

Catholic District School Board Writing Partnership

Canadian and World Studies

Course Profile

The Environment and Resource Management

Grade 12
Workplace Preparation
CGR4E

• *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.

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Course Overview

The Environment and Resource Management, CGR4E, Grade 12, Workplace Preparation

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

Prerequisite: Grade 9 Geography of Canada, Academic or Applied

Course Description

This course examines the impact of human activities on the natural environment and emphasizes responsible resource management, mainly in the context of the local environment. Students will learn about ecosystem structures and processes, the ecological impact of human activities, and sustainable resource management, and will develop practical solutions to environmental and resource management issues.

How This Course Supports The Ontario Catholic School Graduate Expectations

The graduate will be able to achieve many of the Ontario Catholic School expectations in the study of The Environment and Resource Management course. Through their examination, evaluation, and application of knowledge regarding sustainable resource management, students discover what is necessary for all living things of the world to co-exist, while at the same time, sustaining natural systems and protecting the environment.

The course will help students develop into responsible Catholic citizens who respect and affirm the diversity and interdependence of all living things and their natural environment. Furthermore, it is expected that students think reflectively and creatively, in light of gospel values, to evaluate situations and solve problems associated with the natural world and its sustainability.

In the context of a Workplace Preparation course, the students should be aware of the Catholic Social Teachings on the nature of work: “For when, by the work of one’s hands or with the aid of technology, man develops the earth so that it can bear fruit and become a dwelling worthy of the human family, and when he/she consciously takes part in the life of social groups, he/she carries out the design of God.” (*Gaudium et spes*, No. 57)

Course Notes

In this course students learn about ecosystem structures and processes and analyse the impacts that humans have on them. By challenging students to develop solutions through an issue-based approach, students develop practical skills by emphasizing responsible resource management. Catholic students acquire a respect for all things created by God; appreciating the goodness that each contributes to the diversity of the planet. A key objective throughout the course is to have students understand the roles and responsibilities of various stakeholders involved with environmental and resource management as they work towards a common good.

Students apply the geographic knowledge and skills gained in Grades 9 and 11 to an issues-based approach to resource management and the environment. Fundamental to this approach is an understanding that there are complex relationships between living and non-living components of ecosystems.

Workplace Preparation courses are designed to equip students with the knowledge and skills they need for direct entry into the workplace or for admission to apprenticeship programs and other training programs offered in the community. This course, in particular, prepares students for a variety of jobs and careers in the areas of environmental protection and resource management. This course may also be offered in conjunction with cooperative education and school-work transition programs. Employers in the community will be involved with the planning of cooperative education and work experience placements, and will support the implementation of this course in those circumstances.

The Catholic teacher needs to understand the context within which these accommodations are made. Specifically, two Catholic Social teachings apply: the dignity of the human person and a preferential option for the poor. In the first case, everything necessary for leading a life that is truly human must be made available to all people. The dignity of each student requires that this include the right to learn. (See *Gaudium et spes*, No. 26.) The second principle simply applies to the reality that some students are “the poor” in the sense that they are less able to learn and therefore need accommodations.

This course was created within the parameters of the strands outlined in *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies* document. Expectations from the strands were clustered to form four broad units. These units were further subdivided and organized into activities that combine to create a framework for delivery. The activities are designed to provide students with the following enduring learnings:

- demonstrate responsible environmental behaviour and understand the impact of their choices;
- understand that we are part of nature, not apart from nature;
- understand the roles and responsibilities of stakeholders (individual, business, industry, and government) in environmental and resource management in search of a common good;
- analyse environmental issues and be able to support a point of view with sound arguments;
- understand the global nature of all environmental issues;
- use geographic skills, methods, and technologies to gather, analyse, and communicate information and make decisions.

This course involves students in a number of outdoor field activities. Teachers should be aware of board policies concerning field trips. Units in this course can also be organized so that those activities involving outdoor field work can be done when the weather is suitable.

Units: Titles and Time

Unit 1	Becoming Aware of Our Actions	20 hours
* Unit 2	Ecosystems and the Need for Biodiversity	24 hours
Unit 3	Environmental Responsibility and Management	26 hours
Unit 4	Population Growth and Sustainability	25 hours
Course Culminating Activity	A Local Management Undertaking	15 hours class time + independent research time.

* This unit is fully developed in this Course Profile.

Unit Overviews

Unit 1: Becoming Aware of Our Actions

Time: 20 hours

Unit Description

By examining the way they live their everyday lives, students become more aware of their impact on the natural environment. Students reflect on their own personal values and choices and compare them with others around the world, determining whether humans, in general, respect the integrity of God’s creation. The content of this unit challenges students to find ways to improve upon their everyday actions, which may improve the quality of their lives, and reduce consumption. The culminating activity has students creating a multimedia product that encourages the stewardship of the Earth.

Unit Overview Chart

Cluster	Learning Expectations	Assessment Categories	Focus
1	HE1.01 CGE4g	Knowledge/ Understanding	How is a need different from a want?
2	HEV.02, HE1.02 CGE3c	Knowledge/ Understanding	How do humans and living organisms use nature?
3	UCV.01, UC1.05, GC1.01 CGE7h CGE7j	Thinking/ Inquiry Application	What are the rights and responsibilities of citizens with respect to the environment? - stewardship of the global commons
4	UC3.04, GIV.01, GIV.02, GI1.01, GI2.04, GI3.03 CGE3f, CGE7i	Thinking/ Inquiry Application Communication	How can we behave responsibly toward the environment in our everyday lives? What constitutes good research? How can we encourage stewardship? What are people's attitudes towards the environment (conduct a survey)?

Unit 2: Ecosystems and the Need for Biodiversity

Time: 25 hours

Unit Description

In this unit, students learn about ecosystem structures and processes. By investigating the world around them and applying their knowledge to real-life situations, students realize the complexity and fragility of living organisms and their environment. The need for biodiversity and the importance of conserving natural resources is explored, including the role of humans as part of the natural world. Catholic students acquire a respect for every living organism put on Earth and realize that each has a particular goodness and must therefore be respected and helped. The unit concludes with students becoming involved in a field study applying the knowledge and concepts acquired in the unit.

Unit Overview Chart

Cluster	Learning Expectations	Assessment Categories	Focus
1	SSV.01, SS1.01, SS2.02, HE1.03, GI2.05, CGE3c	Knowledge/ Understanding	What are the Earth's major components? - the Earth's spheres - relationships between spheres - sustaining life on Earth
2	SSV.02, SS1.03, SS2.01, SS2.04, GI2.02 CGE2c, CGE5a, CGE7d	Knowledge/ Understanding Application	What is an ecosystem? - living and non-living components - role of producers, consumers, and decomposers - relationships between organisms
3	HEV.01, SS1.02, SS1.04, SS2.03, HE3.01, GI2.06 CGE2b, CGE4b, CGE7d, CGE7i	Application Thinking/ Inquiry	How are humans part of the food web? - dependency on living things - roles of various living organisms - contamination of the food chain
4	GIV.01, SS3.03, HE3.02, UC1.01, UC1.02, GI2.06 CGE7j	Thinking/ Inquiry Communication	Why is biodiversity important? - understanding biodiversity - endangered species in Canada - the need for preservation

Cluster	Learning Expectations	Assessment Categories	Focus
5	SSV.03, SS3.01, SS3.02, GI2.01, GI2.03 CGE2c, CGE5b	Thinking/ Inquiry Application Communication	What is a biome and how does this area fit in? - understanding biomes and types - presentation of biomes Local field study of the ecozones/biome.

