High School Marine Debris Lesson 2 – Assessing Your Watershed
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Summary: Students will identify their local watershed and identify point and non-point sources of pollution. Students will collect and analyze potential marine debris within the watershed and conduct analysis to construct a plan to prevent potential marine debris from entering the watershed.

Instructional Objectives:

1. Students will be able to define and determine watershed, point and non-point sources of pollution within the watershed.
2. Students will be able to determine the sources of potential marine debris through graphing and analysis.
3. Students will construct and implement a plan to prevent further release of potential marine debris into the watershed.

Ocean Literacy Principles:
http://oceanliteracy.wp2.coexploration.org/ocean-literacy-framework/

1. The Earth has one big ocean with many features.
4. The ocean supports a great diversity of life and ecosystems.
5. The ocean and humans are inextricably interconnected.

National Science Standards

High School Life Science

- Matter and Energy in Organisms and Ecosystems
- Interdependent Relationships in Ecosystems

High School Earth and Space Science

- Earth's Systems
- Human Sustainability

High School Engineering Design

- Engineering Design

AP Environmental Objectives:
http://media.collegeboard.com/digitalServices/pdf/ap/ap-environmental-science-course-description.pdf

I. Earth Systems and Resources
C. Global Water Resources and Use
II. The Living World
A. Ecosystem Structure
VI. Pollution
A. Pollution Types
3. Water pollution

Background Information:
A watershed is an area of land in which all water drains to a specific location. Watershed boundaries are influenced by topography and can be determined with topographic maps. For more information about watersheds and pollution please visit
http://www.education.noaa.gov/Freshwater/Watersheds_Flooding_and_Pollution.html .

The two sources of marine debris are from the land and the ocean. Most marine debris comes from non-point sources such as litter and derelict fishing gear, however there are some instances where the specific source of marine debris can be identified, making it a type of point source pollution. These instances are rare and so identifying some of the many sources of marine debris from non-point sources is important in the attempt to reduce marine debris at its source. For more information about types of marine debris and plastic marine debris please visit http://marinedebris.noaa.gov/learn-basics/types-and-sources and http://marinedebris.noaa.gov/info/plastic.html .

Time:
2-3 50 minute class periods
Optional- after school or weekend time for larger watershed clean-up.

Materials:
1. Internet access or maps of your watershed.
2. Graph paper or graphing software.
3. Buckets and/or trash bags for trash collected
4. Clipboards
5. Scales or balances
6. Potential Marine Debris Inventory sheets
7. Potential Marine Debris Analysis worksheet
8. *Optional – Large map of local watershed*

Procedure:
Part 1- Determining and Assessing You Watershed – 50 minutes
1. Introduce the concepts of watershed, point source and non-point source pollution using the power point presentation.
2. Use printed maps of the area from Google or Google Earth. You can go as large (i.e. Ogeechee River Watershed) or as small (your local stream) as you want. Note that it is easier to find maps for the larger watersheds.
   Some helpful sites are http://edna.usgs.gov/watersheds/html_index.htm
   http://serc.carleton.edu/eslabs/drought/2b.html - The directions on this site, along with Google Earth allow you to explore the details of some smaller creeks.
3. Assess current condition of your watershed using the following website http://cfpub.epa.gov/surf/locate/index.cfm. Most importantly, assess the land use activities within the watershed. Based on the land use activities in the area have students predict the types of marine debris that may be produced using the student handout **Potential Marine Debris Inventory.**

Part 2- Collecting and Analyzing Potential Marine Debris – 1 or 2, 50 minute periods
4. Conduct a watershed clean-up in the chosen area and catalog the types of debris collected. Use the **Potential Marine Debris Inventory Data** sheet to record your data.
   Option- If possible you may want students to record the GPS coordinates of the debris collected.
5. Graph and analyze data to determine the most common types of marine debris produced in your community using the student handout **Potential Marine Debris Analysis worksheet**. Have students determine what should be on the x-axis, y-axis, and what the best type of graph to use would be.
   Option- Use a large map of the watershed to post location and types of debris collected.

Part 3 – Planning Solutions

6. Have students develop and write plan to reduce the marine debris at its source. When possible, have students carry out their plan. Some ideas for plans are: 1. contact a local company or store and ask them to post signs reminding customers that all litter eventually goes to the ocean. Students could make signs to post in the store; 2. contact a particular company and request that a recycling or no littering reminder be printed on a product.

Possible Extensions:

1. EXTENSION: One way to solve the issue with marine debris is to clean it up, but the best way is to prevent it from occurring. Have students create and implement a plan for your school or community that will educate citizens about marine debris sources and what can be done to prevent the introduction of potential marine debris into the environment.
2. EXTENSION: Have students conduct further research into the impact that diminished marine resources will have on your local economy.

Potential Marine Debris Inventory

Watershed name _____ Location of specific collection: Lat._____ Long. _____

Names of collectors _____

1. Based on your knowledge of the local community and analysis of the watershed map, make a prediction about the items you will find the most of AND the most likely origins of items you will find during your investigation today.

2. As you collect your potential marine debris, catalog what was found using the data table on the back of this sheet.

3. Calculate the total mass (g) for each category:

Plastics:	Glass:	Processed Lumber:
Metal:	Cloth/Fabric:	Rubber:

4. Before properly disposing of your collection, examine it for signs of decomposition. Record your observations below.

Potential Marine Debris Inventory Data

PLASTIC					
Item	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Plastic fragments					
Food wrappers					
Other jugs or containers					
Beverage bottles					
Bottle or container caps					
Cigar tips					
Cigarettes					
Disposable cigarette lighters					
6-pack rings					
Plastic bags					

Plastic ropes/small net pieces					
Buoys/floats					
Fishing lures and line					
Cups including polystyrene/foamed plastic					
Plastic forks					
Plastic spoons					
Plastic knives					
Plastic plates					
Straws					
Foamed plastic dock parts					
Balloons					
Personal care products					
Other:					

METAL	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Aluminum/tin cans					
Aerosol cans					
Metal fragments					
Other:					
GLASS	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Beverage bottles					
Jars					
Glass fragments					
Other:					

RUBBER	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Flip flops					
Gloves					
Tires					
Rubber fragments					
Rubber balls					
Other:					
PROCESSED LUMBER	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Cardboard cartons					
Paper and cardboard					
Paper bags					
Lumber/building material					
Other:					

CLOTH/FABRIC	**Tally**	**Total**	**Weight of debris item (g)**	**Possible origins of items** **Ex: gas station, convenience store, etc.**	**Specific locations of debris collected(when possible)**
Item					
Clothing and shoes					
Gloves (non-rubber)					
Towels/rags					
Rope/net pieces (non-nylon)					
Fabric pieces					
Other:					

Potential Marine Debris Analysis Worksheet

1. Using the graph paper provided to you or your own, create a graph to display the items collected by quantity and by mass.
2. Using the graph paper provided to you or your own, create a second graph to display the categories of items using the total mass for each category.
3. Answer the analysis questions below on a separate sheet of paper.

Analysis Questions

1. Which items were the most common?
2. Which category had the greatest mass (g)?
3. Examine the potential marine debris you collected. Which items showed the greatest amount of decomposition?
4. Were there any brands of items that you saw repeatedly? If so, what were they?
5. What could be done to prevent these items from entering the ecosystem?
6. What were the top 3 potential origins of the items you found?
7. How do these sites of potential origin compare to the predictions you made earlier?
8. Why do you think these places of origin produce more potential marine debris than other places?
9. What could be done to prevent items from entering the ecosystem?

Graph of Debris Collected