

Catholic District School Board Writing Partnership

Canadian and World Studies

Course Profile

The Environment and Resource Management

Grade 12

University/College Preparation

CGR4M

• *for teachers by teachers*

This sample course of study was prepared for teachers to use in meeting local classroom needs, as appropriate. This is not a mandated approach to the teaching of the course. It may be used in its entirety, in part, or adapted.

Course Profiles are professional development materials designed to help teachers implement the new Grade 12 secondary school curriculum. These materials were created by writing partnerships of school boards and subject associations. The development of these resources was funded by the Ontario Ministry of Education. This document reflects the views of the developers and not necessarily those of the Ministry. Permission is given to reproduce these materials for any purpose except profit. Teachers are also encouraged to amend, revise, edit, cut, paste, and otherwise adapt this material for educational purposes.

Any references in this document to particular commercial resources, learning materials, equipment, or technology reflect only the opinions of the writers of this sample Course Profile, and do not reflect any official endorsement by the Ministry of Education or by the Partnership of School Boards that supported the production of the document.

© Queen's Printer for Ontario, 2002

Acknowledgments

Catholic District School Board Writing Team – Grade 12 The Environment and Resource Management

London District Catholic School Board

Project Leaders

Superintendent: Catherine Sexton

Project Manager: Mike Taylor

Lead Writer: Bill McCormack, Catholic Central Secondary School

Writers

John Marinelli, Catholic Central Secondary School

Steve Patterson, Catholic Central Secondary School, (retired)

Reviewers

Religion Advisor

Tim McDonald, St. Thomas Aquinas Catholic Secondary School (retired)

Destination/Community Reviewer

Ben Porchuk, University of Guelph

Internal Reviewer

Veronica Sferrazza, Catholic Central Secondary School

Special Education Reviewer

Maureen Kerr, St. Thomas Aquinas Catholic Secondary School

Course Overview

The Environment and Resource Management, CGR4M, Grade 12, University/College Preparation

Policy Document: *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies, 2000.*

Prerequisite: Any University, University/College, or College Preparation course in Canadian and World Studies, English, or Social Sciences and Humanities

Course Description

Geography is an integrative subject that brings a variety of perspectives, both social and physical, to the study of people, places, and environments around the world. Understanding the processes that shape the earth and knowing how life-forms interact with the environment allows students to view events from an ecological perspective. This course investigates the complexity and fragility of ecosystems and the effects of human activities on them. Students will study the principles of sustainability and resource management and evaluate various approaches to achieving a more sustainable relationship between the environment, society, and the economy.

How This Course Supports the Ontario Catholic School Graduate Expectations

Catholicism acknowledges that the material world is a channel of God's grace. It is the cosmic medium of God's spirit. As people grow in awareness of the causes and effects on ecosystems, Catholics are called to promote life and to confront the forces of evil, which threaten the preservation of this life. This combines social responsibility and concern for others with a desire to live in harmony with nature, and emphasizes the interrelationship of all life on the planet. It also promotes values such as sustainability and equality. The expectations for graduates of Catholic secondary schools incorporate the distinctive features of Catholicism's core understanding of the human condition found in its worldview. Catholic education views human life as an integration of body, mind, and spirit, which fosters the search for knowledge as a lifelong spiritual and academic quest. The expectations for Catholic graduates are described in terms of the knowledge and skills necessary to succeed in the world of work or postsecondary education and to contribute to the common good. **Note:** A basic principle of Catholic Social Teaching is this commitment to the common good. "Catholics should feel themselves obliged to promote the common good." (Decree on the Apostolate of the Laity. no.14).

Catholic secondary school graduates will achieve many of the expectations in their study of the environment and resource management. Students examine, evaluate, and apply knowledge that acknowledges the need to develop a sustainable relationship between the environment and society. Students come to value the fragility of the earth as a system and the responsibility humans have as integral components of an ecological system. The Environment and Resource Management course provides a framework to aid in the development of responsible Catholic citizens who respect and affirm the diversity and interdependence of the world's peoples and the natural environment.

Course Notes

The Environment and Resource Management course was created within the parameters of the strands outlined in the *Ontario Curriculum, Grades 11 and 12, Canadian and World Studies 2000*. Expectations from the strands were clustered to form five broad units. These units were further subdivided and organized into activities that combine to create a framework for delivery. The sequencing of units takes the student from a global perspective of the earth's natural systems to the human interactions and impacts on these systems.

The culminating activity will require students to create an individual ‘Environmental Bill of Rights’ based on their cumulative understanding of the ‘rights and responsibilities’ of individuals within a global environmental system. This profile represents one interpretation of the way the course could be delivered. Teachers are encouraged to organize the course in a way that reflects their strengths and expertise and meets the needs of the students.

Students taking The Environment and Resource Management gain a thorough understanding of concepts contained in the course material. This course is designed to be offered as a full-credit course. Students develop practical skills and apply the knowledge and skills to assist their understanding of the impact of human interactions with the natural environment. Students are provided the opportunity to improve decision-making and problem-solving skills by completing tasks that require geographic inquiry into a variety of topics including environmental assessment and resource management. Many activities are designed to focus on the local area. Teachers are encouraged to provide their students with as many hands-on learning experiences as possible. This University/College Preparation course is also designed to equip students with the knowledge and skills they need to meet the entrance requirements for specific programs offered at universities and colleges. This course should be relevant to both destinations and emphasize theoretical aspects and related concrete applications of the course content. (*Ontario Secondary Schools, Grades 9 to 12: Program and Diploma Requirements, 1999*)

The four Achievement Chart categories appear in *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies, 2000*. The chart provides a reference point for all assessment practice and a framework within which to assess and evaluate student achievement. Teachers should employ a variety of methods and strategies to assess student achievement. The suggested procedures for assessment and evaluation of student work are outlined in the document *The Ontario Curriculum, Grades 9 to 12, Program Planning and Assessment, 2000*. Thirty percent of the grade will be based on a final exam and two final culminating activities. At the start, of the course it is essential for teachers and students to be familiar with the course culminating activity, Development of an Environmental Bill of Rights. Teachers need to introduce and develop skills that are required for this activity throughout the course. This activity, in the form of an independent study, requires students to spend additional time outside the classroom researching and reflecting on their topic. It is essential that students and teachers develop organizational strategies for tracking progress.

Seventy per cent of the grade will be based on assessments and evaluations conducted throughout the course. It is essential that teachers are careful to measure student performance often and in conjunction with the four categories of the Achievement Chart. Student tasks should be clearly stated and based on the expectations of the course. Rubrics should be used when appropriate and should be constructed in a way that clearly identifies for the student the expectations that are being measured, the level at which they are achieving, and a place for personalized comment. This University/College Preparation course provides students with many opportunities to engage in hands-on learning and to express their understanding in various ways. Students develop their reading and writing skills, and have numerous opportunities to research, model, debate, interpret, and apply the products of their inquiries. Complex tasks, such as using technology for research, problem solving and making predictions for planning courses of action, draw on all categories of the Achievement Chart.

Health and safety considerations relate to the physical and personal well-being of students in class, in community-based learning activities, and in the workplace. Teachers must take all reasonable steps to ensure the health and safety of students, helping them understand the importance of health and safety issues and the need to assume responsibility for their own safety and the safety of others.

Units: Titles and Time

* Unit 1	Geographic Foundation and Environmental Systems	25 hours
Unit 2	Human-Environmental Interaction: The Consequences	25 hours
Unit 3	Impact Assessment and Environmental Protection: Monitoring Change	25 hours
Unit 4	Planning for a Sustainable Future	25 hours
Unit 5	Development of an Environmental Bill of Rights – Final Summative Activity	10 hours

* This unit is fully developed in this Course Profile.

Unit Overviews

Unit 1: Geographic Foundations and Environmental Systems

Time: 25 hours

Unit Description

This unit examines the relationships between the earth's major components: the lithosphere, atmosphere, hydrosphere, and biosphere. Students gain an understanding of energy flows, the structure of ecosystems and the processes that form them. In the culminating activity students have an opportunity to complete a geographic inquiry by conducting field research in the local area. Students begin the process of creating an Environmental Database by researching information on different components and issues concerning the natural environment. Information is collected throughout the entire course and will be evaluated at the end of the semester.

Unit Overview Chart

Activity	Learning Expectations	Assessment Categories	Focus/Task
1.1	SSV.01, SS3.04, CGE1e	Knowledge/ Understanding Thinking/ Inquiry Application	Earth's Components - gather information on the earth's spheres and write a scenario based upon the life of an organism - a discussion recognizing that life on earth is a gift and should be protected - produce a checklist of personal dependence on earth's spheres - research an article and write a critical analysis exploring issues
1.2	SS3.01, GI1.01, GI2.03, CGE3e, CGE1e	Knowledge/ Understanding Communication	Spaceship Earth and Systems - defines systems - prepare a systems diagram based upon a model - explore inputs, outputs and boundaries relating to systems - produce a map of events that have an effect on the earth's spheres

Activity	Learning Expectations	Assessment Categories	Focus/Task
1.3	SS1.03, SS2.02, SS2.03, GI2.03, CGE2b, CGE5a, CGE3f, CGE7, CGE7j	Knowledge/ Understanding Thinking/ Inquiry Application Communication	Flow of Energy and Matter Through Ecosystems - defines ecosystems - outlines role of producers, consumers, and decomposers - creates a flow chart of energy moving through an ecosystem and through a food chain - presentations of a nutrient cycle - class discussion of interdependent systems and how this relates to the development of a just and compassionate society, e.g., human influences on the food chain
1.4	SSV.02, SS1.01, SS2.04, UC1.01, GI1.01, CGE2b, CGE2c	Knowledge/ Understanding Application Thinking/ Inquiry Communication	Ecosystems-Ecological Processes - discussion on the dynamic nature of ecosystems - an exploration of the concept “eco-justice” - write a report applying the concept of succession using a Canadian example - discuss Alberta Bishop’s letter on ecology to eco-justice issues pertaining to Catholic social teachings with respect - create a written report based on research pertaining to ecological change
1.5	SSV.03, SS1.02, SS1.04, SS2.01, SS3.02	Knowledge/ Understanding Communication Application	Natural Systems - a discussion on the definition and characteristics of biomes - explores the influence of temperature and precipitation on biome regions - complete an organizer by gathering information from student presentations of biome regions - investigation of the properties of soil - write a report on soil conservation practices illustrating respect for the environment and wise use of resources
1.6	GIV.02, SS3.05, GI1.04, GI2.08, GI2.09	Knowledge/ Understanding Thinking/ Inquiry Communication Application	Field Research Culminating Activity - a discussion on student expectations for field research - each member of the field team writes a report from a field study based on the local bioregion (effective communications, decision-making, problem-solving, and management skills are required) - create a visual presentation based on field research

Unit 2: Human-Environmental Interaction: the Consequences

Time: 25 hours

Unit Description

This unit provides students with the opportunity to investigate the roles and effects of human linkages to the biosphere and ecological systems. Humans have a dramatic effect on the natural landscape, and this unit will focus on the impact of rural and urban land use practices, as well as environmental degradation and global consumption. On our planet, resources are not distributed evenly. Students examine the spatial distribution of the planet's resources, and the short and long-term consequences of promoting and maintaining sustainability. In the culminating activity students research the relationship between environmental degradation caused by humans altering the natural environment to meet their needs and its effects on human health, or the impact of an introduced species into an environment. Students continue to add to their Environmental Database.

Unit Overview Chart

Activity	Learning Expectations	Assessment Categories	Focus/Task
2.1	HE1.01, HE1.02, HE1.04, GC1.03, GC3.05, GI1.02, HEV.01, GC3.01	Knowledge/ Understanding Communication Thinking/ Inquiry	Humans in Systems Human linkages to Biosphere/Ecological Systems - short and long term effects - the differences between wants and needs - a review of different viewpoints - traditional ecological knowledge
2.2	HE2.05, HE3.02, HE3.04, UC3.02, HEV.02, GC3.01	Knowledge/ Understanding Thinking/ Inquiry	Interrelationships between the Environment/ Economy/Society - impact of urban and rural land use practices - interaction between human and natural systems within local bio regions - threats to spaces and species/preservation
2.3	HE2.01, HE2.02, HE2.04, GI1.02, HEV.03	Knowledge/ Understanding Thinking/ Inquiry	Resources: Availability and Use - spatial distribution of a resource - factors that determine distribution and short and long-term availability - distribution of inhabited areas vs. resource availability - patterns of habitation vs. resource availability - dependence of individual or groups on a resource
2.4	UC1.02, GC2.01, GI2.01, GI1.02, GI2.04, GI3.01, GCV.03	Knowledge/ Understanding Thinking/ Inquiry	Environment and Resources Management: Examples on a Global Scale - impact of human activity in a place, e.g., Chernobyl - patterns of global consumption vs. environmental degradation - media presentations of environmental and resource management issues

Activity	Learning Expectations	Assessment Categories	Focus/Task
2.5	HE1.04, HE2.04, GC1.01, GI2.04, GI3.01, GI1.02, GCV.02	Knowledge/ Understanding Thinking/ Inquiry	Population Growth, Consumption and Sustainability on a Global Scale - perceptions of nature, views of environmental effects of population growth - economic activity and pressure on resources and natural systems
2.6	HE1.03, HE2.03, HEV.02, HE2.05, HE3.01, HE3.02, GI2.04, UC3.03, GI3.01, GI1.02, UC2.04	Knowledge/ Understanding Thinking/ Inquiry	Positive and Negative Impacts of Economic, Social, Political and Technological Changes on the Environment - proliferation and use of chemicals/the effects on people and the environment - human activities that alter the environment - the impact of rural and urban land use on the environment - personal and class consumption of resources (renewable /non-renewable) and waste production
2.7	HE3.01, HE3.03, SS3.03, GI2.06, GI3.03, GI1.02, HEV.03	Knowledge/ Understanding Thinking/ Inquiry Application Communication	Research and report on the relationship between environmental degradation caused by humans altering the natural environment to meet human needs and its effects on human health/or the impact of an introduced species into an environment This may be done as a poster assignment

Unit 3: Impact Assessment and Environmental Protection: Monitoring Change

Time: 25 hours

Unit Description

Throughout this unit students identify and explore issues related to the management of the environment and resources at the local, provincial, national and international levels. Students apply an environmental impact assessment template to model ways that environmental or resource management issues may be analysed. Analysis of an international environmental and resource management issue, such as air quality, will lead to a series of one-on-one debates. Students write a position paper on an international environmental issue. Students review and assess the effectiveness of Canadian environmental legislation by local, provincial, and federal governments for the sustainability of a specific resource. A summative activity, designed to reinforce the steps of the planning process and how it applies to managing change, will take the form of a student role-playing activity. In this simulation of an arbitration hearing, groups of students represent the major interest groups in a land use dispute over development. Students continue to add to their environmental database.

