

## Grade 11 and 12: PURSUING THE PATH OF ORGANIC POLLUTANTS

*Students explore careers related to environmental education by developing a lesson plan for a science or environmental topic recently covered in their class.*

### CURRICULUM CONNECTIONS

#### Related Outcomes

This lesson will contribute to the student's ability to

- explore careers related to the field of science being studied;
- select and use appropriate numeric, symbolic, graphical, and linguistic modes of representation to communicate ideas, plans, and results;
- analyze from a variety of perspectives the risks and benefits to society and the environment of applying scientific knowledge or introducing a particular technology (e.g. using insecticides such as DDT);
- evaluate relationships that affect the biodiversity and sustainability of life within the biosphere.

#### Related Coursework

This lesson works well in classes studying

- careers related to chemistry, biology, communication, and environmental science;
- Aboriginal studies, traditional lifestyles, and related environmental issues;
- organic chemistry, biodiversity, and sustainability;
- the impact of industrial activity on society and the environment.

### PREPARATION

#### Learning Objectives

During this lesson, students will

- develop and demonstrate understanding of Persistent Organic Pollutants (POPs), the process by which they travel through the environment, and their effect on the environment and people of the Arctic and in general through lecture and class discussion;
- construct a storyboard to illustrate the path of POPs from their source in remote locations to Inuit women in the Arctic;
- explain the applications of the skills and knowledge acquired during the lesson in various environmental occupations by researching information provided in the EnviroCareers and EnviroConcerns sections of the Aboriginal EnviroCareers website/CD-ROM.

**Total Time** 95 minutes

#### Material Required

- Copies of the profiles for high school science teacher, professor, environmental trainer, and science camp co-ordinator from the EnviroCareers section of the Aboriginal EnviroCareers website/CD-ROM (one of each profile per student)
- Copies of the lesson plan template provided (one per student)
- Classroom access to a computer preferably with Internet connection
- Access to the Aboriginal EnviroCareers website/CD-ROM



20 minutes

**1. Introduction: Introducing Persistent Organic Pollutants**  
(Lecture)

- 1.1 Present the following quotation to introduce the topic of pollutants and demonstrate their effect on the environment:

"Imagine an enormous tank the size of a football field, 4.5 metres deep, full of healthy fish. If you poured just a tablespoon of mercury into the tank, the fish would become unsafe to eat."

- 1.2 Conduct a lecture on POPs, addressing the following questions:
- What is a POP?
  - Where do POPs come from?
  - How do POPs travel through the environment?
  - How do POPs affects the environment and humans?

15 minutes

**2. Main Activity: Developing A Storyboard**  
(Discussion and Group Activity)

- 2.1 Describe the main activity: "With a partner, design a storyboard showing how an airborne POP travels from a source in southern Canada or a foreign country into the breast milk of Inuit women."

- 2.2 Explain: "Storyboards
- Are used to map out ideas and processes.
  - Consist of a series of frames each showing a single stage in a process or idea.
  - Are mainly visual, i.e. use pictures and symbols.
  - Are similar to comic books and used to plan websites."

- 2.3 Inform students that their storyboards should be approximately 6 -10 frames long and show
- Source of the POP, i.e. agricultural or industrial activity.
  - Entry point of the POP into the environment.
  - Variety of primary, secondary, and final POP consumers.
  - Effects of POPs on humans and the environment.

- 2.3 Review the materials students have available to them. Divide students into pairs. If necessary, review the suggested construction process with students.

- 2.4 Provide class time for students to complete the activity. If necessary, direct students to complete the assignment as homework.

Advise students to submit their completed storyboards to you for evaluation.

- 1.1 This quotation was taken from the Canadian Wildlife Federation's Wild Education website:  
[www.wildeducation.org](http://www.wildeducation.org)

- 1.2 Use the POPs Backgrounder as foundation for your lecture. As an alternative, distribute the backgrounder to students and instruct them to record the additional information you cover in your lecture.

- 1.3 If necessary, review the relationship between producers, consumers, and decomposers in the ecosystem. For more information, see the lesson plan Keep the Chain Connected.

- 2.1 If you have not linked POPs and the Arctic up to this point, review the facts related to the high rates of POPs in Inuit people on the POP Backgrounder with students now.

- 2.2 If possible, show students a sample storyboard, preferably illustrating a different topic, e.g. the evaporation cycle.

- 2.3 The suggested construction of a storyboard
- create frames from 8 1/2" x 11" sheets using artwork, drawings, magazine pictures, or photographs;
  - title each frame to highlight key concepts;
  - paste frames on to the 40" x 30" poster board;
  - illustrate the connection between frames using arrows, lines, etc.

- 2.5 Alternatively, ask students to present their storyboards to the class.



15 minutes



### 3. Closure and Evaluation: Debriefing the Activity

*(Discussion, Brainstorming, and Homework)*

- 3.1 Discuss each group's completed storyboards and its choices related to
  - a. Source of the POP.
  - b. Entry point of the POP into the environment and food chain.
  - c. Types of consumers.
  - d. Visual and verbal images used.
- 3.2 Discuss the ways in which someone might apply the communication skills and/or the scientific knowledge students learned during this lesson in a career.
- 3.3 Assign the following homework: "Using the Aboriginal EnviroCareers website/CD-ROM, research and describe
  - a. Two environmental careers that involve communicating or teaching scientific information.
  - b. Two environmental careers that involve researching, preventing, and/or monitoring POPs and their effect on the environment.
  - c. How the selected careers apply the skills or knowledge covered in the lesson.
  - d. One additional fact about POPs.
  - e. One EnviroConcern related to POPs."

