**Teacher Background**

Cross Currents

The land immediately adjacent to a river or stream plays a large role in determining stream water quality. This land is called the river's "riparian zone." Not surprisingly, human activities alongside the river can profoundly alter the river and its riparian zone.

The student text discusses some of the ways rivers are impacted in rural settings. These include access of livestock to the stream, alterations to the water channel, removal of streamside vegetation, and contamination from septic systems, animal waste and agricultural chemicals.

In urban areas, problems like these are usually compounded by surface drainage from roads and pavement, and by the contaminants carried in this stormwater. Often urban streams are simply obliterated by other land uses while surface water is carried away in storm drains.

Miraculously, despite these assaults, many streams in both rural and urban areas can and do support salmon and other aquatic life. Other streams could too if problem areas were identified and corrected. You and your students are encouraged to identify a local stream as a possible "adopt-a-stream" project. The references given at the end of this section will provide you with the information you need to do this.



Lesson Plan

Cross Currents

Student Objectives:

Students will examine some ways that rural land use along a river can affect fish living in the river.

Materials:

- One copy per student, CROSS CURRENTS
- One pair scissors per student
- Glue

Procedure:

You may use the student text as a classroom reading or as homework prior to the classroom activity, WARMING IT UP.

As in other parts of this guide, the student questions are intended more to provoke thought than to necessarily result in "correct" answers. Be sure to discuss the questions with your class.

Answer Key:

1. River mile 0 is located at the point where the North and South Forks flow together into the main channel.
2. Land has been disturbed by farming, road building, timber harvesting and construction projects, resulting in soil erosion into rivers. Over time, this has changed the composition of the river bottoms from gravel to silt.
3. Salmon eggs can be washed downstream.
4. Along overhanging banks, under submerged logs, under low-hanging tree limbs and roots; anyplace that offers cover for little fish.
5. Livestock has direct access to the stream. Animals trample down the bank and cause soil erosion into the stream. They also contaminate the water with their wastes.
6. Fence off the stream and provide a buffer, that is a strip of natural vegetation along the riparian zone.

LESSON PLAN

7. Accept all reasonable configurations which keep livestock from walking directly in the stream.
8. pesticides, herbicides, and fertilizers
9. A buffer of vegetation slows down surface water carrying contaminants and directs it down into the soil. In the soil some of it is broken down or taken up by plants. Less enters the stream.
10. Salmon eggs and fry need the "cover" or protection of the river's natural bottom and banks. They need a gravel bottom and natural vegetation to hide in while small. These are easily destroyed by efforts to contour a river. Changing the river's course can also make the water flow faster, possibly washing eggs and fry away altogether.
11. Students will probably cite pollution. You can help them understand that it comes not only from industrial sources but from the contaminants in surface drainage off of roads and pavement. Oil, antifreeze, and organic solvents are among the highly toxic "non-point" contaminants which don't have easily identifiable points of origin.

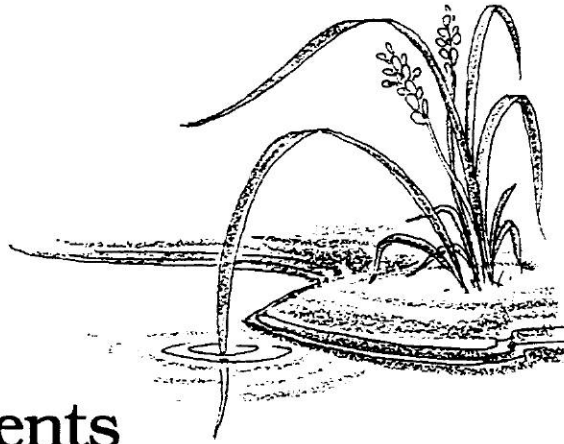
One Step Further:

CROSS CURRENTS covers the topic of streamside management only very lightly. You, however, may be interested in pursuing this subject further with your class, especially if there is a stream near your school. In recent years a number of Washington teachers have initiated some very innovative and highly effective stream adoption programs with their students. Activities have often involved surveying a stream to determine its condition and taking steps to rectify problems. Some schools have even become involved in raising fish to enhance fish stocks in the stream, in cooperation with the Washington Department of Fisheries.

The Adopt-A-Stream Foundation is an excellent local resource for teachers and community groups looking for information or ideas on how to become more involved with stream enhancement. The Adopt-A-Stream Foundation has recently released a new book, *Adopting A Stream: A Northwest Handbook*. This useful book gives directions for many kinds of stream enhancement projects, plus several case studies which illustrate the variety of things done by classrooms around Puget Sound. It also lists the names of many other organizations which can provide valuable information and help.

Steve Yates, *Adopting a Stream: A Northwest Handbook*. Seattle and London: University of Washington Press, 1988.

The Adopt-A-Stream Foundation
Box 5558
Everett, WA 98201



Cross Currents

Are you remembering to mark the movement of the salmon on your SKOKOMISH WATERSHED MAP? The returning school is now approaching river mile 3 on the river's main channel.

If you look closely at the watershed map, you will see small numbers along the river. These numbers mark the distance in river miles from each location to the river's mouth.

Farther upriver, near river mile 8, two smaller rivers flow together. These rivers are called the Skokomish North Fork and the Skokomish South Fork. Up which fork would we find river mile 9? In this case, the numbers from the main channel below continue up the North Fork. On the South Fork, the river mile numbers start all over.

1. Where would you expect to find river mile 0 on the South Fork?

Use a sharp pencil to fill in the missing river mile numbers on the South Fork.

Hyak is searching the river. She is looking for just the right conditions for salmon eggs and young salmon fry. Does this river have everything else Hyak and her young will need? Here are some of the things she is looking for.

