8th Grade Unit: Macro to Micro, a Look at the Salish Sea Watershed

Objectives

Over the course of this unit students will:

- Create a model of run-off pollution in a watershed system and its effects on the organisms within it.
- Define problems of watershed resilience and take action to improve their impact on the ecosystem.
- Observe the relationship between water quality and organism population.
- Assess how water quality impacts organism populations in an ecosystem.
- Understand the concept of indicator organisms
- Learn basic life history information on the marine mammals of the Salish Sea.
- Learn about potential hazards to marine mammals living in the Salish Sea and potential solutions.
- Design solutions to minimize human impacts on watershed health.
- Design a monitoring plan for assessing the health of a waterbody

Background

This unit focuses on the human impacts to the biology and chemistry of the Salish Sea Watershed. The structure of this unit was based on the integration into the Carolina Biological Macro to Micro lessons as a way to further the scaffolding of GSSC lessons into the Blaine School District curriculum. The goal of this unit is to empower students to become stewards of their environment and become more familiar with the ecosystems in their backyard.

Lesson	**Time**
Paper Watershed Model	30 minutes
Aquatic Microscopy	90 minutes
Cain Creek Water Quality and Macroinvertebrates (walking field trip)	30 minutes
Marine Mammals (WMMSN led)	120 minutes
Watershed Design	30 minutes
Unit Reflection	10 minutes

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Next Generation Science Standards

Performance Expectations
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.] MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.] MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Asking questions and defining problems Obtaining, evaluating and communicating information Analyzing and interpreting data Engaging in argument from evidence Developing and Using Models Constructing explanations and designing solutions	LS1.A: Structure and Function LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycle of Matter and Energy Transfer in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience ESS3.C: Human Impacts on Earth Systems	Stability and change Patterns Cause and effect System and system models Energy and Matter Scientific Knowledge Assumes an Order and Consistency in Natural Systems Influence of Science, Engineering, and Technology on Society and the Natural World

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Lesson 1: Paper Watershed Model

Subject

Watersheds

Objectives

The students will:

- Create a model of run-off pollution in a watershed system and the effects of the organisms within it.
- Define problems of the watershed resilience and take action to improve their impact on the ecosystem.

Materials

- Document camera
- Spray bottle
- Each person needs:
    - One half sheet of paper
    - One full sheet of paper
- Each group needs:
    - Clear tape
    - Red visa-v pen
    - Brown visa-v pen
    - Yellow visa-v pen
    - Black visa-v pen
    - Blue visa-v pen
    - Green permanent pen

Size/setting/duration

Full class in lab groups/Indoor/

Background

Learning about how water moves through the system helps students understand how their everyday actions can have an impact on the health of their watershed. This simple model introduces them to some common pollution sources to prepare them to take the Salish Sea Challenge and build new habits. While this model is extremely simple, it does a great job of showing students how the pollutants travel in the Salish Sea.

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Procedure

1. Begin the class by asking who has an idea of what a watershed is.
    a. While the name might make you think it is a shed with water, think of shedding like moving off (like a pet shedding hair). A watershed is the area of land that drains to a body of water.
    b. If you think of this in three dimensions you can almost picture a bathtub which sides are made up by peaks of mountains, all the water from this area "sheds" into one location.
2. How do you think that your actions might impact the health of your watershed? We are going to build a model watershed using paper.
    a. Note: teacher can either model it for the class and have the students do it independently or you can work through each step with the class. Using the document camera is helpful for this exercise.
    b. Everyone gets two sheets. Crumple one sheet & tape onto other – its smaller so keep to one side
    c. Draw your simple city on the flat area – add your name and quick and simple lines and boxes for streets and houses using pencil or pen.
    d. Using the markers add blue for water sources such as the ocean, rivers, lakes, and snowpack.
    e. Green markers represent vegetation like trees and grass. You can also add larger green areas for the forest on the mountain, a park in the city, and farms.
    f. Ask students for a show of hands for who owns dogs. One gram of dog poop (roughly the size of a marble) contains 23 million fecal bacteria. While the majority pick up after their pets, when they don't it gets added to the watershed.
    g. Red is going to represent chemicals like pesticides or fertilizers. This could be added by someone who uses fertilizer on their lawn or a farm that uses pesticides.

