work	Suggested Resources/Notes
<p>1. Read pages 1-5 in the text, and then complete the following:</p>	
<p>a) Describe how the Earth can be compared to a spaceship.</p> <p>b) How is the population of Newfoundland and Labrador in contrast to the population of the world?</p> <p>c) What are some negative consequences of a high growth rate in the human population?</p> <p>d) Explain what is meant by a scientific method. Do you think science will be able to solve all of the Earth's environmental problems? Explain your response.</p>	p. 2 p. 4 p. 4 p. 5
<p>2. Core Lab #1: Read the <i>Mini-Lab Activity</i> on pages 6-7 of the text. Complete a data table, similar to the one on page 7, in your notebook. Complete the analysis items as assigned by your instructor.</p>	pp. 6-7
<p>3. Read pages 8-12 in the text, and then complete the following:</p> <p>a) What is environmental science? Why is environmental science considered a multi-disciplinary field?</p> <p>b) Explain the difference between conservationists and environmentalists.</p> <p>c) Complete the Activity on page 12.</p>	p. 8 p. 8 p. 12
<p>4. Read pages 14-19 in the text, and then complete the following:</p> <p>a) Read the statement by the Dalai Lama on page 15 of the text. Give an example of one thing you can do to support this statement.</p> <p>b) Explain how the development ethic impacts the environment.</p> <p>c) Explain how the preservation ethic impacts the environment.</p> <p>d) Explain how the conservation ethic impacts the environment.</p>	Google the Dalai Lama to learn more about this person. p. 16 p. 16 p. 17

Unit 1: Introduction to Environmental Science

Required Work	Suggested Resources/Notes
<p>5. Assignment #1: Read the Eco Spotlight on pages 20-21 of the text. Complete items 1-4 on page 21.</p>	This assignment is to be submitted and is part of the evaluation for this course.
<p>6. Read pages 26-37 in the text, and then complete the following:</p>	
<p>a) Write a definition of sustainable development.</p>	p. 26
<p>b) Why do some people believe that sustainable development is a concept impossible to achieve?</p>	pp. 26-27
<p>c) Complete questions 1-4 on page 33 related to the <i>Case Study: Population Growth of an Introduced Species</i> on pages 31-33.</p>	pp. 31-33
<p>d) Why is “footprint” a good image to describe the impact we have on the environment?</p>	p. 33
<p>e) What are some things you can do to decrease your ecological footprint?</p>	pp. 34-35
<p>f) What is meant by a socially sustainable society?</p>	p. 36
<p>g) Explain the “Precautionary Principle”.</p>	p. 37
<p>7. Read pages 41-45 in the text, and then complete the following:</p>	
<p>a) Explain how legislation such as the <i>Sustainable Development Act</i> works to (i) protect the environment, (ii) provide leadership, and (iii) enhance our roles as global citizens.</p>	pp. 41-43
<p>b) List examples of renewable resources.</p>	p. 41
<p>c) List examples of non-renewable resources.</p>	p. 42
<p>d) What is the responsibility of the Multi Materials Stewardship Board (MMSB) in Newfoundland and Labrador?</p>	p. 47
<p>e) What are the five action items associated with the Waste Management Strategy?</p>	p. 48
<p>f) What are Household Hazardous Wastes (HHW)?</p>	p. 48