Unit 3: Environmental Responsibility and Management

Time: 25 hours

Unit Description

Students examine the effects of various types of pollution on humans, plants, and animals in an attempt to recognize the need for international cooperation with respect to environmental issues. By examining specific international agreements, students gain the knowledge needed to investigate an environmental issue requiring attention by more than one country and to recommend solutions for its resolution. The culminating task for the unit involves the creation of an electronic presentation outlining the actions of an environmentally-responsible business or industry.

Unit Overview Chart

Cluster	Learning Expectations	Assessment Categories	Focus
1	HE2.02, HE2.03, HE3.03, UC1.03, GI2.03 CGE7i, CGE7j	Knowledge/ Understanding Application	What are the effects of pollution on humans, plants, and animals? - air and water pollution - sources of toxic wastes How do human activities alter the natural environment? - depletion of forests, etc.
2	UCV.02, UC1.04, UC2.02, UC3.01, GI3.03, GI3.04 CGE7j	Thinking/Inquiry Application	What are local and provincial governments doing to promote the sustainable management of resources? - examination of strategies - produce a plan proposing solutions for a local concern
3	GCV.03, GC1.03, GC1.04, GC1.06, GC3.01, GC3.03, GI2.01 CGE7j	Thinking/Inquiry Communication	Why and how are countries cooperating in solving environmental problems? - transboundary pollution - examine international agreements, e.g., Kyoto Write a report on a management issue requiring international cooperation.
4	UCV.03, UC2.05, UC2.06, GI1.02	Knowledge/ Understanding	What jobs and careers are related to the environment and resource management? - industry guest speaker or guidance presentation - newspaper job search
5	UC2.01, UC2.04, UC3.02, GI2.01, GI2.07	Thinking/Inquiry Application Communication	Create an electronic presentation of an environmentally responsible business or industry - examine industry publications

Unit 4: Population Growth and Sustainability

Time: 25 hours

Unit Description

How can we sustain resource use and live in an environmentally sound manner with current population growth? This challenge is examined by students after analysing the effects that a growing population has on resources and the environment. People around the world interact with nature in various ways in their daily lives, however impacting on the Earth. Students assess the actions of various organizations and businesses that have taken a particular interest in environmental issues. Students of Catholic schools recognize that part of being a responsible citizen is to respect the environment and use the resources provided wisely.

Unit Overview Chart

Cluster	Learning Expectations	Assessment Categories	Focus
1	HEV.03, HE1.04, HE2.01, GI1.02, GI2.03	Knowledge/ Understanding Application	Where are Earth's major resources? - mapping of resources using Geographic Information Systems (GIS) - analysing patterns and distribution - renewable vs. non-renewable
2	GC1.02, GC1.05	Knowledge/ Understanding	Why is the world's population growing? - factors contributing to growth How do traditional cultures interact with nature? - examine effects of living and compare with our lifestyles
3	GC2.01, GC2.02, GC3.02, GI2.02	Knowledge/ Understanding Application	How has the consumption of resources changed over time? - global patterns and trends - correlation between population growth and resource use (graph)
4	GCV.02, GC2.04, UC2.03, GI3.02, GI3.01	Thinking/ Inquiry Communication	How do various organizations and government bodies support and encourage sustainable resource use? - goals and actions of various non-governmental organizations - analyse and debate the actions of various interest groups
5	GCV.01, GC2.03, HE2.04, GIV.02, GI1.01	Knowledge/ Understanding Thinking/ Inquiry Application	What are the environmental effects of increased resource consumption? - case study analysis concerning environmental degradation - poor management practices to cope with population growth

Course Culminating Activity: A Local Management Undertaking

The course culminating activity A Local Management Undertaking is not a separate unit; instead, it is the integrating theme introduced in Unit 1 which connects and flows through each of the following units. Students research the local area (ecosystems and resource base) and plan a recreational trail based upon an existing one in Canada, e.g., Rideau Trail, Bruce Trail, Cross-Canada Trail. The proposed trail includes: an evaluation of the impact on the local biome, the management requirements of the trail, the uses/users of the trail, and appropriate maps.

This activity uses the knowledge gained throughout the course. Time is allotted during all the units for the students to add information to their project, practise geographic skills, receive ongoing feedback about their report, and reflect on their achievement. During the last unit, students participate in final teacher conferencing and begin creating a rough draft of their proposal. It is recommended that the teacher book computer access towards the end of the course to allow students to complete the culminating activity for summative evaluation.

Culminating Activity Chart

Learning Expectations	Assessment Categories	Focus
HE3.03, UC3.01, UC3.03, GIV.02, GIV.03, GI3.03	Knowledge/Understanding Thinking/Inquiry Application Communication	Course culminating Activity: Creating an action plan for a recreational trail system in the local area.

Timeline for Course Culminating Activity

Unit	Time Allotted	Focus/ Tasks
1	1 hour	Outline the framework of the activity. Students take notes and brainstorm for possible trail sites.
2	2 hours	Research and inquiry process continues. Teach introductory skills needed. Students make connections between their trail site and the possible impacts on ecosystems. Maps are created.
3	2 hours	Research continues and notes are taken. Student-teacher conferencing begins. Management and responsibility for trail is determined.
4	2 hours	Organization of student research. The teacher discusses format of the proposal. A rough draft is created. The teacher checks work to date and continues conferencing.
End of Course	8 hours	Work sessions with continued teacher and peer feedback. Final editing. Submission of final product.

Teaching/Learning Strategies

Teaching and learning strategies in this course are designed to give students opportunities to be actively engaged in their own learning and to emphasize workplace application of the course content while exploring the theoretical material that underlies these practical applications. Students develop generic employment skills, as well as independent research and learning skills, continually making the connection between what they do in the classroom and the world outside.

Geographic inquiry skills such as collecting, organizing, analysing, and synthesizing information are a part of many activities and include the use of geotechnologies, such as remote sensing and Geographic Information Systems (GIS). Students have multiple opportunities to improve their skills in communication through presentations, reports, and the use of visual geographic tools such as graphic organizers, maps, and diagrams.

The Internet and GIS software are useful tools for assisting students in meeting expectations for this workplace destination course. Cooperative group learning is an important strategy fundamental to some activities in this profile; in particular, those that involve group decision making. Tasks, such as carrying out interviews and role plays and designing commercial ads and posters, develop skills and concepts through a range of student learning styles. As a culminating task, students produce a case study report that reinforces and synthesizes the essential understandings from each unit and gives a final opportunity to demonstrate competency in meeting the expectations of The Environment and Resource Management Course.

The Teaching/Learning Strategies should:

- encourage maximum student engagement in the learning activity;
- permit student choice regarding the processes and products of learning;
- include whole-class, small-group, and individual instruction;
- use electronic technology as appropriate;
- address a variety of learning styles;
- modify activities for exceptional students;
- provide opportunities for genuine inquiry to generate questions, apply a variety of investigative approaches, and communicate learning in a variety of ways;
- encourage students in self-and peer evaluation;
- use formative assessment to provide opportunities for practice and consolidation;
- make authentic connections with the classroom, the school, and the local community and demonstrate respect for the cultural diversity of Ontario classrooms.

Assessment & Evaluation of Student Achievement

The primary purpose of assessment and evaluation is to improve student learning. In order to give students an opportunity to improve their learning in this course, a variety of formative and summative assessment tools are used. The types of assessment used in this particular course should consider not only the expectations but also of the Workplace designation of this course. The types of assessment and evaluation strategies used by the teacher should therefore be reflective of the work-place environment and focus on those skills that are sought after by employers.

The Achievement Chart provides a reference point for all assessment practices and a framework within which to assess and evaluate student achievement. It is found on p. 246 of *The Ontario Curriculum, Grades 11 and 12, Canadian and World Studies*. The categories encompass the curriculum expectations in all courses in Canadian and World Studies. The descriptions at Level 3 represent the provincial standard for student achievement. *The Ontario Curriculum Program Planning and Assessment, Grades 9 to 12* outlines the philosophy and guiding principles concerning assessment and evaluation.