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h. In a town there are lots of cars. When people wash their cars in the driveway the soap is left behind. This is why it is better to go to a carwash where the soapy water is treated.
i. Cars also can leak oil or gas. This is more prevalent on roads or parking areas.
j. Once the models are complete the teacher can walk around with the spray bottle to add water to each model. Enough water should be added so that the pollutants travel into a pool on the model.

3. Have students compare their models. Consider locations of healthy and polluted water. Where would the students want to collect their drinking water in the model? Did some of the models end up with cleaner water than others? How does this model relate to the pollution in the Salish Sea?
4. Hand out the Salish Sea Challenge. This is a list of ideas for ways you can have a positive impact on the health of your watershed and decrease the amount of CO2 you are releasing. Take these home and make a commitment with your families to be stewards of the Salish Sea and practice watershed healthy habits. The back side of the worksheet has a table for students to log their actions and tally the number of times that it was completed. Students should be given at least two weeks to record their actions before turning the challenge back in. This helps us quantify the positive impact that your class and school have on the watershed!

Next Generation Science Standards

Performance Expectations		
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Asking questions and defining problems Developing and using models	LS2.C: Ecosystem Dynamics, Functioning, and Resilience	System and system models Cause and effect Stability and change

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Extension

Students can work with their families to assess their carbon footprint using a carbon footprint calculator. This can show families where they can change their habits to reduce their negative influence on the environment. This calculator has a middle school level option for students to use independently or in class. (The EXPLORE option does not require you to create an account).

There is also an optional extension worksheet to help students dive deeper into how pollution impacts the watershed.

Worksheet

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Salish Sea Watersheds Challenge

Be a Salish Sea Steward!

RECORD YOUR ACTIONS & YOUR FAMILY'S ACTIONS AT HOME

Discuss actions you AND your family will DO to keep our waters clean?

Use the table on the back of this sheet to tally each time you DO your action.

Are you meeting the Challenge?

Scoop the Poop! Pet and livestock waste pollutes water if allowed to RUN OFF, spreading disease and causes algal blooms.

- Scoop it! Bag it! Trash it! I WILL carry a bag and clean up after my dog on the street and in t he yard.
- I WILL encourage my cat to use a litter box, scoop the poop, bag it, and empty into the trash (not the compost bin).
- I WILL keep livestock away from creeks and ditches and scoop the poop.
- I WILL discourage wildlife by securing garbage cans, keeping pet food inside and not feedin g ducks and geese

Septic Sense! WE WILL maintain our septic system. Failing systems can cause, proper ty damage and water contamination.

- Keep septic system in top working order. Have it inspected regularly and get my tank pumped when needed.
- Spread out laundry and dishwasher loads to prevent overloading my septic system.

On the Water!

- WE WILL make sure the valve on the boat's holding tank is kept in the closed position.
- WE WILL never dump the holding tank into the water. WE WILL always use the pumpouts provided at the marina.

Pounding the Pavement!

- I WILL NOT dump toxic materials down storm drains or on the ground.
- WE WILL leave buffers of native vegetation at the base of hills and along the water's edge.
- WE WILL position gutters so that they drain rainwater onto grass or garden beds, away fro m **impervious** surfaces.
- WE WILL use **pervious** spaced paving stones, bricks, sand or gravel in our driveway and w alkways.
- We WILL minimize **impervious** surfaces when remodeling or building.

I WILL Conserve Energy & Reduce my Carbon Footprint!

- I WILL ride a bike or walk instead of driving.
- I WILL turn off lights, appliances, and computers.
- WE WILL put high energy-using items like water heaters on timers.
- We WILL buy local products and foods, **support our local farmers**.
- WE WILL plant trees, vegetation, and cover crops.

WE WILL Reduce, Reuse, and Recycle!

- We WILL minimize the use and purchase of plastics.

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Action	Number of times completed (can be tallies)

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Key

Watershed Model:

- Paper & tape = watershed
- Pencil = house, roads, your name
- Markers
    - blue = water (or snow)
    - green = plants
    - brown = dog poop
    - red = fertilizer & pesticides
    - **black** = oil & gas *(not too much!)*
    - yellow = car wash soap
    - Water spray = Rain!

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Name : _____ Date : _____

Watersheds and Pollution

1. What is a watershed?

_____
_____
_____
_____
_____

2. Describe what happened in your watershed model demonstration.

_____
_____
_____
_____
_____

3. How does pollution affect shellfish and shellfish farmers?

_____
_____
_____
_____
_____

4. What are two things you can do to help reduce pollution?

_____
_____
_____
_____
_____

BONUS: Shellfish help clean the water by eating _____. They are known as _____ _____.