Unit Overview Chart

Activity	Learning Expectations	Assessment Categories	Focus/Activity
3.1	UC1.04, GI1.04, GI2.03, GI2.09, GIV.01	Knowledge/ Understanding Thinking/ Inquiry	<p>What is an Issue? Environmental versus Resource Management Issues</p> <ul style="list-style-type: none"> - purpose/nature of environmental impact assessment (EIA) - What is an EIA model? - Environmental principles and initiatives for sustainability and implications for the environment and the economy
3.2	UCV.03, GCV.01, GCV.02, GCV.03, UC2.02, UC2.05, GI2.02, GI2.03, GI2.09, GC3.01	Knowledge/ Understanding Thinking/ Inquiry Application	<p>International Environmental and Resource Management Issues</p> <ul style="list-style-type: none"> - What is the international community doing? How effective are their efforts? - What is the balance between people and their environment/the need to balance human needs and environmental protection? - How can we improve the balance? - Future technologies/implications - Cause and effect of environmental change - International solutions to environmental problems, e.g., depletion of a resource - Bias in information relative to global environmental issues - Student position paper on an environmental issue
3.3	UCV.02, UCV.03, UC1.03, UC2.01, UC2.02, UC2.03, UC2.05, UC3.05, GI2.04, GI2.05, GI2.06, GI2.07, GI2.08, GI2.09, GI3.01	Knowledge/ Understanding Thinking/ Inquiry	<p>Local, Provincial and Federal Policy concerning Environmental Issues</p> <ul style="list-style-type: none"> - Environmental legislation: purpose/effects/influences/how shaped - Environmental policies effects on economy, e.g., job creation, environmental protection - Future technologies – evaluate implications - Evaluate the efforts of individuals and groups to identify problems and the effectiveness of their goals - What are the causes and effects of environmental change over time?

Activity	Learning Expectations	Assessment Categories	Focus/Activity
3.4	UCV.01, UC3.01, GIV.03, GI2.05, GI2.03, GI2.09, GI3.01, GI3.02, GI3.03	Knowledge/ Understanding Thinking/ Inquiry Application Communication	Role Play Simulation: e.g., ‘A Local Study: A Lesson in Impact Assessment and Environmental Protection’ - Students review the environmental impact of urban development, for example, on a local study once chosen by the teacher, and possible long-term solutions. - Students role play the different interest groups concerning an urban development and prepare a series of presentations to an arbitration panel. - Students prepare a rebuttal to the arbitration panel in the form of a Letter to the Editor.

Unit 4: Planning for a Sustainable Future

Time: 25 hours

Unit Description

This unit begins with an examination of the rights and responsibilities of individuals to preserve the natural environment. Students investigate the contributions of various non-governmental organizations in identifying and solving environmental issues. In particular, the focus is on the impact these organizations have on planning at the local, regional, national and international levels. Students investigate and evaluate Canada’s roles and responsibilities in shaping a sustainable future. In planning for a sustainable future, students are asked to predict the impacts of resource management on environmental problems to be faced this century. Students continue to add to their Environmental Database.

Unit Overview Chart

Activity	Learning Expectations	Assessment Categories	Focus/Task
4.1	UC1.05, GI1.04, GI3.04, UCV.01	Knowledge/ Understanding Thinking/ Inquiry	Introduction - identify and evaluate a variety of ways to resolve environmental concerns - determine the rights and responsibilities of individuals to preserve the environment
4.2	UCV.03, UC1.06, GI1.04, GI1.05, GC2.04, GIV.04, GI3.04, UCV.02	Knowledge/ Understanding Thinking/ Inquiry	Local Planning - explain how non-governmental organizations (NGOs) assist in solving environmental issues - critique or defend a local sustainability or resource management decision - research careers in local environmental and/or resource management
4.3	UCV.03, UC1.06, GI1.04, GI1.05, GC2.04, GIV.04, GI3.04, UCV.02	Knowledge/ Understanding Thinking/ Inquiry	Regional Planning - examine the role of NGOs in solving issues of local or regional concerns. - critique or defend a regional NGO’s efforts in promoting sustainability - research careers in regional environmental and/or resource management

Activity	Learning Expectations	Assessment Categories	Focus/Task
4.4	UCV.03, GII.05, GIV.04, GII.04, UC1.06, GC1.02, GC2.04, GI3.04, UCV.02, GI3.06	Knowledge/ Understanding Thinking/ Inquiry	National Planning - examine the role of NGOs in solving issues of national concern, e.g., Evergreen, Sierra Club - critique or defend a national NGO's efforts in promoting sustainability - identify the need for national cooperation and understanding - justify the choice and distribution of Canada's World Heritage Sites - research careers in national environmental and/or resource management
4.5	UCV.03, GII.05, GC1.02, GC1.04, GC2.02, GC2.03, UC1.06, GC2.04, GII.04, GII.03, GI3.04, GIV.04	Knowledge/ Understanding Thinking/ Inquiry	International Planning - examine the role of NGO's efforts in solving issues of global concern, e.g., United Nations, Greenpeace, World Wildlife Fund - critique or defend an international NGO's efforts in promoting sustainability - evaluate Canada's participation in international organizations - identify the need for international cooperation in managing resources and in the protection of the environment - research careers in global environmental and/or resource management
4.6	UCV.03, UC3.06, GII.04, UC3.01, HE3.05, UC1.05	Knowledge/ Understanding Thinking/ Inquiry Communication Application	A Sustainable Future - predict impacts of resource management or environmental problems throughout the next century - produce a case study to determine the impact of our continued use of resources and the need to plan for a sustainable future (This may be at the local, regional, or national level.)

Unit 5: Developing an Environmental Bill of Rights - Final Summative Activity

Time: 10 hours

Unit Description

Students submit their 'Environmental Data Base' (Appendix 1.1.1), which was compiled throughout the course, and a reflection paper of their compilation for a summative evaluation. As a culminating activity, students create an individual 'Environmental Bill of Rights' based on their cumulative understanding of the 'rights and responsibilities' of individuals within a global environmental system. This activity is presented to the class. A class discussion creates a consensus for the creation of a final product to be called, 'CGR4M: An Environmental Bill of Rights.'

Unit Overview Chart

Activity	Learning Expectations	Assessment Categories	Focus/Task
5.1	GI1.04, GIV.02	Knowledge/Understanding Application Communication Thinking/Inquiry	Students submit their Environmental Database and a reflection paper of their compilation for a summative evaluation.
5.2	GI3.05, GI3.02, HEV.01, UCV.01	Knowledge/Understanding Thinking/Inquiry Communication Application	Students develop and present individual 'Environmental Bill of Rights.' A class consensus creates a final product called, CGR4M: An Environmental Bill of Rights.
5.3			Final Exam

Teaching/Learning Strategies

Recognizing the diverse backgrounds and the multiple intelligences of our students, it is essential that a variety of teaching/learning strategies be employed to ensure student success. Opportunities to develop critical-thinking skills such as formulating a hypothesis, identifying bias and viewpoints, collecting and analysing research data are essential. Using computers to research and record data as well as to indicate spatial relationships (GIS) will help students develop essential technological skills. Individual, small group, and whole-class activities that provide opportunities for reading, writing, and sharing of information will develop thinking skills and understanding of concepts. Following are some Teaching/Learning Strategies that can be used in the geography classroom.

Aerial Photo Analysis - examine photos of landforms for common characteristics

Brainstorming - group generation of initial ideas expressed without analysis

Case Study - investigating a real or simulated problem

Classifying - grouping according to an identified pattern

Cooperative Learning – small-group investigation or problem solving

Conferencing - student-to-student and student-to-teacher discussion

Computer-Assisted Learning - use of a computer to learn or reinforce material

Debate - informed research topics articulated in a formal process

Diagramming - synthesizing concept information into visual illustration

Direct Instruction - teacher-led lessons

Discussion - exchange of ideas on an issue for clarification of views

Field Trips - practical application of geographic inquiry skills

Games - team quizzes

Graphing - visual tool for problem solving

Guest Speakers - experts in the field

Journal writing - reflective writing to share goals, ideas

Lectures - dissemination of information by guest speakers or teachers

Mapping - representing physical, demographic, numerical data through visual forms

Mind Mapping - mental images drawn on paper

Note Making - summarizing text

Organizers - an organized outline, based on a pattern, provided as a direction to be followed leading to a desired product

Portfolio - collection of student's work

Poster Making - synthesizing information or concepts to deliver a message or advertisement

Presentation/Report - oral, written, and visual presentation of researched topic to a specific audience or person

Reading - periodicals, articles, journals, newspapers, magazines, or scripture for information on a selected topic or issue

Role playing/Simulations - enhances metacognition and serves as a hypothesis for predicting actions

Scenario Writing - describes a situation

Seminars - presentation of an opinion or thesis

Statistical Analysis - collection and reporting of data

Video Analysis - viewing with a purpose

Assessment & Evaluation of Student Achievement

The primary purpose of assessment and evaluation is to improve student learning. To give students an opportunity to improve their learning in this course, a variety of formative and summative assessment tools are used. The Achievement Chart found on page 246 of *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies, 2000* provides a reference point for all assessment practices and a framework within which to assess and evaluate student achievement. The four categories identified on the Achievement Chart are identified as Knowledge/Understanding, Thinking/Inquiry, Communication, and Application/Making Connections. The categories encompass the curriculum expectations in all courses in Canadian and World Studies. *The Ontario Curriculum, Program Planning and Assessment, Grades 9 to 12, 2000* outlines the philosophy and guiding principles concerning assessment and evaluation for Ontario teachers. Teachers need to ensure a balance of approaches to assessment, with students actively involved in the establishment of task criteria and assessment tools. Prior learning and level of skill are determined by the teacher through diagnostic assessment. Assessment strategies should be directly linked to specific expectations based on established criteria. Teachers collect exemplars of student tasks to support student achievement. As outlined in *The Ontario Curriculum, Grades 9 to 12, Program Planning and Assessment*, the final evaluation accounts for 30% of the grade, and 70% is assigned to the evaluations conducted throughout the course. In this profile, Developing an Environmental Bill of Rights is used as the course culminating activity and it is recommended that it count for 5% of the final evaluation.

The model below could be used to assess and evaluate student achievement:

Formative Ongoing Assessment and Summative Unit Evaluation – 70%

- Assignments
- Lab Exercises
- Tests and Quizzes
- Independent Field Study (Process)

Summative Final Evaluation – 30%

- Exam
- Environmental Database
- Environmental Bill of Rights

Accommodations

With assistance and appropriate teaching and learning strategies, students are expected to achieve success in Geography. Appropriate adaptations in planning, assessment, and evaluation should include strategies that provide students every opportunity to meet the expectations of the course. The teacher must become familiar with the Individual Education Plans (IEPs) of all exceptional students and the

specific learning strategies that work best with each student. Some students may require modifications to expectations (see *Ontario Secondary Schools, Grades 9 to 12, 1999*). Geography teachers are encouraged to review student IEPs and decide how best to assist the individual in meeting the expectations of this course.

Specific Accommodations that may be required are:

- provide extra time for completion of assignment;
- provide opportunities for oral conferencing;
- cue the student to record information;
- provide reading materials at the students' instructional level;
- permit taping of notes;
- provide a printed copy of overhead or board notes;
- chunk assignments into manageable parts and monitor progress.

Teachers are encouraged to be flexible in their planning and assessment to best meet the needs of individual students with special needs.