Unit 1: Introduction to Environmental Science

Required Work	Suggested Resources/Notes
<p>g) What should you do with the used motor oil after you remove it from your vehicle, ATV, snowmobile, lawn mower, ski-doo, etc?</p> <p>h) It has been suggested that, to encourage people to recycle and compost, each household be limited to a maximum of three bags of garbage per week. For every bag over this number, the household be charged a fee. Do you agree with this? Explain.</p>	p. 50
8. Read pages 55-69 in the text, and then complete the following:	p. 55
<p>a) Define ecosystem.</p> <p>b) What is an ecoregion? What is the purpose of the Ecoregion Classification System?</p> <p>c) What is biodiversity? Describe the biodiversity in your area.</p> <p>d) What is genetic diversity? Name three examples of genetic diversity found in Newfoundland and Labrador animals.</p> <p>e) Name one noticeable feature of the Newfoundland Marten that has evolved.</p>	<p>pp. 58-59</p> <p>p. 62</p> <p>p. 68</p> <p>p. 69</p>
Core Lab #2: 9. Read <i>What Ecoregion Do I Live in?</i> on pages 60-61 of the text. Complete all requirements listed under the procedure and <i>Analyze and Conclude</i> questions.	pp. 60-61
10. Read pages 71-81 in the text, and then complete the following:	
<p>a) Why do species go extinct? Give an example of an extinct species in Newfoundland and Labrador. Are there any species in Newfoundland and Labrador in danger of becoming extinct?</p>	p. 72
<p>b) Why do we protect species?</p> <p>c) How does habitat loss and degradation contribute to the endangerment and/or extinction of a species?</p>	pp. 73-74 p. 78
d) What are ghost nets and why are they an environmental concern?	p. 79

Unit 1: Introduction to Environmental Science

Required Work	Suggested Resources/Notes
<p>11. Read pages 83-95 in the text, and then complete the following:</p> <ol style="list-style-type: none"> <li data-bbox="176 508 1073 582">a) What is an introduced species? Give an example of an introduced species in Newfoundland and Labrador. <li data-bbox="176 614 1073 720">b) Explain how White Pine Blister Rust and Scleroderris canker are invasive alien species and the negative effects of these species in Newfoundland and Labrador. <li data-bbox="176 762 1073 836">c) Explain how the Great Auk is an example of over-exploitation of a species. <li data-bbox="176 878 1024 952">d) What lesson should be learned from the Great Auk regarding sustainability? 	p. 83 p. 85 pp. 86-87
<p>12. Read pages 96-115 in the text, and then complete the following:</p> <ol style="list-style-type: none"> <li data-bbox="176 1100 997 1174">a) What is the purpose of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)? <li data-bbox="176 1205 943 1258">b) Identify the COSEWIC designations for species at risk. 	p. 98 p. 99
<p>13. Read pages 116-122 in the text, and then complete the following:</p> <ol style="list-style-type: none"> <li data-bbox="176 1353 959 1459">a) Which government agencies (federal and provincial) are responsible for creating and managing protected areas in Newfoundland and Labrador? <li data-bbox="176 1501 1073 1660">b) Describe the following federal protected areas in Newfoundland and Labrador: (i) National Parks of Canada, (ii) National Historic Sites of Canada, (iii) Migratory Bird Sanctuaries, (vi) National Marine Conservation Areas, and (v) Marine Protected Areas. <li data-bbox="176 1691 1024 1839">c) Describe the following provincial protected areas in Newfoundland and Labrador: (i) Wilderness Reserves, (ii) Ecological Reserves, (iii) Provincial Parks, (iv) Wildlife Reserves, (v) Wildlife Parks, and (vi) Crown/Public Reserves. <li data-bbox="176 1881 1073 1945">d) Why is the creation and maintenance of protected areas valuable to society from the perspective of sustainability? 	p. 117 pp. 117-118 pp. 118-120 p. 122

Unit 2: Recreation and the Environment

Required Work	Suggested Resources/Notes
1. Read pages 155-163 in the text, and then complete the following:	
a) Explain the difference between conservation of wilderness and preservation of wilderness.	p. 159
b) What is meant by wilderness?	p. 161
c) List values associated with wilderness.	pp. 162-163
d) How can you as an individual enjoy the wilderness in a sustainable manner?	
2. Read pages 164-176 in the text, and then complete the following:	
a) What are some traditional and more recent outdoor recreational activities popular in Newfoundland and Labrador?	p. 164
b) Explain the difference, using an example, between consumptive and non-consumptive outdoor recreational activities.	p. 166
c) What is tourism? What are some growing environmental concerns related to increased tourism?	pp. 171-172
d) What is meant by sustainable tourism? Why is sustainable tourism a valuable approach to both conservation and tourism?	pp. 172-173
3. Assignment #2:	
Many Newfoundlanders and Labradorians enjoy building and using cabins in the wilderness. Identify the environmental impacts of cabin development and use. Include: (i) road access, (ii) waste disposal, (iii) wood harvesting, (iv) noise pollution, and (v) ATV usage. Suggest how each impact can be reduced from an environmental perspective. Also, explain the benefits of this recreational activity.	pp. 169-170 This assignment has to be submitted and is part of the evaluation for this course.

