# Oceans
# Junior High Lesson Plan

*Objective*

This lesson will encourage students to understand that the threat to water ecosystems and oceans in particular is a complex problem because of the many factors that contribute to their pollution and destruction.

*Title*

**Ocean Pollution: The Human Connection**

*Subject*

Environment

*Grade level*

Junior High (Alberta Grade 8: Freshwater and Saltwater Systems)

*Time duration*

2-3 class periods

*Materials*

- Research materials about water ecosystems and factors that contribute to their pollution or destruction
- Paper and pencil for each student
- Computer with Internet access/Google Earth
- Oceans video (5:28)
- TED Garbage Patch video: Great Pacific Garbage Patch (7:23)

*Learning Activities*

***Preparation***

- Ask students to name some water ecosystems. (They might mention oceans, rivers, ponds, lakes, marshlands.)
- Ask students to mention any factors they know of that contribute to the pollution and destruction of water ecosystems. List their suggestions on the board/Smartboard.
- Ask students to explore their school grounds and draw a map of where storm drains, gutters, and other storm water collection features are located. While students are looking for drains, ask them to also look for things that could be swept into storm drains (trash, leaves, oil residue, etc.). They should collect samples or photos to bring back to class.
- Back in the classroom, ask students to catalog the types of debris that they found, and share the information with the class. Ask students about the types of debris they found. Are there many types trash and other debris, or primarily one type?

## *Learning Activities*

Activity1: ***Where Does the Water Go?***

1. Ask students to use the "Cause and Effect chart" (attached to this lesson) to take notes on the video they are about to see. In the center box, students should write "Oceans" and record the facts they learn about it from the video. Students might also identify some causes. Encourage students to use the back of the sheet to write down any questions or thoughts they have on the topic, such as ideas they want to investigate further, reactions to the apparent problem, or possible causes and effects.

2. Show students the Oceans video (5:28) Have each student share one idea they wrote down on the back of the handout. Then briefly discuss their answers, reactions and questions about the video. Ask: What causes and effects did they write down? Do the effects of the problem seem "obvious"? What was the strongest message they heard? Did anything inspire them? Worry them? Anger them? Make them want to learn more about a specific area or issue?

3. Review with students that water pollution is a man-made problem. The wastes, bacteria, fertilizers, oils, and other pollutants mostly come from our activities on land and are carried to rivers and streams by rain or man-made runoff. The water then flows to rivers to ponds, lakes, and, eventually, the ocean. Thus, pollution from your home affects every ecosystem that your runoff passes through.

4. Ask students if they know where runoff from their neighborhood goes. Do they know the path that it takes? Have students find their home or neighbourhood on Google maps/Google Earth, and make a rough sketch of local topography and landmarks. Using the map, ask students to find the path the water travels to the ocean. Water naturally travels downhill (perpendicular to topographical map contours), and finds its way to the nearest canyon, stream, river, or low point. Once water enters a stream or river it is easy to follow that waterway to the ocean or major body of water. Have the students print out the map to sketch the water's path.

5. Students should identify and label what water flows through on their map: drainage ditches, storm drains, canyons, creeks, ponds, rivers, and ocean. Ask students to calculate the distance from the students' neighbourhood to its final destination. This can be done with the "path" tool in Google Earth, or laying a string on the map.

6. Ask students if they have ever visited the place where their water goes. Students should understand their connection to that place, and how their choices (littering, dumping, etc.) have an effect.

Activity 2: ***The Pacific Garbage Patch***

1. Ask students to guess what weighs 4 million tons and covers more than half a million square miles? (Answer: The great Pacific garbage patch) Ask students to share what they already might know about the garbage patch.

2. Ask students to use the "Cause and Effect chart" (attached to this lesson) to take notes on the video they are about to see. In the center box, students should write "Pacific garbage patch" and record the facts they learn about it from the video. Students might also identify some causes, such as "trash from humans" or "swirling ocean currents." Encourage students to use the back of the sheet to write down any questions or thoughts they have on the topic, such as ideas they want to investigate further, reactions to the apparent problem, or possible causes and effects.

3. Show students the Great Pacific Garbage Patch video.

4. Go around the room and have each student share one idea they wrote down on the back of the handout. Then briefly discuss their answers, reactions and questions about the video and about the garbage patch. Ask: What causes and effects did you write down? Do the effects of the problem seem "obvious" to you? What evidence do you think Captain Moore is hoping to gain from his scientific studies and why? What could be the value of studying the problem in depth before acting to address it? Ask students what, if anything, should be done about the garbage patch? Why?