Accommodations for students with learning or physical exceptionalities may include the following:

- maintaining a consistent classroom structure;
- providing for flexible timelines regarding the completion of projects and assignments;
- contacting parent/guardian for support and suggestions;
- adapt handouts in terms of language and content used, and in terms of size and easy-to-read fonts;
- arranging for peer assistance;
- providing a simplified list of terminology prior to the activity;
- providing oral preplanning of activities;
- allowing students to work in an alternate setting;
- providing opportunities to redo all or part of a task;
- adapting tests and exams as recommended in IEP, e.g., time, use of technology, use of a scribe.

ESL

Consideration for students learning English as their second language is also necessary. The classroom teacher should be familiar with the *Ontario Curriculum Grades 9 to 12, English As a Second Language and Literacy Development* where an ESL/ELD teacher is not available.

Accommodations for ESL/ELD students may include the following:

- providing a specialized geographic vocabulary;
- activities such as reading/listening tasks (case study/video viewing) need a specific and concrete product expected of students;
- providing student/teacher conferencing;
- arranging for peer assistance;
- combining both written and verbal instructions;
- highlighting keywords/phrases to be incorporated into the students dictionary;
- grouping students according to first language for brain-storming sessions;
- allowing practice sessions for oral presentations;
- providing sets of reference notes, outlines, or critical information, as well as models of charts, timelines or diagrams;
- reinforcing main ideas by using the think/pair/share peer-assessment strategies.

Resources

Books

- Abram, David. *The Spell of the Sensuous*. 1997. ISBN 067977639-7
- Allen, John L. *Student Atlas of Environmental Issues*. 2001. ISBN 0697365204
- Andrews, W.A. and S.J. McEwan. *Investigating Aquatic Ecosystems*. Canada: Prentice-Hall, 1987. ISBN 0-13-5013129-X
- Andrews, W.A. and D.K. Moore. *Investigating Terrestrial Ecosystems*. Canada: Prentice Hall, 1986. ISBN 0-13-503186-9
- Arms, Karen. *Environmental Science*. Holt, Rinehart and Winston, 2000. ISBN -03-052019-3
- Bailey, Ronald. *Earth Report 2000: Revisiting the State of the Planet*. 1999. ISBN 0071342605
- Benfield, F. Kaid, et al. *Once There Were Greenfields: How Urban Sprawl is Undermining America's Environment, Economy, and Social Fabric*. 1999. ISBN 1893340171
- Berry, Thomas. *The Great Work: Our Way Into The Future*. 1999. ISBN 0609804995
- Blair, Cornelia, Alison Landes, and Jacquelyn Quiram. *The Environment-A Revolution in Attitudes*. 1996. ISBN 1573020281
- Botkin, Daniel B. *Discordant Harmonies: A New Ecology for the Twenty-First Century*. 2000. ISBN 0195074696
- Botkin, Daniel B. *Forces of Change: A New View of Nature by Daniel B. Botkin, (Editor)*. National Geographic Society. 2000. ISBN 0792275969
- Brower, Michael and Warren Leon. *The Consumer's Guide to Effective Environmental Choices: Practical Advice from the Union of Concerned Scientists*. 1999. ISBN 060980281X
- Brown, Lester R. *State of the World 2002. Worldwatch Institute Books*. 2002. ISBN 0393322793
- Campbell, Neil A. and Jane B. Reece. *Biology*. 2001. Addison Wesley Longman. ISBN 0-8053-6624-5
- Carson, Rachel. *Silent Spring*. Reprint Edition. 1994. ISBN 0395683297
- Chamber, Nicky, et al. *Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability*. 2001. ISBN 1853837393
- Chiras, Daniel D., et al. *Natural Resource Conservation: Management for a Sustainable Future*. 2001. ISBN 0130333980
- Christie, Ian and Diane Warburton, eds. *From Here To Sustainability*. 2001. ISBN 1853837350
- Commonor, Barry. *Making Peace with the Planet*. 1992. ISBN 1565840127
- Cozic, Charles P. *Global Resources: Opposing Viewpoints*. 1998. ISBN 1565106733
- Cronon, William. *Uncommon Ground: Rethinking the Human Place in Nature*. 1996. ISBN 0393315118
- Draper, Dianne. *Our Environment: A Canadian Perspective*, 2nd ed. 2002. ISBN 0176222367
- Dudley, William. *The Environment: Opposing Viewpoints*. 2001. ISBN 0737706538
- Dwivedi, O.P., et al. *Sustainable Development and Canada*. 2001. ISBN 1551113236
- Ehrlich, Paul R. *How the Diversity of Life Sustains Us*. 1998. ISBN 1559635207
- Goldfarb, Theodore D. *Taking Sides: Clashing Views on Controversial Environmental Issues*. 2000. ISBN 0072430974
- Harrison, Paul. *Aaas Atlas of Population and Environment*. 2001. ISBN 0520230841
- Huber, Peter W. *Hard Green: Saving the Environment from the Environmentalists (A Conservative Manifesto)*. 2000. ISBN 0465031129
- Klare, Michael T. *Resource Wars: The New Landscape of Global Conflict*. 2001. ISBN 0805055754
- Knudtson, Peter and David Suzuki. *Wisdom of the Elders*. 1997. ISBN 0773756523

-
- Leopold, Aldo. *A Sand Country Almanac*. 1966. ISBN 0345345053
- McNeill, John. *Something New Under The Sun: An Environmental History of the Twentieth-Century World*. Global Century Series. 2001. ISBN 0393321835
- Meadows, Donella H., et al. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. Reprint Edition. 1993. ISBN: 0930031628
- Miller, G. Tyler. *Living in the Environment: Principles, Connections and Solutions*. 2001. ISBN 0534380700
- Nadakavukaren, Anne. *Our Global Environment: A Health Perspective*. 2000. ISBN 0765601885
- Novacek, Michael J. *The Bio-diversity Crisis: Losing What Counts*. American Museum of Natural History Books. 2001. ISBN 1565845706
- Penna, Anthony N. *Nature's Bounty: Historical and Modern Environmental Perspectives*. 1999. ISBN 0765601885
- Pimm, Stuart L. *The World According To Pimm: A Scientist Audits the Earth*. 2001. ISBN 0071374906
- Pointing, Clive. *A Green History of the World: The Environment and the Collapse of Great Civilizations*. Reprint Edition. 1993. ISBN 01400176608
- Roa, Michael L. *Environmental Science Activities Kit/Ready-To-Use Lessons, Labs & Worksheets for Grades 7-12*. 1993. ISBN 0876283040
- Shabecoff, Philip. *Earth Rising: American Environmentalism in the 21st Century*. 2000. ISBN 1559635835
- Stauber, John. *Toxic Sludge is Good for You – Lies, Damn Lies and the Public Relations Industry*. 1997. ISBN 1567510604
- Stevens, William K. *The Change in the Weather: People, Weather, and the Science of Climate*. 1999. ISBN 0195074696
- Suzuki, David and Amanda McConnell. *The Sacred Balance: Rediscovering Our Place in Nature*. 1999. ISBN 1550546910
- Topfer, Klaus. *Global Environmental Outlook 2000*. United Nations Environment Programme. 2000. ISBN 1853835889
- Vital Signs 2001: The Environmental Trends That Are Shaping Our Future*, 2001 ed. Worldwatch Institute. 2001. ISBN 0393321762
- Wilson, Edward Osborne. *The Diversity of Life*. 1999. ISBN 0393319407
- World Resources 2000-2001 – People and Ecosystems: The Fraying Web of Life*. World Resources Institute. 2000. ISBN 1569734437
- Wright, Richard T. and Bernard J. Nebel. *Environmental Science: Toward A Sustainable Future*. Prentice-Hall. 2001. ISBN 0130325384

Organizations

Greenpeace	Federation of Ontario Naturalists
Earthroots	Sierra Club
World Wildlife Fund	EarthFirst
Bruce Trail Organization	Save the Rouge Valley System Inc.

Periodicals

<i>Adbusters</i>	<i>Environment</i>
<i>Alternatives Journal</i>	<i>Environment: Where Science and Policy Meet</i>
<i>Canadian Geographic</i>	<i>Green Teacher</i>
<i>E Magazine</i>	<i>The Journal of Environmental Education</i>
<i>Earth First! – The Radical Environmental Journal</i>	<i>OnEarth</i> formerly <i>Amicus Journal</i>
<i>The Ecologist</i>	<i>World Press Review</i>
<i>The Economist</i>	<i>World Watch</i>

Multimedia and Software

Ah...the Money, the Money, the Money. Video: logging vs. wilderness preservation. National Film Board. 2001.

Champions of the Land. Video: development of conservationist movement DiscoverySchool.Com

Footprints in the Delta. Video: Peace-Athabasca delta ecosystem. National Film Board. 1999.

Natural Connections. four videos from Bullfrog Films

- *Introduction to Biodiversity.* 1999. ISBN 1-56029-842-1
- *Forests, Biodiversity and You.* 1999. ISBN 1-56029-845-6
- *Keystone Species.* 1999. ISBN 1-56029-844-8
- *Biodiversity vs. Extinction.* 1999. ISBN 1-56029-846-4

Sustainable Development and the Ecosystem Approach. 2 video set. 1993. Produced by Environment Canada and distributed by the National Film Board.

Race to Save the Planet. 10-part video series 2002. Annenberg/CPB Channel. PBS Television

Worldwatch CD-ROM. Worldwatch Institute

Websites

Note: The URLs for the websites have been verified by the writers prior to publication. Given the frequency with which these designations change, teachers should always verify the websites prior to assigning them for student use.

Websites (General)

The Canadian Resource Page – <http://www.cs.cmu.edu/Unofficial/Canadiana/README.html>

David Suzuki Foundation – www.davidsuzuki.org

Gary's Geographic Gnome – <http://www.jgds.com/gnome/>

Geographic Information Systems, K-12 – www.esri.com/industries/k-12/index.html

Geography World – <http://members.aol.com/bowermanb/101.html>

Eco-Portal – www.eco-portal.com

Websites (Specific)

Canada Centre For Remote Sensing – <http://www.cct.rncan.gc.ca/>

Canada's Aquatic Environments – <http://www.aquatic.uoguelph.ca/index.asp>

Canadian Geographic Online – <http://www.canadiangeographic.ca/>

The Great Lakes – <http://www.great-lakes.net/lakes/>

The Great Lakes: An Environmental Atlas and Resource Book
– <http://www.on.ec.gc.ca/great-lakes-atlas/>

Greenpeace – www.greenpeace.org

The International Development Research Centre – <http://www.idrc.ca/>

The International Institute for Sustainable Development – <http://iisd1.iisd.ca/>

Media Watch – <http://www.mediawatch.ca/>
National Round Table on the Environment and the Economy
– http://www.nrtee-trnee.ca/eng/home_e.htm
Pollution Watch Scorecard – <http://www.scorecard.org/pollutionwatch/>
Species at Risk in Canada – <http://www.speciesatrisk.gc.ca/sar/>
Sustainable Development – <http://www.dfait-maeci.gc.ca/sustain/SustainDev/overview-e.asp>
Sustainable Development (F.A.O.) – http://www.fao.org/waicent/faoinfo/sustdev/index_en.htm
The World Heritage List – www.unesco.org/whc/heritage.htm
World Resources Institute – <http://www.wri.org/>
Worldwatch Online – <http://www.worldwatch.org/>

Note Concerning Permissions

Units in this Course Profile make reference to the use of specific texts, magazines, films, videos, and websites. Teachers need to consult their board policies regarding use of any copyrighted materials. Before reproducing materials for student use from printed publications, teachers need to ensure that their board has a Cancopy licence and that this licence covers the resources they wish to use. Before screening videos/films with their students, teachers need to ensure that their board/school has obtained the appropriate public performance videocassette licence from an authorized distributor, e.g., Audio Cine Films Inc. Teachers are reminded that much of the material on the Internet is protected by copyright. The copyright is usually owned by the person or organization that created the work. Reproduction of any work or substantial part of any work on the Internet is not allowed without permission of the owner.

OSS Considerations

This profile is designed to aid teachers in developing and delivering The Environment and Resource Management. This course fulfills the requirements for an additional compulsory credit in Canadian and World Studies within the 18 compulsory credits required for an Ontario Secondary School Diploma in section 3.1.1 (p. 9) and Appendix 5 (p. 72) of *Ontario Secondary Schools, Grade 9-12, Program and Diploma Requirements, 1999*. The needs of both college and university-bound students have been considered and the activities have been constructed with a balance of theory and application. Expectations for accommodations are outlined in section 7.12 (pp. 56-8) and Appendix 6 (pp. 74-75). The basis for assessment, evaluation, and reporting practices is outlined on pp. 13-16 of *The Ontario Curriculum, Grades 9-12, Program Planning and Assessment*. Strategies for assessment and evaluation are therefore based on the four categories of Achievement Chart as described in *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies, 2000*. The analytical skills that can be developed in this course can be applied in various situations. By participating in co-op programs and working in the community, students begin to understand the relevance of their studies. An essential component of geographic study is learning to use computers to research and interpret data. Geographic information systems, global positioning systems, and spreadsheet software prepares students for the future. Fieldwork is an essential aspect of this course and, therefore, teachers must be familiar with local board policies regarding field trips and field research.