Unit 2: Recreation and the Environment

Required Work	Suggested Resources/Notes
4. Read pages 180-187 in the text, and then complete the following:	
a) How has access to the interior of Newfoundland and Labrador been expanded over the years?	p. 182
b) Give examples of how access roads can affect the environment.	p. 185
c) Give examples of how access roads can affect wildlife.	p. 185
d) Consider this scenario: A new forest access road has opened up near your community. It provides easier access to many ponds and streams, and opens up new territory for hunting and wilderness camping. What responsibilities do you have regarding the use of this new road and the access it gives you? How can you use the access road in a sustainable manner?	
5. Read pages 189-192 in the text, and then complete the following:	
a) What are some negative environmental impacts caused by ATV use in Newfoundland and Labrador?	p. 189
b) Give examples of how ATV use negatively impacts wildlife.	p. 189
c) List some of the environmental impacts of two-stroke engines.	pp. 189-190

Unit 2: Recreation and the Environment

Required Work	Suggested Resources/Notes
6. Read pages 193-201 in the text, and then complete the following:	
a) What is the main negative environmental impact of using outboard engines?	p. 193
b) What is the main negative environmental impact of using personal watercrafts (PWC)?	p. 193
c) List ways you can ride ATV's in order to lessen the environmental impact on wet and slick trails, streams and boggy areas.	p. 201
7. Read pages 203-209 in the text, and then complete the following:	
a) Explain the impact of snowmobile use on caribou in Newfoundland and Labrador.	p. 204
b) Explain the impact of snowmobile use on the Arctic hare in Newfoundland and Labrador.	pp. 204-205
c) Explain the impact of snowmobile use on vegetation in Newfoundland and Labrador.	p. 205
d) What are the effects of soil compaction?	p. 208
e) List ways to reduce recreational impacts on soils.	p. 208
f) Describe how you can use your snowmobile in a manner that promotes sustainability.	

Unit 2: Recreation and the Environment

Required Work	Suggested Resources/Notes
8. Read pages 213-215 in the text, and then complete the following: <ol style="list-style-type: none"><li data-bbox="169 481 1041 515">a) Describe how game populations are managed.<li data-bbox="169 551 1041 620">b) Explain how hunters, fishers and trappers play a role in conservation.<li data-bbox="169 656 1041 726">c) What hunting rules would you recommend in order to keep this activity sustainable for the future?	p. 214 p. 214
9. Read pages 216-236 in the text, and then complete the following: <ol style="list-style-type: none"><li data-bbox="169 834 1041 868">a) What are the two hare species in Newfoundland and Labrador?<li data-bbox="169 903 1041 1015">b) How does the provincial Inland Fish and Wildlife Division manage the population of moose, caribou and bear in Newfoundland and Labrador?<li data-bbox="169 1058 1041 1091">c) What are the goals of big-game management?<li data-bbox="169 1127 1041 1161">d) Item #5, page 229.<li data-bbox="169 1197 1041 1267">e) What is the coyote's main source of food in Newfoundland and Labrador?	p. 216 p. 222 p. 222 pp. 235-236
10. Core Lab #3: Complete the "Moose Population Census" lab on pages 223-226 of the text. Complete the table on page 225 and all analysis items assigned by your instructor.	
11. Read pages 237-242 in the text, and then complete the following: <ol style="list-style-type: none"><li data-bbox="169 1573 1041 1643">a) Who is responsible for the management of the recreational fishery in Newfoundland and Labrador?<li data-bbox="169 1679 1041 1748">b) List common recreational fish species found in Newfoundland and Labrador.<li data-bbox="169 1784 1041 1818">c) Define fish habitat and list its three components.<li data-bbox="169 1854 1041 1924">d) List some pressures on the recreational fishery in Newfoundland and Labrador.	p. 237 p. 238 p. 238 p. 242