It is essential that teachers measure student performance often and in conjunction with the four categories of the Achievement Chart. Student tasks should be based on the clearly stated expectations of the course. Rubrics should be used, when appropriate, and constructed in a way that clearly identifies for the student the expectations that are being measured, the level at which the student is achieving, and a personalized comment.

Teachers ensure there is a balance of approaches to assessment, with students actively involved in the establishment of task criteria and assessment tools. The teacher, through diagnostic assessment, determines prior learning and level of skill. 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, Program Planning and Assessment, Grades 9 to 12*, seventy per cent of the grade will be based on assessments and evaluations conducted throughout the course. Thirty per cent of the grade will be based on a final evaluation in the form of an examination, performance, essay and/or other methods of evaluation.

Accommodations

With assistance and appropriate teaching and learning strategies, all students are expected to achieve success in Geography. Throughout this Course Profile, an emphasis is put on active participation in learning activities and on providing opportunities for students to demonstrate their achievement in a variety of ways. Additional accommodations for students with special needs are also identified for each activity. The general approach taken to accommodation is outlined below.

All learners benefit if models or scaffolds for oral, written, and visual expression are initially provided by their teachers. Teachers are encouraged to be flexible in their planning and assessment to best meet the needs of individual students with specific needs. Teachers should consult individual exceptional students' Individual Education Plans (IEPs) for specific direction on accommodation for individuals. The proficiency levels outlined in *The Ontario Curriculum, Grades 9 and 10, English As a Second Language and English Literacy Development* provide teachers and school administrators with a guide to receiving and accommodating these learners in the regular classroom. Students who have completed Level 2 courses in ESL/ELD and are currently enrolled in Level 3 or higher courses have the greatest chance of success in meeting the minimum requirements for a credit in this course.

The subject discipline of Geography has its own particular ways in which language is used to express concepts. In order to help all students, but especially ESL/ELD students, teaching and learning strategies should show formative attention to the following aspects of language in written and oral forms:

- specialized geographic vocabulary;
- statements of opinion, interpretation, inference, and prediction;
- activities such as reading/listening tasks (case-study/video-viewing) need a specific and concrete product expected of students;
- completion of graphic organizers;
- note taking/summarizing.

Resources

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 a authorized distributor, e.g., Audio Cine Films Inc. Teachers are reminded that much of the material on the Internet is protected by copyright. The person or organization that created the work usually owns the copyright. Reproduction of any work or substantial part of any work on the Internet is not allowed without permission of the owner.

Print

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. *Investigating Terrestrial Ecosystems*. Prentice-Hall Canada, 1986. ISBN 0135031869

Andrews, W.A. and S.J. McEwan. *Investigating Aquatic Ecosystems*. Prentice-Hall Canada, 1987. ISBN 0-13-5013129-X

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, A., Landes, and J. 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*. National Geographic Society. 2000. ISBN 0792275969

Brower, Michael, and Leon, Warren. *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 2001*. Worldwatch Institute Books. 2001. ISBN 0393320820

Campbell, Neil A. and Jane B. Reece. *Biology*. Addison Wesley Longman, 2001. 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

Chasmer, Ron. *Earth Dynamics: Studies in Physical Geography*. 1995. ISBN 0195409841

Catechism of the Catholic Church. Ottawa: CCCB Publications Service, 1994.

Chiras, Daniel D., et al. *Natural Resource Conservation: Management for a Sustainable Future*. 2001. ISBN 0130333980

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

Dudley, William. *The Environment: Opposing Viewpoints*. 2001. ISBN 0737706538

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

Enger, Eldon D. *Environmental Science: A study of interrelationships*. 1998. ISBN 0697286568

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

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: Principals, Connections and Solutions*. 2001. ISBN 0534380700

McNeill, John. *Something New Under The Sun: An Environmental History of the Twentieth-Century World*. Global Century Series, 2001. ISBN 0393321835

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 Scientists 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

Stevens, William K. *The Change in the Weather: People, Weather, and the Science of Climate*. 1999. ISBN 0195074696

Stauber, John. *Toxic Sludge is Good for You - Lies, Damn Lies and the Public Relations Industry*. 1997. ISBN 1567510604

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

Wilson, Edward Osborne. *The Diversity of Life*. 1999. ISBN 0393319407

Vital Signs 2001: *The Environmental Trends That Are Shaping Our Future*, 2001 Edition. Worldwatch Institute, 2001. ISBN 0393321762

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 0-13-032538-4

Video

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

Basic Ecology. Video: food chains – predator vs. prey. Magic Lantern Communications. 1999.

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

The Delicate Balance II Video: populations and environmental challenges. Magic Lantern Communications. 1999.

Earth: A Special Case. Video: Earth's ability to sustain life. TVO. 1995

Ecosystems and the Biosphere. Video: ecosystem processes. Magic Lantern Communications. 1996.

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

Human Population Growth Video: unsustainable consumption levels. Canadian Learning Company. 1997.

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

Our Fragile World: Clayoquot Sound. Video: uncertain future of Clayoquot sound. TVO. 1996.
Population – How many is Enough Video: ecological management. School Services. 1994.
Sustainable Development and the Ecosystem Approach 2 video set. 1993. Produced by Environment Canada and distributed by the National Film Board

Websites

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

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/>
Canadian Species at Risk – <http://www.speciesatrisk.gc.ca>
Catechism of the Catholic Church – <http://www.christusrex.org/www1/CDHN/cc.html>
Ducks Unlimited Canada – <http://www.ducks.ca>
Earth Endangered – <http://www.bagheera.com/inthewild/>
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/>
Green Peace – www.greenpeace.org
The International Development Research Centre – <http://www.idrc.ca/>
The International Institute for Sustainable Development – <http://iisd1.iisd.ca/>
MapQuest – <http://www.mapquest.com/>
Media Watch – <http://www.mediawatch.ca/>
National Round Table on the Environment and the Economy
– http://www.nrtee-trnee.ca/eng/home_e.htm
Nature Conservancy Canada – <http://www.natureconservancy.ca/>
Parks Canada – <http://www.parkscanada.pch.gc.ca>
Pastoral Constitution: On The Church In The Modern World – Gaudium et Spes. Pope Paul VI,
December 7, 1965. – <http://www.christusrex.org/www1/CDHN/v4.html>
Statistics Canada – <http://www.statcan.ca>
Sierra Club of Canada – <http://www.sierra.ca>
Pollution Watch Scorecard – <http://www.scorecard.org/pollutionwatch/>
Population Reference Bureau – <http://www.prb.org>
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/>

OSS Considerations

Workplace Preparation courses such as The Environment and Resource Management may serve as the basis for cooperative education courses and work experience. This course may be offered in conjunction with cooperative education and school-work transition programs. Employers in the community will be involved with the planning of cooperative education and work experience placements, and will support the implementation of this course in those circumstances. Policy and procedure considerations are found in *Cooperative Education and Other Forms of Experiential Learning, Policies and Procedures for Ontario Secondary Schools, 2000* (pp.9-10, 28, 29, 32).

This course may also be part of a specialized program that incorporates the environment and resource sustainability. These specialized programs are school-based and are intended to provide students with a particular curriculum focus.

Using computers across the curriculum is addressed in this course. The use of Geographical Information Systems (GIS) is very appropriate in this course as it is a skill that is sought after by employers in this field. Guidance counsellors and guest speakers from the community are able to give insight into the importance of computer skills for students seeking work in the field of geography.