Discuss the students' findings in a subsequent class.



- 3.2 Examples of the ways some environmental practitioners might use the skills and knowledge covered in the lesson include
  - using storyboards or similar methods to communicate information about POPs to various audiences;
  - studying, monitoring, and managing POPs and their affect on the environment and humans.
- 3.3 Potential responses include
  - a. Environmental trainer, science teacher, professor, Traditional Environmental Knowledge (TEK) advisor.
  - b. Fisheries technologist, marine biologist, environmental scientist, conservation biologist, wildlife technician.
  - c. See specific occupations listed in a and b.
  - d. See the Job Description Fact in the EnviroCareer wildlife technician.
  - e. Related EnviroConcerns: Mining, Commercial Agriculture, and Hunting and Fishing.

#### Evaluation Considerations

Did students

- illustrate the path of POPs through multiple cycles of evaporation;
- identify and demonstrate the relationship between a variety of consumers;
- visually represent the required concepts accurately;
- explain the effects of POP's on humans and the environment;
- explain how the skills and knowledge explored during the lesson could be applied in various environmental careers?



### SUGGESTIONS FOR ADAPTATION

- Write an editorial about Canada's efforts to regulate and control POPs and its role in the international community.
- Research and debate the risks and benefits associated with a selected POP source such as pesticides, fertilizers, or pulp and paper production.



## HYDROELECTRICITY: Backgrounder

### Quick facts

- Over 60% of electricity produced in Canada is hydropower.
- In 1997, the Supreme Court of Canada ruled Aboriginal peoples must be informed and consulted about hydroelectric developments affecting them, their environment, their culture and their way of life.
- The electricity sector, including coal, oil and gas, produces 17% of the green house gas emissions in Canada.
- There is controversy over whether hydropower is a clean and renewable resource.

### What does hydroelectric development involve?

- Hydroelectric projects often involve flooding land to construct and operate a dam. The dam controls the flow of water.
- Camps for construction workers, access roads to the site, and construction power are usually required during development.
- All weather roads are also often built to provide ongoing access to the generating station once it has been completed.
- Some hydroelectric facilities require a storage dam or reservoir to store the water for long periods of time.

### How can hydroelectric development affect the environment?

Hydroelectric development may:

- Change water levels at the dam site and throughout the water system, sometimes stabilizing water levels, other times changing water levels daily
- Produce green house gas emissions if a storage dam is built
- Increase shoreline erosion and debris which can:
  - Increase sediment, making the water murky
  - Change fish habitats and spawning grounds
  - Increase food sources such as bugs and minnows, which can increase fish populations
- Cause mercury to be released from flooded peat beds, potentially affecting the local commercial fishing industry
- Destroy vegetation during construction, through flooding, by causing increased shoreline erosion
- Alter the types of shoreline plants in the area as a result of changing water levels
- Destroy wildlife habitats when clearing or flooding the land
- Increase people's access to the area, possibly increasing hunting of and accidents involving animals

### How can hydroelectric development affect a community directly?

Hydroelectric development in or near a community may:

- Attract new services such as retail stores, Internet access, etc.
- Increase population, potentially causing a housing shortage
- Affect the community's local or traditional economy and way of life
- Create a "boom and bust" economy
- Create jobs with hydroelectric companies and in supporting industries like childcare and construction
- Provide training opportunities before and during the project
- Generate profits for the community if it shares ownership in the hydroelectric development facilities
- Develop new recreational activities and locations, like boating on the reservoir

5. Data from sediment samples in the Great Lakes and other regions reveal that the concentrations of dioxins and furans have increased steadily since the 1940s, indicating that these substances are generated and released through industrial activities.
6. According to the World Health Organization, a piece of dioxin the size of a small grain of rice, if distributed equally and directly to people, is equivalent to the allowable yearly dose for one million people.

### **Related Resources:**

- Environment Canada website:
  - Taking Action on Persistent Organic Pollutants: [www.ec.gc.ca/pops](http://www.ec.gc.ca/pops)
  - Persistent Organic Pollutants in the Arctic: [www.ec.gc.ca/press](http://www.ec.gc.ca/press)
  - Mercury and the Environment: [www.ec.gc.ca/mercury](http://www.ec.gc.ca/mercury)
  - The Long-Range Transport of Airborne Pollutants, Pollution, the Management of Water: [www.ec.gc.ca/water](http://www.ec.gc.ca/water)
- Persistent Organic Pollutants, Toxics, the Canadian Association of Physicians for the Environment website: [www.cape.ca](http://www.cape.ca)
- The Canadian Wildlife Federation's Wild Education website: [www.wildeducation.org](http://www.wildeducation.org)
- Report: Negotiating a POPs Treaty: Our Duty to the North, Canadian Arctic Resources Committee website: [www.carc.org](http://www.carc.org)