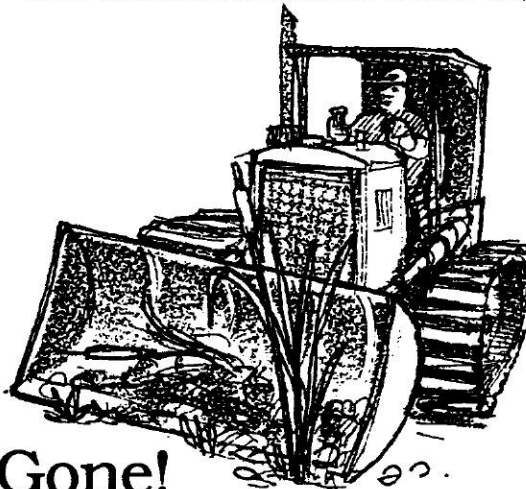


Teacher Background



Going, Going, Gone!

Despite the critical link they provide for salmon, crab, and other species, estuaries are under intense pressure for development, as the students will learn in the lesson, GOING, GOING, GONE! Urbanization has taken a major toll on estuaries nationwide, and throughout Puget Sound, waterfront is coveted for a range of industrial, transportation, recreational, and residential activities. More than 60% of Puget Sound's estuarine wetlands have already been destroyed by such development. Today development projects are given close scrutiny when larger wetlands are likely to be impacted, however our once ubiquitous smaller wetlands are faring less well. At this time, there is still little protection in Washington State for this important habitat.

Lesson Plan

Student Objectives

- Students will discuss reasons for the high productivity of coastal environments, and estuaries in particular.
- They will examine a waterfront development conflict to understand why many estuarine wetlands are destroyed.
- They will identify Puget Sound rivers which have lost significant amounts of estuarine wetland to development in recent years.
- They will discuss the effects of these changes on salmon.

Materials

- Graphics:
 - PRODUCTIVE ECOSYSTEMS
 - SKOKOMISH RIVER DELTA
- One copy per student, GOING, GOING, GONE!

Procedure

1. To emphasize the importance of estuaries to life in the sea, show your students the graphic, PRODUCTIVE ECOSYSTEMS. Explain that the pie-chart represents the total area of the Earth's ocean surface. The small slice represents the less than 1% which are coastal environments. The columns represent the primary productivity of each environment per unit area. Primary productivity refers to the amount of

LESSON PLAN

plant material produced in an environment. Ask the students what could make the water along the coasts so rich in life?

2. As a clue, show them the transparency of the Skokomish River delta. Ask them to look at the fan-like pattern made by the river channels as it flows into the water of the canal.

From examining the chart, can they tell you what the bottom is like near the Skokomish River mouth. The stippled area, representing mud is labeled on the chart.

Discuss where so much mud could have come from. *(It was carried down the river.)*

Does this provide any clues about the high productivity of an estuary?

(Rivers carry suspended material from the entire river basin. This runoff is high in the nutrients which plants require. Mixed with seawater, it creates a rich "estuary soup" that nourishes the algae, plankton, and eelgrass of estuaries.)

3. To highlight the conflicts we residents of Puget Sound are having over development of wetlands, give your students a real-life situation to consider. Use a shoreline development conflict from your own community, or choose one of the following scenarios. Divide your class into two groups. One group will represent the people who would like to see the development take place, while the other group will represent the environmentalist position. Give the students some time to brainstorm arguments for their position, then take turns hearing arguments from each side. When all argument have been stated, have the students decide by a vote which side had the stronger argument.

Possible scenarios:

Many people in a waterfront town want to expand the size of its port so that larger ships can come to its shipyards. If this happens, more people could have jobs repairing boats, and the new port would have space for many more tourist boats too. But, to expand the port, the harbor must be deepened to make room for bigger ships. This development would cause an eelgrass meadow offshore to be destroyed and nearby marshlands along the shore to be lost. What should the town do?

The scenic mouth of a Puget Sound river has become a popular location for new home sites. Because flooding is occasionally a problem, residents have been asking the town to control the water level by digging the channel deeper and covering the shallow marsh land along its banks with fill dirt. This practice makes more room for houses, but it's causing the area within the estuary to shrink.