Considering the amount of field work required from students in this course, students should be made aware of the health and safety issues as these concerns arise in the course. 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 to understand the importance of health and safety issues and the need to assume responsibility for their own safety while being mindful of the safety of others. The teacher should also be aware of potential dangers that this course may involve. School policies regarding field trips and out of class activities should be explored and implemented by the teacher before the course begins.

The foundations for assessment, evaluation, and reporting practices are outlined on pp. 8-9 of *The Ontario Curriculum, Grades 9 to 12, Program Planning and Assessment, 2000*.

Coded Expectations, The Environment and Resource Management, Grade 12, Workplace Preparation, CGR4E

Geographic Foundations: Space and Systems

Overall Expectations

- SSV.01** · 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 role played by the atmosphere, the lithosphere, the hydrosphere, and the sun in maintaining life on Earth;
- SS1.02** – explain the role played by plants (e.g., phytoplankton, trees) in the growth of other living organisms (e.g., providing food and oxygen);
- SS1.03** – demonstrate an understanding of the role played by producers, consumers, and decomposers in relationships between organisms;
- SS1.04** – describe a generalized food web.

Developing and Practising Skills

- SS2.01** – explain relationships between the living and non-living components of ecosystems;
- SS2.02** – explain how the biosphere, lithosphere, hydrosphere, and atmosphere interact;
- SS2.03** – predict the results when a species is removed from a food web;
- SS2.04** – explain how and why some ecosystems are more fragile than others (e.g., the tundra compared to a tropical rain forest).

Learning Through Application

- SS3.01** – describe their local bioregion and selected ecosystems within it and identify the biome within which it is located;
- SS3.02** – explain how various components of their local bioregion or of their local bioregion and another ecosystem interact with one another (e.g., water, wind, soils, vegetation, people);
- SS3.03** – predict the effects of the destruction of selected natural habitats on biodiversity.

Human-Environment Interactions

Overall Expectations

- HEV.01** · demonstrate an understanding of how humans depend on nature and are an integral part of ecosystems;
- HEV.02** · explain how human use of the Earth and its resources has positive and negative impacts on natural and human systems;
- HEV.03** · analyse patterns of resource availability and use.

Specific Expectations

Understanding Concepts

- HE1.01 – demonstrate an understanding of the difference between needs and wants;
- HE1.02 – explain the ways in which people and other living organisms are dependent on the natural environment;
- HE1.03 – demonstrate an understanding of the Earth as a finite system;
- HE1.04 – identify the earth’s major resources (e.g., soil, water, minerals, forests, fossil fuels) and classify them according to their renewability.

Developing and Practising Skills

- HE2.01 – analyse the global distribution of selected resources (e.g., agricultural lands, forests, energy sources) and determine patterns of availability;
- HE2.02 – explain how selected human activities alter the natural environment (e.g., effect of depletion of forests on oxygen production, effect of chlorofluorocarbon use on the ozone layer);
- HE2.03 – explain the effects of different kinds of air and water pollution on humans, plants, and materials;
- HE2.04 – explain the impact on the natural environment of selected methods of extracting and transporting resources (e.g., mining, oil, pipelines in the Arctic).

Learning Through Application

- HE3.01 – explain how human use of toxic substances contaminates the food web;
- HE3.02 – analyse the distribution of endangered spaces and endangered species in Canada and account for the patterns observed;
- HE3.03 – use community resources (e.g., planning department, public library) effectively to research and report on local human-environment interactions (e.g., effects of fossil fuel use on the local environment, effects of local urban development on availability of resources such as water).

Global Connections

Overall Expectations

- GCV.01 · demonstrate an understanding of the relationship between increasing global population, increased consumption of resources, and environmental degradation on a global scale;
- GCV.02 · explain how the sustainable use of resources may be achieved through the cooperation of governments, businesses, industries, non-governmental organizations, and citizens around the world, despite their varied perceptions of nature;
- GCV.03 · evaluate the effectiveness of international efforts to deal with global environmental issues.

Specific Expectations

Understanding Concepts

- GC1.01 – explain the concept of stewardship and how it relates to the sustainability of the resources of the global commons (e.g., air, water, soil);
- GC1.02 – demonstrate an understanding of selected factors contributing to global population growth;
- GC1.03 – demonstrate an understanding of transboundary pollution and its implications;
- GC1.04 – explain the need for international cooperation to solve global environmental problems (e.g., ozone layer depletion);
- GC1.05 – identify ways in which people in a traditional culture (e.g., indigenous peoples) interact with the natural environment;
- GC1.06 – explain the purpose of selected international agreements to protect the global environment.

Developing and Practising Skills

GC2.01 – analyse global trends in the consumption of a variety of resources;

GC2.02 – explain the relationship between increasing population and rate of consumption for a selected global resource;

GC2.03 – explain the relationship between increasing rates of consumption of the earth’s resources and environmental degradation;

GC2.04 – evaluate ways (e.g., international conferences, round-table processes, public hearings, environmental laws, voluntary participation) to encourage cooperation between opposing interest groups in finding solutions to environmental and resource management problems.

Learning Through Application

GC3.01 – evaluate Canada’s contribution to the resolution of a selected global environmental or resource management issue;

GC3.02 – analyse the impact of population growth on a selected ecosystem (e.g., tropical rain forest) or resource (e.g., water supply, fishery);

GC3.03 – research and report on an environmental or resource management issue (e.g., ozone layer depletion, global warming, rehabilitation of the Great Lakes) that requires international cooperation for its resolution, and make recommendations for solutions.

Understanding and Managing Change

Overall Expectations

UCV.01 · explain the rights and responsibilities of citizens and consumers with respect to the environment and sustainable resource management;

UCV.02 · evaluate local or provincial government and industry strategies to promote sustainable management of resources;

UCV.03 · demonstrate an understanding of the effect that environmental protection and resource management has had on careers and the workplace.

Specific Expectations

Understanding Concepts

UC1.01 – provide a rationale for the preservation of Canada’s natural resources and wild spaces (e.g., wetlands, forests, natural habitats);

UC1.02 – explain why preserving large spaces and wildlife corridors is necessary if we are to preserve species;

UC1.03 – identify major sources of toxic chemical wastes;

UC1.04 – explain a variety of alternatives for waste management and disposal;

UC1.05 – explain the rights and responsibilities one has as a citizen and consumer with respect to protecting the environment and managing resources sustainably.

Developing and Practising Skills

UC2.01 – analyse the impact of reducing, reusing, and recycling waste on the sustainability of resources and on the environment;

UC2.02 – explain initiatives that individuals, governments, industries, and non-governmental organizations can take to improve the quality of air and water;

UC2.03 – analyse the costs and benefits of using selected alternative sources of energy;

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- UC2.04** – research and report on technologies that improve the efficiency of resource use or waste management;
- UC2.05** – research and report on jobs and careers that relate to the environment and resource management;
- UC2.06** – evaluate the impact of technology related to the environment and resource management on careers and the workplace.

Learning Through Application

- UC3.01** – produce an action plan for rehabilitating a local environment or managing a local resource in a sustainable way;
- UC3.02** – produce a case study of how a business or industry (e.g., recycling company, organic lawn care company, home renovator, environmental consulting firm, printing company) uses responsible and sustainable resource management;
- UC3.03** – produce recommendations for a recreational trail system in the local community, using existing systems as models (e.g., Rideau Trail, Bruce Trail, Cross-Canada Trail);
- UC3.04** – describe examples of responsible environmental behaviour in aspects of daily life (e.g., transportation, lawn care, water and energy consumption, shopping).

