

# TURNING THE TIDE ON TRASH

**A LEARNING GUIDE ON MARINE DEBRIS**



## LESSON TWO

# A Scientific Cleanup

## Grade Level:

Grades 9-12

## Subjects:

Science, Social Studies, Language Arts

## Overview:

This lesson helps students understand the effects of natural events and human influences on ecosystems. The lesson also teaches students several science process skills, including forming questions and answering questions by experiments, carrying out research to validate or challenge ideas, and designing experimental tests. As a class, students organize and conduct a cleanup of a local beach, lake, or stream. Students keep track of the types and amounts of trash picked up and analyze this information in the classroom. As a class, students discuss the marine debris problem in their community and consider ways to prevent it.

## Objectives:

- To understand how marine debris can affect a community and to learn that people can make a difference.
- Discuss problems associated with aquatic debris.
- Identify testable questions relating to litter distribution at a local water site.
- Design an experiment to investigate litter distribution at the site.
- Make predictions of litter distribution at site.
- Participate in a cleanup at the site.
- Compile data on litter collected.
- Analyze data and make conclusions

relating to litter at the cleanup site.

- Make conclusions relating litter to the local ecosystem as well as human health and safety.
- Communicate findings from investigation.
- Recommend actions for remediation and pollution prevention.

## Vocabulary:

community, data, lifestyle, prevention, volunteer

## Materials:

- One kitchen-sized garbage bag for each pair of students in the class (Note: If collected items will be separated for recycling, additional kitchen-sized garbage bags will be necessary)
- One pair of latex gloves for each student in the class
- Bucket for sharp items
- Scissors to cut fishing line
- Digital camera to record cleanup
- First aid kit
- One 'Cleanup Checklist' handout for each pair of students in the class
- One "ICC Data Collection Card" handout for each pair of students in the class
- Clipboards and pencils

## Learning Skills:

Analyzing, Classifying, Collecting Data, Decision Making, Observing, Working in Small Groups and Experiment Design

## Duration:

This lesson will involve a field trip to participate in a cleanup. In addition, up to two class periods could be used before the

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trip. Another period will be needed after the trip.

### SAFETY & REGULATIONS

See Cleanup Checklist for Students, and also refer to your school's guidelines for planning a safe field trip.

## Activity

**1.** Discuss with the students some problems associated with litter and marine debris. Ask students about different water sites they are familiar with, including ocean beaches, lakeside beaches, and river banks and streams. Ask students what they like to do at these sites and what they have seen other people doing. Activities will include playing and relaxing, swimming, fishing, canoeing, and using larger boats. Also ask students to think about animals that live in or around the water. Both humans and other animals depend on the water being litter-free and unpolluted. Ask students to name examples of what they consider to be litter, and what kinds of litter they have seen around water sites. Ask the students how they think these kinds of litter can create problems.

**2.** Before students begin planning any details of their experimental cleanup, you should determine where the cleanup site will be. Several groups organize volunteer cleanups and are happy to include school groups. The Ocean Conservancy coordinates the International Coastal Cleanup throughout the world every fall. You may want to incorporate its program with this lesson, allowing the class to work with adults to clean up a site. The beach cleanups can be scheduled for September through October and take about three hours. Several states have “Adopt-a-



Stream,” “Adopt-a-Beach,” and other programs that encourage cleanup events. Have students participate in a pre-planned local cleanup event or select a nearby public beach for the class cleanup. Public land adjacent to a local stream or lake also can be used. (Note: Notify the appropriate municipal or state agency responsible for the site prior to the cleanup.) A park or beach manager may also be able to provide you with cleanup supplies and arrange for trash collection after the cleanup.

**3.** Have students work in small groups to identify possible testable questions for the class to study. After each group has identified a possible question, the class will need to decide which they will study. They could vote on this, but you must make sure they choose a “doable” question. Students are likely to choose a question relating different locations on the beach to the amount of debris collected. Different areas on the beach could include open water areas, areas influenced by a river, and areas influenced by a dock or harbor. Students also can also look at high tide, mid tide, and low tide parts of the beach.

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A large-scale map of the beach can be used to assign different areas for different groups of students. Groups of students can walk “transects” on different areas of the beach, and different groups of students covering similar areas of the beach will represent replications in the experiment or “repeated trials.” The amount of debris collected by each group of students will be recorded on the ICC data card. Most likely, the amount of debris will be recorded as number of items. It also could be recorded as estimated weight. Students can be assigned to carry out background research on their chosen question. This could be done using computers in class time at school, or students could be asked to do their research as an out-of class assignment.

**4.** To prepare for the cleanup, explain the ICC data card handout to the students and demonstrate how to record the items they find. (Note: You may want to use this as an opportunity to show recycling in action. Have the students separate easily identifiable recyclable materials, such as bottles, cans, and newspapers into bags for recycling.) Be sure to carefully explain the necessary safety procedures while collecting debris, including wearing safety gloves. Sharp objects should not be put in the trash bags, but instead should be put in a bucket.

**5.** Once your class arrives at the cleanup site, help the students translate their experimental design into a working plan at the site. Depending on the exact nature of the experiment, students may need help measuring off distances along the beach or stream. Have students pair up. One student in the pair should carry the bag for trash (and a bag for recyclables, if they will be separating these) and actually gather the debris. As the first student collects the trash, both students should try to identify



the item. The second student then records the information on the data card.

**6.** At the end of the cleanup, be sure that all the debris is disposed of properly. Park rangers and beach employees can show you where the bags of trash should be left for pick up. Remind students not to eat any food until after they have washed their hands.

**7.** Back in the classroom, have the students total the amounts of debris found for each category listed on their “Cleanup Card.” Students should be encouraged to use spreadsheet and database software to organize their data. They should produce data tables and graphs using computers. The students should be able to compare the number of pieces or estimated weight of debris collected by different categories of debris. Either bar graphs or pie charts will be effective. Have the student groups share their data and graphs with the other students. Discuss any trends found:

- Was there a prevalence of certain types of items? Where might these items have come from (e.g., from boaters, from sewers, from people who threw their

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trash on the ground, or other sources)?

- What were some of the most unusual types of debris found? Where might these items have come from?
- Which types of debris could pose problems to area wildlife? How? Could some debris pose threats to humans?
- Will beach cleanups solve the marine debris problem? Why or why not?
- If the litter is not picked up, what do you think will happen to it in the next five years?
- What could we ask lawmakers to do about the problem of pollution?
- What are some steps we can take to prevent marine pollution in the first place?

Ask the students to consider how community residents' lifestyles have contributed to the collected debris. Did they find any items that they or their families use every day? Have them consider ways they could prevent these items from appearing on their beach, including recycling, proper disposal, and other pollution prevention techniques.

Students can analyze their data to make conclusions about the litter collected at the water site. They should write a conclusion about their experiment. The conclusion should summarize the purpose of the experiment, the major findings, whether the original hypothesis was supported, a comparison with other people's findings, a possible explanation for the findings, and suggestions for extending the experiment. Students should try to include conclusions relating the litter collected at the water site to the local ecosystem. Encourage students to link their conclusions to important local water quality issues.

*This lesson was adapted from "A Scientific Beach Cleanup" in the "Save Our Seas" curriculum and "A Scientific Cleanup" in Clean Virginia Waterways' "Virginia's Water Resources: A Tool for Teachers".*

- [www.coastal.ca.gov/publiced/aab/saveourseas.pdf](http://www.coastal.ca.gov/publiced/aab/saveourseas.pdf)
- [www.longwood.edu/cleanva/images/sec6.scientificclean.pdf](http://www.longwood.edu/cleanva/images/sec6.scientificclean.pdf)

## EXTENSIONS

Students can make a short oral presentation of their work to the class. These oral reports can include summaries of the question tested, background information collected, the experimental design, data tables and graphs, and final conclusions.

The class could work together to make a poster display of their findings. They could also display some of the litter and debris that was collected. If the students contributed to a larger cleanup effort, they may be able to prepare part of a summary report by the organization leading the cleanup.

Have students write letters to organizations that support cleanup activities or to local appointed and elected officials. Students can describe their cleanup and state their positions on litter-related legislation.

Have the class adopt the cleanup site or another area for the semester or the school year. This will involve making regular tours to the site to keep it clean, as well as educating the community about the site, its natural inhabitants, and how to keep it clean.

## Cleanup Checklist for Students

### CLOTHES TO WEAR

- Windbreaker or jacket (waterproof jacket if rain is forecasted)
- Sweater
- Long pants
- Sturdy shoes (no sandals or open toed shoes)
- Gloves (gardening gloves, dish gloves, or disposable gloves)

### ITEMS TO BRING

- Drinks (On hot or sunny days, you should have at least a quart of water, juice, or soft drinks per person)
- Sunscreen
- Sunglasses
- Change of clothes (in case of getting wet)
- Hat (depending on the weather)

### SAFETY DURING THE CLEANUP

- Stay with your group members at all times.
- Do not go near or into the water.
- Keep your shoes on at all times to protect your feet.
- Keep out of dunes and do not step on any plants.
- Do not touch any wildlife that you find or taste any water or plants.
- Learn what poison ivy and poison oak look like, and avoid these plants.
- Call an adult immediately if you find any stranded animal.
- Call an adult immediately if you find any dangerous item, such as a syringe, large drum, chemical container, or medical waste.
- Do not eat any food without first carefully washing your hands.



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## HANDOUT

Please pick up **all** debris that you find. Only record information for the **items listed below**.

Keep a count of your items using tick marks and enter the item total in the box.

Example: **8** Beverage Cans |||||

### SHORELINE AND RECREATIONAL ACTIVITIES

(Debris from fast food, beach-goers, sports/games, festivals, litter from streets/storm drains, etc.)

<input type="text"/>	Bags (paper or plastic) _____	<input type="text"/>	Cups, Plates, Forks, Knives, Spoons _____
<input type="text"/>	Balloons _____	<input type="text"/>	Food Wrappers/Containers _____
<input type="text"/>	Beverage Bottles (plastic) 2 liters or less _____	<input type="text"/>	_____
<input type="text"/>	_____	<input type="text"/>	Pull Tabs _____
<input type="text"/>	Beverage Bottles (glass) _____	<input type="text"/>	6-Pack Holders _____
<input type="text"/>	Beverage Cans _____	<input type="text"/>	Shotgun Shells/Wadding _____
<input type="text"/>	Caps, Lids _____	<input type="text"/>	Straws, Stirrers _____
<input type="text"/>	Clothing, Shoes _____	<input type="text"/>	Toys _____

### OCEAN/WATERWAY ACTIVITIES

(Debris from recreational/commercial fishing and boat/vessel operations)

<input type="text"/>	Bait Containers/Packaging _____	<input type="text"/>	Fishing Nets _____
<input type="text"/>	Bleach/Cleaner Bottles _____	<input type="text"/>	Light Bulbs/Tubes _____
<input type="text"/>	Buoys/Floats _____	<input type="text"/>	Oil/Lube Bottles _____
<input type="text"/>	Crab/Lobster/Fish Traps _____	<input type="text"/>	Pallets _____
<input type="text"/>	Crates _____	<input type="text"/>	Plastic Sheeting/Tarps _____
<input type="text"/>	Fishing Line _____	<input type="text"/>	Rope _____
<input type="text"/>	Fishing Lures/Light Sticks _____	<input type="text"/>	Strapping Bands _____

### SMOKING-RELATED ACTIVITIES

<input type="text"/>	Cigarettes/Cigarette Filters _____
<input type="text"/>	_____
<input type="text"/>	_____
<input type="text"/>	Cigarette Lighters _____
<input type="text"/>	Cigar Tips _____
<input type="text"/>	Tobacco Packaging/Wrappers _____

### DUMPING ACTIVITIES

<input type="text"/>	Appliances (refrigerators, washers, etc.) _____
<input type="text"/>	Batteries _____
<input type="text"/>	Building Materials _____
<input type="text"/>	Cars/Car Parts _____
<input type="text"/>	55-Gal. Drums _____
<input type="text"/>	Tires _____

### MEDICAL/PERSONAL HYGIENE

<input type="text"/>	Condoms _____
<input type="text"/>	Diapers _____
<input type="text"/>	Syringes _____
<input type="text"/>	Tampons/Tampon Applicators _____

### DEBRIS ITEMS OF LOCAL CONCERN

(Identify and count 3 other items found that concern you)

<input type="text"/>	_____
<input type="text"/>	_____
<input type="text"/>	_____