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

- Strengthen familiarity with Columbia Basin geography
- Practice reading a scientific graph and interpreting the data
- 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 sample)

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)

Record the web addresses (see appendix for names and links).See samples in Appendix

Instructions

Total time: 80 minutes

1. Review maps of the Columbia River watershed with particular attention to the direction of flow of the Columbia River and the dams located on it in Canada. Use this map to focus on the Canadian portion of the Columbia Basin, showing towns, dams, and reservoirs. Explain that the section of the river between its headwaters in Canal Flats and the end of the Kinbasket Reservoir below Donald is the only remaining section of the river that is undammed and experiences natural flow patterns (because there are no significant dams upstream either). **10 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. **5 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?
4. Facilitate a discussion about the differences between the answers for each graph, given that they are all on the same river. **20 minutes**.
    a) From the 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?

c) From the Revelstoke Reservoir graph: How does the Revelstoke Dam operate differently than the Mica Dam? Why might this be the case?

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?

5. Based on what students have learned in Teach The Columbia Module 2 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. **15 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 Marta Creek station number 08ND026
- Arrow Reservoir at Nakusp station number 08NE104
- Do additional research on environmental impacts of dams. Some resources may include: **The Downside of Dams** (Scientific American article); **Impact of Dams on Freshwater Health** (International Institute for Sustainable Development).

Curriculum links

Science 10
Social studies 10
Social studies 11
Earth Sciencesyper 11
Environmental Science 11
Physical Geography 12

Appendix

Hydrological graphs:

1. **Columbia River at Nicholson**
2. **Kinbasket Lake below Garrett Creek**
3. **Revelstoke Reservoir at Martha Creek**
4. **Arrow Reservoir at Nakusp**