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Lesson 2: Aquatic Microscopy

Subject

Microscopy

Objectives

The students will:

- Observe the relationship between water quality and organism populations

Materials

- Microscopes (students work in pairs)
- Slides and slipcovers (including well slides)
- Samples in large containers
    - Blaine Harbor
        - Plankton tow
        - Oysters
    - Skallman Pond
        - Water
        - sediment
    - Cain Creek
        - Water
        - Sediment
    - Others (depending on availability)
        - GSSC microscope and computer with phytoplankton sample
        - Geoduck velligers
        - Frog eggs
        - Prepared slides
- Sample collection
    - 3 large tubs
    - Nets
    - Acrylic tanks
    - Plankton tow

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- Buckets for sediment
- Cooler (for oysters)

Size/setting/duration

Full class in lab groups/indoors/90 minutes

Background

In this lesson students begin to learn about the vast array of organisms that live in their watershed - even if they can't see them with just their eyes! By observing three different water bodies students can compare and contrast the different organisms found in them and interpret why these trends might exist.

Procedure

Before GSSC comes into the classroom teachers will have given students basics of microscopes and separate the students into lab groups.

- (20 min) Water Quality Powerpoint
  - Start this lesson by taking the class through the introductory powerpoint
- (60 min) Microscope classwork
  - The samples should be arranged around the room by site (Skallman Pond, Cain Creek, Blaine Harbor, other). The expectation is for students to diagram one organism from each of the water bodies. Diagrams should include labels such as waterbody, scale, magnification, and organism identification when possible.
- (10 min) Clean up/wrap up
  - Wrap up: Sketch a map-diagram and label/describes differences between sites.
  - Discussion of Indicator organisms. How did the organisms you see fit in with your watershed?
  - What biotic and abiotic factors could define what can live in a pond vs a creek or a bay.
  - Revisit Salish Sea Challenge
  - Discuss opportunity for student engagement. (can include community clean-ups, restoration projects, etc.)

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Next Generation Science Standards

Performance Expectations
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.] MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Obtaining, evaluating and communicating information	LS1.A: Structure and Function LS1.C: Organization for Matter and Energy Flow in Organisms LS2.A: Interdependent Relationships in Ecosystems	Patterns

Graphics

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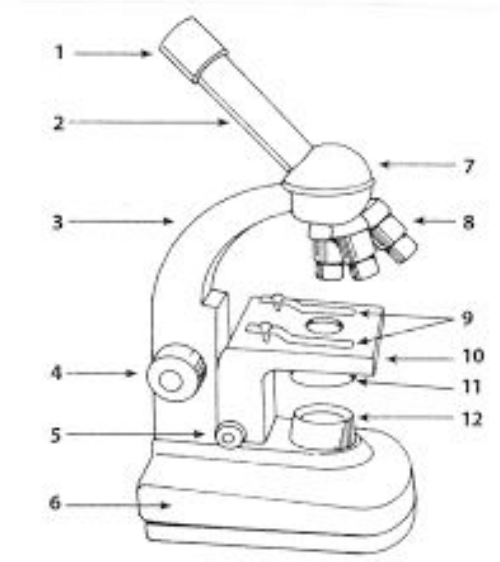

Worksheet (in student's science notebook)

- Page of organism drawings (one drawing per waterbody)
    - Draw Scale
    - Label magnification
    - Label water body
    - Label organism
- Include scientific name of one organism displayed
- Describe the differences they found between the three sites

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Lesson 3: Cain Creek Water Quality and Macroinvertebrates

Subject

Water Quality

Objectives

The students will:

- Assess how water quality impacts organism populations in an ecosystem.
- Understand the concept of indicator organisms

Materials

- Macroinvertebrates
  - Hand lenses
  - Macroinvertebrate keys
  - Sample trays
  - Ice cube trays
  - Forceps
  - Kick net
  - Spoons
  - Hand sanitizer
- Water Quality
  - Thermometers
  - Pocket pH meter
  - Hach pH kit
  - Hack dissolved oxygen kit
  - Turbidimeter
  - Live tank (for water sample)

Size/setting/duration

Entire class/Outdoors, Mitchell Street Apron/30 minutes

Background

By conducting a walking field trip students gain perspective on how close they are to the ecosystems they have been learning about. Comparing the information they interpret from the macro-invertebrate population to the water quality tests enables students to see the direct correlation been organisms and the chemistry.