Community leaders of a small town have been encouraging an out-of-town developer to build a new shopping center on part of its old, neglected shoreline. Supporters of the project say this development will bring more tourists into the community where they will spend money in local businesses. However, the planned shoreline changes would destroy a rich offshore eelgrass meadow.

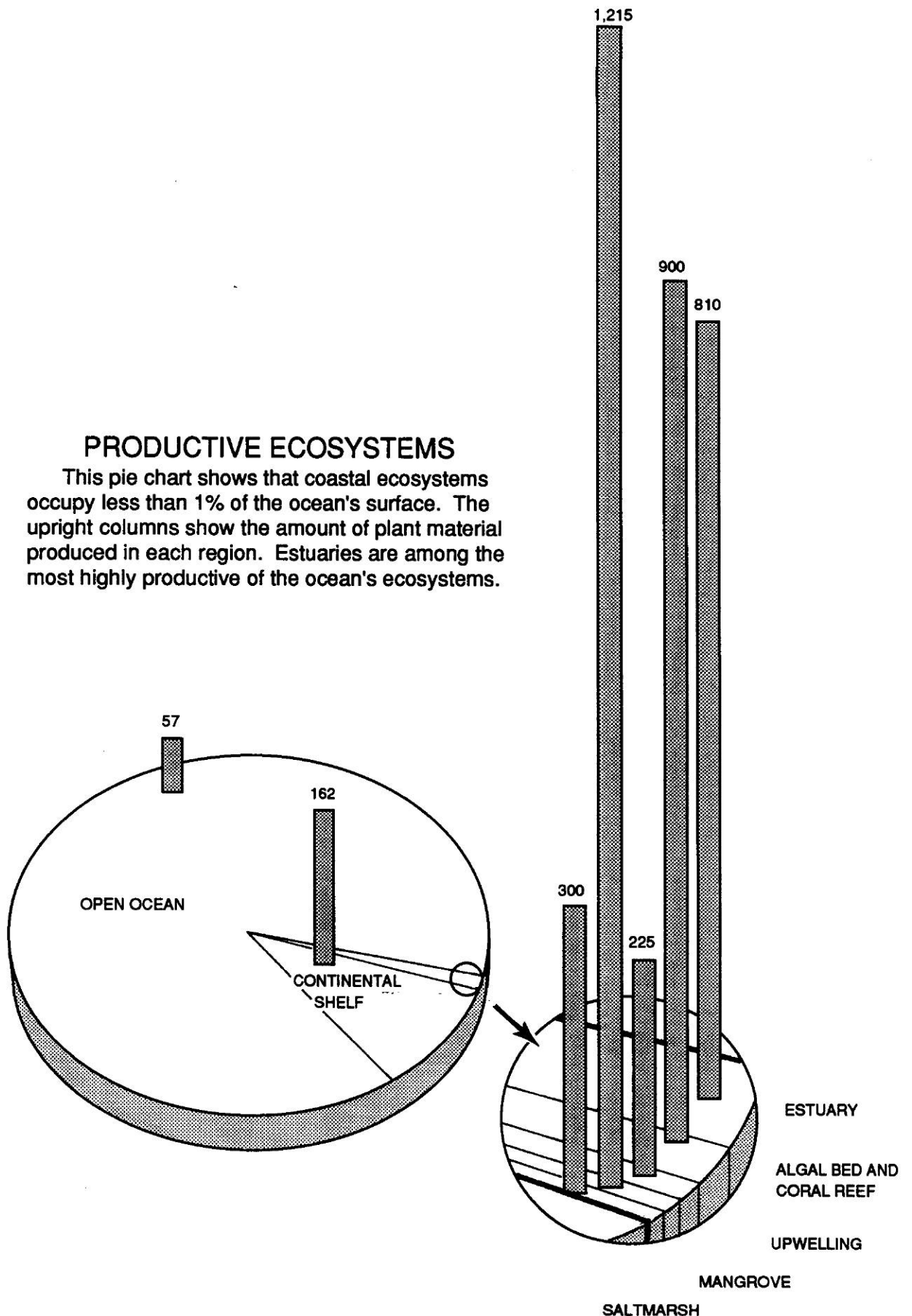
4. Have your students finish by reading the student text, GOING, GOING GONE! After they have answered the questions, you may want to discuss their answers as a class.

