A Sea of Debris

Objectives: This is designed to provide more information about marine debris. Participants will gain a better understanding of the persistence of different types of trash. They will understand that different types of trash represent different potential hazards. They will think about sources of marine debris and how they can prevent the problems posed by litter.

Time needed: 10-20 minutes

Target age: General Public

Materials needed:

- Marine Debris Decay Timeline for different types of trash, such as paper, apple, glass, photodegradable 6-pack ring, Styrofoam, plastic bottle, aluminum can, etc. The times should be affixed to a board, and there should be representations (pictures or items) of the different trash types that can be manipulated by participants.
- Trash or Food paper bags (or some other container that participants can't see through) with paired items that are similar but one of which is edible and one of which is not. Examples of pairs are rice cake & Styrofoam, cheese puff and packing peanut, craft gimp and shoestring candy, gummy worm and fishing lure.
- Watershed model, spray bottle of water, and litter representation (tiny pieces of Styrofoam)
- Preserved jellyfish in a clear jar paired with a clear jar of water with a plastic bag
- Photos of marine debris affecting wildlife
- A few rubber bands
- An assortment of collected litter and marine debris
- Map and/or photo of coastal watershed

Description: The presenter will start by reviewing participants' knowledge of marine debris, which may be an unfamiliar term for a familiar, maybe less-specific concept. Then the question, "How does it get there?" should be posed and discussed. A visual of a watershed is helpful in discussing how rivers can carry trash from the mainland to the sea. An assortment of trash collected from a beach might assist with some critical thinking here. For example, when asked whether the source (careless beachgoers, boats, washed down by rivers from the mainland) of the trash can be deduced, participants might observe barnacles on the item and note that it spent some time in the sea. Sometimes freshwater plants can be found on beaches and taken as evidence that rivers wash things to the coast and deposit them on beaches. Such plants or pictures of these plants on beaches can be included in the assortment of beach finds. The presenter can ask participants to reflect on why it is important to understand sources of marine debris. Next, the question, "Now that it's in the ocean, how long will it be there?" can be posed. The Marine Debris Decay Timeline can be employed to get participants thinking about a few specific items that are representative for broad categories (paper towel, apple, etc.). The presenter can have participants place the items and then rearrange the timeline correctly, discussing different factors as this is done. For example, discussion should include the point that persistence in the environment does not directly correlate to potential damage, i.e. glass will persist longer but does not pose the potential risk of plastic; the photodegradable 6-pack ring and the plastic bottle, while similar in some ways are quite different in their persistence, etc. Next, there should be a discussion about potential harm to wildlife. The two most obvious answers are entanglement and ingestion. Entanglement can be shown effectively through photos and a simple demonstration. The presenter will ask a participant to use his hand to simulate a bird's head then slip a rubber

band onto his wrist. Then the presenter will ask the "bird" to get the rubber band off of his neck while staying in bird form and without using his other hand. Ingestion can be illustrated with a Trash or Food activity. Participants should reach into the paper bags and, without looking, feel both items and pull out the one that is edible. Participants can usually pull out the correct item. However, after being challenged to figure it out, it is easy enough for them to understand how animals confuse trash for food. Another demonstration of how similar trash can look to food is the comparison between a jellyfish in a jar with a plastic bag in a jar of water. A discussion of the different mechanisms by which animals are killed by plastic is useful here. Finally, participants should discuss ways in which marine debris and the deaths of wildlife affect humans and personal actions that can prevent or reduce this problem. These might include reduction in recreational and economic value of beaches, boat prop entanglement, loss of biodiversity, properly disposing of trash in trash or recycling bins, picking up litter, and reducing consumption of plastic, etc.

Extensions:

- This activity might involve a more in-depth discussion of the interdependence of organisms, including humans - how organisms are resources, and how marine debris might affect the behavior of animals, populations, and humans.
- Discussion might include diversity of animals and their adaptations, i.e. different birds appear to show preference for specific colors in plastic, sea turtles eat plastic bags or balloons, etc.
- This might include a more in-depth discussion of the decomposition, chemical, physical, biological, of different types of materials.
- Discussion might include the basic resource material from which these man-made items come, i.e. plastics from petroleum, paper from tree pulp, etc. This can be expanded to include the implications of societal demand on these resources and how individuals can reduce the demand.
- This activity can include a discussion of population growth, how it affects resource demand, the production of man-made materials, and the need for disposal of those materials.
- Discussion might include the value humans attribute to aesthetics in a pristine environment.

National Science Education Standards:

Unifying Concepts and Processes – Evidence, models, and explanation
Science as Inquiry – Abilities necessary to do scientific inquiry
<u>K-4</u>
Physical Science – Properties of objects and materials; Position and motion of objects
Life Science – Organisms and environments
Earth and Space Science – Changes in earth and sky
Science and Technology – Abilities to distinguish between natural objects and objects made by man
Science in Personal and Social Perspectives – Types of resources; Changes in environments; Science and technology in local challenges
History and Nature of Science – Science as a human endeavor
<u>5-8</u>
Physical Science – Properties and changes of properties in matter; Motions and forces
Life Science – Regulation and behavior; Populations and ecosystems
Science in Personal and Social Perspectives – Populations, resources, and environments; Science and technology in society
History and Nature of Science – Science as a human endeavor
<u>9-12</u>
Physical Science – Structure and properties of matter; Motions and forces
Science in Personal and Social Perspectives – Personal and community health; Natural resources; Environmental quality; Natural and human-induced hazards; Science and technology in local, national, and global challenges
History and Nature of Science – Science as a human endeavor

Ocean Literacy: Essential Principles and Fundamental Concepts:

1. The Earth has one big ocean with many features. – g. The ocean is connected to major lakes, watersheds and

waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.; h. Although the ocean is large, it is finite and resources are limited.
The ocean and life in the ocean shape the features of the Earth. – c. Erosion – the wearing away of rock, soil and other biotic and abiotic earth materials – occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.

6. *The ocean and humans are inextricably interconnected.* - e. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollutions (point source, non-point source . . .) and physical modifications (changes to beaches, shores and rivers).; g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

Extensions:

NSES:

K-4

Science in Personal and Social Perspectives – Personal health; Characteristics and changes in populations

5-8

Life Science – Diversity and adaptations of organisms

9-12

Physical Science – Chemical reactions; Interactions of energy and matter
Life Science – Interdependence of organisms; Behavior of organisms
Earth and Space Science – Geochemical cycles
Science in Personal and Social Perspectives – Population growth

Ocean Literacy:

6. *The ocean and humans are inextricably interconnected.* – c. The ocean is a source of inspiration, recreation, rejuvenation and discovery.

Resources:

http://marinedebris.noaa.gov/

http://water.epa.gov/type/oceb/marinedebris/index.cfm