Coded Expectations, The Environment and Resource Management, Grade 12, University/College Preparation, CGR4M

Geographic Foundations: Space and Systems

Overall Expectations

- SSV.01** · analyse and explain relationships between the earth's major components: the lithosphere, atmosphere, hydrosphere, and biosphere;
- SSV.02** · explain key ecological processes and their significance for ecosystem health;
- SSV.03** · analyse the spatial distribution of global biomes and explain the natural conditions that shape these patterns.

Specific Expectations

Understanding Concepts

- SS1.01** – demonstrate an understanding of the variety, complexity, and evolutionary characteristics (e.g., primary and secondary succession) of selected ecosystems;
- SS1.02** – explain the role of micro-organisms in maintaining soil fertility;
- SS1.03** – demonstrate an understanding of the process of bioaccumulation of chemicals within the food chain;
- SS1.04** – demonstrate an understanding of the factors that affect the survival of a species (e.g., genetic characteristics, availability of habitat, population size).

Developing and Practising Skills

- SS2.01** – analyse selected relationships between the earth's diverse natural systems (e.g., climate, soils, vegetation, wildlife);
- SS2.02** – explain the flow of matter and energy through ecosystems (e.g., nutrient cycling; carbon, nitrogen, and water cycles; energy flow);
- SS2.03** – explain interactions between producers, consumers, and decomposers within a selected ecosystem;
- SS2.04** – analyse the factors that contribute to the fragility and/or resilience of selected ecosystems.

Learning Through Application

- SS3.01** – explain how the earth is a self-sustaining system (e.g., using the analogy of a spaceship);
- SS3.02** – explain the combination of biotic and abiotic factors and processes that produce a selected soil, wetland, or forest;
- SS3.03** – research and report on the impact of an introduced species (e.g., zebra mussel, purple loosestrife, Asian beetle) on an ecosystem;
- SS3.04** – evaluate the contributions made by various characteristics of the biosphere, lithosphere, atmosphere, and hydrosphere to their daily life;
- SS3.05** – analyse interactions between the distinctive natural features (e.g., climate, watershed, plants, animals) of the local bioregion.

Human-Environment Interactions

Overall Expectations

- HEV.01** · demonstrate an understanding of how humans are an integral part of an ecological system and of how human activity has short- and long-term effects on the natural environment;
- HEV.02** · analyse and evaluate interrelationships between the environment, the economy, and society;
- HEV.03** · analyse patterns of resource availability and use.

Specific Expectations

Understanding Concepts

- HE1.01** – demonstrate an understanding of how human well-being and survival depend on complex linkages with other components of the biosphere;
- HE1.02** – explain the difference between needs and wants;
- HE1.03** – demonstrate an understanding of the proliferation and uses of synthetic chemicals in society and identify the effects of selected chemicals on human health and the environment;
- HE1.04** – identify differences in the perceptions of nature and the views on environmental preservation of selected individuals and groups.

Developing and Practising Skills

- HE2.01** – analyse spatial distribution patterns of a selected resource and identify the factors that determine its distribution and its short- and long-term availability;
- HE2.02** – compare distribution patterns of inhabited regions with patterns of resource availability;
- HE2.03** – analyse ways in which selected human activities alter the natural environment (e.g., the effect of clear-cutting west coast forests on salmon spawning, the effect of chlorofluorocarbon use on the ozone layer);
- HE2.04** – analyse the ways in which various groups or individuals (e.g., indigenous peoples, lumber companies, pharmaceutical companies, farmers, tourists) depend on a selected resource (e.g., a tropical rain forest) and evaluate the environmental, economic, and social implications of their dependence on the resource;
- HE2.05** – explain the impact of selected rural and urban land use practices (e.g., irrigation, use of pesticides on crops, development in the buffer zone of a wetland) on human and natural systems.

Learning Through Application

- HE3.01** – estimate personal and class consumption of renewable and non-renewable resources and production of wastes;
- HE3.02** – analyse interactions between human systems (e.g., land use, transportation networks, culture) and natural systems within the local bioregion;
- HE3.03** – research and report on the relationship between environmental degradation and human health concerns;
- HE3.04** – explain the factors that threaten the preservation of wild spaces and the relationship between preservation of wild spaces and preservation of species;
- HE3.05** – predict the social, economic, and environmental impacts of the extraction and depletion of selected resources in a particular location (e.g., the effect of depletion of fish stocks on the Atlantic provinces, of depletion of caribou populations on indigenous peoples, of extinction of rain forest species on the pharmaceutical industry).

Global Connections

Overall Expectations

- GCV.01** · analyse environmental and resource management issues on a global scale;
- GCV.02** · analyse the relationships between global population growth, accelerating consumption of resources, and sustainability of ecosystems on a global scale;
- GCV.03** · explain the efforts of the international community to deal with environmental and resource management issues and evaluate their effectiveness.

Specific Expectations

Understanding Concepts

- GC1.01** – demonstrate an understanding of how growth in population and economic activity around the world increases pressure on natural resources and natural systems;
- GC1.02** – explain the requirements for including natural sites on the World Heritage List;
- GC1.03** – identify ways in which the “traditional ecological knowledge” and activities of indigenous peoples affect the environment;
- GC1.04** – demonstrate an understanding of the need for international cooperation in achieving the sustainable use of global resources.

Developing and Practising Skills

- GC2.01** – analyse the relationships between global resource consumption and environmental degradation;
- GC2.02** – evaluate the effectiveness of selected organizations and agreements in implementing solutions to global environmental concerns;
- GC2.03** – evaluate Canada’s participation in selected international organizations and agreements that deal with global environmental concerns;
- GC2.04** – produce a critique or defence of selected viewpoints regarding a sustainability or resource management issue.

Learning Through Application

- GC3.01** – predict the effects of climate change on a selected region of the world;
- GC3.02** – compare Canada’s protection of endangered spaces and species with that of another country;
- GC3.03** – describe the distribution of Canada’s natural World Heritage Sites and explain why selected sites were chosen;
- GC3.04** – make recommendations for wilderness sites that could be protected in the future;
- GC3.05** – produce a survey of how people in the school and local community perceive nature and classify their attitudes towards a global environmental issue.

Understanding and Managing Change

Overall Expectations

- UCV.01** · evaluate the impact of economic, social, political, and technological change on natural environments;
- UCV.02** · analyse the purpose and effects of current and evolving environmental legislation and regulations at the local, provincial, and national levels;
- UCV.03** · evaluate a variety of ways to resolve environmental and resource management concerns on the local, regional and global scale.

Specific Expectations

Understanding Concepts

- UC1.01** – demonstrate an understanding of concepts associated with change (e.g. paradigm shift, world view, synergy, trends, adaptation);
- UC1.02** – explain the ways in which human activity in one place may cause changes to the environment in another place (e.g., effects of fallout from the Chernobyl disaster, effects of acid precipitation from distant airborne emissions);
- UC1.03** – explain how environmental policies can affect the economy (e.g., job creation or reduction, health costs, future costs of lack of environmental protection);
- UC1.04** – demonstrate an understanding of the purpose and nature of environmental impact assessment studies;

UC1.05 – describe the rights and responsibilities of individuals with respect to protecting the environment for future generations;

UC1.06 – explain how selected non-governmental organizations assist in finding solutions to environmental problems.

Developing and Practising Skills

UC2.01 – explain selected environmental protection principles and initiatives (e.g., voluntary compliance, polluter-pays principle, zero discharge, wildlife migration corridors, pollution taxes and credits) and predict their implications for a sustainable environment and economy;

UC2.02 – explain ways to improve the balance between human needs and the protection of natural systems (e.g., organic food production, wetland restoration);

UC2.03 – evaluate the implications for the future of developments in selected areas of technology (e.g., renewable energy technologies, biotechnology, forest-harvesting technologies);

UC2.04 – explain the economic and environmental implications of reusing and recycling selected products (e.g., computers, photocopier toner cartridges, cars);

UC2.05 – evaluate efforts by individuals and groups to achieve solutions to environmental problems.

Learning Through Application

UC3.01 – produce a case study of a particular industry or human system (e.g., transportation system) to determine its environmental impact and make recommendations for environmental and economic sustainability;

UC3.02 – analyse the effects on urban and rural environments of Canada’s dependence on cars and fossil fuels;

UC3.03 – identify household products that contain hazardous substances and describe ways of reducing their use and encouraging proper disposal;

UC3.04 – produce a plan to reduce personal levels of consumption;

UC3.05 – assess the level of risk from natural or human-caused disasters in the local community and identify requirements for personal and community preparedness;

UC3.06 – predict the major impacts of a selected resource management problem or environmental problem (e.g., tropical deforestation, climate change) on both natural and human systems over the next century.

Methods of Geographic Inquiry

Overall Expectations

GIV.01 · use geographic skills, methods, and technologies to gather, analyse, and synthesize information on environmental and resource management issues and concerns;

GIV.02 · use a variety of methods and technologies to communicate the results of geographic inquiry in written, oral, and visual forms;

GIV.03 · produce a structured plan and conduct an independent inquiry that applies geographic knowledge, skills, methods, and technologies to a selected sustainability and resource management issue;

GIV.04 · describe careers related to the environment and resource management.

Specific Expectations

Understanding Concepts

- GI1.01** – define and use geographic terms correctly in written and oral communication (e.g., *region, pattern, system, interdependence, rural, urban, wilderness, ecology, biodiversity, succession, biotic, abiotic, adaptation, optimal conditions*);
- GI1.02** – define and use terms associated with the environment and resource management correctly (e.g., *global commons, carrying capacity, ecological footprint, sustainable development, sustained yield, silviculture*);
- GI1.03** – demonstrate an understanding of the technologies used in geographic inquiry (e.g., remote sensing, geographic information systems, hypermedia, mapping);
- GI1.04** – demonstrate an understanding of the geographic inquiry process;
- GI1.05** – identify careers related to the environment and resource management.

Developing and Practising Skills

- GI2.01** – analyse how different media (e.g., political cartoons, government reports, advertising, alternative and mainstream periodicals) present the realities and complexities of environmental and resource management issues;
- GI2.02** – explain how information may be biased, and identify the types and sources of information that are relevant to particular inquiries;
- GI2.03** – use graphic organizers (e.g., Venn diagrams, semantic webs, timelines) to analyse and synthesize data;
- GI2.04** – interpret maps showing environmental and resource management concerns on local, regional, national, and global scales;
- GI2.05** – produce original maps, sketches, and/or photographs to illustrate the results of geographic inquiries on environmental and resource management issues;
- GI2.06** – use statistical methods to effectively analyse data related to the environment and resource management;
- GI2.07** – apply geotechnology (e.g., remote sensing, geographic information systems, global positioning systems) effectively to the collection and analysis of data related to environmental and resource management concerns;
- GI2.08** – use field research skills to collect information about environmental and resource management issues;
- GI2.09** – use written, oral, and visual communication skills to present the results of geographic inquiry and analysis effectively.

Learning Through Application

- GI3.01** – use maps, aerial photographs, satellite images, and geographic information systems to analyse causes and effects of environmental change;
- GI3.02** – synthesize ideas presented in a round-table discussion on a selected environmental issue, make recommendations, and rank possible solutions;
- GI3.03** – develop focusing questions and apply geographic methods and technologies to conduct an independent geographic inquiry on a sustainability or resource management issue (e.g., deforestation, depletion of the ozone layer, soil depletion, loss of biodiversity);
- GI3.04** – present reasoned arguments to defend a position on a sustainability or resource management issue;
- GI3.05** – produce workable guidelines for and develop, as part of a team, an environmental action plan to address a concern or initiate a local environmental improvement project;
- GI3.06** – analyse educational requirements, job descriptions, current opportunities, and future prospects for a selected career related to the environment or resource management.

Ontario Catholic School Graduate Expectations

The graduate is expected to be:

A Discerning Believer Formed in the Catholic Faith Community who

- CGE1a** -illustrates a basic understanding of the **saving story** of our Christian faith;
- CGE1b** -participates in the **sacramental life** of the church and demonstrates an understanding of the centrality of the Eucharist to our Catholic story;
- CGE1c** -actively reflects on **God’s Word** as communicated through the Hebrew and Christian scriptures;
- CGE1d** -develops attitudes and values founded on Catholic **social teaching** and acts to promote social responsibility, human solidarity and the common good;
- CGE1e** -speaks the **language of life**... “recognizing that life is an unearned gift and that a person entrusted with life does not own it but that one is called to protect and cherish it.” (Witnesses to Faith)
- CGE1f** -seeks intimacy with God and celebrates **communion** with God, others and creation through prayer and worship;
- CGE1g** -understands that one’s purpose or **call in life** comes from God and strives to discern and live out this call throughout life’s journey;
- CGE1h** -respects the **faith traditions**, world religions and the life-journeys of **all people of good will**;
- CGE1i** -integrates faith with life;
- CGE1j** -recognizes that “sin, human weakness, conflict and forgiveness are part of the human journey” and that the cross, the ultimate sign of forgiveness is at the heart of **redemption**. (Witnesses to Faith)

An Effective Communicator who

- CGE2a** -listens actively and critically to understand and learn in light of gospel values;
- CGE2b** -reads, understands and uses written materials effectively;
- CGE2c** -presents information and ideas clearly and honestly and with sensitivity to others;
- CGE2d** -writes and speaks fluently one or both of Canada’s official languages;
- CGE2e** -uses and integrates the Catholic faith tradition, in the critical analysis of the arts, media, technology and information systems to enhance the quality of life.

