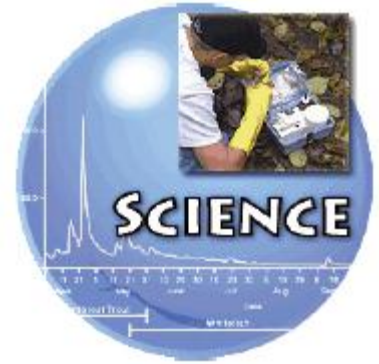


# LESSON 5: SEDIMENT DEPOSITION AT THE SEA



## ESSENTIAL QUESTION:

What combination of factors both natural and manmade is necessary for healthy river restoration and how does this enhance the sustainability of natural and human communities?

## GUIDING QUESTION:

As rivers carry sediment to the sea different sediment structures are formed along shorelines, how is sediment important to both river and the shoreline ecosystems?

## OVERVIEW:

The focus of this lesson is depositional and erosional effects as rivers meet the sea. As a river meets the sea, the sediment it carries is deposited in a fan-like formation called a delta. As longshore drift picks up and transports the sediment, it can be carried and deposited down current to form shoreline sediment features such as sand bars, spits, and barrier islands. These sediments can protect areas behind them from the effect of ocean waves to form estuaries, salt marshes, and lagoons. Features such as headlands and sea stacks can intercept and deflect the currents, allowing sediments to be deposited on beaches in sheltered coves.

## TIME:

One class period

## MATERIALS:

- **Lesson 5- Sediment Deposition at Sea.pptx**
- **Lesson 5a- Sediment Deposition at Sea.pdf**
- Stream Table
- Sand
- Reflection journal pages (printable handout)
- Vocabulary Notes (printable handout)

## PROCEDURE:

1. Review Essential Question and introduce Guiding Question.
2. Students should take a few minutes to respond to the reflection prompts. Discuss their answers and any questions they've generated.

3. Hand out Vocabulary Notes. Review the words. Students along with teacher can define words as they watch the PowerPoint Lesson.
4. Present PowerPoint Lesson
5. Run Demonstration on Stream Table of a low-gradient mature river entering stagnant water
6. Show features such as braiding, delta formation, and longshore drift
7. Hand out the second Reflection Journal Page. Give students time for a final reflection on the lesson.

## ASSESSMENTS:

## WASHINGTON STATE STANDARDS:

### SCIENCE

1. **EALR4: 6-8 ES3A** Our understanding of Earth history is based on the assumption that processes we see today are similar to those that occurred in the past.
  - a. Describe Earth processes that we can observe and measure today (e.g., rate of sedimentation, movement of crustal plates, and changes in composition of the atmosphere) that provide clues to Earth's past.
2. **EALR 4: 6-8 ES2G** Landforms are created by processes that build up structures and processes that break down and carry away material through erosion and weathering.
  - a. Explain how a given landform has been shaped by processes that build up structures and by processes that break down and carry away material.

### READING

1. **EALR 1:** The student understands and uses different skills and strategies to read.
  - a. **Component 1.2** Use vocabulary (word meaning) strategies to comprehend text.

### SOCIAL STUDIES

1. **EALR 5:** The student understands and applies reasoning skills to conduct research, deliberate, form, and evaluate positions through the processes of reading, writing, and communicating.
  - a. **Component 5.2:** Uses inquiry-based research.

### WRITING

1. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.
  - a. **Component 2.1:** Adapts writing for a variety of audiences.

**ADDITIONAL RESOURCES AND ENRICHMENT:**

Barrier Island

<http://science.howstuffworks.com/barrier-island.htm>

Sea Stacks

<http://walrus.wr.usgs.gov/pubinfo/jump.html>

<http://www.bennett.karoo.net/topics/waves.html#headland>

## VOCABULARY TERMS:

- **Delta:** As a river encounters a stagnant body of water, such as a lake or the ocean, the sediment load is deposited. The river will spread out across this delta into multiple channels, due to the meanders through this deposited sediment. Rivers with less sediment will form rounded fans (Nile), as the sea erodes its edges.
- **longshore drift:** The movement of sediment down shore in a common direction caused by the combination of the ocean currents, wind direction, tidal movements, and oblique wave action on the shore.
- **Beach:** The zone above the water line at a shore of a body of water, marked by an accumulation of sand, stone, or gravel that has been deposited by the tide or waves.
- **spit:** A long sandbar that heads far out into the ocean, formed by longshore drift. They often grow in length in the direction of the current and can form lagoons or salt marshes behind them.
- **sand bar:** A strip of land formed by deposition of sediment via longshore drift or at the mouth of a river.
- **barrier island:** - A sandbar disconnected from the land. They form due to longshore drift and protect shallow brackish bays or salt marshes behind them. They general form in areas of low shore gradient.
- **Lagoon:** A shallow body of water, especially one separated from a sea by sandbars or coral reefs.
- **tombolo:** A spit or sandbar which connects an island to the shore.
- **headland:** An extension of land that juts into the sea from the coastline. Often it is made of materials resistant to erosion.

- **sea stack:** An island of rock resistant to erosion, that is left behind, as the erosional action of the sea erodes into the surrounding material. They are often formerly connected to headlands.
- **Ria:** A flooded river valley from the ice age when sea level was lower (Grays Harbor or Chesapeake Bay)
- **Cove:** - A sheltered bay with headlands on two sides where sediment can be deposited.

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### DEMO:

Using a stream table, demonstrate the formation of a delta by plugging the drain to form a lake. With the river flowing, watch how the sediment is deposited in the lake. While draining the lake, show how the delta moves downstream again as the lake level drops and the gradient increases.

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### EXPERIMENT

*(I have never tried this.)* Using the stream table, fill half the table (long side) with sand to represent the coastline and the other side with water (lower level than the sand) to represent the sea (with drain closed). Rather than a straight shoreline, having it contain features like headlands jutting out and coves. Very slowly turn on the water spout and release the drain so that the rate of flow into the water is equal to that draining. As the current slowly flows across the table, it should take sediment downstream and deposit it in areas where the current is slower to demonstrate longshore drift.



**Elwha River Restoration  
Sediment Deposition at the Sea  
Reflection Journal 1**

As rivers carry sediment to the sea different sediment structures are formed along shorelines, what kind of sediment structures have you seen or visited and did you build a sand castle?

What questions do you have about sediment structures along shorelines?



**Elwha River Restoration  
Sediment Deposition at the Sea  
Vocabulary Notes**

**Delta:**

**Longshore drift:**

**Beach:**

**Spit:**

**Sandbar:**

**Barrier Island:**

**Lagoon:**

**Tombolo:**



**Headland:**

**Sea stack:**

**Ria:**



**Elwha River Restoration**  
**Sediment Deposition at the Sea**  
Reflection Journal 2

How do you think sediment and sediment structures are important to the river and shoreline ecosystems? Does sediment need to be controlled? How and why?

What additional questions do you have about sediment and sediment structures?