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Procedure

- Site Assessment (5 minutes)
    - As students arrive to the site have them make observations of the location. Each student should have at least three written observations. These can include: storm drains (number and location), vegetation (native and invasive), and pollution sources.
- Biological indicators: (15 minutes)
    - Have students look through the macro-invertebrate samples with scientific keys to identify as many organisms as possible. Have a teacher keep a running list of all organisms found.
    - Use pollution indicator groupings to have the class classify the health of the creek based on the organisms found and the quantity.
- Water quality (10 minutes)
    - Instructor will have tests set up and ask for volunteers to add a reagent or read a result while the rest of the groups records results. GSSC will photograph the white boards and compile pooled data. If the weather in the field is not conducive to data recording, students should copy testing results from the whiteboard to their science notebooks in field sheet format when they get back to the classroom.
    - Tests include: temperature, dissolved oxygen, pH, and turbidity.
        - If you use a turbidity tube use a conversion chart to convert cm to NTUs.
    - Each test result should be compared with water quality standards to determine the health of Cain Creek. Compare this information to the water quality tests done on the creek that day. Did the results agree with each other? Discuss as a class why or why not.
    - Grade level data will be pooled which can be compared with data collected by local agencies.

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Next Generation Science Standards

Performance Expectations		
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Analyzing and interpreting data Engaging in argument from evidence	LS2.A: Interdependent Relationships in Ecosystems	Cause and effect System and system models

Worksheet

Cain Creek Water Quality Field Data Sheet - BMS 8th grade

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Excellent Quality Aquatic Life Use Criteria Marine water designated uses and criteria for Washington State salmonid and other fish migration, rearing, spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

Temperature	< or = to 16°C (60.8°F)
Dissolved oxygen	> or = to 6.0 mg/L (milligrams per liter)
pH units	7.0-8.5 (above 8.0 protects formation of shells in shellfish larvae).
Fecal coliform bacteria	Geometric mean of 14 colonies or less and not more than 10% of samples greater than 43 colonies.
Turbidity	Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU

Date:_____ Time:_____ Weather:_____

Site Name: Cain Creek park, between CC 0.4- CC0,8_____

GPS Coordinates: Latitude (N to S)_____ Longitude (E to W)_____

Test	Air temperature	Water temperature	Dissolved Oxygen	pH	Fecal bacteria density	Turbidity
Measurement	°C	°C	mg/L (parts per million)		(colonies per milliliter)	
Meets standards? Yes or No						

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Lesson 4: Marine Mammals

General Framework for Marine Mammal Lesson

Section 1: For the Teacher

This is designed as a 2-hour lesson and is broken into 2 parts. In part one, the focus is on the location of the Salish Sea and the types of marine mammals found there, including a lab activity to demonstrate how baleen and toothed whales feed. The second part is about hazards to marine mammals, with a focus on marine plastic, including a lab on density of plastics. The presentation is done using power point for delivery of information, as well as small group and large group discussion, with use of white boards. There are slides included in the power point with notes and information for the presenter that do not show up in the slideshow.

In the lab on whale feeding the students will learn about how baleen and toothed whales feed and will use a simulation to demonstrate the feeding.

In the plastics lab the students will test different types of plastics based on their recycling number to see it they float or sink in seawater. This information will then be used to see how different marine mammals may be affected by the location of the plastics in the water column.

Quick Look Lesson Chart

<table>
<tr><td>LESSON NAME</td><td colspan="3">Part One: Marine Mammals in the Salish Sea</td></tr>
<tr><td>ESSENTIAL QUESTIONS</td><td colspan="3">What are the common marine mammals found in the Salish Sea?
How do different whales feed?</td></tr>
<tr><td>KEY CONCEPTS</td><td>STUDENTS WILL ALSO LEARN</td><td>SCIENCE INQUIRY</td><td>SCIENCE VOCABULARY</td></tr>
<tr><td rowspan="4">There are a variety of marine mammals living in the Salish Sea</td><td>They will learn basic life history information on the local marine mammals.</td><td rowspan="4">Lab 1: How do Baleen and Toothed whales feed?</td><td>Baleen
Toothed
Echolocation
Salish Sea</td></tr>
<tr><td>STANDARDS</td><td></td></tr>
<tr><td rowspan="2"></td><td>ASSESSMENTS</td></tr>
<tr><td>Students will pick a local marine mammal to research in more detail and develop a poster board presentation of their information.</td></tr>
</table>