A Reflective and Creative Thinker who

- CGE3a** -recognizes there is more grace in our world than sin and that hope is essential in facing all challenges;
- CGE3b** -creates, adapts, evaluates new ideas in light of the common good;
- CGE3c** -thinks reflectively and creatively to evaluate situations and solve problems;
- CGE3d** -makes decisions in light of gospel values with an informed moral conscience;
- CGE3e** -adopts a holistic approach to life by integrating learning from various subject areas and experience;
- CGE3f** -examines, evaluates and applies knowledge of interdependent systems (physical, political, ethical, socio-economic and ecological) for the development of a just and compassionate society.

A Self-Directed, Responsible, Life Long Learner who

- CGE4a** -demonstrates a confident and positive sense of self and respect for the dignity and welfare of others;
- CGE4b** -demonstrates flexibility and adaptability;
- CGE4c** -takes initiative and demonstrates Christian leadership;
- CGE4d** -responds to, manages and constructively influences change in a discerning manner;
- CGE4e** -sets appropriate goals and priorities in school, work and personal life;
- CGE4f** -applies effective communication, decision-making, problem-solving, time and resource management skills;
- CGE4g** -examines and reflects on one's personal values, abilities and aspirations influencing life's choices and opportunities;
- CGE4h** -participates in leisure and fitness activities for a balanced and healthy lifestyle.

A Collaborative Contributor who

- CGE5a** -works effectively as an interdependent team member;
- CGE5b** -thinks critically about the meaning and purpose of work;
- CGE5c** -develops one's God-given potential and makes a meaningful contribution to society;
- CGE5d** -finds meaning, dignity, fulfillment and vocation in work which contributes to the common good;
- CGE5e** -respects the rights, responsibilities and contributions of self and others;
- CGE5f** -exercises Christian leadership in the achievement of individual and group goals;
- CGE5g** -achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others;
- CGE5h** -applies skills for employability, self-employment and entrepreneurship relative to Christian vocation.

A Caring Family Member who

- CGE6a** -relates to family members in a loving, compassionate and respectful manner;
- CGE6b** -recognizes human intimacy and sexuality as God given gifts, to be used as the creator intended;
- CGE6c** -values and honours the important role of the family in society;
- CGE6d** -values and nurtures opportunities for family prayer;
- CGE6e** -ministers to the family, school, parish, and wider community through service.

A Responsible Citizen who

- CGE7a** -acts morally and legally as a person formed in Catholic traditions;
- CGE7b** -accepts accountability for one's own actions;
- CGE7c** -seeks and grants forgiveness;
- CGE7d** -promotes the sacredness of life;
- CGE7e** -witnesses Catholic social teaching by promoting equality, democracy, and solidarity for a just, peaceful and compassionate society;
- CGE7f** -respects and affirms the diversity and interdependence of the world's peoples and cultures;
- CGE7g** -respects and understands the history, cultural heritage and pluralism of today's contemporary society;
- CGE7h** -exercises the rights and responsibilities of Canadian citizenship;
- CGE7i** -respects the environment and uses resources wisely;
- CGE7j** -contributes to the common good.

Unit 1: Geographic Foundations and Environmental Systems

Time: 25 hours

Unit Description

This unit examines relationships between the earth's major components: the lithosphere, atmosphere, hydrosphere, and biosphere. Students gain an understanding of energy flows, the structure of ecosystems and the processes that form them. In the culminating activity students have an opportunity to complete a geographic inquiry by conducting field research in the local area. Students begin the process of creating a Data Bank by researching information on different components and issues concerning the natural environment. Information is collected throughout the entire course and will be evaluated at the end of the semester. Refer to Appendix 1.1.1 – Environmental Database Sources of Information.

Unit Synopsis Chart

Activity	Time	Learning Expectations	Assessment/Evaluation	Tasks
1.1 Earth's Components	3 hours	SSV.01, SS3.04 CGE1e	Formative and summative K/U, T/I, C, A Rubric	Information gathering on the earth's spheres Written scenario based upon the life of an organism Article analysis
1.2 Spaceship Earth and Systems	4 hours	SS3.01, GI1.01, GI2.03, CGE3e, CGE1e	Formative and summative K/U, C, Checklist	Create a diagram based upon a model Produce a map of events that have an effect on the earth's spheres
1.3 Flow of Energy and Matter Through Ecosystems	3 hours	SS1.03, SS2.02, SS2.03, GI2.03 CGE2b, CGE5a, CGE3f, CGE7i, CGE7j	Formative K/U, C, T/I, A, Checklist	Create a flow chart of energy moving through an ecosystem and a food chain Student presentations of a nutrient cycle
1.4 Ecosystems – Ecological Processes	4 hours	SSV.02, SS1.01, SS2.04, UC1.01, GI1.01 CGE2b, CGE2c	Diagnostic K/U Checklist Formative A, T/I	Written report applying the concept of succession using a Canadian example
1.5 Natural Systems	5 hours	SSV.03, SS1.02, SS1.04, SS2.01, SS3.02 CGE7f, CGE7i	Formative Assessment K/U, C, A Comparison Organizer/rubric	Organizer and information gathering Oral presentation
1.6 Field Research	6 hours	GIV.02, SS3.05, GI1.04, GI2.08, GI2.09 CGE4f, CGE5a	Formative Assessment Summative K/U, T/I, C, A, Comparison organizer rubric, checklist	Culminating Activity: Field research and written report

K/U = Knowledge/Understanding

C = Communication

T/I = Thinking/Inquiry

A = Application

Activity 1.1: Earth's Components

Time: 3 hours

Description

This introductory activity focuses on the spheres of the earth and how the biosphere is most significant to daily life. Students gain an understanding of the role that is played by the atmosphere, the lithosphere, the hydrosphere, and the sun in maintaining life on earth. The interactions and relationships among the earth's spheres are examined. The knowledge and understanding gained in this activity are the platform for future units where students critically explore the dynamic nature of the earth.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE1e - speaks the language of life...“recognizing that life is an unearned gift and that a person entrusted with life does not own it but that one is called to protect and cherish it.” (Witnesses to Faith)

Strand(s): Geographic Foundations: Space and Systems

Overall Expectations

SSV.01 - analyse and explain relationships between the earth's major components: the lithosphere, atmosphere, hydrosphere, and biosphere.

Specific Expectations

SS3.04 - evaluate the contributions made by various characteristics of the biosphere, lithosphere, atmosphere, and hydrosphere to their daily life.

Prior Knowledge & Skills

- The Grade 9 Geography course provided the students with a general background knowledge of the spheres, as information was presented on tectonic processes as well as on weather and climate (See Grade 9 Geography Course Profile.)

Planning Notes

- The teacher provides a copy of Appendix 1.1.1 – Environmental Data Sources of Information to each student.
- The teacher prepares necessary materials required to present information on the spheres of the earth. (This information is available in notes for the Grade 11 Physical Geography course.)

Teaching/Learning Strategies

1. The teacher introduces and explains the Environmental Data Base assignment. Refer to Appendix 1.1.1 – Environmental Data Sources of Information.
2. For each of the following three spheres of the earth, the teacher presents introductory notes and explanations of each, highlighting some of the suggested geographic aspects:
 - Lithosphere - with a focus on: tectonics, diastrophism/volcanism, geologic time scale, rocks and minerals
 - Atmosphere - energy budget, air, moisture, gas, acid rain, global warming, systems/cycles, layers of atmosphere, climate/weather
 - Hydrosphere - hydrologic cycle, properties of water, use of water/misuse, fresh/salt water, wetland, riversOnce the three spheres are fully developed then the students develop the concept of a biosphere and write their own definition/diagram.
3. Have students do a personal checklist of all of the activities they did in a 24-hour period to demonstrate just how much we depend on the spheres.

-
4. The teacher leads a class discussion that examines the fragility of the earth and the need to cherish and protect it.
 5. Under the headings of Atmosphere, Lithosphere, Hydrosphere, and Biosphere - brainstorm to create lists of as many things as possible that fit under each heading, e.g., air, water, soil, flora, fauna.
 6. Looking at the lists choose an organism, e.g., elephant, and trace how it interacts with the four spheres. Write a scenario “A day in the life of.....” explaining the interdependence of the four spheres.
 7. As a follow-up ask: If you eliminate one of the components (air, water, soil, fauna), how would it impact your organism (e.g., the elephant goes to the water hole and it has dried up)? Students are assigned a research activity about such an event. Students are required to find an article (newspaper, journal, etc.) and critically evaluate it in written form. The review addresses the issues presented, highlights the human impact, and presents solutions to the problems outlined in the article. (The video *The Diversity of Life* could be used to introduce the process of critically evaluating a situation in the biosphere.)

Assessment & Evaluation of Student Achievement

- The teacher completes a formative assessment of the scenario for completion and proper use of the vocabulary used in these lessons.
- The teacher completes an assessment of the newspaper article review using a rubric. See Appendix 1.1.2 – Newspaper/Magazine/Journal Rubric.

Resources

The Diversity of Life, National Geographic Film

Ehrlich, Paul R. *How the Diversity of Life Sustains Us*. 1998. ISBN 1559635207

Miller, G. Tyler. *Living in the Environment: Principals, Connections and Solutions*. 2001.

ISBN 0534380700

Appendices

Appendix 1.1.1 – Environmental Database Sources of Information

Appendix 1.1.2 – Newspaper/Magazine/Journal Rubric

Appendix 1.1.1

Environmental Database Sources of Information

Later in the course, you will be researching many different components and issues concerning the natural environment. It is very important that you become more aware of how and where to locate information about environmental and resource management issues. This assignment will help you to acquire useful research skills that will help you to be successful in college or university. The Database will be evaluated by your teacher in Unit 5.

Your group will provide seven pages of the following sources of information:

Every entry must be accompanied by an annotation consisting of a one-sentence description of the resource, and a one-sentence explanation of how it applies to the course. All sources should be listed using the conventions of proper referencing.

- Page One: List of Internet websites that provide information on the environment. You must have at least one site dealing with each of the course units.
Be sure to include a correct address.
(Minimum 10 sites)
- Page Two: List of journals, periodicals, and magazines.
Be sure to include the call numbers and ISBN numbers.
(Minimum 10 titles)
- Page Three: List of media sources – television programs, movies, videos, software.
Be sure to include the channel and time.
Minimum 10 titles
- Page Four: Popular Music pertaining to the environment.
Be sure to include the artist and song title.
(Minimum 10 songs)
- Page Five: Book Titles – any books that provide a personalized account or a story based on nature.
Be sure to include a call number or bibliography.
(Minimum 10 titles)
- Page Six: List of organizations, services, or agencies that are involved in or deal directly with environmental issues.
Be sure to include the mailing address.
(Minimum 5 organizations)
- Page Seven: List of articles from the local newspaper(s) focusing on issues of local concern.
Be sure to include the page number and date of the article.
(Minimum 10 articles)

- Completing the minimum requirements equals a mark of at least Level 1.
- Your final mark will be determined by the number of items, the variety of sources and their relevance, and the quality of annotations.
- Final product must be typed and submitted in a binder or duo tang.
- Your teacher will review the issue of copyright on the Internet, video and any published materials.

Appendix 1.1.2

Review of Newspaper or Magazine Article Rubric

Student's Name: _____

Criteria	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)
Knowledge/ Understanding Quality of Research Information GI1.01, GI1.02	- student displayed limited knowledge and understanding of facts, terms, concepts, principles, theories, and/or relationships	- student displayed some knowledge and understanding of facts, terms, concepts, principles, theories, and/or relationships	- student displayed considerable knowledge and understanding of facts, terms, concepts, principles, theories, and/or relationships	- student displayed thorough knowledge and understanding of facts, terms, concepts, principles, theories, and/or relationships
Communication (Written) Communication Through Written Work GI2.09	- written work was communicated with limited clarity	- written work was communicated with some clarity	- written work was communicated with considerable clarity	- written work was communicated with a high degree of clarity
Thinking/ Inquiry Evidence of Analysis of Issues SSV.01 Evidence of Synthesis of Information SSV.02	- issues were critically evaluated with limited effectiveness - personal conclusion to solve problem showed limited evidence of thought	- issues were critically evaluated with some effectiveness - personal conclusion to solve problem showed some evidence of thought	- issues were critically evaluated with considerable effectiveness - personal conclusion to solve problem showed considerable evidence of thought	- issues were critically evaluated with a thorough degree of effectiveness - personal conclusion to solve problem showed a high degree of insight
Application of Prior Knowledge and Skills Logical Connections SSV.02	- prior knowledge and skills were applied to the task with limited effectiveness	- prior knowledge and skills were applied to the task with some effectiveness	- prior knowledge and skills were applied to the task with considerable effectiveness	- prior knowledge and skills were applied to the task in a highly effective manner

Note: A student whose achievement is below Level 1 (50%) has not met the expectations for this assignment or activity.