Methods of Geographic Inquiry

Overall Expectations

- GIV.01** · use geographic skills, methods, and technologies to gather and analyse information and make decisions;
- GIV.02** · use a variety of methods and technologies to communicate the results of geographic inquiries in written, oral, and visual forms;
- GIV.03** · apply geographic knowledge, skills, and technologies to conduct an independent inquiry related to sustaining a natural resource or improving the natural environment.

Specific Expectations

Understanding Concepts

- G11.01** – use geographic terms correctly and explain geographic concepts related to the environment and resource management (e.g., *ecosystem, biodiversity, rehabilitation, succession, natural habitat, sustainable development*);
- G11.02** – demonstrate an understanding of how geotechnologies are used by business and industry (e.g., remote sensing, geographic information systems, hypermedia).

Developing and Practising Skills

- G12.01** – demonstrate an understanding of the steps involved in the geographic inquiry process;
- G12.02** – produce and interpret maps, diagrams, charts, and models that illustrate geographic and ecological concepts;
- G12.03** – use cartographic conventions (e.g., scale, legend, direction) correctly;
- G12.04** – apply field research skills (e.g., observation, surveying, interviewing) effectively to collect information and determine attitudes and viewpoints on local environmental and resource management issues;
- G12.05** – use graphic organizers (e.g., timelines, future wheels, Venn diagrams) to clarify, visualize, and interpret geographic information;
- G12.06** – use a variety of print, broadcasting, and electronic sources effectively to gather information;
- G12.07** – explain how information from various sources may be biased.

Learning Through Application

GI3.01 – use reasoned argument to defend a position on a sustainable resource management issue;

GI3.02 – apply communication skills (e.g., letter writing, oral presentations) effectively to influence change and decisions relating to an environmental protection and/or resource management issue;

GI3.03 – produce an action plan, in connection with an independent inquiry on a geographic issue, that includes proposals for ways to sustain or improve the environment in their local community;

GI3.04 – work as part of a team to produce a plan that proposes solutions to a local environmental or resource management concern (e.g., restoration of a local park, woodlot, river, or wetland; reduction of the impact of a local development project on the environment).

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 2: Ecosystems and the Need for Biodiversity

Time: 24 hours

Unit Description

In this unit, students learn about ecosystem structures and processes. By investigating the world around them and applying their knowledge to real-life situations, students realize the complexity and fragility of living organisms and their environment. The need for biodiversity and the importance of conserving natural resources is explored, including the role of humans as part of the natural world. Catholic students acquire a respect for every living organism put on Earth and realize that each has a particular goodness and must therefore be respected and helped. The unit concludes with students becoming involved in a field study applying the knowledge and concepts acquired in the unit.

Unit Synopsis Chart

Activity/ Time	Learning Expectations	Assessment	Student Tasks
2.1 Earth's Spheres 4 hours	SSV.01, SS1.01, SS2.02, HE1.03, GI2.05 CGE3c	Knowledge/Understanding • Roving Conferences	<ul style="list-style-type: none"> Organizer completion Note taking Observation and notes Small group activity
2.2 Ecosystems 4 hours	SSV.02, SS1.03, SS2.0, SS2.04, GI2.02 CGE2c, CGE5a, CGE7d	Knowledge/Understanding Application • Observational Checklist	<ul style="list-style-type: none"> Flow diagrams Video watching with note taking or questions Small group activity Cause and effect scheme
2.3 The Food Web 4 hours	HEV.01, SS1.02, SS1.04, SS2.03, HE3.01, GI2.06 CGE4b, CGE7d, CGE7i	Application Thinking/Inquiry • Roving Conferences	<ul style="list-style-type: none"> Creation of food webs Research of organism Note taking from board Class discussion \ Predicting outcomes
2.4 Biodiversity and Preservation 5 hours	GIV.01, SS3.03, HE3.02, UC1.01, UC1.02, GI2.06 CGE7j	Thinking/Inquiry Communication • Presentation Checklist	<ul style="list-style-type: none"> Brainstorming ideas Class discussion Note taking Research and report Map making Electronic presentation
2.5 Biomes and the local Bioregion 7 hours	SSV.03, SS3.01, SS3.02, GI2.01, GI2.03 CGE2c, CGE5b	Thinking/Inquiry Application Communication • Written Report Rubric	<ul style="list-style-type: none"> Presentation of biomes Biome mapping and organizer Field Study – Unit Culminating Activity

Note: 2 hours are set-aside in this unit for the course culminating activity.

Activity 2.1: Earth's Spheres

Time: 4 hours

Description

God himself created Earth as a unique planet within the solar system. Interactions between the four spheres and energy from the sun offer all of the elements needed to provide and maintain various forms of life. Students examine the Earth's spheres by studying the components within them and the interactions between them. By investigating the world around them, students apply this knowledge and verify the many complex components that allow humans and other living things to occupy Earth.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE3c - thinks reflectively and creatively to evaluate situations and solve problems.

Strand(s): Geographic Foundations: Space and Systems, Human-Environment Interactions, Methods of Geographic Inquiry

Overall Expectations

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

Specific Expectations

SS1.01 - demonstrate an understanding of the role played by the atmosphere, the lithosphere, the hydrosphere, and the sun in maintaining life on Earth;

SS2.02 - explain how the biosphere, lithosphere, hydrosphere, and atmosphere interact;

HE1.03 - demonstrate an understanding of the Earth as a finite system;

GI2.05 -use graphic organizers to clarify, visualize, and interpret geographic information.

Prior Knowledge and Skills

- Familiarity with note taking from observations
- Familiarity with concepts of distinct areas, e.g., deserts, wetlands, etc.

Planning Notes

- The teacher could have an overhead illustration of the Earth's spheres prepared ahead of time.
- The teacher should refer to board policies concerning safety for field trips/field work.
- Weather conditions may influence likelihood of outdoor field work, therefore, the teacher should have alternate teaching strategies in place that reflect those in this activity, i.e., video activity.
- The teacher should find an outdoor location on school property that accommodates the number of students in the class and is appropriate for the activity. The school policy regarding taking students out of the building should be referred to.

Teaching/Learning Strategies

1. The teacher uses a spaceship analogy to explain how Earth is moving through the solar system together with all elements it needs to travel. The teacher poses the task for the students to create zones within this spaceship to easily identify the various parts. After a few minutes the teacher solicits the possibilities from the students. Ideas are discussed as a class.
2. The teacher introduces the Earth's spheres by drawing a diagram on the board or on an overhead. The teacher identifies each sphere on the diagram and labels it making connections to the student's prior ideas. A written definition for each sphere is provided to the students.

- Given any three distinct areas in the world, e.g., arctic, tropical rainforest, desert, wetland, students create an organizer and give the characteristics of the areas using the spheres as column headings.

Earth's Spheres				
Type of Area	Atmosphere	Lithosphere	Hydrosphere	Biosphere
Arctic				
Desert				

- Led by the teacher, the class discusses the interactions between the spheres and discovers that the spheres are not separate but in fact overlap in areas. The teacher asks the class to brainstorm ways in which the spheres overlap. The teacher makes a note on the board using points from the discussion.
- Somewhere outdoors, students are given 10-15 minutes to take field notes regarding ways in which they witness interactions between elements from the various spheres. In the classroom, a debriefing is led by the teacher whereby students share their observations from the field.
- The teacher explains the difference between a closed system and an open system, once again using the spaceship analogy to describe the difference. The teacher probes students for possible examples of each. The teacher asks students what sorts of things are possibly entering the Earth's system.
- Earth is the only known planet capable of maintaining life. In small groups, students consider ways in which the various spheres and the sun contribute to sustain life on Earth. Students also identify ways in which the spheres and the sun work together in maintaining life on Earth. The teacher ties together the ideas from the various groups by organizing them on the board for the students to complete.

