



# A RIVER REBORN

## DAM REMOVAL AND RIVER RESTORATION

Educational Funding Provided By;



**GRADE LEVELS**

6-12

**CONTENT AREA**

Biology/Life Science

**UNIT THEME**

Biodiversity

**TOPIC**The connection between  
environmental stability and  
human impact

The following list of short videos follow the timeline progression of what occurred and the logistics of planning, removing the dam and restoring the river.

1. Historic Impacts on Rivers (need hyperlink to this website page)
2. White Pine Logging Era (need hyperlink to this website page)
3. Worth Of A River (need hyperlink to this website page)
4. Purpose and Life of a River (need hyperlink to this website page)
5. What Voices & Values Matter (need hyperlink to this website page)
6. Balancing Emotion, Science & Facts (need hyperlink to this website page)
7. When A Dam Dies (need hyperlink to this website page)
8. A River Restored (need hyperlink to this website page)

## ENDURING KNOWLEDGE

Students should know the 3 purposes of a river, and how rivers sustain the natural and human communities around them.

**Learning Targets:**

1. Students should know where the Ottaway/Boardman River is geographically located, who benefits from the river, what affects the health of the river, what changed the river habitat in the past and how do people determine the health of the river and its beneficiaries for the future?
2. Students should know how undisturbed rivers develop diverse conditions for different life forms, how human activities have changed these river conditions in the last 200 years, that the Ottaway/Boardman River is a model of many rivers regions affected similarly, that people are now examining how to restore river habitats through naturalization, reconstruction and replanting.

3. Students should understand the importance of researching the habitat conditions needed for biodiversity of native life to make decisions that will maintain or restore the health of that natural community and the people who live in it.
4. Students should understand the choices people make regarding how they use resources will change the availability or viability of that resource in the future.
5. Students should understand everyone who uses a resource has a stake, so everyone has a right to be heard. No strong power should overtake another for control of the resource without regard to other stakeholders or natural ecosystems. We are all part of the same community – Mother Earth.
6. Students should understand that increasing our awareness and knowledge of an issue can empower us to make better choices about how we use and protect resources that sustain all the connected life forms in the habitat surrounding the resource.

## TEACHER BACKGROUND

### History:

The Boardman River, in the region of Traverse City, Michigan, was once called the Ottaway by the native tribes who lived and depended on the river. These native tribes, the Ottawa and Chippewa Indians, believed that nature has a “voice” that tells people what it needs, and the river is like an artery giving life to all who depend on it within the region. Because they respected the river as they would an ancestor, they used many of the things they needed from the river and natural community of plants and animals it sustained, in order to pay respect to the river and in turn be able to continue to live in community with the river. They felt that their creator made nature first and then them, so the resources of nature should



be respected above people. European settlers had a different view however. In their eyes, men are second to God, and nature is third. So, in other words, nature is a resource to serve man’s needs, until it is used up. These two ideals could not coexist. Consequently, the river became a place where the two ideals clashed, and the river habitat changed due to practice of the dominant ideal, which from 1850-recent times was the European immigrant’s viewpoint. The Ottaway is a case study of evolving cultural ideals with resource management in rivers like the Boardman River over the last 200 years.

### Science and Technology:

European immigrants first changed the river habitat by clear-cut logging white pine forests which changed conditions and habitat in the uplands, and by floating logs down river which straightened the bends, silted the river, scraped away plant life, and wiped out most of the water animals or their habitat. Next, a series of dams were subsequently built to produce hydroelectric power in the developing cities, thereby causing the river to back up and form reservoir lakes, which slowed, stagnated and warmed the naturally cold and fast moving water. This changed the fish species populations in the dam reservoirs from cold to warm water species. Fishery surveys in the river sections that still flowed water have shown that this also changed the composition of the fish community, away from the colder-water species such as brook trout to the warmer-water tolerant brown trout. Removal of the dams and naturalization of the shoreline have restored water temperature and quality that brook trout need, and has allowed their numbers and population ratios to rapidly recover.

## VOCABULARY:

**Ottaway/Boardman:** a river in the area of Traverse City Michigan.

**Clear-cut logging:** a method of cutting all the trees in a mature forest in order to most quickly use its resource lumber

**Hydroelectric power plant:** a method of generating electricity that requires a dam to build up a column of static water pressure to create fast controlled water flow over a turbine.

**Biodiversity:** a wide range of different types of life forms, which typically require a wide range of habitat conditions in the same region.

**Resource:** something that has value to a population. Such as lumber for building shelters, water for drinking or washing, fish or mammals or birds or plants for food, rivers for hydroelectric power generation.

**Restoration:** taking a natural area back to a previous point of habitat conditions and diversity through protection, natural re-growth, and replacing plants or animals.

## LEARNING FOCUS

**Critical question:** *When humans take advantage of resources and the environment for personal economic gain, what are the resulting consequences?*

Observe what the native tribes described as their practice of using the Ottaway, compared to the description of how the European immigrants of the 1800's used the same river, which they renamed The Boardman after a logging baron. Discuss the differences: Of how the tribes did not destroy the habitat, but rather recognized that the health of the habitat that determined their own communal health. Then discuss the contrasting land use of the immigrants who cut and moved masses of lumber resources as quickly as possible to make economic gain, build their city infrastructures, then dammed the river as a power resource for electricity to further expand their economies and cities. Both native tribes and European emigrants used resources, but the impacts of their uses was very different.

How does understanding the effect human activity has historically on natural communities help us make decisions on best practices in using present and future natural resources?

### Before Viewing One or More of the Selected Videos:

Ask the students to discuss what they currently know about how people typically use rivers, and what kinds of life forms depend on river habitats. Ask them what different ways humans use rivers that may change the habitat in and around the river?





## K-W-L Chart

Topic: \_\_\_\_\_

What I <b>K</b> now	What I <b>W</b> ant To Know	What I <b>L</b> earned

### VIEWING AND DISCUSSION GUIDE:

Before viewing one of the eight particular videos, it may be helpful to create a “guide sheet” for students to take notes on while watching the video. From the Teacher Background and from watching the video, select key headings and questions that will help guide students in picking out significant information from that particular video. Include questions about how the topic could impact their lives and how the topic relates to other areas of science.

#### Here are some examples

**History:**

- Who lived in our own region over 200 years ago?
- How did people at that time get the resources they needed to survive?
- In what ways do we still use the same resources now? What is different?

**Conservation and Technology:**

- What does the term “Biodiversity” mean?
- Why is biodiversity important in a human, plant or animal communities?
- How are people connected to the natural surroundings in which they live?
- What are the benefits and drawbacks to hydroelectric dams?

# A RIVER REBORN: DAM REMOVAL & RIVER RESTORATION

## Life Cycle and Habitat

- Why do different animals need different habitat conditions? Watch for important differences.
- What makes the Boardman River a suitable habitat for brook trout?
- What are people doing to restore natural habitats in rivers like the Boardman?
- Why is it important to restore natural communities?

## AFTER VIEWING THE VIDEO

After viewing the video, guide a student discussion about the key points and questions in the Discussion Guide. Also explore what the students learned and the significance of the topic to their lives.

If the topic is potentially controversial or has different stakeholders involved, divide the students into “user groups”. Have the different groups prepare a presentation of their viewpoints or goals for a classroom debate on the topic. Focus the discussion to address the critical questions in the video or key points in the Teacher Background. For expanded learning, give the student groups additional time to prepare posters or media presentations as part of their presentations.

## Evaluation:

1. An informal assessment can be made from students’ notes and their participation in the before and after viewing discussions.
2. Activities can be assessed using rubrics based on good research, presentation, and material construction.

## Extended Learning:

- Complete the L part of the KWL chart after the discussion.
- Have students research the answers to the questions they had in their KWL chart or Discussion Guide that were not covered in the discussion.
- Students can group together and research a sub-topic related to the main topic. These sub-topics could include the following: history, innovation or technology, careers, and impacts on the environment or society. Students have the option on the method to present their findings to the class.
- Have groups of students identify three dammed rivers in their state. Have them research how old the dams are, how they impacted the historic environment, and hypothesis what might happen to human and wild stakeholders if the dam was removed.