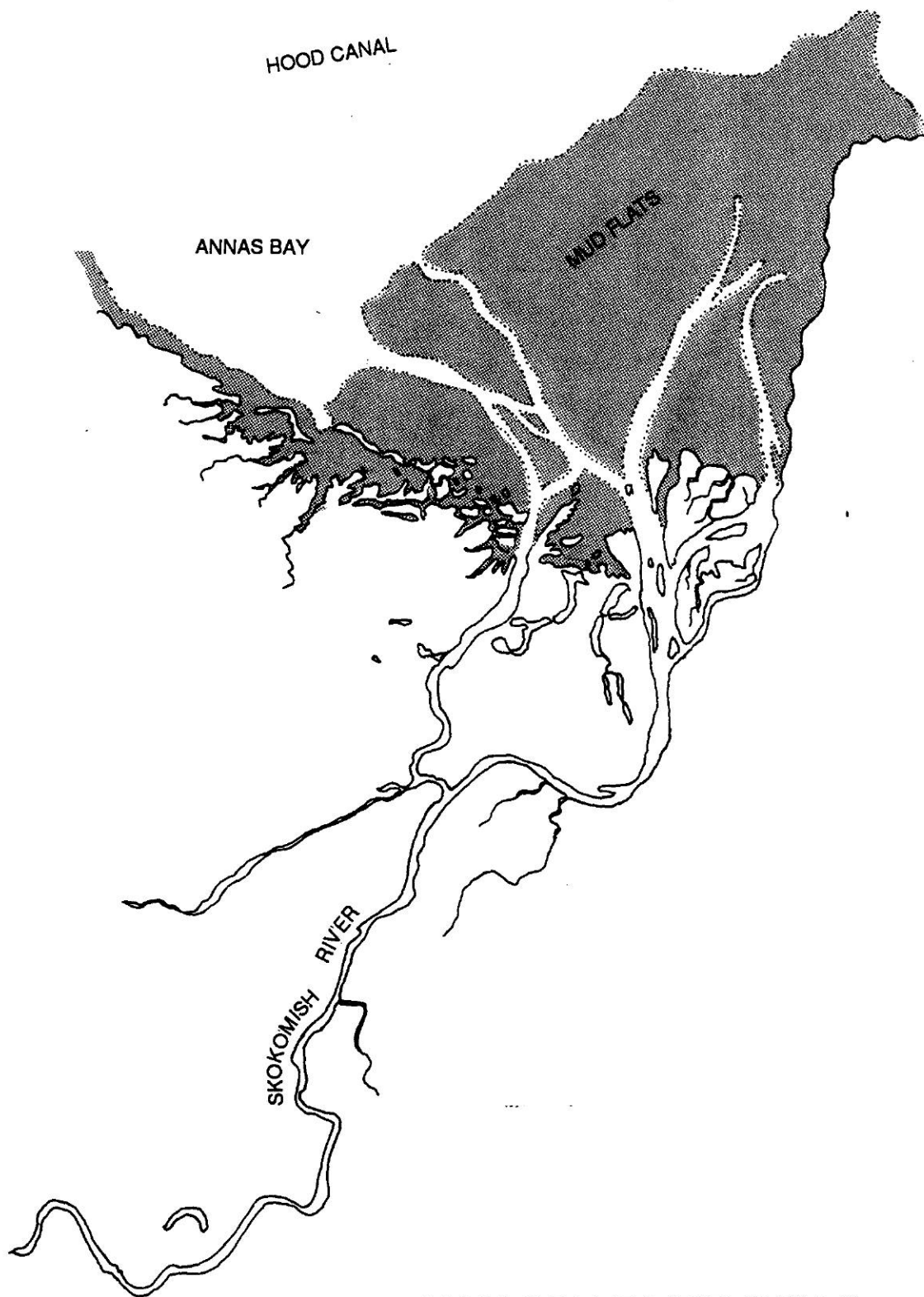
Answer Key:

1. The Lummi, Sammish, Skagit, Stillaguamish, Snohomish, Duammish, and Puyallup have lost more than 50% of their estuarine wetlands.
2. The Sammish, the Duwamish, and the Puyallup have lost more than 95% of their wetlands.
3. The Skokomish and the Nisqually have lost less than 50% of their wetlands.
4. This thinking is wrong because it ignores the needs of salmon after they leave the hatchery. Salmon need food and shelter from rivers and estuaries. If these environments are not protected, all the hatcheries in the world will not guarantee the survival of Pacific salmon.