Assessment & Evaluation of Student Achievement

- A check of student organizer by the teacher to ensure completion and understanding of concepts related to the Earth's spheres and the application to particular areas
- Informal roving conferences by the teacher to ensure understanding and provide feedback when students are noting interactions outdoors
- Probe questions by the teacher to confirm the students' application of classroom knowledge to the world outside of school when discussing student observations from the outdoors

Accommodations

- Make available teacher/peer tutor assistance in note taking.
- Where necessary, provide copies of teacher board/overhead notes to students.
- Ensure that groups are equally balanced in both verbal and written ability.

Resources

Video – *Earth: A Special Case* (Planet Under Pressure series), TVO

Pastoral Constitution: On The Church In The Modern World - *Gaudium et spes*, No.36. Pope Paul VI

Activity 2.2: Ecosystems

Time: 3 hours

Description

Students are introduced to ecosystems and the dynamic nature of the relationships within them. God wills the interdependence of living things – to exist only in dependence of each other, to complete each other, in the service of each other. By producing a model ecosystem, students assess the fragility and complexity of these systems by changing various conditions. Students gain an understanding that changes in any of the ecosystem components affects the entire ecosystem; a concept that is applied throughout the course.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

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

CGE5a -works effectively as an interdependent team member;

CGE7d - promotes the sacredness of life.

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

Overall Expectations

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

Specific Expectations

SS1.03 - demonstrate an understanding of the role played by producers, consumers, and decomposers in relationships between organisms;

SS2.01 - explain relationships between the living and non-living components of ecosystems;

SS2.04 - explain how and why some ecosystems are more fragile than others (e.g., the tundra compared to a tropical rain forest);

GI2.02 - produce and interpret maps, diagrams, charts, and models that illustrate geographic and ecological concepts.

Prior Knowledge & Skills

- Knowledge of ecosystems from Grade 10 Science curriculum
- Use of flow diagrams from previous courses in Geography or Science
- Ability to work in small groups and contribute to a common purpose

Planning Notes

- The teacher should prepare chart paper and markers for small groups.
- The teacher may use a Grade 10 Science text for additional information.
- The teacher can make use of overheads that have the framework for students to work from for the various tasks.

Teaching/Learning Strategies

1. The teacher introduces the term ecosystem by using a bicycle or car analogy. A bicycle or car depends on all parts to function; similarly, an ecosystem depends upon the interactions between organisms and their surroundings. The teacher gives students a written definition of ecosystem – *a group of living organisms that, along with their environment, form a self-regulating system through which energy and materials are transformed.*
2. The teacher explains that an ecosystem consists of two main parts, a biotic part (living things) and an abiotic part (non-living things). Students give examples of each of these and a short list is created and written on the board.
3. The teacher describes how energy flows through an ecosystem using the trophic level concept. Beginning with energy from the sun, the teacher constructs a flow diagram continuing with the flow of energy to producers and consumers at higher trophic levels.
4. Students add to the teacher-created flow diagram by including real-life examples of producers and consumers. Students share their answers within a class discussion and discuss how there may be many organisms at the various trophic levels.

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5. In small groups, students are given a piece of chart paper and a marker in order to create a well-labelled ecosystem using both biotic and abiotic parts and producers and consumers. They must incorporate many examples of each and use flow lines to show the interactions among the variables in their diagram. A member from each group explains their diagram to the class.
 6. Each student creates a cause and effect scheme whereby they suggest possible ways in which an ecosystem could change, e.g., Cause: clear-cutting a woodlot, Effect: loss of habitat, etc. The teacher has students share some of the possibilities with the class.

Assessment & Evaluation of Student Achievement

- Probe questions to gauge individual students' understanding of ecosystem components and interactions
- Teacher conferences with individual groups to assess their understanding of the group activity and the application of ecosystem concepts – the teacher provides feedback to the groups
- Formative teacher assessment of group discussions using a checklist while students are working in groups (Appendix 2.2.1)
- Students' cause and effect schemes are checked by the teacher for completion and understanding and feedback is given in the form of anecdotal notes

Accommodations

- Create a balance within the group structures to reflect the varied abilities and needs of the students.

Resources

Environmental Science: A Canadian Perspective. Prentice Hall Canada

Investigating Terrestrial Ecosystems. Prentice Hall Canada, 1986.

Environmental Science: A Study of Interrelationships, 6th ed. McGraw Hill, 1998.

Video - *Ecosystems and the Biosphere* (1996), Magic Lantern Communications

Video - *Basic Ecology* (1999), Magic Lantern Communications

Video - *Producers Capture Solar Energy* (1997), ACCESS

Introduction to Biogeography and Ecology (Okanagan University College)

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

Appendices

Appendix 2.2.1 – Observational Checklist for Assessing Group Discussions

Activity 2.3: The Food Web

Time: 4 hours

Description

Humans depend on nature and are an essential part of ecosystems. Like humans, all organisms get energy by consuming different foods and this energy moves through an ecosystem. Students examine the food web model and take part in building a food web. The complexity of food webs and the role of every organism, regardless of size and including humans, is observed. Catholic students acquire a respect for every living organism put on Earth and realize that each has a particular goodness and must therefore be respected.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE4b - demonstrates flexibility and adaptability;

CGE7d - promotes the sacredness of life;

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

HEV.01 - demonstrate an understanding of how humans depend on nature and are an integral part of ecosystems.

Specific Expectations

SS1.02 - explain the role played by plants (e.g., phytoplankton, trees) in the growth of other living organisms (e.g., providing food and oxygen);

SS1.04 - describe a generalized food web;

SS2.03 - predict the results when a species is removed from a food web;

HE3.01 - explain how human use of toxic substances contaminates the food web;

GI2.06 - use a variety of print, broadcasting, and electronic sources effectively to gather information.

Prior Knowledge and Skills

- Research skills with the Internet and library systems learned in other courses

Planning Notes

- The food web exercise requires a large open space (possibly the gym, school foyer, or outdoors) and materials such as string, paper, and markers.
- The teacher should organize roles for the students ahead of time and prepare a food web key.
- Internet access, library access, additional text resources or a combination of these is required by students to research their role in the food web.

Teaching/Learning Strategies

1. The teacher begins the lesson by asking students about the origins of their food. A discussion with the class leads them to realize that most of our food, directly or indirectly, comes from nature. Also, most of our food is mass-produced.
2. Students compare human consumption and sources of food with those of a wild animal. As a class, a list of differences and similarities is created on the board.

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3. The teacher introduces the terms food chain and food web and distinguishes between the two. Students give the teacher examples of organisms that are consumed by more than one other organism, e.g., rabbits are consumed by wolves, foxes, owl, hawks, etc. Students note that the connection or overlap of food chains is what makes a food web.
 4. The teacher assigns each student a role in a food web by giving them a card (paper size) with their role written on it in large print (Appendix 2.3.1). Students research their organism to determine what they consume. Students assigned the role of a plant must research their needs in order to prosper and also note what nutrients they provide when consumed.
 5. Organized in a circle, students are given string and in an orderly fashion each student must extend string to all of the other organisms that they need to consume, creating a food web.
 6. The teacher removes one living organism from the food web and asks students to predict the effect(s) that would occur from the loss. Each student chooses one other organism from the food web and repeats the exercise noting the effects that would occur from the loss of that particular organism.
 7. The teacher debriefs with the class soliciting the following ideas and making brief notes on the board:
 - some organisms are sought after more than others and therefore their populations must be greater;
 - the network of interactions and complexity of the food web created;
 - the role of producers, consumers, and decomposers;
 - the role of plants within the food chain – the repercussions from contamination in the soil and its progress through the food web;
 - possible competition among organisms.

