Curriculum Links for Environmental Science Investigator Programs: Water Quality and its Importance

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ST. LAWRENCE RIVER INSTITUTE OF ENVIRONMENTAL SCIENCES

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Introduction:

The River Institute offers a variety of programs for intermediate and high school groups:

- Aquatic Invertebrates
- Fish Ecology
- Human Genetics and DNA
- Water Quality and its Importance
- Nature Hike (at Cooper Marsh)
- The Marsh Ecosystem (at Cooper Marsh)

All programs are appropriate for grades 7 through 12 and connect to certain Ontario Ministry of Education Curriculum goals. This document is aimed to provide teachers with an idea of which curriculum goals will be covered by the following program: Water Quality and its Importance. Curriculum links to other programs are listed in separate documents.

On the next page is a description of the Water Quality and its Importance program, followed by an account of which curriculum components are covered for each grade. Overall Expectations are listed (as put forth by the Ministry of Education). Teachers can expect that most of the Overall Expectations for the particular strand or course listed will be touched, as well as additional curriculum topics (listed in the "additional curriculum topics" section). Program content may vary depending on weather, current research projects or staff specializations. As such, the curriculum links may also vary within each program.

The following curriculum guides were used to produce this document:

The Ontario Curriculum: Grades 7 and 8 History and Geography – 2004

The Ontario Curriculum: Grades 1-8 Science and Technology – 2007

The Ontario Curriculum: Grades 9 and 10 Science – 2008

The Ontario Curriculum: Grades 11 and 12 Science – 2008

Program Description:

In this program, students will collect a sample of water from the river, and use this sample to measure water quality parameters such as turbidity, pH, conductivity, dissolved oxygen and bacterial counts in the River Institute's labs. They will learn how these measurements relate to the health of aquatic ecosystems and human health. Students are invited to bring a sample of well or other water for comparison if they wish.

Grade 7 History and Geography

Geography: Patterns in physical geography

Overall Expectations

By the end of Grade 7, the student will:

- Identify patterns in physical geography and explain the factors that produce them;
- Use a variety of resources and tools to gather, process, communicate geographic information about the earth's physical features and patterns;
- Explain how patterns of physical geography affect human activity around the world.

Geography: Natural Resources

Overall Expectations

By the end of Grade 7, the student will:

- Describe how humans acquire, manage and use natural resources, and identify factors that affect the importance of those resources;
- Use a variety of resources and tools to gather, process and communicate geographic information about the distribution, use, and importance of natural resources;
- Describe positive and negative ways in which human activity can affect resource sustainability and the health of the environment.

- Additional curriculum topics:
    - Distribution of natural resources in the world (for example where there is more freshwater)
    - Concept of sustainable development and renewable/non-renewable resources.
    - Major river systems of the world, including the St Lawrence
    - Effect of pollution in the Great Lakes on Canadians.

Grade 8 Science and Technology

Understanding Earth and Space Systems: Water Systems

Overall Expectations

By the end of Grade 8, the student will:

- Assess the impact of human activities and technologies on the sustainability of water resources;
- Investigate factors that affect local water quality;
- Demonstrate and understanding of the characteristics of the earth's water systems and the influence of water systems on a specific region.

- Additional curriculum topics:
    - Personal water consumption (and comparing with other countries)
    - Water treatment processes in municipalities
    - Chemical characteristics of water (pH, turbidity, etc.) and local water issues.

Grade 9 Science

B. Biology (Academic and Applied)

Overall Expectations
By the end of the course, students will:

B1. Assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts;

B2. Investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems;

B3. Demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems.

- Additional curriculum topics:
    - Human impact on aquatic ecosystems (invasive species)
    - Government and/or local initiatives on environmental issues affecting ecosystems (Clean water act and spill response)
    - Scientific Investigation Skills and Career Exploration

Grade 11 Environmental Science (University/College and Workplace Preparation)

B. Scientific Solutions to Contemporary Environmental Challenges (University/College)

Overall Expectations
By the end of the course, students will:

B1. analyse social and economic issues related to an environmental challenge, and how societal needs influence scientific endeavours related to the environment;

B2. investigate a range of perspectives that have contributed to scientific knowledge about the environment, and how scientific knowledge and procedures are applied to address contemporary environmental problems;

B3. demonstrate an understanding of major contemporary environmental challenges and how we acquire knowledge about them.

B. Human Impact on the Environment (Workplace)

Overall Expectations
By the end of the course, students will:

B1. analyse selected current environmental problems in terms of the role human activities have played in creating or perpetuating them, and propose possible solutions to one such problem;

B2. investigate air, soil, and water quality in natural and disturbed environments, using appropriate technology;

B3. demonstrate an understanding of some of the ways in which human activities affect the environment and how the impact of those activities is measured and monitored.

C. Human Health and the Environment (University/College and Workplace)

Overall Expectations
By the end of the course, students will:

C1. analyse initiatives, both governmental and non-governmental, that are intended to reduce the impact of environmental factors on human health;

C2. investigate environmental factors that can affect human health, and analyse related data;

C3. demonstrate an understanding of various environmental factors that can affect human health, and explain how the impact of these factors can be reduced.

E. Natural Resource Science and Management (Workplace)

Overall Expectations
By the end of the course, students will:

E1. assess the environmental impact of the harvesting and/or extraction of resources, including ways of reducing this impact, and analyse threats to the sustainability of natural resources;

E2. investigate methods scientists use to classify and monitor natural resources, and conduct investigations using those methods;

E3. demonstrate an understanding of the sustainable use of resources and its relationship to the biodiversity and sustainability of ecosystems.

- Additional curriculum topics:
    - Scientific Investigation Skills and Career Exploration

Grade 12 Science (University/College Preparation) (2008)

E. Science and Public Health Issues

Overall Expectations
By the end of the course, students will:

E1. assess the impact of scientific research, technological advances, and government initiatives on public health;

E2. investigate various strategies related to contemporary public health issues;

E3. demonstrate an understanding of major public health issues, past and present.

- Additional curriculum topics:
    - Lack of clean drinking water can spread infectious diseases
    - Legislation is a public health measure that can protect the public.
    - Scientific Investigation Skills and Career Exploration

Grade 12 Chemistry (College Preparation) (2008)

F. Chemistry in the Environment

Overall Expectations
By the end of the course, students will:

F1. evaluate the importance of government regulations, scientific analyses, and individual actions in improving air and water quality, and propose a personal plan of action to support these efforts;
F2. investigate chemical reactions, using appropriate techniques of quantitative analysis;
F3. demonstrate an understanding of chemical reactions that occur in the environment as a result of both natural processes and human activities.

- Additional curriculum topics:
    - Scientific Investigation Skills and Career Exploration