Marine Debris in the Pacific Ocean

V.1 - May 2017

esri Canada

Lesson Overview

This overview contains the background information about this lesson, along with the **associated curriculum connections**, skills learned and materials required for students to complete the lesson.

Grade Range:
- 8 – 12.

Topics and Themes:
- The Pacific Ocean
- Ocean currents
- Human impacts
- Marine debris.

Geographic Scope:
- Canada
- Global.

GIS Skills:
- Searching for Layers
- Creating and Symbolizing Features
- Adding Information to Features.
- Creating a Map Journal Story Map

Materials Required:
- An ArcGIS Online organization account. If you or your students do not have an account, you can request accounts here: www.esri.ca/agolaccess. Please allow up to two business days for accounts to be created. For more information on ArcGIS Online, visit: www.arcgis.com.
- An electronic version of this lesson is available at: http://bit.ly/2rdaWNU.

Lesson Contents and Time Required

GIS lessons are assembled for teachers as a collection of resources that are needed to facilitate learning a specific topic or issue using mapping and spatial data. This lesson contains the following resources:

- **Lesson Plan**
  A teacher's resource that outlines the suggested workflow for using the contents of a lesson. This workflow is the same across all of Esri Canada Education's lessons. To download a copy, visit: http://bit.ly/2nsY0Dg.
- **Presentation (10 – 15 minutes)**
  A Story Map presentation in ArcGIS Online for the teacher to introduce the GIS skills that will be studied. To view the Story Map, visit: http://arcg.is/2a2CfVt.
- **Tutorial(s) (130 – 180 minutes)**
  Hands-on documents referenced in this overview including step-by-step instructions for learning GIS skills.
  1. Introduction to ArcGIS Online (Parts B – F): 60 – 75 minutes - http://bit.ly/2mtQRQm
  2. Creating a Map Journal Story Map: 60 – 90 minutes - http://bit.ly/2oQkKej.
- **Assignment (90 – 120 minutes)**
  A student activity intended to be the final part of a lesson. Students can complete the tasks by applying the GIS skills learned through tutorials that are relevant to the lesson outcomes.
- **Data**
  The data required for this assignment can be found in ArcGIS Online. There is a map created for the purposes of this assignment. Your students can access the map through the following link: https://arcg.is/1H8Dfm. After following the link provided, the students will need to log into their ArcGIS Online accounts to save their map.

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Note: For a complete learning experience, it is highly recommended that students complete the tutorials associated with this lesson. If the tutorials have already been taught, students can use them as a point of reference to complete the assignment.

Learning Outcomes

By completing this lesson, students will gain the following curriculum-focused knowledge:

1. **Analyse interrelationships between physical processes, phenomena, and events in Canada and their interaction with global physical systems.**
   (**Ontario** – Grade 9 Geography, Grade 11 Geography; **British Columbia** – Grade 11 Science, Grade 11 Science, Grade 12 Science; **Alberta** – Grade 10 Science; **Manitoba** – Grade 8 Science, Grade 10 Science; **New Brunswick** – Grade 11 Science; **Nova Scotia** – Grade 10 Science; **Prince Edward Island** – Grade 12 Science; **Newfoundland & Labrador** – Grade 11 Science; **Saskatchewan** – Grade 11 Science; Grade 12 Science; **Northwest Territories** – Grade 10 Science; **Yukon** – Grade 11 Science, Grade 11 Science, Grade 12 Science).

2. **Describe how winds and ocean currents influence regional climates.**
   (**Ontario** – Grade 11 Geography, Grade 12 Science; **British Columbia** – Grade 8 Science, Grade 9 Science, Grade 11 Science; **Alberta** – Grade 8 Science, Grade 10 Science; **Manitoba** – Grade 8 Science, Grade 10 Science; **New Brunswick** – Grade 8 Science; **Nova Scotia** – Grade 8 Science, Grade 10 Science; **Prince Edward Island** – Grade 10 Science; **Newfoundland & Labrador** – Grade 8 Science, Grade 11 Science; **Saskatchewan** – Grade 8 Science; **Northwest Territories** – Grade 8 Science, Grade 10 Science; **Yukon** – Grade 8 Science, Grade 9 Science, Grade 11 Science; **Quebec** – Secondary Cycle 2 Science).

3. **Analyse issues related to human impacts on the global commons.**
   (**Ontario** – Grade 10 Geography, Grade 10 Science, Grade 11 Geography, Grade 11 Science, Grade 12 Geography, Grade 12 Science; **British Columbia** – Grade 8 Science, Grade 11 Science, Grade 12 Science; **Alberta** – Grade 8 Science; **Manitoba** – Grade 8 Science, Grade 10 Science, Grade 12 Social Studies; **New Brunswick** – Grade 11 Science; **Nova Scotia** – Grade 10 Science; **Prince Edward Island** – Grade 11 Science; **Newfoundland & Labrador** – Grade 8 Science, Grade 10 Geography, Grade 11 Science; **Saskatchewan** – Grade 11 Science; Grade 12 Science; **Northwest Territories** – Grade 8 Science; **Yukon** – Grade 8 Science, Grade 11 Science, Grade 12 Science).

4. **Investigate the impact of hydrospheric processes on society and the environment.**
   (**Ontario** – Grade 11 Science, Grade 11 Geography, Grade 12 Geography; **British Columbia** – Grade 11 Science, Grade 12 Science; **Alberta** – Grade 10 Science; **Manitoba** – Grade 10 Science; Grade 12 Social Studies; **New Brunswick** – Grade 11 Science; **Nova Scotia** – Grade 10 Science; **Prince Edward Island** – Grade 12 Science; **Newfoundland & Labrador** – Grade 11 Science; **Saskatchewan** – Grade 11 Science; Grade 12 Science; **Northwest Territories** – Grade 10 Science; **Yukon** – Grade 11 Science, Grade 12 Science; **Quebec** – Secondary Cycle 2 Science).

Background Sources Used

At the end of the lesson, students will be able to gain a deeper understanding of ocean currents, what processes cause accumulation of marine debris in certain areas of the ocean, and the impact of marine debris on humans and ocean ecosystems. Students will use ArcGIS Online to explore: areas within the Pacific Ocean, the role of ocean currents, and the human impact on debris accumulation.

Review the following web links for background information. All links were last accessed on May 20th, 2017.

- https://www.youtube.com/watch?v=7c9mSVPXYxU
- https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/

- https://marinedebris.noaa.gov/info/patch.html
- http://response.restoration.noaa.gov/about/media/how-big-great-pacific-garbage-patch-science-vs-myth.html
- http://www.davidsuzuki.org/issues/oceans/science/marine-planning-and-conservation/canadas-pacific-north-coast/
- http://www.canadiangeographic.com/watersheds/map/?path=english/watersheds/pacific-ocean
- https://www.ec.gc.ca/eaudouce-freshwater/default.asp?lang=En&n=E81C5DC6-1
- http://naturecanada.ca/tag/great-pacific-garbage-patch/
- http://oceanservice.noaa.gov/education/yos/resource/101mdfacts.pdf