PRODUCTIVE ECOSYSTEMS

This pie chart shows that coastal ecosystems occupy less than 1% of the ocean's surface. The upright columns show the amount of plant material produced in each region. Estuaries are among the most highly productive of the ocean's ecosystems.



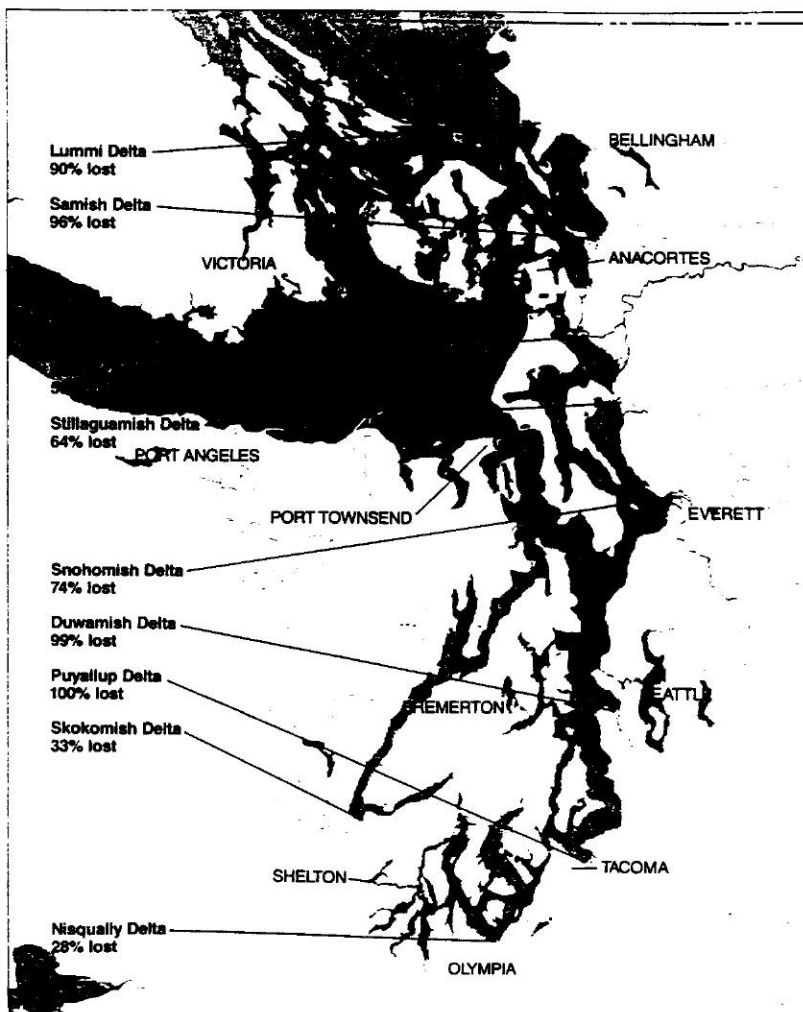


SKOKOMISH RIVER DELTA



Going, Going, Gone

In the past we called wetlands "swamps" and filled them to make solid ground for our developments. Now we know how important they are for fish and wildlife. Even so, large amounts of Puget Sound's original wetlands have already disappeared. The map below shows how much of our wetlands have already been lost at the mouths of Puget Sound's nine largest rivers.



LOSSES OF WETLANDS FROM MAJOR RIVER DELTAS
IN THE PUGET SOUND REGION

State of the Sound 1988 Report

- 1. Which rivers have lost more than half their wetlands?**

- 2. Which rivers have lost more than 95% of their original wetlands?**

- 3. Of these nine large rivers, which two still have at least 50% of their original wetlands?**

- 4. For years people believed that as long as they built fish hatcheries, they could eliminate the places salmon live, such as estuarine wetlands. What is wrong with this way of thinking?**