5. Have students complete their Identifying Cause and Effect charts with information from the article and their own inferences and predictions. Tell students to use the handout as a basic framework, but to add boxes as necessary to reflect their thoughts and ideas.

6. Form pairs or small groups to compare their charts from each video. Ask: What do you know about each cause-and-effect relationship you listed? What causes and/or effects do you agree on? Which, if any, do you disagree about? Why?

7. Invite students to share and discuss the causes and effects, making a class chart on the board (the handout can be filled in on a SmartBoard if you have one) or chart paper. Encourage students to add their own inferences and hypotheses about problems not specifically mentioned in the article. For example, students might

know something about animals becoming tangled in discarded fishing gear, and add this as an effect. Or they might add another effect of discarded trash in the ocean that "seems obvious" to them.

8. Assign each group to cover one cause-and-effect relationship or have students select the one they are most interested in. Provide copies of the handout Evaluating Cause and Effect (PDF) and instruct the groups to fill it out as comprehensively as possible.

9. Ask students to creatively present their findings to the rest of the class. This could be in the form of a skit, news presentation, or any other means that is agreed to prior.

*Assessment*

You can evaluate your students on their presentation as well as extension assignments using the following three-point rubric:

- Three points: complete description, accurate description of the way or ways in which factors might affect the relationship/ecosystem, clear description of methods being used to combat, reasonable suggestions for future methods
- Two points: adequate description, acceptable description of the way or ways in which the factor affects the relationship/ecosystem, vague description of methods being used to combat, unrealistic suggestions for future methods
- One point: vague description, unsatisfactory description of the way or ways in which the factor affects the relationship/ecosystem, inadequate description of methods being used to combat, no suggestions for future methods

You can ask your students to contribute to the assessment rubric by self-assessing their involvement and contribution to the presentation/statement.

*Activities for Extension and/or Integration*

- Ask students to revisit the factors they know of that contribute to the pollution and destruction of water ecosystems (PCBs, DDT, metylmercury chloride, sewer sludge, thermal effluents, radioactive wastes, destruction of marshlands, beach erosion, etc.). Refer to the first activity in this lesson.
- Divide your class into groups, and have each group research one of the factors you have listed. Groups should focus their research on how their factor affects water ecosystems, particularly oceans, and the methods that are being employed to counter it.
- When their research is complete, each group should choose one water ecosystem that has been affected by the factor they have been assigned and prepare an environmental-impact statement about it. Each statement should include four elements:

- a description of the current environmental status of the ecosystem
- a description of the way or ways in which the factor affects the ecosystem
- a description of the existing methods that are being used to combat the factor
- suggestions for future methods of combating the factor

- When the statements are complete, invite groups to share their findings with the class.

OR

- Students could extend their knowledge regarding our reliance on plastic and research "The Story of Stuff" to further focus on the indirect causes of the Pacific problem. (www.youtube.com/watch?v=gLBE5QAYXp8)

*Subject and Level Learning Outcomes (Alberta)*

This classroom activity will help students understand concepts introduced in **Alberta's grade 8 science curriculum, Freshwater and Saltwater Systems**. In particular, it addresses the general learner expectation of appreciating the dynamic nature of aquatic ecosystems and investigating factors that affect the distribution and health of living things in aquatic environments and the supply and quality of water for human use.

*Resources*

http://learning.blogs.nytimes.com/2009/11/11/floating-flotsam-studying-the-causes-and-effects-of-the-pacific-garbage-patch/

http://earthref.org/SCC/lessons/2009/oceanpollution/

http://www.discoveryeducation.com/teachers/free-lesson-plans/pollution-solutions.cfm

# EVALUATING CAUSE AND EFFECT

Name: _____ Date: _____

**Identify the topic under consideration and the cause and effect that you are investigating, and then answer the following questions. Conduct your own additional research as necessary.**

The issue/topic is _____

The (or one) apparent cause is _____

The (or one) apparent effect is _____

1. Is the cause-and-effect relationship supported by scientific evidence? If so, what is the evidence?

2. If not, why do scientists and individuals speculate that a link exists? What evidence would further suggest a link between the two?

3. Is the relationship still being studied? How and why are scientists trying to learn more?