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Setting: Inside

Time: About 45 minutes

Materials:

- Power point on "Marine Mammals of the Salish Sea"
- Copy of "Marine Mammals of the Salish Sea Note sheet" (for each student)
- Copy of "Whale Feeding: Baleen vs. Toothed Whales" data collection sheet.
- Samples of marine mammal bones, etc., if available
- One white board and pen per lab group or pair
- Whale Feeding Lab Materials: (one set per lab group)
- Plastic tub
- Hair comb
- 2 pairs spring hair clips
- Basil or parsley flakes
- 15 Cheerios
- 3 Rubber fishing squid

Procedure:

A. Use the power point to introduce the topic, and to present information about each marine mammal, while students record information on the note sheet.

B. How Whales Feed Lab

a. Fill plastic tub with about 2 to 3" of water.

b. Add a cup of basil or parsley flakes across the surface. These represent "krill."

c. Run the comb through the water to collect the "krill."

d. After each run, tap the comb on a paper towel to collect the krill before the next run. Do this for 15 seconds.

e. Have 2 people use the spring hair clips for 15 seconds to collect krill and collect it in a different place than from the comb.

f. Count and record the "krill" collections from each method of feeding on "Whale Feeding: Baleen vs. Toothed Whales"

g. Discuss the results before going on using the questions on the power point slide.

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h. Add 15 Cheerios and 3 rubber squid to the plastic tub. These represent larger fish/squid.

i. Run the comb through the water 15 seconds and try to collect the larger fish

j. Using the 2 pairs of hair clips, try to pick out as much food as you can in 15 seconds.

k. Count and record on the lab sheet.

l. Discuss the results before going on using the questions on the power point slide.

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<table>
<tr><td>LESSON NAME</td><td colspan="3">Part Two: Hazards to Marine Mammals</td></tr>
<tr><td>ESSENTIAL QUESTIONS</td><td colspan="3">What are the main hazards that impact the health of marine mammals?

How does plastic debris impact life in the ocean?</td></tr>
<tr><td>KEY CONCEPTS</td><td>STUDENTS WILL ALSO LEARN</td><td>SCIENCE INQUIRY</td><td>SCIENCE VOCABULARY</td></tr>
<tr><td rowspan="4">There are a variety of hazards that may have an effect on the health of marine mammals living in the Salish Sea.</td><td>They will learn about potential hazards to marine mammals living in the Salish Sea and potential solutions.</td><td rowspan="4">Lab 1: How can different types of plastics cause problems with the feeding of marine organisms.</td><td>Density
Pelagic
Surface
Benthic
Bioaccumulation</td></tr>
<tr><td>STANDARDS</td><td></td></tr>
<tr><td></td><td>ASSESSMENTS</td></tr>
<tr><td></td><td>Informal: Fill out an Exit ticket at the end of the class.

Formal: As part of their assessment from part one, students will pick at least one of the Salish Sea Watershed Challenges and show how their chosen marine mammal will benefit from it.</td></tr>
</table>

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Setting: Inside

Time: About 55 minutes

Pt. 2 of power point, “Hazards to Marine Mammals”

One white board and pen per lab group or pair

One “Exit Ticket” for each student to use at the end if time.

Plastic Lab Materials: (for each group)

Plastic tub

Copy of “Plastics in the Water Column Lab” data collection sheet. (for each student)

One set of plastic samples of each different type per lab group

Samples of plastic that has washed up on the beach

Procedure:

Use the power point to introduce the topic and to present information.

Use the white boards to have students write down and share things made of plastic.

Lab Procedure:

1. Examine the plastic objects
2. Choose one object and find its recycling number (on the bottom of the object).
    - Predict: Do you think this item will sink or float? Why?
3. Place the object in the tank of water.
    - What happened?
    - Were you surprised? Why or why not?

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- Do you think the recycling number relates to its buoyancy?

