OIMB GK12 CURRICULUM

3rd Grade **45 minutes**

MARSHES AS FILTERS

Oregon Science Content Standards:

3.1 Structure and Function: Living and non-living things vary in their characteristics and properties.
3.2 Interaction and Change: Living and non-living things interact with energy and forces.
3.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations and investigations.
3.4 Engineering Design: Engineering design is a process that uses science to solve problems or address needs or aspirations.

Ocean Literacy Principles:

5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.

Goals:

- Students recognize that different types of pollution enter estuaries via runoff, and that marshes are important filters, removing some pollution.
- Students gain experience working with a model.
- Students practice using some steps of the scientific method.

Concepts:

- Pollutants include trash, oil, nutrients, etc. that are out of place.
- When it rains, pollution can wash from the land in runoff.
- Marshes on the edges of estuaries are important in filtering out pollutants.
- Marshes are better at filtering some pollutants than others

Materials: It is suggested that students work in groups of 4.

- Trays (1 per group)
- Jars with wide openings to attach coffee filters and collect runoff (1 per group)
- Coffee filters (1 per group)
- Rubber bands (2 per group)
- Stir sticks (1 per group)
- Small pieces of paper and plastic (small pile per group)
- Seasoning, e.g. dried parsley flakes (approx 1 T per group)
- Vegetable oil (about 3 tablespoons per group)
- Food coloring (1 drop per group)

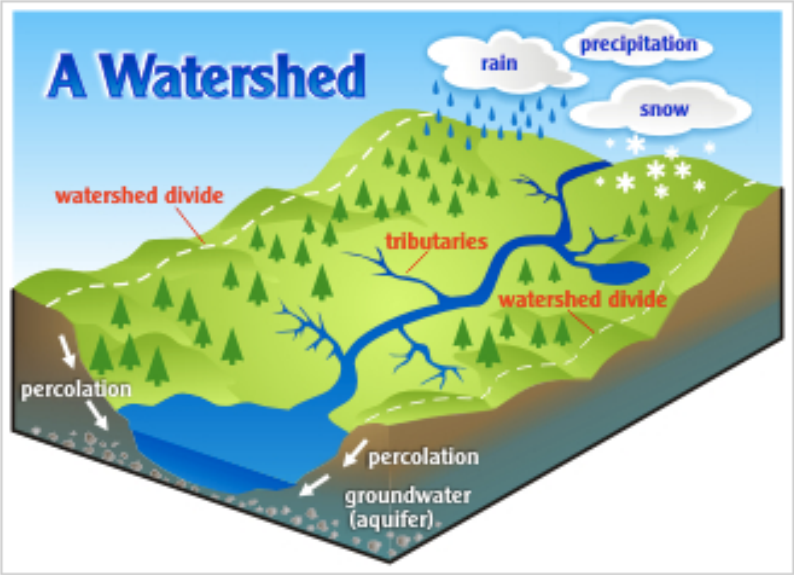
- Water (1 cup per group)
- Small plastic cups to hold paper and plastic pieces, seasoning, oil and water (4 per group)

Lesson plan:

1. Ask what students know about pollution. What does 'polluted' mean? *Pollution is the introduction of contaminants that cause harm to physical systems or living organisms. Pollution can take the form of chemical substances or energy, such as noise, heat, or light.*
2. Draw a diagram of a watershed on the board and add the different parts (label a mountain, valley, river, estuary, and ocean, and add cities, roads, farms etc.)

What is a Watershed?

A watershed is an area of land that drains to a common location. A watershed can vary in size, they can represent the area draining to a small stream to the entire are draining to an ocean. See the diagram below.



Reference provided by: http://www.depweb.state.pa.us/justforkids

3. How does pollution enter the estuary? *(Direct discharge, but also run off from cities, roads, farms etc.)* Indicate on the watershed the different land sources of pollution (e.g. cities, roads, farms). How does the pollution get into the water? *(flows downhill when it rains)*
4. Ask students where the marshes are *(marshes grow along the edges of estuaries)*. Add marshes to your drawing on the board, in between the land and water.

5. Explain that marshes help keep the estuary and ocean clean by filtering out pollutants before they enter the bay. *Marshes act as both physical and biological filters. They slow water flow, allowing pollutants to be filtered out and broken down. (Marshes act like a filter in a fish tank.)*
6. Explain reasons we use models, and the model the students will make. *We can't bring an actual estuary into the classroom, but the students can make a model of one. They will make a model to represent an estuary, and conduct an experiment to understand how marshes can be filters. Point out that models have limitations. After the experiment—ask the students what was well represented by the model and what wasn't.*
7. Pass out the worksheets and show the materials the students will use. Have the students guess what each material will represent in the model. Make sure students label the models on their worksheets.
    - Jar- bay/ocean
    - Filter- marsh
    - Paper and plastic pieces- garbage/litter
    - Seasoning- plant debris
    - Vegetable oil- motor oil
    - Water- precipitation
    - Food coloring- chemical pollutants (fertilizers and other chemicals)
8. Have the students predict what will happen to the paper and plastic pieces, seasoning, vegetable oil, water and food coloring. Go over their predictions.
9. Explain the rest of the worksheet (where/how students should draw their observations and mark "x" to show results.)
10. Assign roles within the groups (best to work in groups of 4): engineer (designs and builds the model), polluter (adds pollutants to model), EPA agent (clean up!) and rain (pours water). Pass out all materials.
11. Conduct the experiment.
    1. Have the engineer put the filter over the mouth of the jar using rubber bands.
    2. Have the polluter add the substances one at a time (paper and plastic pieces, seasoning, vegetable oil and food coloring).
    3. After each addition, have the rain pour water into the estuary model. After each addition to the model, make sure students draw their observations and record the results.
    4. Remove trays and have the EPA agents help clean up by pouring used water into the sink and throwing away used filters. Point out that it is often better to prevent a mess than clean one up!
12. Discuss what happened. What were the results? Which pollutants went through? Which were filtered out? Why? What do you think this means in an estuary?