Activity 1.2: Spaceship Earth and Systems

Time: 4 hours

Description

By studying a classic example of a system, students understand the function, complexity and dynamic nature of the earth's systems. Students investigate the key features of geographic systems by examining the concept of inputs, outputs, and boundaries. The ideas of open and closed systems focus attention on the finite nature of the earth-atmosphere system and on the processes that transport matter from place to place within it. A thorough knowledge of the systems approach is crucial to the exploration of geographic thought and processes in this unit.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE5g - achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others;

CGE1e - speaks the language of life... "recognizing that life is an unearned gift and that a person entrusted with life does not own it but that one is called to protect and cherish it." (Witnesses to Faith)

Strand(s): Geographic Foundations: Space and Systems, Methods of Geographic Inquiry

Learning Expectations

SS3.01 - explain how the earth is a self-sustaining system (e.g., using the analogy of a spaceship);

GI1.01 - define and use geographic terms correctly in written and oral communication (e.g., region, pattern, system, interdependence, rural, urban, wilderness, ecology, biodiversity, succession, biotic, abiotic, adaptation, optimal conditions);

GI2.03 - use graphic organizers (e.g., Venn diagrams, semantic webs, timelines) to analyze and synthesize data.

Prior Knowledge & Skills

- The Grade 11 Physical Geography has sections dealing with systems and systems diagrams. (Unit 1 Planetary Systems: Quest for Balance).

Planning Notes

- Students are to collect newspaper articles for this activity over a period of time.
- The teacher gathers chart paper, scissors, glue for student use in Activity 2.
- The teacher prepares a handout of systems diagram and blank world maps.
- The Grindsbrook Clough (Valley) is used as a classic example of a system. Background information can be found in textbooks and/or an Internet site to help to familiarize the teacher and/or the students. Students can find information and photos of this valley in England by doing an Internet search, using a search engine such as Google, and then searching for Grindsbrook.

Teaching/Learning Strategies

1. The teacher presents students with a definition of a system (...a set of components linked by flows of energy and matter or ...an ecological, social or economic unit of organization made up of interdependent parts).
2. The teacher arranges the class into groups of three or four and gives each group a sheet with the following 10 variables that make up a system (use a large font print when preparing this list).

Atmosphere	Woodland	Floodplain	Soil	Stream
Valley Side	Sheep	Cliffs	Bedrock	Bracken and Grass

Cut out the 10 variables and as a group decide upon an arrangement to create a systems diagram to understand the flow and connection of the variables. Once a decision has been made, students paste the labels to the chart paper and add the flow lines and label them showing flow of energy, nutrients, and matter.

Each group presents and defends their version of the systems diagram.

3. The teacher gives each student a blackline master of a systems diagram, and using a transparency and an overhead projector adds the labels and flow arrows. This completed version is then compared with the students' versions and any similarities and differences are noted. See Appendix 1.2.1 for a completed version.
4. Review proper format for the structure of a systems diagram with boxes, flow arrows, inputs, outputs, open/closed systems, etc. Students are assigned homework that requires them to prepare a minimum two-page informal draft essay on the topic: Open or Closed Natural Systems. This assignment will prepare students for the following in-class writing assignment.
5. The teacher collects the informal rough copy of the draft essay. The teacher allots adequate class time for students to write an in-class formal essay on the topic: Open or Closed Natural Systems. The teacher collects the finished product from each student for evaluation.
6. As a culminating activity students create an "Earth Watch" type of world map as used in daily newspapers by:
 - a) For a one-week period, students collect newspaper articles that tell about major world events that have occurred throughout the world. These could be about natural disasters (earthquakes, hurricanes) or human events (over-fishing of cod, building a hydro dam).
 - b) Students create a world map that plots their events and relates the effect of the event on the spheres. Challenge the students to include an event for each sphere and each continent.

Assessment & Evaluation of Student Achievement

- The teacher completes an informal check of each group's diagram and presentation.
- The teacher completes a formative or summative evaluation of the in-class writing assignment.
- The teacher completes a summative assessment of the maps created by students using a checklist Appendix 1.2.2 – Marking Scheme for Mapping Activity. The teacher provides the student the opportunity to conduct a self-assessment of the Mapping Activity.

Resources

Briggs, D., P. Smithson, and T. Ball. *Fundamentals of Physical Geography*. Toronto: Copp Clark Pitman Ltd., 1989. ISBN 0773047514

Myers, N., U. Ram, and M. Westlake. *G.A.I.A., an Atlas of Planet Management*. London: GAIA Books Ltd., 1984. ISBN 0385190719

Computers, library, maps

Worldwatch Online – <http://www.worldwatch.org/>

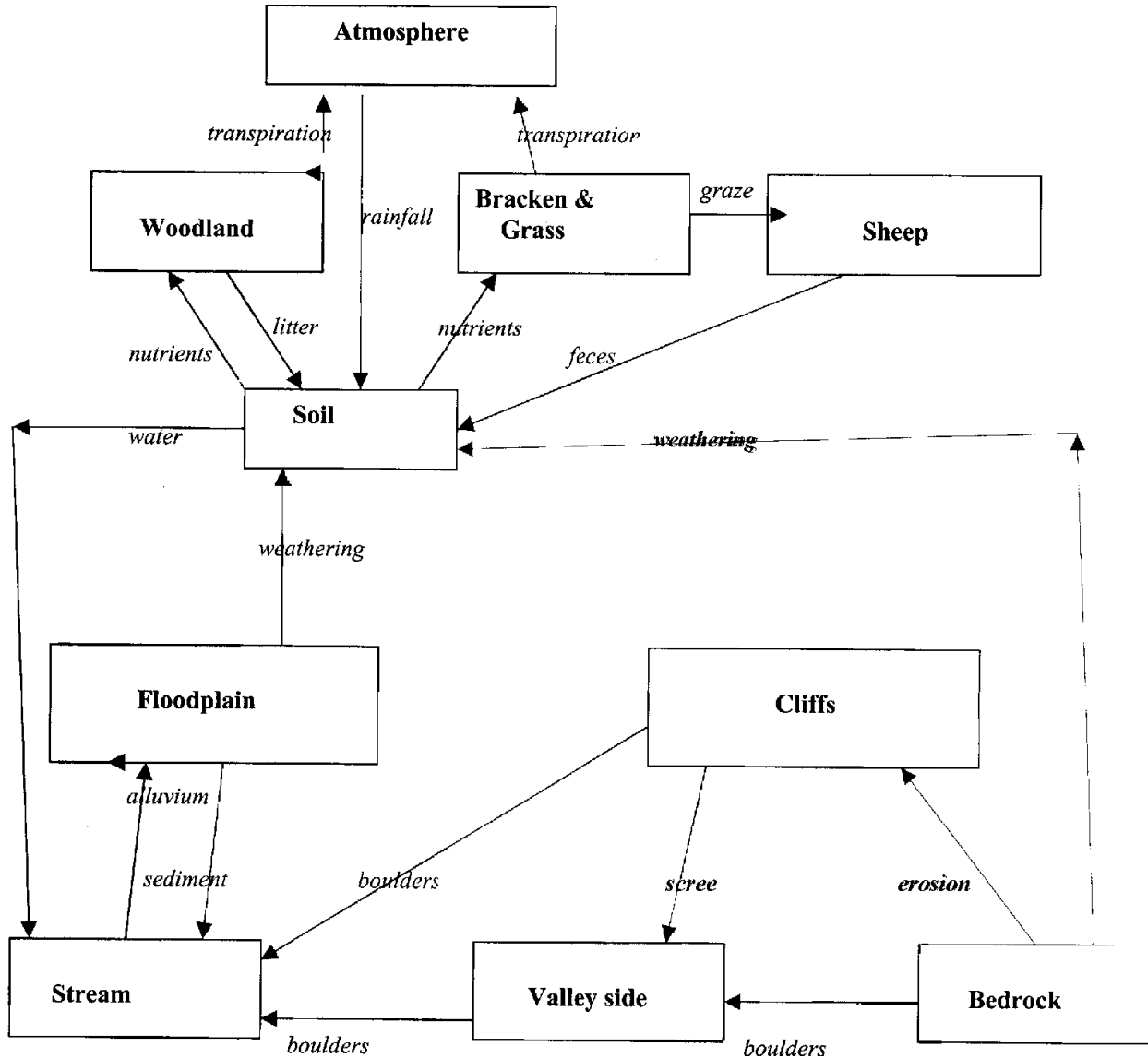
Appendices

Appendix 1.2.1 – Systems Diagram Model (Grindsbrook)

Appendix 1.2.2 – Checklist for Mapping Activity

Appendix 1.2.1

Systems Diagram of the Grindsbrook Valley



Appendix 1.2.2

Marking Scheme for Mapping Activity

(Can be used by student for self-assessment and by teacher for summative evaluation)

Student's Name: _____ Map Topic: _____

Evaluator: Teacher: _____ Student: _____

Geographics (5 marks) Notes/Comments

- Title
- Scale
- Labels
- Legend
- Direction Arrow

Cartographic Presentation and Style (5 marks)

- appropriate use of colour
- creative use of symbols
- clear and concise presentation
- innovative display techniques
- accurate and tidy map

Content (10 marks)

- location of world events noted
- explanation of events included on map
- most continents are represented
- variety of events noted
- spheres identified

Activity 1.3: Flow of Energy & Matter Through Ecosystems

Time: 3 hours

Description

Students are introduced to ecosystems and the dynamic nature of the relationships within them. The flow of energy and matter through ecosystems is examined, and the interdependence of different types of organisms between trophic levels is analysed. Students gain an understanding that a change in any of the ecosystem components affects the entire ecosystem; a concept applied throughout the course.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE2b - presents information and ideas clearly and honestly and with sensitivity to others;
CGE5a - works effectively as an interdependent team member;
CGE3f - examines, evaluates, and applies knowledge of interdependent systems (physical, political, ethical, socio-economic and ecological) for the development of a just and compassionate society;
CGE7i - respects the environment and uses resources wisely;
CGE7j - contributes to the common good.

Strand(s): Geographic Foundations: Space and Systems, Methods of Geographic Inquiry

Specific Expectations

SS1.03 - demonstrate an understanding of the processes of bioaccumulation of chemicals within the food chain;
SS2.02 - explain the flow of matter and energy through ecosystems (e.g., nutrient cycling; carbon, nitrogen, and water cycles; energy flow);
SS2.03 - explain interactions between producers, consumers, and decomposers within a selected ecosystem;
GI2.03 - use graphic organizers (e.g., Venn diagrams, semantic webs, timelines) to analyse and synthesize data.

Prior Knowledge & Skills

- Students use knowledge of ecosystems from the Grade 9 Geography curriculum.
- Use of flow diagrams in previous courses in geography could be employed.
- Students understand the dynamics of working in small groups and contributing to a common purpose.

Planning Notes

- Materials required include a sample food web diagram on an overhead, chart paper and markers.
- The teacher provides sample diagrams to explain the structure and characteristics of flow or systems diagram construction.
- Additional resource texts, books, and/or online resources should be provided by the teacher, or access to the school library/resource centre should be arranged.
- A vocabulary list of all significant geographic words/terms could be prepared and handed out to students.
- The teacher may incorporate the Alberta bishops' letter on ecology for October 4, 1998 into the Teaching /Learning Strategies. See Resources.

Teaching/Learning Strategies

1. The teacher introduces the term *ecosystem* by using an analogy of a bicycle or car. Where a bicycle depends on all parts to function orderly, similarly an ecosystem depends upon the interactions among organisms and their surroundings. The teacher gives students a written definition of ecosystem.
2. By using a flow diagram, the teacher outlines the energy flow through ecosystems, identifying the categories of organisms (producers, consumers and decomposers) involved and defining their roles at various levels known as trophic levels.
Using a pond or woodlot as a model, students create a second flow diagram identifying members of the producer, consumer trophic levels, and explaining how energy moves through the various levels using the identified members.
3. The teacher introduces the concept of a food chain and shows an example to the class. Students add to their flow diagram and create a food chain.
4. Terms such as *habitat*, *niche*, and *competition* are discussed and defined by the teacher. Students give examples of each of these terms, e.g., earthworm habitat = soil. At this point the video *Ecosystems and the Biosphere* could be used to reinforce concepts.
5. The teacher explains how energy is lost as it moves to a new trophic level, but nutrients flow through the food chain and are recycled in what is known as the nutrient cycle. The teacher, showing the relationships between producers, consumers, and decomposers, draws a diagram of the nutrient cycle.
6. In small groups, students research one of the nutrient cycles (water, carbon, nitrogen, phosphorus) and on chart paper draw the cycle, explain the processes involved, and define any new terminology. Each group presents their cycle to the class and fields questions pertaining to the cycle.
7. A class discussion led by the teacher addresses the issue of the affects of an overload or excessive amount of chemicals within the food chain.

Assessment & Evaluation of Student Achievement

- The teacher makes a quick check of student flow diagrams to ensure completion and understanding of concepts related to ecosystems and food chains.
- The teacher makes a formative assessment of student presentations of the nutrient cycles, using a checklist to ensure that the groups address all requirements and that the information conveyed is accurate.

