wildsight

TEACH THE COLUMBIA
Environmental Impacts of Dams

Guiding questions

How does the Columbia River flow naturally throughout the year? How does its hydrology change with the seasons? How do dams in Canada change this natural flow? What ecological or environmental impacts might these changes cause?

Learning goals

Students will:

- Strengthen familiarity with Columbia Basin geography
- Practice reading a scientific graph and interpreting the data in combination with visual images and other kinds of information
- Discuss data based conclusions and connect them with other kinds of knowledge
- Gain an understanding of some of the ways that dams affect the flow of the Columbia River and its ecosystems

Materials

- Columbia Basin maps
- Four hydrology graphs (see prepration section)
- Slideshow

Preparation

- Print off the four hydrology graphs (or "hydrographs") found in the Appendix (or follow the instructions in the Extensions below for students to create their own hydrographs from the Hydrometric Data website)
- Have slideshow ready

Instructions

Total time: 90 minutes

1. Show introductory slideshow providing review of the Columbia River watershed geography, hydrology and impacts when these are changed by dams. 20 minutes
2. Split the students into small groups. Hand out print outs or direct students to web links for each of the four Columbia River "hydrometric data graphs": (1) the Columbia Wetlands at Nicholson, (2) Kinbasket Reservoir, (3) Revelstoke Reservoir, and (4) Arrow Lakes Reservoir. Begin by orienting students to the graph and explaining how to read it including the data it represents, the timeline, the X and Y axis, etc. 10 minutes
3. Get students to identify where on the map each graph shows data from. Get students to identify what is on the x and y axis of each graph. Now, get each group to assess each graph by answering the following questions. Then, have groups share their answers with the whole class. Check if all the groups agree and discuss any differences of interpretation. 30 minutes
   a. What is the scale of the graph (i.e. the lowest and highest data points, the number of metres between them)?
   b. When during the year is the water level lowest?
   c. When during the year is the water level highest?
   d. How smooth or jagged is the trend line? What does this say about the fluctuations in water level?
   e. Can you identify correlations between the information shown on the graphs and the photos?

4. Facilitate a discussion about the differences between the answers for each graph and the photos, given that they are all on the same river. 20 minutes.
   a. From the Columbia River at Nicholson graph:

What can we learn about the hydrology of the undammed portion of the Columbia River? How does the river naturally flow over the course of the year?

b. From the Kinbasket Reservoir graph: How does the Mica Dam change this naturally flowing hydrology? What ecosystem impacts do you think have resulted from these changes?

c. From the Revelstoke Reservoir graph: How does the Revelstoke Dam operate differently than the Mica Dam? Why might this be the case? What ecosystem impacts do you think have resulted from these changes?

d. From the Arrow Lakes Reservoir graph: How does the Hugh Keenleyside Dam operate? How is it similar or different to the naturally flowing river or the two other reservoirs? What ecosystem impacts do you think have resulted from these changes?

5. Based on what students have learned in Teach The Columbia Lesson 2-1, in the introductory slideshow for this lesson or in other classes, discuss ways that the hydrological impacts of the dams might affect ecosystems, fish and wildlife, and other environmental values along the Columbia River. See if anyone in the class has been to one or more of these locations. If so, connect their personal observations with the conclusions drawn from the hydrological graphs. Photos or satellite images (e.g. Google Earth) might also be useful for this. 10 minutes

Extensions

- Instead of just handing out print outs for the hydrology graphs, take some time to teach students how to use the Government of Canada's online "Real Time Hydrometric Data" database. Before getting to the four stations used in this lesson, you could practice by getting students to search for monitoring stations closest to your home.

  Then, for each of the following Stations, generate a hydrograph to show a full calendar year of time on the x-axis with water level on the y-axis (and no secondary y-axis parameter).

  Stations:

  - Columbia River at Nicholson station number 08NA002
  - Kinbasket Lake below Garrett Creek station number 08NB017
  - Revelstoke Reservoir at Martha Creek station number 08ND026
  - Arrow Reservoir at Nakusp station number 08NE104

- If you also did lesson 2-2 ("Dams Mechanics and Benefits from Hydropower"), consider debating the pros and cons of dam using the four corner debate strategy (a few examples online include this one and this one)

Curriculum links

Science 10

Social studies 10

Social studies 11

Physical Geography 12

Earth Science 11

Environmental Science 11

Appendix

Hydrological graphs:

Columbia River at Nicholson

Kinbasket Lake below Garrett Creek

Revelstoke Reservoir at Martha Creek

Arrow Reservoir at Nakusp