4. Record your type of plastic, your predictions, and results on the lab sheet.
5. Share and discuss the results.

Next Generation Science Standards

Performance Expectations		
MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Developing and Using Models	LS2.B: Cycle of Matter and Energy Transfer in Ecosystems	Energy and Matter Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Worksheet

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MARINE MAMMALS OF THE SALISH SEA

Record the name and one fact for each marine mammal._____

SEALS AND SEA LIONS	TOOTHED WHALES	BALEEN WHALES	OTTERS

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WHALE FEEDING: BALEEN VS. TOOTHED

TYPE OF WHALE	# OF KRILL CAUGHT	# OF FISH/SQUID CAUGHT
BALEEN		
TOOTHED		

Basil Flakes = Krill Cheerios = Fish

WHALE FEEDING: BALEEN VS. TOOTHED

TYPE OF WHALE	# OF KRILL CAUGHT	# OF FISH/SQUID CAUGHT
BALEEN		
TOOTHED		

Basil Flakes = Krill Cheerios = Fish

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PLASTICS IN THE WATER COLUMN LAB

NAME _____

1. Experiment with a variety of plastic objects.
   a. Record the name of the item and its recycling number in the chart below.
   b. Predict whether it will sink or float and write in the chart below.
   c. Now submerge the items in the water and record your results below.

	Plastic Item	Recycling #	Prediction: Do you think this plastic sinks or floats?	Results: Did it sink or float?

2. Look at the **Density Table** to answer the following questions.

- Compare the densities of fresh and salt water. Which is the most dense? Which is the least dense? Why do you think salt water is more dense than fresh water?

- Which plastics will float in fresh water? Sea water? How do you know?

- Does that match your findings? Explain. (Think about why you may have gotten different results.)

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EXIT TICKET

Two marine mammals found in the Salish Sea are

_____

_____

One thing that can harm marine mammals is_____

_____ because _____

_____

Two things I will try to do to help protect the Salish Sea are

_____

_____

EXIT TICKET

Two marine mammals found in the Salish Sea are

_____

_____

One thing that can harm marine mammals is_____

_____ because _____

_____

Two things I will try to do to help protect the Salish Sea are

_____

_____

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Lesson 5: Watershed Design

Subject

Final Assessment

Objectives

The students will:

- Design solutions to minimize human impacts on watershed health.
- Design a monitoring plan for assessing health of a waterbody

Materials

- Worksheet

Size/setting/duration

Full class (independently)/indoors/30 minutes

Background

As a culmination of this unit student will design a healthy and unhealthy watershed. Key ideas include how they can reduce pollution, how impervious surfaces impact runoff, and how water quality determines the organisms which can live there.

Procedure

- Remind students of the site assessment completed at Cain Creek. Each student made at least three observations at Cain Creek which they can use to compare and contrast to their watershed designs. Using the information gained during this unit have students fill in the worksheet to show understanding of the unit.

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Next Generation Science Standards

Performance Expectations		
MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Constructing explanations and designing solutions	ESS3.C: Human Impacts on Earth Systems	Cause and Effect Influence of Science, Engineering, and Technology on Society and the Natural World

Graphics

None.

Worksheet

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Watershed Design

Design and map a healthy and unhealthy watershed and ocean intertidal zone. Use arrows to show the flow of run-off. Label the following features: a stream, the ocean, pervious and impervious surfaces, storm drains, vegetation, pollution sources, transportation, and energy sources. Indicate where the stream (with riparian or vegetated corridor) lies and where it enters the ocean.

Healthy Watershed	Unhealthy Watershed

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In the section below explain how you would test and monitor the health of both watersheds. What macro-invertebrates or organisms would you expect to find in each waterbody? Compare your designs to the site assessment you completed of Cain Creek.

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Salish Sea Challenge - Unit Reflection

In order to assess the impacts that your class had on the environment through the Salish Sea Challenge we ask that you either have students return the Salish Sea Challenge with the table on the back filled out or hand out the following post survey so that we are able to quantify the impact of the program. Lead a class discussion

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During this unit how many times did you: (circle)

Ride your bike or walk instead of taking a car

Did not complete 0-5 times 5-10 times more than 10

Picked up your pet's waste

Did not complete 0-5 times 5-10 times more than 10

Recycled, reduced, or reused

Did not complete 0-5 times 5-10 times more than 10

Conserved energy by turning off power or other ways

Did not complete 0-5 times 5-10 times more than 10

Limited purchase and use of disposable plastics

Did not complete 0-5 times 5-10 times more than 10

I discussed septic system maintenance, proper waste disposal while boating, animal access to water bodies, use of pervious paving materials or yard maintenance practices with my household. (please circle which topic you discussed)

Did not complete 0-5 times 5-10 times more than 10

Other (Please explain what you did and the number of times you did it)

_____

_____

_____

_____

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