Unit 3: Water Use and the Environment

Required Work	Suggested Resources/Notes
1. Read pages 441-449 in the text, and then complete the following:	
a) Compare fresh water and salt water in relation to quantity and quality.	p. 442
b) Describe the water/hydrological cycle.	pp. 443-444
c) If all precipitation falls as fresh water, why does the Earth have huge bodies of salt water?	p. 443
d) How does water clean itself?	pp. 444-445
e) What is the availability and demand for water in Newfoundland and Labrador?	pp. 445-446
f) Newfoundland and Labrador appears to have an abundance of water resources. What do you think are some sustainability issues that may be relevant to these water resources?	
2. Assignment #3	
Read the <i>Case Study: Water—An Export Product</i> on pages 448-449 of the text. Complete questions 1 and 2 on page 449.	This assignment has to be submitted and is part of the evaluation for this course.
3. Read pages 449-458 in the text, and then complete the following:	
a) What is the pressure on water resources caused by pollution and contamination?	p. 449
b) What is a watershed? There are five drainage basins in Canada. Where does the water in them flow?	p. 450
c) Which river in Newfoundland and Labrador has the largest drainage area?	p. 450
d) Why are wetlands considered important for the health of the environment?	p. 452
e) List the types of wetlands found in Newfoundland and Labrador.	p. 453
f) What are the two main differences between a bog and a fen?	pp. 454-455

Unit 3: Water Use and the Environment

Required Work	Suggested Resources/Notes
g) What are some of the positive and negative impacts of developing wetlands for agriculture or peat farming? h) How would you advise a community which is considering draining a wetland for residential development?	
4. Read pages 460-464 in the text, and then complete the following:	
a) What are the four major types of water-quality indicators used by Environment Canada laboratories?	p. 462
b) What is the Real Time Water Quality (RTWQ) Network in Newfoundland and Labrador?	p. 462
5. Read pages 471-478 in the text, and then complete the following:	
a) How do forestry operations affect water quality and aquatic habitat? Of these activities, which one may have the greatest impact on the watershed if not developed carefully?	p. 471
b) How does road construction and maintenance affect fresh water resources?	p. 471
c) What is the impact of mining activity on fresh water resources?	pp. 472-473
d) What are the potential environmental impacts of large-scale hydroelectric development?	pp. 474-475
e) How does urbanization influence the amount of water entering surrounding rivers?	p. 477
f) How would you advise a large-scale hydroelectric development in Newfoundland and Labrador to proceed in a sustainable manner?	

Unit 3: Water Use and the Environment

Required Work	Suggested Resources/Notes
6. Read pages 479-489 in the text, and then complete the following:	
a) List the main sources of drinking water in Newfoundland and Labrador?	p. 480
b) What are some common pathogens found in drinking water? Include the symptoms associated with each pathogen.	p. 484
c) What were determined to be the causes of the Walkerton water tragedy?	pp. 485-489
d) Why are communities sometimes subject to a boil water advisory?	pp. 489-490
7. Read pages 491-497 in the text, and then complete the following:	
a) List the main components of the multi-barrier approach for ensuring drinking water quality.	p. 491
b) Different types of treatment systems are used to remove different types of chemical and physical contaminants from drinking water. List and briefly describe each method.	p. 493
c) Outline the advantages and disadvantages of adding different states of chlorine to a water system.	p. 494
d) In some jurisdictions, people are permitted to use community water sources (lakes and rivers) for recreational activities such as fishing and boating. Why do you think Newfoundland and Labrador does not allow this?	p. 497