



Science Unit: *Resource Extraction and the Environment*

Lesson 3: *Ecological Impact of River Dams*

School year: 2008/2009

Developed for: Trafalgar Elementary School, Vancouver School District

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Grade level: Presented to grades 4 - 5; appropriate for grades 3 – 7 with age appropriate modifications.

Duration of lesson: 1 hour and 20 minutes

Objectives

1. Learn how dams affect river ecology

Background Information

As a society we need to extract resources to heat and build our homes. Electricity is one of these resources. There are many ways to obtain electricity; in Canada nuclear and hydroelectric plants are the most common. Both methods produce ecological imbalances. Nuclear energy is deemed 'clean' as it only requires the fission of small radioactive elements; however, disposing of the radioactive waste becomes a serious problem. Hydro energy is very common in BC, as our province has many rivers. A hydroelectric plant requires a river site where a dam can be constructed to accumulate the water. The potential energy of the accumulated water is then converted into electrical energy as the water rushes through a turbine. Dams however, affect the river ecology as most of the organic material of the river does not pass through the turbine; it accumulates in the upstream from the dam. This is a significant concern, as the silt and other organic material are needed in the river food web. The organic material feeds the plants which in turn provide food for the herbivores, which will then become food for the carnivores.

Vocabulary

Word: Brief definition.

Dam A barrier used to pool water from a river

Hydroelectric Electrical energy obtained from water

Materials: (per group of 2)

- 2 x 4L milk jugs
 - sharp scissors
 - 2 cups of sand
 - water (a tap is best)
 - 1 cork
 - 1 2L plastic bottle
 - 1 cup
 - Worksheet
 - 1 tray to catch the water and sand
- For introduction Demo
- 1 rectangular container filled with sand
 - 1 small piece of wood
 - water



In the Classroom

Introductory Discussion

1. Show them a small model of a river (use a the container full of sand and make a path in it)
 - How could I use this river?
 - What are the resources I could get from this river?
 - a) Electricity (with the construction of a dam)
2. Add the wood to the model and ask them what they think it would do to the river
 - Its food web? (prevent the organic matter from feeding the producers along the river)
 - The food web of the area surrounding the site of the dam? (herbivores have no plants to eat and carnivores have no herbivores to eat)
 - The people living around the site of the dam? (dam will flood the region and dislodge communities)
3. Introduce experiment on the effects of dams on river ecology

Scientific Experiment: How does a dam affect the transport of organic matter in a river?

Discovering the effect of dams on river ecology

Safety rules:

This experiment requires the use of sharp scissors. Please be careful when cutting your milk jugs.

(if your class is too young it is best to have the milk jugs pre-cut.)

Experiment setup

1. Take one milk jug and cut a window that goes from the bottom to the middle of the jug (label it **Natural River**)
2. Take the other milk jug and mark the exact size of the small end of the cork about 5 cm from the bottom
3. Cut the circle and fit the cork in (label it with **River with a Dam**)
4. Take your models outside
5. Use the cup and add 2 cups of sand to the inside of both jugs (use a rolled sheet of paper as funnel)
6. Fill the 2L plastic bottle with water

Experiment

1. In groups of 2, the students should work together.
2. Start with the natural river jug. While one student pours the 2L water bottle through the jug opening, the other student should watch the sand in the jug.
3. Measure the amount of sand left inside the container and record your observations in the worksheet– how much sand remained in the milk jug?



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4. Refill your 2L water bottle and pour it into the River with Dam model through the jug opening
5. Once you poured all the water remove the cork (turbines remain shut until the flooding is complete)
6. Measure the amount of sand left inside the jug and record your observations – how much sand remained in the milk jug?

Discuss the results with the class

Show pictures of the Colorado River upstream and downstream from the dam (included at the end of this lesson)

Upstream of the Hoover Dam the water is brown and filled with organic matter. In fact, the brown colour is what gave this river its name (Colorado in Spanish means coloured). Downstream from the dam, the river turns bluish green. It is devoid of silt and organic particles, which have stayed behind trapped by the dam.

Activity #2: Watch Flow

Watch the dam section

Closure Discussion

What are some alternative/ sustainable ways to create save water and generate electricity?

Ask each student to think about ways they can help the rivers

Looking the dioramas with rivers

1. What would happen if we put a dam in this river?
2. What would be the consequences to the ecosystem?
3. What are the strategies we could use to obtain energy in such a way to minimize our impact?

References

1. Colorado River. Wikipedia. [http://en.wikipedia.org/wiki/Colorado_River_\(U.S.\)](http://en.wikipedia.org/wiki/Colorado_River_(U.S.)) Accessed Jan 26th 2009.
2. Colorado river brown water. Flagstaff to Beaver. Chasing the sun: The Dempster Highway by motorcycle. <http://deweerd.us/CTB%20long%20version/Page%20004.html> De Weerd Family Homepage. Accessed on May 18, 2009.
3. Colorado river blue water. Hiking to a Hot Spring – Justinsomnia. Watt, Justin. <http://justinsomnia.org/2009/04/hiking-to-a-hot-spring/>. Accessed May 18, 2009. Uploaded April 3, 2009.
4. Flow: For Love of Water Movie (2008). Documentary released September 12, 2008. Directed by Irena Salina.

Extension of Lesson Plan

1. Make a hydroelectric turbine (<http://www.re-energy.ca/pdf/hydroelectric-generator.pdf>)



Colorado River before a dam





Colorado River after the Hoover dam



Name: _____

Effect of dams on River Ecology Worksheet

Natural River (control)	River with a dam (treatment 1)
Amount of sand: _____ Amount of water: _____	Amount of sand: _____ Amount of water: _____
Methods: (describe what you did) _____ _____ _____ _____	Methods: (describe what you did) _____ _____ _____ _____
Results: (What happened?) _____ _____ _____ _____ Amount of sand left in the jug: _____	Results: (What happened?) _____ _____ _____ _____ Amount of sand left in the jug: _____
Conclusion: (Is a dam healthy for a river?) _____ _____ _____	