Assessment & Evaluation of Student Achievement

- Probe questions to gauge individual students' understanding of food webs and their complexity-discussion follows
- Roving conferences by teacher to confirm understanding, provide feedback, and ensure effective research is performed by the students for their food web roles

Accommodations

- Create a balance within the group structures to reflect the varied abilities and needs of the students. Review cooperative groups skills.
- Provide a research information sheet for students with reading and organizing difficulties.
- Provide use of a scribe, if necessary, to record comparisons between human and wild animal food consumption.
- Alter text/readings/Internet sources to accommodate student needs.
- Allow for alternate presentation formats.

Resources

Video - *Plant Diversity*, Marlin

Appendices

Appendix 2.3.1 – Food Web Organisms

Appendix 2.3.1

Food Web Organisms

		Prairie Community	Willow Community	Aspen Community
<i>Sample Organisms</i>	Humans	Garter Snake Ants Grasses Prairie Vole Squirrels Coyote Grasshoppers	Ducks Leaf beetle Frog Willow Spiders Insects	Woodpeckers Rabbit Crow Owl Grouse Aspen Beetles Oriole Flicker

Activity 2. 4: Biodiversity and Preservation

Time: 5 hours

Description

The world is composed of a tapestry of unique natural regions each containing a wide array of biodiversity. Students gain an understanding of the connection between habitat destruction and the loss of biodiversity. Students discover the importance of conserving Canada's natural resources, the importance of preserving biodiversity, and the role individuals play in protecting endangered spaces and endangered species.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

CGE7j - contributes to the common good.

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

Overall Expectations

GIV.01 - use geographic skills, methods, and technologies to gather and analyse information and make decisions.

Specific Expectations

SS3.03 - predict the effects of the destruction of selected natural habitats on biodiversity;

HE3.02 - analyse the distribution of endangered spaces and endangered species in Canada and account for the patterns observed;

UC1.01 - provide a rationale for the preservation of Canada's natural resources and wild spaces (e.g., wetlands, forests, natural habitats);

UC1.02 - explain why preserving large spaces and wildlife corridors is necessary if we are to preserve species;

GI2.06 - use a variety of print, broadcasting, and electronic sources effectively to gather information.

Prior Knowledge and Skills

- Knowledge of types ecozones and regions from previous Geography courses
- Knowledge and skill at print and Internet search, as well as electronic presentation software

Planning Notes

- The teacher provides a text or atlas reference to ecozones of Canada.
- If students have access to computers, the teacher should ensure their availability for a GIS task and for use to prepare electronic presentation.
- The teacher ensures that students have access to the Internet for this activity – alternate arrangements should be made such as library-based research.
- The teacher provides hard copy lists and/or appropriate websites for gathering information on species at risk.
- The teacher should review the methods and procedures for citing sources.

Teaching/Learning Strategies

1. The teacher leads a discussion with the class by asking students to define the term – biodiversity. (“the variety of life,” biodiversity includes the full range of genes, species, communities, ecosystems, functions, and evolutionary processes). Once a suitable definition has been established, a teacher-led discussion explores the factors that contribute to loss of biodiversity.
2. Students brainstorm while the teacher uses their ideas to complete an organizer on the board using the following headings:

Natural Causes of Biodiversity Loss	Human Causes of Biodiversity Loss	World Examples

Students record the information in their notebooks. The results are discussed as a class.

3. Using an atlas and a blank map of the world, students create a map that provides location and causes of global biodiversity loss. GIS could also be used to create the maps if access to computers is available.
4. The teacher asks the students the following question: How is the world like a large “jigsaw puzzle” of biodiversity? The teacher elicits student responses and results are recorded on the board. “Puzzle pieces” such as the tropical rain forest, African savanna, marine tidal flats, interior grasslands, deserts, polar regions, etc., should be included in the board outline. The teacher leads a discussion that centres on the notion that each piece of the puzzle is interconnected and is essential to regional and global survival.
5. Canada’s role in this global “jigsaw puzzle” is explored. The teacher provides a brief review and discussion of selected ecozones in Canada. Reference to an ecozone map from an atlas or text would be useful. The teacher selects sample ecozones and uses probe questions to examine the characteristics and possible causes of biodiversity loss in each zone. A general discussion on endangered species and the need for protection introduces the topic of species at risk.
6. The teacher introduces the topic of “species at risk” by developing a vocabulary list providing definitions and explanations for the terms pertinent to the topic. These include: endangered, threatened, vulnerable, extirpated, extinct, sustainable, wildlife corridors, management plan/strategies, recovery plan, habitat, fragmentation, keystone species, wetlands.
7. Each student is given a list that names species nationally recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or named in the Index List of Vulnerable, Threatened, Endangered, Extirpated or Extinct Species of Ontario (Issued by the Ontario Ministry of Natural Resources). Using the Internet (see websites in Resources section), students research and summarize the information for five species by creating a chart in their notebooks using the headings below.

Species at Risk	Location in Canada	Reasons for Species Stress	Management Strategies

8. The teacher leads a discussion by having students share their chart entries. The class shares various examples and student opinions are probed and challenged by the teacher to provoke discussion.
9. In pairs or individually, students select a sample species from one of the lists, and research and prepare a short electronic presentation on the selected species at risk. The presentation includes:
 - a. a map showing the location of species habitat;
 - b. background information on the species and reasons why the species is stressed;
 - c. reasons why the species should be preserved and protected;
 - d. a management strategy or recovery plan that would protect and sustain the species at risk;
 - e. sources cited using an approved method.

Assessment & Evaluation of Student Achievement

- Using the expectations being assessed, the teacher designs a checklist for the formative assessment of student contribution to class discussion
- A check of student notes by teacher to ensure completion and understanding of concepts and map – the teacher provides feedback and makes anecdotal notes
- Summative evaluation by the teacher of the Species at Risk electronic presentation using a checklist (Appendix 2.4.1) to ensure that all components are addressed and the information is accurate

Accommodations

- Alter length of subject material or format for students with writing difficulties.
- Enrichment for students may involve the use of GIS to create maps.
- Create a balance within the group structures to reflect the varied strengths, abilities, and needs of the group. Review cooperative group skills and the responsibilities of individuals.
- Alternate evaluation/assessment strategies may be devised to more accurately reflect student participation and effort.

Resources

Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

– <http://www.cosewic.gc.ca>.

Ontario Ministry of Natural Resources (OMNR) – <http://www.mnr.gov.on.ca/MNR/fwmenu.html>

Hummel, Monte, ed. *Endangered Species*. Toronto: Key Porter, 1989.

Hummel, Monte, ed. *Protecting Canada's Endangered Spaces*. Toronto: Key Porter, 1995.

Naar, Jon and Alex J. Naar. *This Land is Your Land*. New York: Harper Collins, 1993.

Appendices

Appendix 2.4.1 – Teacher Assessment - Presentation Checklist

Appendix 2.4.1

Teacher Assessment - Presentation Checklist

Student Names: _____

Date: _____

Criteria	Rarely 1	Sometimes 2	Most Times 3	Always 4	Comments
Students. ...					
- demonstrate a detailed understanding of the topic;					
- use visuals and technology effectively;					
- explain concepts clearly and effectively;					
- are able to field questions pertaining to the topic;					
- use new terminology with accuracy;					
- remain focused on the task at hand during preparation;					
- demonstrate an equal part in preparing and delivering presentation.					

Overall Comments:

Activity 2. 5: Biomes and the Local Bioregion

Time: 7 hours

Description

This activity is designed to introduce students to the characteristics and spatial distribution of global biomes. Students explore biomes by studying the components and interactions of selected ecosystems within the local area. This activity is designed as a practical hands-on activity for students to describe, identify, and explain components of the natural environment. Students observe, collect, organize, synthesize, and explain how various components of an ecosystem interact with one another.