Accommodations

- Ensure that a peer tutor/educational assistant is available to help with terminology and note taking if necessary.
- Allow for alternate presentation formats, such as audio taping.

Resources

Video *Ecosystems and the Biosphere*, Magic Lantern Communications Ltd.

The Hydrologic Cycle (Earthscape) – <http://www.und.nodak.edu/instruct/eng/fkarner/pages/cycle.htm>

Introduction to Hydrology (Okanagan University College)

– <http://www.geog.ouc.bc.ca/physgeog/contents/8b.html>

Nutrient Overload: Unbalancing the Global Nitrogen Cycle (World Resources Inst.)

– <http://www.wri.org/wri/wr-98-99/nutrient.htm>

Introduction to Biogeography and Ecology (Okanagan University College)

– <http://www.geog.ouc.bc.ca/physgeog/contents/chapter9.html>

– <http://www.wcr.ab/bin/eco-lett.html>

Appendices

Appendix 1.3.1 – Teacher Assessment - Presentation Checklist

Appendix 1.3.1

Teacher Assessment - Presentation Checklist Group Work

Student Names: _____

Date: _____

Criteria	Rarely 1	Some- times 2	Most Times 3	Always 4	Comments
Students					
demonstrated a thorough understanding of the topic.					
used visuals effectively.					
explained concepts clearly and effectively.					
were able to field questions pertaining to the topic.					
used new terminology with accuracy.					
remained focused on the task at hand during preparation.					
had an equal part in preparing and delivering the presentation.					

Overall Comments:

Activity 1.4: Ecosystems – Ecological Processes

Time: 4 hours

Description

Ecosystems are dynamic, changing units. By applying the concept of succession, students analyse areas that have undergone change and investigate the causes and effects of these changes to the specific area. A written report is created in the process. This activity prepares students for the study of natural systems in the following activity and for the field research performed in the unit culminating activity.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE2b - reads, understands, and uses written materials effectively;

CGE2c - presents information and ideas clearly and honestly and with sensitivity to others.

Strand(s): Geographic Foundations: Space and Systems, Understanding and Managing Change, Methods of Geographic Inquiry

Overall Expectations

SSV.02 - explain key ecological processes and their significance for ecosystem health.

Specific Expectations

SS1.01 - demonstrate an understanding of the variety, complexity, and evolutionary characteristics (e.g., primary and secondary succession) of selected ecosystems;

SS2.04 - analyse the factors that contribute to the fragility and/or resilience of selected ecosystems;

UC1.01 - demonstrate an understanding of concepts associated with change (e.g., paradigm shift, world view, synergy, trends, adaptation);

GI1.01 - define and use geographic terms correctly in written and oral communication (e.g., region, pattern, system, interdependence, rural, urban, wilderness, ecology, biodiversity, succession, biotic, abiotic, adaptation, optimal conditions).

Prior Knowledge & Skills

- Knowledge regarding detecting bias will help students analyse the article(s) they collect without being influenced.
- Analytical, summation, and other inquiry skills learned in previous courses will help students with the report writing.

Planning Notes

- Some questions and possible scenarios prepared in advance by the teacher may aid the discussion of ecosystem change.
- Diagrams used as examples of succession may be useful for students to see for further understanding.
- The teacher prepares a list of periodicals and other sources for which students collect articles needed for this activity.
- The teacher could also consider having students examine their backyard as an example of succession.

Teaching/Learning Strategies

1. The teacher begins by reviewing the concept of an ecosystem as a community. The teacher questions students as to what happens if certain conditions in the community/ecosystem change.
2. Students brainstorm ways in which an ecosystem may change, e.g., competition, human activity, and environmental change. The possibilities are discussed. The teacher stresses that some ecosystems are more susceptible to change, e.g., sand dune, while others seem to be more resilient (wood lot). The teacher makes reference to The Alberta bishops' letter on ecology for October 4, 1998 (See Resources) to discuss with students the Catholic social teachings pertaining to "eco-justice."
3. The teacher introduces the concept of succession (succession – a series of regular, predictable changes in the structure of a community over time). The teacher differentiates between primary and secondary succession by the use of examples (see Appendix 1.4.1).
4. Students brainstorm local areas that have undergone changes. Each of the areas is loosely analysed for the possible causes of the changes and effects to the area.
5. The teacher introduces concepts pertaining to sustainable development and stewardship.
6. Students collect an article(s) concerning a particular area that has experienced an ecological change. Students are to read the article(s) and create a written report with the following components:
 - a brief description of the situation;
 - the event(s) responsible for the changes that occurred to the area;
 - the conditions/interactions changed because of the impacts on the area;
 - the results of these changes;
 - an explanation of the type of succession of which this is an example;
 - impact on humans and the need for sustainability and stewardship.

Assessment & Evaluation of Student Achievement

- The teacher uses probe questions to confirm the students' understanding of ecosystem change;
- The teacher uses a rubric or checklist designed for report writing to assess the students' application and inquiry skills used to complete the written report.

Accommodations

- Provide peer tutor/educational assistant for assistance for research, brainstorming, and assessment of the process. This person could also assist with note recording.
- Provide computer technology and time to assist with the writing of the report on ecological change.
- Teachers may refer to individual IEPs for further creative accommodations for students.

Resources

Eco-Portal – www.eco-portal.com

Chasmer, Ron. *Earth Matters: Studies in Physical Geography*. Oxford University Press, 2001.

Succession (East Carolina University) – <http://drjoe.biology.ecu.edu/ch09/success.htm>

Celebrate Life: Care for Creation – <http://www.wcr.ab.ca/bin/eco-lett.htm>

Appendices

Appendix 1.4.1 – Examples of Succession

Appendix 1.4.1

Examples of Succession

Succession: sequence of changes in a community after disturbance

Primary succession: initial environment has no living organisms

Example: after the retreat of glaciers

Bare rock → lichens, mosses → shallow-rooted herbs → shrubby willow (Arctic) → alders (N-fixing) → conifers (southern)

Characteristics: Plants alter conditions for later-arriving plants

Changes in soil quality most important

Secondary succession: initial environment has some living organisms

Example: hardwood forest after a clear-cut (Nova Scotia)

Resprouting → seedbank germinates → seeds colonize → trees out-compete others

Maple, birch raspberry, cherry grasses, asters maple, birch dominate elderberry goldenrod

Characteristics: Interactions among plants most important (competition)

First invaders - fast-growing, sun-loving

Replaced by shade-tolerant species

Activity 1. 5: Natural Systems

Time: 5 hours

Description

This activity is designed to introduce students to the characteristics and spatial distribution of global biomes. Students explore the factors that influence the formation and location of biomes around the world. Students investigate the physical, biological, and chemical factors responsible for soil formation and explore the impact humans have on this natural system. The use of Geographic Information Systems technology is encouraged to develop student skills in map construction and interpretation.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE7f - respects and affirms the diversity and interdependence of the world's peoples and cultures;

CGE7i - respects the environment and uses resources wisely.

Strand(s): Geographic Foundations: Space and Systems, Understanding and Managing Change, Methods of Geographic Inquiry

Overall Expectations

SSV.03 - analyse the spatial distribution of global biomes and explain the natural conditions that shape these patterns.

Specific Expectations

SS1.02 - explain the role of microorganisms in maintaining soil fertility;

SS1.03 - demonstrate an understanding of the process of bioaccumulation of chemicals within the food chain;

SS2.01 - analyse selected relationships between the earth's diverse natural systems (e.g., climate, soils, vegetation, wildlife).

Prior Knowledge & Skills

- Students should be familiar with previous activities.

Planning Notes

- Teacher should consult with teacher/librarian regarding availability of resources. Students should have access to an adequate supply of resources, e.g., texts, books, newspapers, journals, CD-ROMs, Internet, etc.
- Newspapers should be available to each group to cover desks during soil investigation.
- Students should be presented with tasks that employ the use of computers and software, that allows for spatial assessment and quantitative analysis. It is recommended that use of Geographic Information Systems (GIS) and other computer technology be incorporated into the activities, wherever possible. A visit to the website at esri.ca is a good starting point for teachers or students not familiar with GIS.

Teaching/Learning Strategies

1. The teacher introduces the topic of the Earth's Terrestrial Biomes by explaining the meaning of the term *biome*. (Biomes are terrestrial climax communities with wide geographic distribution. Biomes describe what the world would be like if people had not altered the natural environment.)
2. The teacher initiates discussion by asking probe questions about the definition of biome.
 - What does the word *terrestrial* mean?
 - What is meant by a 'climax community'?
 - How does the term *distribution* relate to biomes?
 - What would the local area be like if humans had not altered the landscape?
 - How have humans altered the landscape in the last 300 years?
3. The teacher explains that the abiotic factors (non-biological) - temperature and precipitation, play a dominant role in determining the type and location of terrestrial biomes. The teacher discusses the connection between temperature and precipitation and their influence determining vegetation patterns. The teacher promotes discussion using probe questions:
 - Does the form of precipitation (rain or snow) make a difference?
 - Will the amount of total annual precipitation influence vegetation distribution?
 - Will seasonal precipitation make a difference? (wet or dry seasons?)
 - What role do temperature extremes play in determining the location of biomes?
 - Are there any other factors that may have a role in determining type of vegetation found in a biome, e.g., periodic fires, severe wind patterns, type of soils, organisms?
4. The teacher provides each student with a blank world map, an atlas, and a list of the major Terrestrial Biomes (a list is provided below). Students locate and label the major world Terrestrial Biomes on the map provided.

Polar Ice Cap	Mediterranean Scrub and Woodland	Tropical Seasonal Forest
Tundra	Temperate Grassland	Tropical Savannah
Boreal Forest (Taiga)	Tropical Thorn Scrub/Woodland	Desert
Temperate Forest	Tropical Rain Forest	Mountain
5. The teacher divides the class into 12 groups based on the world biome regions listed above. Each group researches their assigned biome region. Students present their findings to the class. All presentations include:
 - location of the biome on a world map;
 - an analysis of the significant abiotic factors: temperature patterns and precipitation patterns;
 - a completed climagraph or hythergraph for a selected station located within the region;
 - an analysis of the significant biotic factors: vegetation and animal life.Students complete a comparison organizer during each group presentation. Refer to Appendix 1.5.1.

-
6. Teacher introduces the topic: Investigating the Properties and Characteristics of Soil. Teacher leads a discussion that:
 - explains the difference between land and soil.
 - discusses the significance of soil to humans.
 - discusses the positive and negative impacts humans have on soil fertility. Connections are made to the significance of nutrient cycling and bioaccumulation of chemicals in soil.
 - explains the physical and biological factors or components that contribute to soil formation (information should include: parent material, mechanical and chemical weathering, humus, air, moisture content, microorganisms, burrowing animals, etc.);
 - explains the properties of soil using the following terms: soil texture, gravel, sand, silt, clay, loam, soil structure and friability. Specific reference to a Soil Texture (pyramid) Graph is recommended. (See data disk available to all schools for ArcView GIS d:\prov_name\soil.shp.)
 7. Prior to class the teacher prepares three separate bins containing different soil samples in each. Bins containing samples of sand, clay, and loam are placed at the front of the room and labelled - Soil Samples A, B, and C. Students are divided into small groups. Each group takes one cup of soil from one of the bins. Each soil sample will be analysed separately. Students analyse each soil sample by completing the chart: Appendix 1.5.2 - Investigating the Properties of Soil. As a class the teacher and students complete the exercise by discussing the results.
 8. The teacher prepares an overhead of a typical soil profile diagram. A copy of the diagram is provided to each student. Using the overhead diagram the teacher explains the structure and processes that form a soil profile. The teacher uses examples of different soil profiles that are associated with grasslands, forests, and deserts. The teacher develops a series of questions related to each soil type. Students are asked to analyse each soil type by comparing the factors that contribute to soil development.
 9. The teacher assigns the following as a homework assignment - a textbook or other resource may be used as a reference.
 - a) Prepare a chart that outlines the major causes and effects of soil erosion.
 - b) Write a short report on various soil conservation practices that are utilized to preserve soil fertility.

Assessment & Evaluation of Student Achievement

- Informal teacher observation of student performance during group activities
- Teacher or peer assessment of student oral presentations
- Teacher evaluation of comparison organizer and chart (Appendix 1.5.3 – Rubric for Organizer/Chart)
- Teacher evaluation of homework assignment (chart and written report)

Accommodations

- Allow for alternate formats for oral presentations.
- Students could be provided enrichment opportunities that would allow students to interview and report on a local farmer's soil conservation practices.
- Enrichment activities could also include the use of GIS technology to create student presentations.
- Some students may require remediation. Flexible timelines regarding completion of activities should be provided.

Resources

Allaby, Michael. *Biomes of the World* (Grolier Educational, Danbury, CT) 1999. Vol.1-9.
ISBN 0717293416

Andrews, William A. *Investigating Terrestrial Ecosystems*. Scarborough, ON: Prentice-Hall Canada Inc., 1986. ISBN 0135031869

Birchall, G. and J. McCutcheon. *Planet Earth: A Physical Geography*. John Wiley, 1993.

Chasmer, Ron. *Earth Matters: Studies in Physical Geography*. Oxford University Press, 2001.