First, Hyak needs a river bottom covered with coarse gravel. The gravel will protect the eggs but allow water to circulate around them. Years ago, before people began disturbing nearby soil, nearly all rivers around Puget Sound had gravel bottoms. Today, many rivers are filled with silt.

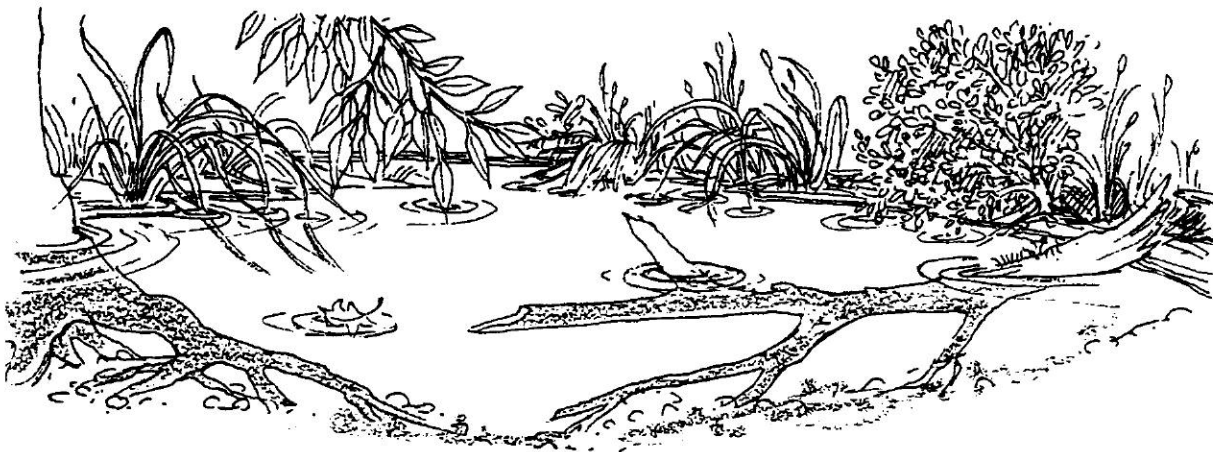
2. What human activities are taking place today which might cause more soil to erode into rivers now than 200 years ago?

Second, the water must be flowing quickly -- but not too fast. A rapid flow keeps the eggs clean and brings oxygen to them. But please, not too fast!

3. If the water speed is too fast, what could happen?

Third, the eggs and later the young salmon fry need shelter as they develop.

4. Where could small fish find shelter in this stream?

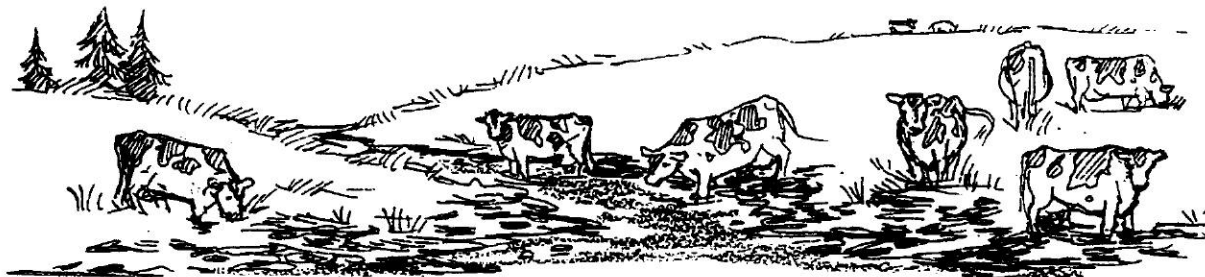


Finally, as you probably suspect, Hyak's eggs and young need clean water, water which has not been contaminated with chemicals, animal waste, or human sewage.

Before we look closer into the river environment, an important term to know is "riparian" zone. A river's riparian zone is the wetland alongside the river. It is not actually under water, but it is still a very important part of the river to animals and plants of the river.

Whether or not salmon eggs can survive depends a lot on how people are using the riparian zone. Let's take a look at some things happening along the river as it passes some small farms.

On some farms we still see scenes like this:



- 5. What's wrong with that picture? Why is this especially bad for salmon?**

- 6. What could a farmer do to keep livestock from walking in the stream?**

- 7. At the end of this section are some small pictures for you to use to show how this problem can be corrected. Cut and paste the pictures in an arrangement which illustrates one way the stream could be protected from livestock. (Or if you prefer, show this with a drawing of your own.) Use the rest of this page for your work.**

- 8.** Recall that everything put on the ground in a watershed eventually gets into the river. What kinds of chemicals, used on crops, might also get into the river? (You may be able to name several.)
- 9.** How could vegetation in the riparian zone keep some of these chemicals from washing into the water?

From time to time the river floods its banks. Farmers downstream have tried to protect their land from flooding by digging the riverbottom deeper. They have also tried building up the river's sides to keep it in its banks.

Sometimes people even change the path of a river. Winding streams are straightened so that more land can be used for agriculture. This often makes the water flow faster.

- 10.** How could these changes create problems for young salmon in the river?
- 11.** The problems faced by Hyak and her young are common on rivers which flow through rural areas around Puget Sound. What other problems might salmon face in rivers flowing through cities like Seattle, Tacoma, Everett, or Olympia?

We have discussed four conditions which must be met for Hyak's young to survive in this river. Here is a fifth.

The water must be cold. Salmon can only grow in water less than 68 degrees F. They prefer even colder water.

In the next activity, **WARMING IT UP**, you will investigate one of the reasons water temperature is so important for healthy fish.