Strand(s) & Learning Expectations

Ontario Catholic School Graduate Expectations

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

CGE5b - thinks critically about the meaning and purpose of work.

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

SS3.01 - describe their local bioregion and selected ecosystems within it and identify the biome within which it is located;

SS3.02 - explain how various components of their local bioregion or of their local bioregion and another ecosystem interact with one another (e.g., water, wind, soils, vegetation, people);

GI2.01 - demonstrate an understanding of the steps involved in the geographic inquiry process;

GI2.03 - use cartographic conventions (e.g., scale, legend, direction, correctly).

Prior Knowledge & Skills

- The teacher provides knowledge of ecozones and their characteristics from Grade 9 Geography
- Understanding of the expectations and responsibilities associated with outdoor field research and in school research (Students have to be fully prepared to observe, test, and gather data in an outdoor and classroom setting.)
- Familiarity with concepts and content generated in the previous activities of this unit
- Knowledge of slide show presentation software is essential for reporting in this activity
- Proper cartographic conventions used in previous Geography courses

Planning Notes

- The teacher provides a text, atlas or online reference to ecozones of Canada.
- The teacher should refer to board policies concerning safety for field trips/field work.
- 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 could be used to record information. The teacher should provide a list of the materials required to complete each field and classroom exercise, e.g., sketch pad, camera, rubber boots, etc.
- The teacher should consult with library staff regarding availability of resources.

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 past 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 probing 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 students 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 using proper cartographic conventions (this task could also be completed using GIS, if available).

Polar Ice Cap	Tropical Seasonal Forest	Mediterranean Scrub and Woodland
Tundra	Temperate Grassland	Tropical Savannah
Boreal Forest (Taiga)	Desert	Tropical Thorn Scrub/Woodland
Temperate Forest	Tropical Rain Forest	Mountain
5. The teacher divides the class into 11 groups based on the world biome regions listed above. (Do not assign the local biome region to any group.) The characteristics of the local biome will be explored at the end of Activity 2.5.

Each group researches their assigned biome region. Students briefly present their findings to the class via a presentation.

All presentations include:

 - a) location of the biome on a world map;
 - b) an analysis of the significant abiotic factors: temperature patterns and precipitation patterns;
 - c) a completed climagraph or hythergraph for a selected station located within the region;
 - d) an analysis of the significant biotic factors: vegetation and animal life.

Students complete a comparison organizer during each group presentation. Refer to Appendix 2.5.1.
6. In groups of three or four, students select an appropriate site for a field activity from a location chosen by the teacher such as forested areas, wetlands, meadows, or hedgerows. Each group's site should be a fair distance from each other but close enough that the teacher could observe all of them conveniently.
- 7 During class time, students sketch the site they have chosen and use video, sketch diagrams, digital photographs and/or 35 mm photographs to capture additional visuals of the site location.
8. Students construct a map of the study site. The map includes significant biotic and abiotic characteristics of the selected area. Completed maps must follow all cartographic conventions.

-
9. By using the visuals collected in the sites, students describe and account for each of the following:
 - a) the biotic characteristics of the area:
 - describe the vegetation characteristics of the selected site - collect small samples of vegetation
 - (leaves, flowers, buds, bark, etc.) and identify the various types of plants located in the area;
 - describe animal life within the area - identify the various types of birds, animals, insects, etc.;
 - that inhabit the area.
 - b) the abiotic characteristics of the study area:
 - describe and account for the abiotic components of the selected site(s);
 - comment on the role temperature patterns, precipitation levels, and soil characteristics play in influencing the biotic characteristics of the area.
 10. Students describe the interactions and connections between the following components of the local biome:
 - a) biotic and abiotic
 - b) biotic and biotic
 - c) abiotic and abiotic
 11. Each group creates a written report of the field study site using all of the fieldwork they have gathered. The report must include maps, pictures/sketches and text that pertain to the research of their selected site.

Assessment & Evaluation of Student Achievement

- Formative teacher assessment of student understanding of concepts through the use of probe questions when discussing biomes
- A check of student notes and organizer by the teacher to ensure completion and understanding of concepts related to terrestrial biomes and to provide feedback to students
- Informal teacher observation of student interactions during group activities to ensure that students understand and remain on task
- Teacher assessment of student oral presentation on biomes using a checklist to ensure that all components are included and are of satisfactory quality
- Student assessment by peer and/or self using a checklist (Appendix 2.5.2)
- Summative evaluation by the teacher using a rubric designed to fit the field study of the local region and evaluation of the students' report based upon the requirements of the teacher (Appendix 2.5.3)

Accommodations

- Organize student groupings so that the various skills of students are complemented.
- Provide opportunity for peer editing and support.
- Provide an alternate Research Information Sheet for students with reading and organizing difficulties.
- Gifted students may extend their understanding by researching more in-depth information.
- Alter length of subject material or format for students with writing difficulties.

Resources

Material and resources gathered from the local area.

Allaby, Michael. *Biomes of the World*. Danbury, CT: Grolier Educational, 1999. Vol.1-9.
ISBN 0-7172-9341-6

Project Wild, Project Wild Activity Guide. Ottawa, Ontario: Canadian Wildlife Federation, 1991.
ISBN1-55029-044-4

Appendices

Appendix 2.5.1 – World Biomes

Appendix 2.5.2 – Peer/Self-Assessment Observation Checklist

Appendix 2.5.3 – Local Field Work and Written Report Rubric

Appendix 2.5.2

Peer/Self-Assessment Observation Checklist

Group Work

Student Name: _____

Group Name: _____ Date: _____

Criteria	Rarely 1	Sometimes 2	Most Times 3	Always 4
- was willing to have ideas questioned				
- showed respect for the ideas of others				
- stayed focused on the task at hand				
- participated in planning by volunteering information or ideas				
- accepted an equal share of the workload				
- could be counted upon to complete the task assigned by the group				
- modified views when faced with new ideas, information or evidence				

Overall Comments:

Appendix 2.5.3

Local Field Work and Written Report Rubric

Students Name(s): _____

Date: _____

Criteria	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)
Knowledge/ Understanding Understands ecosystems and their components	- demonstrates limited understanding of ecosystems	- demonstrates some understanding of ecosystems	- demonstrates considerable understanding of ecosystems	- demonstrates insightful understanding of ecosystems
Thinking/Inquiry Conducts research effectively of the assigned site	- conducts research with limited effectiveness	- conducts research with some effectiveness	- conducts research with considerable effectiveness	- conducts research with a high degree of effectiveness
Analyses the information collected critically	- little critical analysis performed on information	- some critical analysis performed on information	- considerable critical analysis performed on information	- thorough critical analysis performed on information
Communication Written communication in report format	- communicates in report format with limited effectiveness	- communicates in report format with some effectiveness	- communicates in report format with considerable effectiveness	- communicates in report format with a high degree of effectiveness
Use of visuals (map and photos, video, etc.)	- uses visuals with limited effectiveness	- uses visuals with some effectiveness	- uses visuals with considerable effectiveness	- uses visuals with a high degree of effectiveness
Application Transfers concepts associated with biomes to the local area/site	- transfers concepts with limited effectiveness	- transfers concepts with some effectiveness	- transfers concepts with considerable effectiveness	- transfers concepts associated with biomes with a high degree of effectiveness
Making connections between biotic and abiotic components	- makes connections with limited effectiveness	- makes connections with some effectiveness	- makes connections with considerable effectiveness	- makes connections with a high degree of effectiveness

Note: A student whose achievement is below Level 1 (50-59%) has not met the expectations for this assignment or activity.

Overall Comments: