



## GLOSSARY

<b>BENTHOS</b>	The substrate at the bottom of a body of water; the adjectival form of benthos is benthic.
<b>BIODEGRADABLE</b>	Something capable of being broken down to simple compounds, especially into harmless products, by the action of microorganisms.
<b>BIODIVERSITY</b>	The richness, abundance and variety of life across all trophic levels of which all ecological systems, including the planet earth, are comprised.
<b>BRACKISH</b>	Water that has more salt than fresh water but not as much as seawater.
<b>CLAY</b>	Small particles of sediment which cannot be individually felt or seen; particle diameters are smaller than 1/256 (.0039)mm.
<b>COMMUNITY</b>	A group of plants or animals living in the same area and depending on one another for survival.
<b>DECOMPOSER</b>	An organism that breaks down organic material and releases simple substances usable by other living things. Examples of decomposers are bacteria and fungi.
<b>DECOMPOSITION</b>	The breakdown of substances into inorganic forms.
<b>DEPOSIT FEEDER</b>	An animal that feeds by ingesting substrate and filtering out the small organic particles on the substrate.
<b>DETRITIVORE</b>	An animal that eats detritus.
<b>DETRITUS</b>	Dead plant and animal material.
<b>DIATOM</b>	A type of microscopic, one-celled photosynthetic organism. All diatoms are surrounded by a silica shell and most are a golden brown in color.
<b>DISSOLVED OXYGEN</b>	Oxygen that has dissolved in water and can be used for respiration.
<b>ECOLOGY</b>	The study of relationships between organisms and their environment.
<b>ENVIRONMENT</b>	The sum of all physical and biological factors that affect an organism.
<b>ESTUARY</b>	A semi-enclosed body of water where salt water and fresh water meet and mix.
<b>FOOD WEB</b>	An assemblage of organisms in an ecosystem, including plants, herbivores and carnivores, which shows the relationship of "who eats whom."
<b>GILL</b>	An organ used for underwater breathing or respiration by fishes and some invertebrates.

<b>HABITAT</b>	The particular area in which an organism normally lives.
<b>NUTRIENTS</b>	The raw materials necessary for continuing life processes.
<b>PHOTIC ZONE</b>	Upper sunlight portion of the water column. The depth of the photic zone in the ocean ranges from 30 to 200 meters.
<b>PHOTOSYNTHESIS</b>	The process used by plants to make food; in this process light energy is used to combine carbon dioxide and water to make carbohydrates (sugar and starch); oxygen gas is given off as a by-product.
<b>PHYTOPLANKTON</b>	Algae, usually microscopic, which freely drift in the sunlit portions of the water column.
<b>PLANKTON</b>	Drifting aquatic plants and animals; the adjectival form of plankton is planktonic, and a planktonic organism is called a plankter.
<b>POLLUTION</b>	Harmful impact on the environment resulting from human activities.
<b>PRODUCER</b>	An organism that makes its own food; an example of a producer is a green plant.
<b>RESPIRATION</b>	Process used by animals and plants to release energy from food; this process requires oxygen and releases carbon dioxide and water.
<b>SALINITY</b>	The amount of salt in the water. Measured in parts per thousand.
<b>SALT MARSH</b>	Salt-water wetland between terrestrial and marine ecosystems; salt marshes can also be seasonal or tidal wetlands.
<b>SPECIES</b>	A population of plants or animals that are able to produce viable of with each other and not with other species.
<b>WETLANDS</b>	Areas that periodically have waterlogged soils, support plants adapted to wet soil, and are covered or occasionally submerged by water.
<b>ZOOPLANKTON</b>	Animal plankton.

## PRE-VISIT ACTIVITIES

You may want to ask your librarian to set aside ecology or marine science books for your class, or ask students to bring books and magazines from home to share.

### NO GARBAGE LUNCH (Part 1)

Within a day or two of your class trip, hold a surprise "lunch raid" by making a collection of all the garbage (man-made materials only!) to be potentially thrown out after lunch is over.

- Sort the garbage into piles such as plastics, paper, aluminum, etc., and count the number of items in each pile. Make a colorful bar graph depicting your findings.
- Discuss the results and the importance of recycling.
- Discuss where the solid garbage goes. Much of it goes into landfills which are actually "bay fills." How long can this go on?
- Challenge your class to make "No Garbage" lunches. This means bringing a lunch box or a bag that can be used again. Reuse containers for sandwiches and snacks.
- Talk about the drawbacks of snack food that come in cute little packages but create lots of garbage. What could we do instead? (Buy bulk size).
- Encourage the three "R's": Reuse, Reduce (garbage) and Recycle.

## ORGANISM REACTIONS

### A. Varying salinity

Have students make wet mounts of a thin section of red onion bulb. Mount in 1% NaCl (salt) solution and observe effects. Flush with fresh water and observe effects. Have students explain the reactions.

### B. Varying temperature

Put equal numbers of fruit flies in jars and keep them at different temperatures for a few minutes. Observe relative activity rates. If a pond or other body of water is nearby, measure air and water temperatures at different times of the day to see which environment has more stable temperatures.

## GEOGRAPHY

Make a map of the Bay Area, or a 3-D model of the Bay Area. Emphasize the mountains, and the Hayward and San Andreas Faults. Clay, or a mixture of baker's dough works well.

### Activities/Curriculum links:

<http://aswc.seagrant.uaf.edu/kindergarten/investigation-1.html>

<https://coast.noaa.gov/estuaries/curriculum/>

<http://www.waquoitbayreserve.org/research-monitoring/salt-marsh-carbon-project/teachers/>

<https://dataintheclassroom.noaa.gov/>

<http://www.noaa.gov/resource-collections/hands-on-science-activities>

<http://www.noaa.gov/resource-collections/hands-on-science-activities>

<https://coast.noaa.gov/estuaries/curriculum/human-impacts-on-estuaries-terrible-spill-in-grand-bay.html>  
<http://www.afterschoolalliance.org/STEM-curriculum.cfm>

## POST-VISIT ACTIVITIES

### COASTAL CLEAN UP BAR GRAPHS

**Description:** The students will make bar graphs based off the statistics from the California Coastal Commission.

**Objective:** Students will reinforce their bar graph making skills.

**Grade Level:** 4<sup>th</sup>-8<sup>th</sup>

**Set up time:** 5 minutes

**Activity time:** 45 minutes

**Materials:** Graph paper, markers, data tables

**Procedure:** Divide your class into six groups and give each group one of the data tables (from below). Have your students graph the data. Have the students present their completed graphs to the group.

**Discussion points:** Why do you think there are more of certain types of trash? Why do you think certain trash amounts increased or decreased throughout the years?

#### Top 5 Trash Items

	1989	1990	1991	1992
Bags (Paper and Plastic)	31,637	49,436	42,847	58,217
Caps, Lids	33,919	55,101	51,148	58,166
Cups, Plates, Forks, Knives, Spoons	39,367	49,812	39,382	53,932
Food Wrappers/Containers	8,509	31,504	27,983	36,164
Cigarettes/Cigarette Filters	52,031	153,112	222,561	14,8079

#### Top 5 Trash Items

	1993	1994	1995	1996
Bags (Paper and Plastic)	12,052	62,180	42,215	48,711
Caps, Lids	40,239	61,166	41,220	45,941
Cups, Plates, Forks, Knives, Spoons	15,518	51,750	37,810	39,966
Food Wrappers/Containers	11,409	39,896	28,077	31,471
Cigarettes/Cigarette Filters	396,404	313,406	204,544	153,983

### Top 5 Trash Items

	1997	1998	1999	2000
Bags (Paper and Plastic)	68,043	70,817	36,657	69,591
Caps, Lids	65,528	75,835	43,219	68,829
Cups, Plates, Forks, Knives, Spoons	55,260	54,142	15,502	44,631
Food Wrappers/Containers	41,921	48,098	65,735	43,821
Cigarettes/Cigarette Filters	238,500	333,876	222,523	229,928

### Top 5 Trash Items

	2001	2002	2003	2004
Bags (Paper and Plastic)	50,592	33,268	29,207	30,841
Caps, Lids	53,736	56,951	58,863	60,016
Cups, Plates, Forks, Knives, Spoons	38,543	38,992	34,556	39,137
Food Wrappers/Containers	68,406	107,929	106,111	113,883
Cigarettes/Cigarette Filters	297,280	305,680	315,806	309,891

### Top 5 Trash Items

	2005	2006	2007	2008
Bags (Paper and Plastic)	26,119	120,551	64,355	76,738
Caps, Lids	61,117	67,107	73,570	83,069
Cups, Plates, Forks, Knives, Spoons	40,215	33,518	40,922	34,354
Food Wrappers/Containers	98,895	10,3145	12,5038	11,4758
Cigarettes/Cigarette Filters	258,075	347,948	392,771	340,221

### Top 5 Trash Items

	2009	2010	2011	2012
Bags (Paper and Plastic)	10,3671	95,005	88,402	63,233
Caps, Lids	99,243	64,517	68,692	48,225
Cups, Plates, Forks, Knives, Spoons	43,837	39,254	36,704	23,990
Food Wrappers/Containers	143,556	124,637	128,510	94,182
Cigarettes/Cigarette Filters	394,920	335,320	305,697	217,423

### NO GARBAGE LUNCH (Part 2)

After our program, once again hold a lunch raid and compare how much garbage they have this time as opposed to the last time (there should be much less). Let the colorful bar graphs of the

two days emphasize the dramatic difference the students themselves are making to the health of the planet!

### **WRITING THANK YOU LETTERS**

Write letters to the instructors and/or your class sponsor to tell them about the trip. When we receive letters and pictures back from the kids our instructors remember what a thrill it is to be teachers. The sponsors also enjoy getting direct feedback from the class and teacher to reinforce that they are making a difference for kids learning science. Please include the day, date and time of your trip so we can try to remember your group a little better.

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