Biodiversity Debate

Duration:
Classroom
50 minutes

Setting:
Classroom

Purpose: To evaluate the biological, aesthetic, ethical, social and economic arguments with regard to maintaining biodiversity.

Summary: In this exercise, students will hold a debate about the construction of a dam in terms of the biological, aesthetic, ethical, social and economic arguments with regard to maintaining biodiversity. Students will be assigned different roles to argue either for or against the dam.

Background: When people build a dam on a river it changes the ecosystem in many ways. Dams may impact, both positively and negatively, the biodiversity of terrestrial plant communities, fish and other aquatic life, mammals and birds. See the Further Discussion questions following the activity for more information about these impacts.

Note that there are many other arguments for and against a new reservoir that do not relate specifically to biodiversity. These include economic opportunity (irrigation or drinking water) versus economic losses (flooded communities or cost of construction), recreational opportunities (boating and fishing), and opportunities for developers (water front housing), aesthetic considerations and more.

Other Stream Side Science activities such as, That's Predictable and Missing Macroinvertebrates, may be helpful for the students to review how ecosystems change due to various factors.

More information about dams can be found on the internet sites listed on the Resource pages.

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Materials:

- Access to the internet
- The Utah Stream Team Manual
- Other reference sources (see a list on the Resource page)
- Results from the following activities (optional):
  - What's in the Water?
  - Riparian Review
  - Who Lives in the Water?
  - Missing Macroinvertebrates
  - That's Predictable

Classroom Activity:

1. Ask the students to define the term biodiversity, *(biological diversity in an environment is indicated by numbers of different species of plants and animals).* Ask the students to give a biological, aesthetic, ethical, social and economic reason to maintain biodiversity.

2. Discuss with the students how biodiversity may change due to a change in the ecosystem. Ask the students if a change in biodiversity is always negative. Specifically, discuss with the students the different impacts of a dam on the biodiversity of the river system and surrounding plant community.

3. Divide the students into eight groups. Tell the groups they will be assigned different roles as community members in a community that is proposing the construction of a dam on the river in their area. See the Resource page for community roles and helpful worksheets.

4. Tell the students that they will be holding a debate on whether the dam should be constructed or not. The students will need to discuss their role in the community and, based on their assigned role, debate on whether or not they support the construction. Remind the students to keep in mind the idea of maintaining biodiversity when preparing their debate (e.g., is biodiversity something they value or not?).

5. To help this activity run smoothly, assign one student the role of facilitator. They would be in charge of coming up with a list of questions to keep the dialog moving. Alternatively, the teacher may play this role.

6. You may want the students to come up with their positions in a short amount of time, or have them research their positions further as an assignment and hold the debate another day.

ACTIVITY EXTENSIONS:
• Have the students research actual case studies (or follow a local situation in the news) where two parties have had conflicting views about a natural resource/biodiversity issue.
• Have the students interview people in their community about their thoughts on dams in relation to biodiversity.

Applying the Information:

• After the debate, have the students write a brief summary of the arguments presented.

• Have the town vote on whether the dam should be constructed.

• Have the town consider alternatives or strategies for reducing negative impacts of a dam.

Further Discussion:

1. What impacts could a dam have on the biodiversity of terrestrial plant communities?

• *Increased agriculture may replace native plant communities with monocultures (e.g., fields of corn).*

• *Reduced or eliminated flooding events downstream of reservoir may harm native riparian communities. These communities depend on floods for seed germination, replenishing soils with nutrients and to increase shallow groundwater.*

• *Diversion of irrigation water to canals may create new riparian areas along these new waterways.*

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2. What impacts could a dam have on the biodiversity of fish populations?

• The reservoir provides new habitat for fish and invertebrates and often results in a new sport fishery.

• Large reservoirs in big rivers such as the Columbia and Snake disrupt migration patterns of salmon. Salmon have evolved to migrate during the high flows of spring runoff from the high mountain areas to the ocean. When a dam is introduced into the system, the salmon start down the stream and are stopped by a reservoir. The reservoir slows the fish, and delays their arrival at the ocean. As salmon travel to the ocean, their bodies change to allow them to live in a salt water environment. When the migration is slowed, these changes occur before they reach the ocean, which can be fatal to the fish.

• Changes in downstream fish communities will depend on the temperature of the water released from the reservoir.

• If cold, deep water is released from the reservoir, downstream temperatures may be too cool for native warmwater fish, because the cool temperatures slow the development of eggs and young.

• BUT, cold water releases from reservoir may create a trout fishery below the dam where none existed before.

3. How might a dam affect the physical structure of a river system?

Reservoirs are natural sediment traps, so downstream of the dam, the water may be much clearer. This may cause loss of beaches and gravel bars, but may allow aquatic plants and trout fisheries to thrive. When a dam causes a stretch of river to dry up completely, all invertebrates and fish are lost from that area. Canals do not typically have water year round, so they do not create similar habitat.

4. What impacts could a new dam have on diversity of birds and mammals?

• Reservoirs would provide new habitat for ducks and other waterfowl.

• New wetland areas near their inflows may also be created, providing new habitat for mammals and shorebirds.

• A new reservoir would flood existing habitat.

Community Role

Worksheet

Name: _____
Date: _____

Community Role: _____

Benefits of the River	Benefits of the Dam/Reservoir

Do the benefits of the river outweigh the benefits of the dam? _____

How does your position relate to biodiversity? Is it important to you? Why or why not?

Student Roles

For Dam Construction		Against Dam Construction	
Farmer	Wants sustained flows for irrigation.	Tax payers	Don't want to pay for it.
Local business owner	Increase in tourism will help business.	River guides/rafters	Companies will lose business. Rafters and kayakers want the river.
Electric company	Will sell electricity produced by dam.	Conservationist groups- concerned with native species	Change in ecosystem up and down stream. Loss of native species.
Recreationists -houseboats, and lake fishing	Excited about having a reservoir in the local area.	River front property owner	Will lose prime area for summer home. Doesn't want to lose the view of the river.
Water district	Would use water to supply drinking water for urbanizing areas.	Local Hiking Club	Don't want to lose the trail access along the river.

Websites for further information:

Tennessee Valley Authority - www.tvakids.com/environment/cleanwater_dams.htm

The Nature Conservancy - http://www.nature.org/ourinitiatives/habitats/riverslakes/index.htm

Bureau of Reclamation - http://www.usbr.gov/projects/

EPA - http://water.epa.gov/type/watersheds/index.cfm