Why are pollutants bad for the estuary? What can you do to reduce pollution?
Why are marshes important? *(habitat, role as a filter)*
Stress the role of marshes in blocking debris and litter from entering estuary waters as well as removing chemicals and fertilizer runoff.

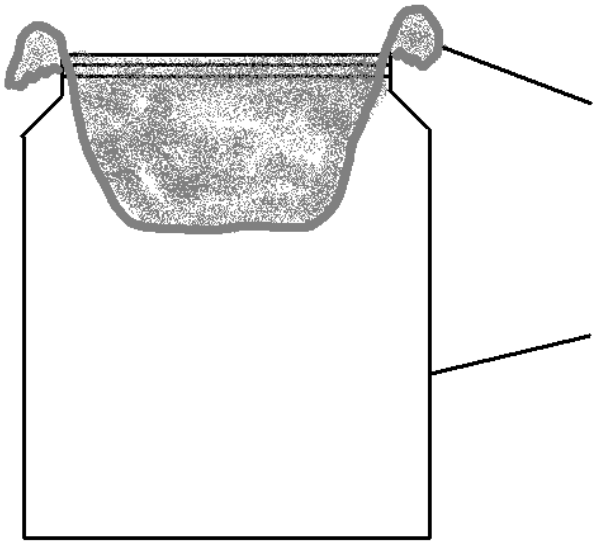
13. Point out that the model is limited. *Marshes are better filters because they slow down water flow, allowing some pollutants to settle out. Salt marsh plants use some excess nutrients in the runoff and bacteria on the roots of the plants also help break down some pollutants.*
14. Ask how the model could be improved.

Assessment: model and worksheet

GK12 Fellows: Jim Trainer, Erin Morgan and Kira Treibergs

Name:_____ **Marshes as Filters**

Part 1: Look at the picture below. What does each part of our model represent? Write what each item represents in the blank



Coffee filter = _____

Jar = _____

Paper and plastic pieces = _____

Seasoning = _____

Vegetable oil = _____

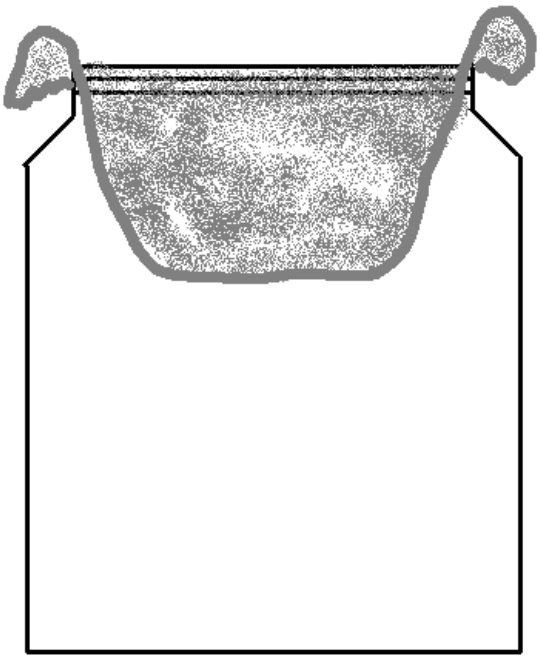
Water = _____

Green dye = _____

Part 2: Make predictions. What will happen to each pollutant? Put an "X" in the box.

Pollutant	Sit on top	Get stuck	Go through
Paper & plastic			
Seasoning			
Vegetable oil			
Green dye			

Part 3: Draw your observations. Color in the picture to show what happened to each pollutant



Part 4: Show your results. Where did each pollutant end up? Put an "X" in the box.

Pollutant	Sat on top	Got stuck	Went through
Paper & plastic			
Seasoning			
Vegetable oil			
Green dye			

Name:_____KEY_____ **Marshes as Filters**

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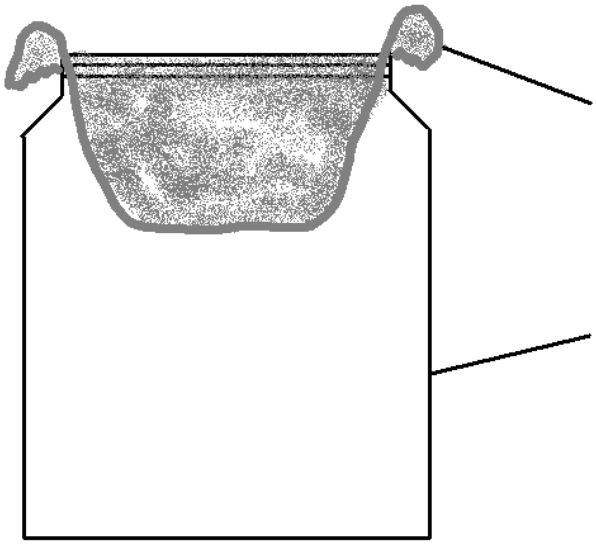

Coffee filter = Marshes

Jar = Bay/Ocean

Paper and plastic pieces = Litter/garbage

Seasoning = Plant debris

Vegetable oil = Oil- from cars and boats

Water = Rain (precipitation)

Green dye = Fertilizers and chemicals