Chasmer, Ron. *Earth Dynamics: Studies in Physical Geography*. Oxford University Press, 1995.

Ontario Ministry of Natural Resources: *Ecological Land Classification*.

ArcView GIS d:\prov_name\soil.shp.

Canadian Oxford School Atlas, 7th ed. Oxford University Press.

Appendices

Appendix 1.5.1 – Comparison Organizer: World Biomes

Appendix 1.5.2 – Chart: Investigating the Properties of Soil

Appendix 1.5.3 – Rubric for Comparison Organizer/Chart

Appendix 1.5.1

Comparison Organizer: World Biomes

Terrestrial Biome	Biotic Factors Temperature and Precipitation	Abiotic Factors Vegetation and Animal Life	Location of World Biome

Appendix 1.5.2

Chart: Investigating the Properties of Soil

Soil Properties	Soil Sample: A	Soil Sample: B	Soil Sample: C
Soil Components (Write a brief description for each component listed below.) a) Humus content b) Air content c) Moisture content d) Evidence of parent material e) Evidence of organisms	a) b) c) d) e)	a) b) c) d) e)	a) b) c) d) e)
Soil Structure (Do the soil particles clump together? Describe.)			
Friability (Does the soil crumble? Describe.)			
Texture (Classify as gravel, sand, silt, clay, or loam. Explain.)			

Appendix 1.5.3

Rubric for Organizer/Chart

Student's Name: _____

_____ Biomes

_____ Investigating Properties of Soil

Criteria	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)
Knowledge/ Understanding Quality of Facts and Research Information	- organizer(s) demonstrated limited knowledge of facts and research	- organizer(s) demonstrated some knowledge of facts and research	- organizer(s) demonstrated considerable knowledge of facts and research	- organizer(s) demonstrated thorough knowledge of facts and research
Thinking/Inquiry Evidence of Analysis	- information presented demonstrates little analysis	- information presented demonstrates some degree of analysis	- information presented demonstrates a considerable degree of analysis	- information presented demonstrates a high degree of analysis
Communication (Written) Communication Through Written Work	- information has been communicated with limited effectiveness	- information has been communicated with some effectiveness	- information has been communicated with considerable effectiveness	- information has been communicated with a great degree of effectiveness
Application Logical Connections	- conclusions and connections were made with limited clarity and logic	- conclusions and connections were made with some clarity and logic	- conclusions and connections were made with considerable clarity and logic	- conclusions and connections were made with a high degree of clarity and logic

Note: A student whose achievement is below Level 1 (50%) has not met the expectations of this assignment or activity.

Activity 1.6: Field Research: Culminating Activity

Time: 6 hours

Description

Students examine components of the natural environment through the use of fieldwork. This activity is designed to provide students an opportunity to conduct a geographic inquiry within the local bioregion. It is designed as a practical hands-on activity for students to collect, organize, synthesize, and evaluate geographic data. Through field activities students investigate environmental and resource management issues related to the local area. The use of Geographic Information Systems (GIS) technology is encouraged to develop student skills in map construction and interpretation.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE4f - applies effective communication, decision-making, problem solving, time, and resource management skills;

CGE5a - works effectively as an interdependent team member.

Strand(s): Geographic Foundations: Space and Systems, Understanding and Managing Change, Methods of Geographic Inquiry

Overall Expectations

GIV.02 - use a variety of methods and technologies to communicate the results of geographic inquiry in written, oral, and visual forms.

Specific Expectations

SS3.05 - analyse interactions between the distinctive natural features (e.g., climate, watershed, plants, animals) of the local bioregion;

GII.04 - demonstrate an understanding of the geographic inquiry process;

GI2.08 - use field research skills to collect information about environmental and resource management issues;

GI2.09 - use written, oral, and visual communication skills to present the results of geographic inquiry and analysis effectively.

Prior Knowledge & Skills

- Students should understand the expectations and responsibilities associated with field research. Students will have to be fully prepared to observe, test and gather data in an outdoor setting. Students should be familiar with concepts and content generated in the previous activities of this unit.
- The teacher must follow the board/school policy for out of school activities.

Planning Notes

- The teacher must decide on the number and type of field activities offered. Field activities are designed to be local in nature. The teacher must decide if students work in pairs or individually. Students are reminded that photographs should be taken at each study site. The teacher should provide a list of the materials required to complete each field exercise, e.g., sketch pad, camera, rubber boots, shovel, measuring equipment, etc. For each field exercise, the teacher must take the steps to ensure the health and safety of students, helping them understand the importance of health and safety issues and the need to assume responsibility for their own safety and that of others.
- Students submit all field notes and final lab write-ups.
- The teacher consults with library staff regarding availability of resources.

-
- The use of digital technology would enhance student presentations. Students should be presented with tasks that employ the use of computers and software which allows for spatial assessment and quantitative analysis. It is recommended that use of Geographic Information Systems (GIS) and other computer technology be incorporated into the activities, wherever possible.
 - The Field Activity Rubric (Appendix 1.6.3) has been designed to be generic in nature and can be used for individual activities or can be adapted to combine all of them.
 - The teacher refers to a checklist for field activities (Appendix 1.6.4 – Checklist for Field Activities).

Teaching/Learning Strategies

1. The teacher introduces the culminating activity by having a brief review of the content and interconnections of topics within the first unit. The teacher explains the scope and nature of the field activities students are required to complete. The teacher decides on the types of field activities the students are required to complete.
2. The teacher provides an information package to each student that outlines details of the culminating activity. Teacher reviews the material which may include: objectives, expectations, specific instructions, a required-materials and equipment list, timeline, and assessment and evaluation strategies.
3. The field activities are designed to be generic in nature and should be adapted to sites associated with the local environment. See Appendix 1.6.1.

Assessment & Evaluation of Student Achievement

- This activity is largely summative. The teacher may use the Field Activity Rubric (Appendix 1.6.3) to evaluate student achievement.
- The teacher may use the Checklist For Field Activities (Appendix 1.6.4) as an assessment tool.

Accommodations

- Enrichment activities for students could include opportunities to develop video and electronic-slide presentations.
- Enrichment activities could also include the use of GIS technology to create student presentations.
- Some students may require remediation. Flexible timelines regarding completion of activities should be provided.

Resources

Material and resources gathered from the local area.

Birchall, G. and J. McCutcheon. *Planet Earth: A Physical Geography*. John Wiley, 1993.

Chasmer, Ron. *Earth Matters: Studies in Physical Geography*. Oxford University Press, 2001.

Chasmer, Ron. *Earth Dynamics: Studies in Physical Geography*. Oxford University Press, 1995.

Ontario Ministry of Natural Resources. *Ecological Land Classification*.

Canadian Oxford School Atlas, 7th ed. Oxford University Press.

Appendices

Appendix 1.6.2 – Plant Communities: Abiotic and Biotic Characteristics

Appendix 1.6.3 – Rubric for Field Activity

Appendix 1.6.4 – Checklist for Field Activities

Appendix 1.6.1 – Sample Field Activities

Field Activity 1: Plant Communities

Select two separate and distinct locations for the plant community study. One study plot (quadrat) will be located in a forest community and the other plot from a field community.

1. On a sketch map, indicate the location of the selected test plots.
2. Using string and small stakes, mark off a test site (quadrat) the size of one square metre.
3. Section the quadrat area into quarters by tying string to stakes across the 0.5 metre marks to labelling a grid. Using graph paper, draw a detailed map of the test plot. Identify and label the various plant types.
4. Sketch a side view of the plot, labelling all vegetation types. Provide a vertical scale to indicate relative heights of vegetation.
5. Complete the chart that compares the abiotic factors and biotic characteristics of each plant community. See Appendix 1.6.2.
6. Collect samples at each location and create a visual display that compares the two test sites.
7. Using sketch maps and field notes, rewrite the information and submit it as a final copy. Include photographs and be sure to submit all field notes.
8. Making reference to the new Ecological Land Classification (ECL) prepared by the Ontario Ministry of Natural Resources could make an interesting connection.

Field Activity 2: Soil Analysis

Use the same locations to complete the soil analysis.

Note: Be careful not to damage plants and habitat. Fill in the pit completely and restore the area to its original state.

1. Dig a pit 1/2 metre to 1 metre in depth. Dig the pit no larger than necessary.
2. Look for the horizons in the soil. Make a scale drawing to show a detailed soil profile. Identify, label, measure, and describe the characteristics for each of the horizons. Be sure to describe the humus content and colour, water content, evidence of parent material, soil structure and texture. Make specific reference to a soil texture diagram. Describe the similarities and differences of the soil at each location. Explain the factors that influence the formation of soil at each site.
3. Collect a soil sample at each location. Use the soil samples to create a scale model of each soil profile. Using sketch maps and field notes rewrite the information and submit as a formal good copy. Include photographs and be sure to submit all field notes.

Field Activity 3: Ecological Succession

1. Choose a site that will best demonstrate the phenomena of ecological succession, e.g., along a shoreline or edge of a woodlot.
2. Using string and stakes, establish the length and location of a transect line. On a sheet of paper, draw a detailed sketch along the transect line. Record all information by labelling physical features, vegetation types, and changes you observe along this line. Distances from the starting point must be accurately measured.
3. Draw a well-labelled profile diagram (side view) of the vegetation changes along the transect. Draw your diagram to scale, include a vertical and horizontal scale.
4. Does this location exhibit the classic stages of succession? Explain.
5. Write a description of each zone that is evident along the transect line.
6. In the future, what changes do you expect to occur along this transect line?
7. Using sketches and field notes, rewrite the information and submit as a final copy. Include photographs and be sure to submit all field notes.

Appendix 1.6.1 (Continued)

Field Activity 4: Systems: An Application

1. Select a site that clearly demonstrates the biosphere, e.g., pond, stream, bog, marsh, forest, meadow, valley, geomorphic feature, etc.
2. Using photographs taken at the site, create a systems diagram complete with labels and arrows that clearly demonstrate the human and natural interconnections within the biosphere.
3. Prepare a creative visual display and present to the class.

Appendix 1.6.2 – Plant Communities: Abiotic and Biotic Characteristics

Factor: Site Description	Forest Community	Field Community
a) wind influence		
b) intensity of light on the ground		
c) temperature (in the air, on ground)		
d) topography (flat, rolling, hilly, etc.)		
e) shade (dense, medium, slight, etc.)		
f) other details (wet, dry, etc.)		
g) number of different plant species		
h) depth of litter (organic matter)		
i) soil (sand, clay, loam)		
j) evidence of animal life		
k) other interesting observations		

Appendix 1.6.3

Rubric for Field Activity

Student's Name: _____

Field Activity #1 ____, #2 ____, #3 ____, #4 ____.

Criteria	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)
Knowledge/ Understanding Quality of Research Information GI2.08	- research demonstrated limited knowledge of concepts and relationships	- research demonstrated some knowledge of concepts and relationships	- research demonstrated considerable knowledge of concepts and relationships	- research demonstrated thorough knowledge of concepts and relationships
Thinking/Inquiry Research Information is Collected and Organized GI2.08	- research has not been organized and conducted in an effective manner	- research has been organized and conducted in a somewhat effective manner	- research has been organized and conducted in an effective manner	- research has been organized and conducted in a highly effective manner
Communication (Written) Communication Through Written Work GIV.02, GI2.09	- information has been communicated with limited effectiveness	- information has been communicated with some effectiveness	- information has been communicated with considerable effectiveness	- information has been communicated with a great degree of effectiveness
Communication (Visual) Communication Through Visual Presentation GIV.02, GI2.09	- inappropriate or ineffective visuals have been utilized	- appropriate visuals have been utilized in an ineffective manner	- appropriate visuals have been utilized in and effective manner	- appropriate visuals have been utilized highly effectively
Application Logical Connections CGE 4f, GI1.04	- conclusions and connections were made with limited clarity and logic	- conclusions and connections were made with some clarity and logic	- conclusions and connections were made with considerable clarity and logic	- conclusions and connections were made with a high degree of clarity and logic

Note: A student whose achievement is below Level 1 (50%) has not met the expectations for this assignment or activity.

Appendix: 1.6.4

Checklist for Field Activities

Field Activity 1: Plant Communities

Activities Completed:

- area sketch map
- test plot map
- sketch diagram of vegetation types (side view)
- chart (Appendix 1.6.1)
- samples collected and visual display
- written report with field notes and photographs
- efficient use of time
- respect for the process and environment
- personal preparation for outdoor activities
- instructions followed

Comments:

Field Activity 2: Soil Analysis

Activities Completed:

- soil profile diagram and written field observations
- samples collected and model of soil profile
- sketches, photographs and field notes
- written report
- efficient use of time
- respect for the process and environment
- personal preparation for outdoor activities
- instructions followed

Comments:

Field Activity 3: Ecological Succession

Activities Completed:

- site selected and transect line diagram
- profile diagram
- field notes and photographs
- written analysis
- efficient use of time
- respect for the process and environment
- personal preparation for outdoor activities
- instructions followed

Comments:

Field Activity 4: Systems: An Application

Activities Completed:

- site selected and photographs taken
- systems diagram visual display
- efficient use of time
- respect for the process and environment
- personal preparation for outdoor activities
- instructions followed

Comments: