Chapter 9
Community Action Activities

One way to tackle to environmental problems is through community action. Once your students have learned of their precious heritage, California's natural resources and wealth of habitats and species, they will be inspired to become a part of the community that seeks to preserve and protect it from the pressures of our state's growing population. These activities can be adapted for all grades, from elementary to high school. To gain the most educational value from these community action activities, we suggest you conduct them in sequence.

Community action is a great way to tie abstract classroom lessons into a student's life outside the school walls. In school, she or he will learn about where environmental problems exist and from where they originate—the stories of how wildlife is harmed can be illuminating yet discouraging. The best antidote to discouragement is action! A student will feel empowered when she or he knows that there is always something that can be done to combat marine pollution and habitat loss. The activities in this section include suggestions that a student can implement at home as well as in the community.

The activity CA3: *Clean Shorelines, Clean Oceans* can be a part of the annual Coastal Cleanup Day (the third Saturday in September), or a part of the Coastal Commission's year-round Adopt-A-Beach program. You may also clean up a creek, river, or lake shore.

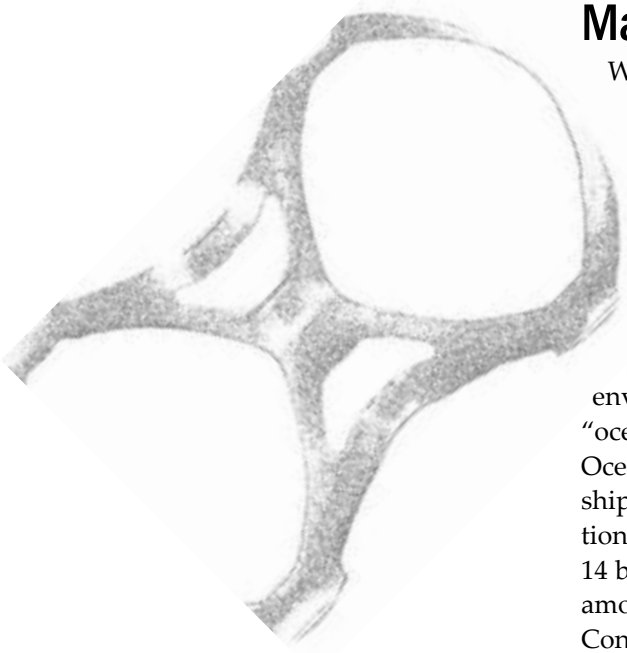
Coastal Cleanup Day is the largest volunteer event focused on the marine environment in the state. Between 1985 and 2006, over 750,000 Californians removed more than 12 million pounds of debris from our state's shorelines and coast. The event is part of the International Coastal Cleanup, organized by The Ocean Conservancy. Between 1986 and 2005, six million people from all 55 U.S. states and territories and 118 countries have participated in the event, removing more than 100 million pounds of debris and cleaning more than 170,000 miles of coastline.

The Coastal Commissions' Adopt-A-Beach program can be done at any time. When a group "adopts" a beach, they commit to cleaning it at least three times per year, although school groups can fulfill their obligation with a single cleanup.

If your class is unable to participate in a field trip activity, then the CA1: *Marine Debris—It's Everywhere*, CA2: *Searching Out Nonpoint Sources of Pollution*, and CA4: *Preventing Pollution at the Source* are still valuable activities that have community service extensions. And remember, trash in our communities could eventually reach the ocean, so cleaning up your schoolyard or neighborhood park can make a difference.

To find out more about California Coastal Cleanup Day, the Adopt-A-Beach Program and other programs available to educators through the California Coastal Commission, visit *www.coastforyou.org*, call (800) Coast-4U, or email *coast4u@coastal.ca.gov*.

Activity for All Grades



Science skills
- Analyzing
- Evaluating
- Predicting
- Problem solving

Concepts
- Marine debris harms ocean wildlife.
- Our actions contribute to marine debris.
- We can make a difference in the amount of marine debris in the oceans by conducting a beach cleanup and by changing some of our trash habits.

Objectives
Students will:
- Understand what marine debris is and from where it comes.
- Describe the hazardous effects of marine debris on marine wildlife.
- Consider solutions to problems associated with marine debris.

Time to complete
50 minutes

Activity CA1
Marine Debris: It's Everywhere!

What is marine debris—where does it come from, and where does it go? Find out the sources and figure out some solutions to one of our ocean's most pervasive problems.

Background

Marine debris is trash found in the ocean or along its shores. From the sandwich wrapper left on the playground that's washed into the gutter leading to an ocean outfall, to the cigarette butt a smoker left in the sand, it's all trash that ends up in the ocean environment. The source of marine debris can be classified as either "ocean-based" or "land-based" depending on where it enters the water. Ocean-based marine debris is waste that is disposed of in the ocean by ships, recreational boats, and petroleum rigs and platforms. The National Academy of Sciences estimates that ocean sources once dumped 14 billion pounds of garbage into the ocean every year! While the amount of ocean dumping has been curtailed due to the International Convention for the Prevention of Pollution from Ships, known as MARPOL 73/78 (MARine POLlution), illegal dumping continues to contribute to the marine debris problem.

Land-based debris, on the other hand, is debris that blows, washes, or is discharged into the water from land. Studies estimate that about two-thirds of marine debris enters the water from land. Contributors include recreational beach users, people who drop litter on sidewalks and streets, plastics manufacturers and transporters, inadequate sewage treatment operations, and illegal dumping. It is important to remember that land-based garbage has the potential to become marine debris. People don't often realize that garbage they produce in their homes and communities can reach the ocean via storm drains, sewer systems, streams, and rivers.

Besides the fact that trash on beaches and in oceans looks ugly, why should we be concerned with marine debris? For one reason, dirty beaches reduce tourism in the area and subsequently tourist revenue, so communities are forced to spend millions of dollars each year to clean their beaches. Marine debris is also dangerous to beach visitors and scuba divers. Beach visitors have required stitches from stepping on broken pieces of glass and metal buried in the sand, and scuba divers have become entangled in lost fishing gear.

Marine debris not only harms humans, it can be fatal to marine wildlife. Marine mammals, sea turtles, birds, and fish can become entangled in plastic fishing line, plastic strapping bands, six-pack rings, and other plastic trash. Once entangled, they may spend energy trying to get free, may become sick or weak, and even die. Certain marine animals can also mistake plastic debris for food and may die as a result of eating it. Sea turtles mistake plastic bags for their favorite food, jellies, and birds mistake small pieces of plastic for fish eggs. Humans are responsible for

Mode of instruction

Students watch the *International Coastal Cleanup* slide show and afterward discuss the various sources of marine debris. Next, conduct a whole class discussion on waste reduction as one solution to the problem.

Materials

1. *International Coastal Cleanup* slide show (order from *www.oceanconservancy.org*)
2. One 3" x 5" card for each student

Preparation

Three weeks in advance, order *International Coastal Cleanup* slideshow from:
www.oceanconservancy.org
cleanup@oceanconservancy.org
(202) 429-5609
Director of Publications
The Ocean Conservancy
1725 De Sales Street, NW, #600
Washington, DC 20036

Outline

Before class
Order Coastal Cleanup slideshow

During class
Whole class discussion on marine debris and waste reduction methods.

the destruction caused by marine debris and it is up to us to bring the destruction to an end.

What can we as individuals do to help solve the hazardous problem of marine debris? We can participate in a beach cleanup. We can also rethink some of our habits, and reduce, reuse, and recycle trash—all trash is potential marine debris.

Activity

1. Begin by asking what your students know about marine debris. What is it, where does it come from, who is responsible for it, and how does it affect our lives? How does it affect marine life? Put some of the student answers on the blackboard to refer to later.

2. Present the *International Coastal Cleanup* slide show. Hold a whole class discussion on the sources of marine debris. Questions can include: How does marine debris reach the oceans? What are some additional land-based sources? What happens to all the trash they throw away? What is "away?" How can this trash become marine debris? What about litter that they see in the streets and on the school grounds? *(Pipes connected to storm drains often carry runoff storm water from streets directly to nearby bodies of water such as streams, rivers, and oceans. Consequently, they transport street litter to the nearest body of water as well.)*

3. Now discuss with your students how they can become part of the solution instead of part of the problem. What can they do to decrease the amount of debris ending up on the beach and in the ocean? Write the solutions on the blackboard. *They can rethink purchasing a product that is poorly packaged; reduce, reuse, and recycle trash; and remember that every choice they make can make a difference.* What kinds of trash are recyclable? Do any of the students recycle regularly? What about non-recyclable trash—can these items be reused or can our use of them be reduced?

4. Make a Reduce, Reuse, Recycle, Remember table on the board. Ask students for their ideas on specific actions they can take to reduce the amount of waste they produce. Here are some suggestions to get started. See if your students can add to this list.

Reduce

Use a sponge instead of paper towels; use metal utensils, a glass, or a plate instead of paper cups and plates and plastic utensils; write on both sides of paper; bring a canvas bag to the store instead of accepting a paper or plastic one; share items with friends and family and use the library; buy products with less packaging—one-third of our garbage is packaging! If you don't really need something, don't buy it!

Reuse

Use a lunch sack for more than one day; bring lunch in reusable containers; reuse bags from the store; use containers such as shoe boxes and margarine tubs for storage; donate items to charities and thrift stores when you're done using them.

Recycle

Newspapers, bottles, aluminum cans, car batteries, paint, automotive fluids, and plastic bottles. Complete the recycling loop and buy recycled products.

Remember

We can all make a difference!

5. Emphasize that in taking these actions, students can help solve the problem of marine debris. Encourage students to implement these waste reduction methods at school and at home. Encourage them to share these ideas with their families.

Results and reflection

Students write a one-page summary on the sources and effects of marine debris, and what they can do to help reduce the problem.

Conclusions

It's never too late to do something for the oceans. Rethinking our use of everyday products can make a difference to the creatures that depend upon clean oceans and beaches for survival.

Extensions and applications

1. Design and conduct a survey of local boaters and fishers to find out how they handle their trash.
2. Design an informative handout or pamphlet about marine debris using photographs of marine wildlife and marine debris.

Adapted from

Save Our Seas, A Curriculum for Kindergarten through Twelfth grades. The Ocean Conservancy (formerly known as Center for Marine Conservation) and California Coastal Commission, 1993.

Activity for All Grades

Activity CA2
Searching Out Nonpoint Sources of Pollution

What is it, and what can you do to stop it?

Science skills
Map reading

Concepts
Nonpoint source pollution is a major problem to marine life. The good news is that each of us can be part of the solution.

Objectives
Students will identify nonpoint source pollution and how it affects both water quality and water organisms.
Students will understand how consumer choices can reduce nonpoint source pollution.

Time to complete
50 minutes

Background
Land-based marine pollution can either be from a "point source" or a "nonpoint source." Point source pollution originates from a specific place such as an oil refinery or a paper mill. Nonpoint source pollution, on the other hand, is contaminated runoff originating from an indefinite or undefined place, often a variety of places (e.g., farms, city streets and parking lots, yards and landscaping, construction sites, and logging operations). The soot, dust, oil, animal wastes, litter, sand, salt, pesticides and other chemicals that constitute nonpoint source pollution often come from everyday activities such as fertilizing lawns, walking pets, changing motor oil, and driving. With each rainfall, pollutants from these activities are washed from lawns and streets into stormdrains that often lead directly to nearby bodies of water such as streams, rivers, and oceans.

While rarely visible, nonpoint source pollution is a chronic and ubiquitous form of coastal water contamination. The U.S. Environmental Protection Agency estimates that the primary cause of the pollutants in the ocean are not from point sources, but from various forms of contaminated runoff. The table on page 129 outlines examples of nonpoint source pollutants, their sources, and their effects.

Finding solutions to nonpoint source pollution is difficult, even if the sources can be identified and located. Often solutions involve major changes in land-use practices at the local level and expensive methods to minimize runoff. However, nonpoint source pollution does offer individual citizens an ideal opportunity for combating marine pollution. There are actions we can take every day that can help—by changing some of our habits, we can help reduce nonpoint source pollution. The first step is understanding what some of the common types of pollutants are that we put in the ocean every day. The next step is to look for alternatives to use in place of those pollutants. Using these alternatives, we can still have clean houses and luxuriant yards—and a healthy ocean!

Activity
1. Ask students what they know about nonpoint source pollution, and write their answers on the board. Have they heard of the term? Do they know what it means? What are some examples? (*Nonpoint source pollution is contaminated runoff originating from an indefinite or undefined place, often a variety of places, see list above.)*

Mode of instruction

Students study a local map to identify possible sources of nonpoint source pollution, followed by a classroom discussion on actions students can take to reduce nonpoint source pollution.

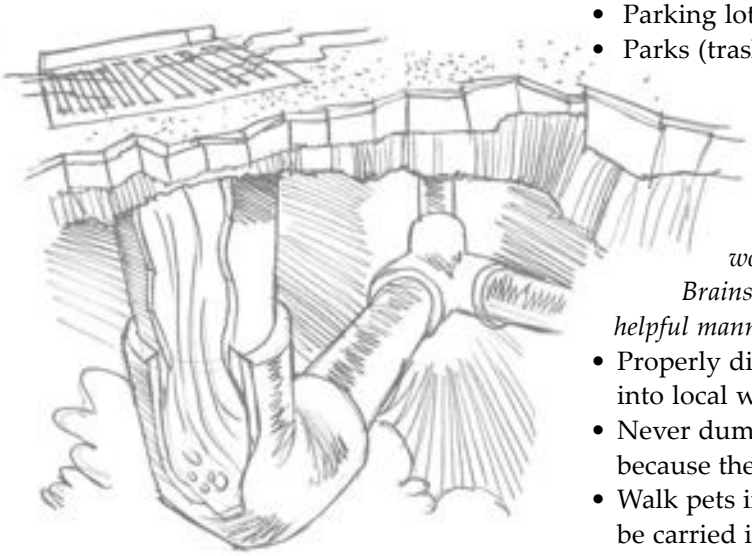
Materials

1. Local map of the community, photocopied for each student
2. Map of community's storm drain system from the local Department of Public Works (optional)
3. "Nonpoint Source Pollution" and "Safe Substitutes" handouts

Preparation

Contact your local Department of Public Works to get map of storm drains. Find map of local community that includes waterways. Photocopy maps and information sheets.

Outline



Before class

1. Photocopy maps of storm drains and local community, one for each student.
2. Photocopy "Nonpoint Source Pollution" and "Safe Substitutes" (one page, double-sided) for students to read and take home.

During class

1. Hand out maps for whole class discussion.
2. Hand out "Nonpoint Source Pollutants" and "Safe Substitutes" information sheets.

2. Next, ask students what types of nonpoint source pollution they think could be originating from their school and their community. Write this on the board.

3. Pass out the "Nonpoint Source Pollutants" and "Safe Substitutes" handout. Go over the list as a group.

4. Pass out a copy of a map of your community. Each student will now study the map and locate possible sources of nonpoint source pollution in your community. Some examples could include:

Schools

- Playground, football field (trash, fertilizers, pesticides)
- Sewage system, including restrooms, cafeteria, science classes (trash, excess nutrients, detergents, chemicals, pathogens)
- Parking lot (trash, heavy metals, dripping oil)
- Sidewalks and outdoor hallways (trash)

Community

- Farmland (sediments, excess nutrients, fertilizers, pesticides)
- Construction sites (trash, sediments)
- Residential areas (trash, fertilizers, pesticides, detergents from car washing)
- Parking lots (trash, heavy metals, dripping oil)
- Parks (trash, fertilizers, pesticides, animal waste)

5. Brainstorm with students about actions they *or their parents and caregivers* can take to reduce pollutants entering the marine environment. (*Note: Many of these are activities that adults would likely undertake; students would need to advocate these suggestions to their parents. Brainstorm with your students how they can approach adults in a helpful manner.*) Ideas could include:

- Properly dispose of trash in garbage cans. Storm drains empty into local waterways and can carry litter.
- Never dump chemicals on the ground or down storm drains because they may end up in the local stream, river, or bay.
- Walk pets in grassy areas or parks. Pet wastes on pavement can be carried into streams by storm water. Pick up after your pets.
- Do not pour chemicals down drains or toilets because they may not be removed in sewage treatment and can end up contaminating coastal waters. Use non-hazardous alternatives whenever possible (see "Safe Substitutes," page 130).
- Keep cars well maintained and free of leaks. Recycle used motor oil (contact local public works department or call (800) CLEANUP, for how to store and where to take waste oil).
- Don't dispose of leaves or grass clippings in your storm drain. Remember, storm drains usually lead to a body of water, and excess nutrients are a type of pollution. Instead, try composting yard waste.
- Landscape your yard to prevent runoff. Use as few pesticides as possible. Try "natural" (non-toxic) approaches to pest control wherever possible and use organic gardening techniques.

Results and reflection

1. Students locate their homes or neighborhoods on the maps. Then, draw on maps with a colored pencil or crayon the nonpoint source pollution originating from their homes and community, and track where it may go. Does it empty into a nearby waterway? Does it enter the ocean?
2. On the other side of the paper, students will list some possible solutions to reducing nonpoint source pollution from their homes and community.

Conclusions

Nonpoint source pollution presents a significant challenge to address on a large scale, as it is pervasive and difficult to control. However there is much we can do to reduce nonpoint source pollution at its source, beginning at home, extending to our schools, and out in our community.

Extensions and applications

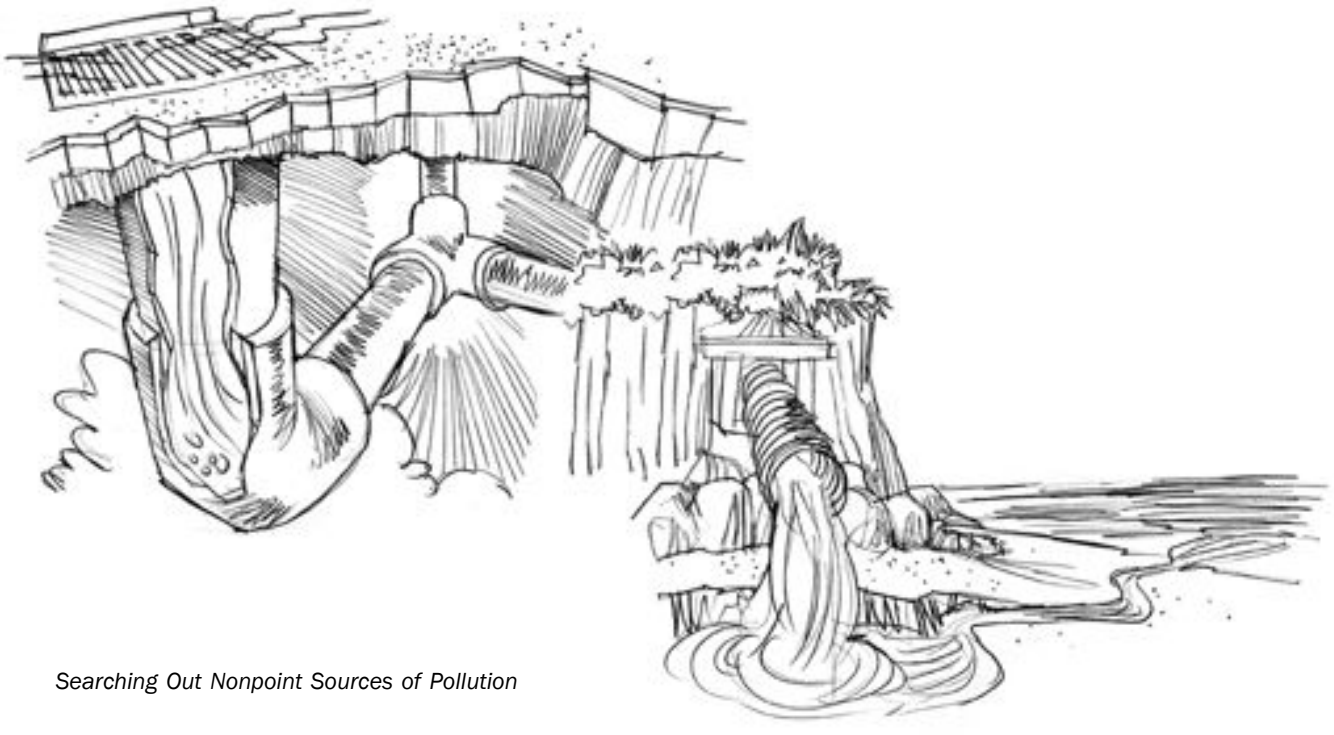
1. Using the maps and information from this activity, create a nonpoint source pollution display for your school and/or community.
2. Find out what types of pollutants your school is generating (detergents, pesticides, fertilizers) and make a list. Discuss with school staff nonpoint source pollution, and suggest alternative products.
3. Conduct a storm drain stenciling activity around your school to alert people about the hazards of nonpoint source pollution. For information and stencils, contact The Ocean Conservancy at *stormdrain@oceanconservancy.org* or (757) 496-0920. You may also contact your local public works department to find out if they have a stenciling program.
4. Write to local or state representatives to find out what measures are being taken (or considered) to reduce nonpoint source pollution in your community. (Refer to Appendix D, *Make Your Views Known*, for letter-writing tips.)

Adapted from

Save Our Seas, A Curriculum for Kindergarten through Twelfth grades. The Ocean Conservancy (formerly known as Center for Marine Conservation) and California Coastal Commission, 1993.

Nonpoint Source Pollutants

Pollutant types	Sources	Effects
Marine debris (e.g., plastics, glass, metals, woods)	Runoff from roads, landfills, and parking lots into storm drains; sewer systems, beach and boating activities	Can harm marine life by entanglement or ingestion
Sediments	Construction sites; agricultural lands; logging areas	Clouds water, decreases plant productivity; suffocates bottom-dwelling organisms
Excess nutrients (e.g., fertilizers, animal wastes, sewage, yard waste)	Livestock; gardens; lawns; sewage treatment systems; runoff from streets	Prompts phytoplankton or algal blooms; causes eutrophication (depleted oxygen), and odor
Acids, salts, heavy metals	Runoff from roads, landfills, and parking lots; salt from roadway snow dumping sites	Toxic to marine life and can be taken up by organisms and bioaccumulate in their tissues
Organic chemicals (e.g., pesticides, oil, detergents)	Forests and farmland; antifouling boat paints; homes (lawns); golf courses; sewage treatment systems; street runoff	Chronic and toxic effects on wildlife and humans, possibly carcinogenic
Pathogens (e.g., coliform bacteria)	Municipal and boat sewage; animal wastes; leaking septic/sewer systems	Causes typhoid, hepatitis, cholera, dysentery



Safe Substitutes: Reduce Nonpoint Source Pollution

At Home

Air Fresheners
- For sink disposal odors, grind up used lemons.
- For surface odors on utensils and chopping blocks, add a few drops of white vinegar to soapy water.

Deodorizers
- For carpets, mix 1 part borax with 2 parts cornmeal; spread liberally and vacuum after an hour.
- Sprinkle baking soda in the bottom of cat boxes and garbage cans.

Dish Detergents
- Use mild, biodegradable, vegetable oil-based soap or detergent.
- For dishwashers, choose a detergent with the lowest phosphate content.

Disinfectants
- For disinfecting tasks, use ½ cup borax in 1 gallon hot water.

Drain openers
- Pour boiling water down the drain once a week.
- For clogs, add a handful of baking soda and ½ cup white vinegar to your drain, cover tightly and let sit 15 minutes while carbon dioxide bubbles work on clog. Finish with 2 quarts boiling water, follow with a plunger.

Floor cleaners
- For plain wood floors, use a damp mop with mild vegetable oil soap and dry immediately.
- For painted or varnished wood floors, combine 1 teaspoon of washing soda with 1 gallon of hot water. Rinse and dry immediately.
- For vinyl floors, combine ¼ cup white vinegar and ¼ cup washing soda with 1 gallon of warm water, and mop.
- For scuff marks on linoleum, scrub with toothpaste.

Furniture polish
- For finished wood, clean with mild vegetable oil soap.
- For unvarnished wood, polish with almond, walnut, or olive oil; be sure to remove excess oil.
- Revitalize old furniture with linseed oil.

Glass cleaner
- Combine 1 quart water with ¼ cup white vinegar.

Laundry detergent
- Avoid products containing phosphates and fabric softeners.

Bathrooms
- Combine ½ cup borax in 1 gallon of water for cleaning and disinfecting toilets.
- Clean toilets frequently with baking soda.
- Tub and sink cleaners: Use baking soda or a non-chlorinating scouring powder.

For the Garden

Garden fertilizers
- Use organic materials such as compost, either from your own compost pile or purchased from the store.

Garden weed and fungus control
- Use less-toxic soap solutions for weed killers.
- For fungus, use less-toxic sulfur-based fungicides.
- To control powdery mildew on roses, spray both sides of rose leaves (in the morning, weekly) with a mixture of 2 tablespoons mild liquid soap, 2/3 teaspoon baking soda, and 1 gallon water.

Pest control
- For outdoor ants, place boric acid in problem areas.
- For indoor ants and roaches, caulk entry points. Apply boric acid dust in cracks and insect walkways. Be sure it's inaccessible to children and pets (it's a mild poison to mammals).
- For garden aphids and mites, mix 1 tablespoon of liquid soap and 1 cup of vegetable oil. Add 1 teaspoon of mixture to a cup of water and spray. (Oil may harm vegetable plants in the cabbage family.)
- For caterpillars in the garden, apply products containing *Bacillus thuringiensis* to the leaves when caterpillars are eating.
- For mosquitoes in the yard, burn citronella candles.

Source: *Take Me Shopping: A Consumers Guide to Safer Alternatives for Household Hazardous Products*. Published by the Santa Clara County Hazardous Waste Management Program.

Watch Out for These Toxic Ingredients!

Degreasers: trichloroethylene (TCE), toluene, methylene chloride. **Disinfectants**: o-phenylphenol, phenol chlorobenzene, diethylene glycol. **Drain cleaners:** sodium hydroxide, potassium hydroxide, hydrochloric acid. **Dry cleaning fluids:** TCE, perchloroethylene (PERC), 1,1,1-trichloroethane (TCA), naptha..

Gasoline: benzene, paradichlorobenzene. **Oven cleaner**: methylene chloride, xylene, toluene, methyl ethyl ketone chloride, nitrobenzene. **Spot remover or cleaning fluid**: carbon tetrachloride, 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), perchloroethylene (tetrachloroethylene, PERC). **Toilet bowl deodorizer**: paradichlorobenzene. **Upholstery cleaner**: TCE. Wood preservatives: pentachlorophenols (PCPs), arsenic.

Activity for All Grades

Science skills

- Identifying
- Classifying
- Hypothesizing
- Cataloging
- Graphing

Concepts

- Humans affect ocean ecosystems and marine wildlife.
- Through our efforts, we can make a difference in the amount of trash that enters the oceans.

Objectives

- Students will demonstrate the role they can play in marine conservation by participating in a shoreline cleanup.
- Students conduct the shoreline cleanup according to a scientific method.

Time to complete

Field trip to the beach, river, lake site: 2-3 hours at the site

Mode of instruction

Classroom discussion and preparation for field trip, then field trip to shoreline followed by data analysis in the classroom.

If you would like to do your cleanup on California Coastal Cleanup Day, it is held on the third Saturday in September. Begin planning as soon as school starts in the fall!

Activity CA3
Clean Shorelines, Clean Oceans: Shoreline Cleanup

Tons of marine debris are picked up each year off California's beaches, river banks, and lake shores. Be a part of the solution—do a shoreline cleanup with your class. You never know what you may find!

Background

If your students have completed the activities CA1: *Marine Debris—It's Everywhere!* and CA2: *Searching Out Nonpoint Sources of Pollution*, they will have an understanding of the many types of marine debris and its hazardous effects on wildlife. Now is the time to put this newfound awareness into action with a shoreline cleanup. The shoreline cleanup allows the students to participate in an immediate solution to the problem of marine debris; simultaneously, the students employ scientific methodology to analyze the problem of marine debris. They will form a hypothesis, decide on their purpose, follow a particular method, summarize their results, and make a final conclusion.

Picking up trash from beaches and waterways so it doesn't enter the oceans and harm marine life is clearly an important job. Why collect data on what you find? By collecting data, students can begin to understand the types and amount of trash littering the beach. From this information, students can also determine some possible sources of the debris. By determining what type of trash is littering the shore and how it might have arrived there, students will discover that marine debris is caused by human behavior. We all use and discard products that can become part of the problem, and by understanding this connection, we can begin to develop solutions to the problem. There are actions that we can take every day that can reduce marine debris.

Activity

Follow instructions under "Outline" (in the sidebar, p. 134) for preparation for field trip.

1. The day before the field trip, discuss these steps of scientific methodology with your students:
Purpose: Students will come up with a purpose for their scientific study. A likely purpose might be, "I want to understand where marine debris comes from."
Hypothesis: Have your students come up with hypotheses they can test by collecting data during the cleanup. Possible hypotheses might include: "There is more marine debris farther up the beach than closer to the water." Or, "There is more plastic debris than any other type of debris."
Method: Students will break into teams to comb two different sections of the beach. One team will clean near the water line, another will clean the upland portion of the shore. Within each team, students will break into groups of 3-4 students to cover a segment of their section. In each group, one student will be the recorder, one student will hold the trash

Materials

1. Separate bags for trash and recyclable debris
2. "Shoreline Cleanup Data Card" (There are two options available. *Option A* groups debris by its substance. This card allows for a reflection activity in which students determine what human actions led to the debris ending up on the shore, and allows them to understand which materials are most abundant. *Option B* is used by volunteers throughout the world during the International Coastal Cleanup. With this card, students organize the debris into source categories as they collect it.)
3. Clipboard and pencil for each small group (3-4 students)
4. School parental consent form
5. Adopt-a-Beach waiver form (if applicable)
6. First aid kit
7. Gloves (two for each small group)
8. Tide chart

and recycle bags, and two students with gloves will pick up the trash. Students will switch jobs half way through, so all students have an opportunity to pick up trash. Every item that is picked up is recorded on the data sheet. The groups will discuss and agree to which "category" each piece of debris belongs. If there is a question, the student should ask the teacher or adult supervisor (i.e., some debris will include both plastic and metal).

2. The morning of the cleanup, check weather conditions at the cleanup site and review the following safety information with the students:

- Do not go near any large metal drums.
- Do not pick up any sharp objects – inform an adult where the sharp object is located.
- Notify an adult if you find a syringe.
- Debris collectors wear gloves.
- Stay out of dunes and any protected areas.
- Watch out for wildlife and do not approach any animals you encounter.
- Don't lift anything too heavy.
- If you begin to feel very hot, dizzy or tired, drink some water and notify an adult.
- If you are walking near the surf, never turn your back to the ocean.

3. At the site, select a stretch of shoreline that the teams will cover. Make sure you have adequate supervision of the teams if the stretch is a wide one (choose the stretch according to the age of your class, cover a wide stretch with older children, or a shorter one with younger).

4. Instruct students to keep their eyes open to possible clues as to debris sources, e.g. are there adequate trash cans, is there a nearby storm outfall, does the site get heavy use, do people fish in the area?

Preparation

Select a public site for the cleanup and a field trip date. For locations on the coast, San Francisco Bay, and some inland waterways, call (800) Coast-4U or visit www.coastforyou.org to find a local Adopt-A-Beach manager. (If you wish to hold your cleanup on Coastal Cleanup Day, the third Saturday in September, use the same phone number and webpage to obtain local participation information.) The beach manager will assist you in selecting a clean up location and will supply you with bags, gloves, and waivers for your students. Arrange with the beach manager to have the trash and recycling collected after your cleanup.

If you would like to do a shoreline cleanup and are in an inland area that is not covered by the Adopt-A-Beach program, try contacting your local city or county public works department for assistance with supplies or find a local citizens' group that holds cleanups in your area. (Check the on-line "Marine, Coastal & Watershed Resource Directory" at *www.coastforyou.org*.)

5. Have students assemble into their two teams (waterline and upper shore). Within their teams, have students break up into groups of four students:
    1. Data writer
    2. Debris bag holder
    3. Debris collector
    4. Debris collector

6. Within each group of four, distribute one trash bag, one recycling bag, two gloves (one for each of the two people who will pick up debris) and one data card with clipboard and pencil.
7. Define the boundaries of the project for the students and adult volunteers so no one strays away. Set a time for the completion of the cleanup and a meeting place, and identify a way of telling students when it is time to return (e.g., three blows on a whistle, a special classroom signal or call, etc.). Remind the students to only work in their designated area (water line or upper shore).
8. After the cleanup, pile the bags in two designated areas: one for recyclables, and one for nonrecyclables. Collect the clip boards and data cards. Have lunch and congratulate yourselves on a job well done. Be sure not to leave any trash from your lunches behind! You may place your trash in your bags.

Results and reflection

Back in the classroom, analyze the data collected at the cleanup:
1. Individually or in groups, provide students with copies of all the data cards. Have them tabulate the data card totals onto two new data cards—one for the water line and one for the upper shore. (This may be done as a homework assignment or it may be assigned to a designated two students if you prefer.)
2. Break the students into their small groups of four. Photocopy the two data cards that contain the totals from the beach cleanup and give each small group a copy of the card for the area that they cleaned up.
3. If Data Card Option A was used, the class (or each small group) will choose a method for organizing the data. Some ideas include keeping it organized by material (plastic, glass…), or organizing it by the source activity (fishing, littering, dumping...), or by the manner in which they think the debris reached the beach (from boats, from beach-goers, through storm drains…). You may choose to have students transfer their data to Data Card Option B to help guide them to possible conclusions as to the source of the debris.
4. Each small group will choose a method for displaying the data from their cleanup area: pie charts, line graphs, and/or bar graphs.
5. Have each team share their visual presentation of the data with the class. Did the results confirm the hypotheses that were made before the cleanup? Which was the most effective method of presenting the data? Which was most visually appealing? Which was the easiest to understand? Did they tell different stories?

Outline

Before class

Two weeks to one month before cleanup:

1. Select a cleanup site. The shoreline should be sand or gravel and known to collect litter.
2. Begin assembling the materials and support you need. (Decide whether to use Data Card *Option A* or *Option B*. Page 2 backside will be the same for either option.)
3. Arrange transportation to the site.
4. If using the Adopt-A-Beach Program, send the school's parental consent form and the Adopt-A-Beach waiver form home with the students to be signed and returned.
5. You may wish to obtain a SHARPS container for syringes the students may discover. Your local fire department can assist you.

Day before cleanup

1. Collect parental consent forms.
2. Break the class up into two teams. One team will be responsible for the upland portion of the shoreline (if there are dunes at the beach, this team will clean up the beach-side of the dunes). The other team will be responsible for the water line. Within each team, students will break out into small groups of four students.
3. As a group, predict the type of debris that each group will find. Will there be a difference? Why?
4. Discuss the purpose of the cleanup.
5. Go over the data cards with the students.
6. Remind the students to wear appropriate clothing for the cleanup: layers, closed-toed shoes, hats and sun screen. Suggest that they bring a bottle of drinking water for their own use during the field trip as well as a bag lunch. (You may want to encourage the students to try to create a "trash-free" lunch, using recyclable and reusable containers.)
7. Photocopy data cards (*Option A* or *Option B*), one per each group of four students.

Day of cleanup

Follow activity instructions.

Day after cleanup

Data analysis and classroom discussion.

6. After the presentations, conduct a whole class discussion that touches on relevant questions, such as:

- Where is the trash coming from?
- Do certain items indicate specific sources of debris? (For example, fishing nets represent the fishing industry and are an ocean-based source of marine debris.)
- How can the information that was collected be used by the students and others to reduce marine debris? (Perform Activity CA4 to delve further into this topic.)
- Why is it important to know the location of the debris and the date of the sampling? Where does most of the trash accumulate? Which items of debris do they think are the most dangerous to marine wildlife?
- How does it make them feel to see the trash along the beach?
- How does it make them feel to see the beach clean after their work?

Conclusions

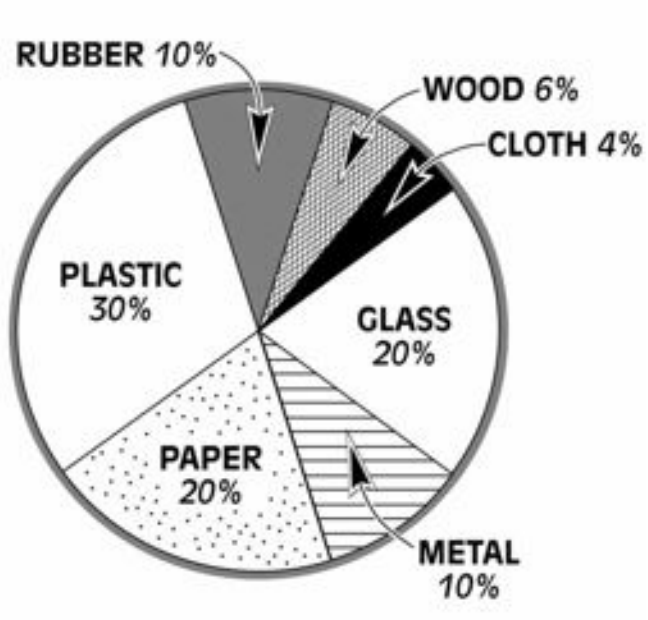
A cleanup helps us care for our shorelines and oceans, and tells us about what types of debris builds up on the shore. Knowing this, we can make some lifestyle choices to reduce marine debris.

Extensions and applications

1. Ask students to bring a "trashless" lunch to the cleanup, using reusable containers. Discuss alternatives to plastic sandwich bags, paper lunch sacks, disposable drink containers, etc.
2. Make a display of the trash collected.
3. Write an article about your beach cleanup for school or local newspaper (See Appendix D, *Make Your Views Known*).

Adapted from

Save Our Seas, A Curriculum for Kindergarten through Twelfth grades. The Ocean Conservancy (formerly known as Center for Marine Conservation) and California Coastal Commission, 1993.



Shoreline Cleanup Data Card

Option A, page 1

- ✔ Count items in groups of five and record the total. For example: 𝍸 𝍸 || = 12
- ✔ Do not write the words "lots" or "many." Please count each item.
- ✔ Please leave natural items such as driftwood and seaweed on the beach.
- ✔ Avoid stepping on dune grass and plants. They hold the sand and prevent erosion.
- ✔ Work with a few people–have one person record the numbers while others collect and bag the trash.

PLASTIC

	# of items (𝍸 |||)	Total # of items
Bags:		
food bags/wrappers		
other bags		
Bottles:		
beverage bottles		
motor oil/lube bottles		
other plastic bottles		
Caps, lids		
Cigarette filters		
Cigarette lighters		
Cigar tips		

	# of items (𝍸 |||)	Total # of items
Cups, utensils, plates, straws		
Diapers		
Fast food containers		
Fishing line, nets, lures, floats		
Foam peanuts		
Six-pack holders		
Syringes		
Tampon applicators		
Toys		
Other plastic		

GLASS

Beverage bottles		Other glass	
Other bottles/jars			

METAL

Bottle caps, pull tabs		Nails	
Beverage cans		Other metal	
Other cans			

RUBBER

Balloons		Tires	
Condoms		Other rubber	

PAPER

Bags		Cups/plates	
Cardboard		Newspapers/magazines	
Cartons		Other paper	

WOOD

Lumber pieces		Other wood	
Pallets			

CLOTH

Clothing		Other cloth	

Adapted from The Ocean Conservancy's International Coastal Cleanup Data Card (in use 1986-2000)

ITEMS COLLECTED

The Ocean Conservancy
www.oceanconservancy.org

Human-made debris, trash and litter...

- Harms the environment & wildlife
- Causes communities to lose money
- Threatens human health & safety
- Looks bad!

Think about where all this debris comes from and how **we** can prevent it!

Please pick up all debris found on the beach. Record information on only 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** 𝍸 III

SHORELINE AND RECREATIONAL ACTIVITIES

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

- [ ] Bags
- [ ] Balloons
- [ ] Beverage Bottles (plastic) 2 liters or less
- [ ] Beverage Bottles (glass)
- [ ] Beverage Cans
- [ ] Caps, Lids
- [ ] Clothing, Shoes
- [ ] Cups, Plates, Forks, Knives, Spoons
- [ ] Food Wrappers/Containers
- [ ] Pull Tabs
- [ ] 6-Pack Holders
- [ ] Shotgun Shells/Wadding
- [ ] Straws, Stirrers
- [ ] Toys

OCEAN/WATERWAY ACTIVITIES

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

- [ ] Bait Containers/Packaging
- [ ] Bleach/Cleaner Bottles
- [ ] Buoys/Floats
- [ ] Crab/Lobster/Fish Traps
- [ ] Crates
- [ ] Fishing Line
- [ ] Fishing Lures/Light Sticks
- [ ] Fishing Nets
- [ ] Light Bulbs/Tubes
- [ ] Oil/Lube Bottles
- [ ] Pallets
- [ ] Plastic Sheeting/Tarps
- [ ] Rope
- [ ] Strapping Bands

SMOKING-RELATED ACTIVITIES

- [ ] Cigarettes/Cigarette Filters
- [ ] Cigarette Lighters
- [ ] Cigar Tips
- [ ] Tobacco Packaging/Wrappers

DUMPING ACTIVITIES

- [ ] Appliances (refrigerators, washers, etc.)
- [ ] Batteries
- [ ] Building Materials
- [ ] Cars/Car Parts
- [ ] 55-Gal. Drums
- [ ] Tires

MEDICAL/PERSONAL HYGIENE

- [ ] Condoms
- [ ] Diapers
- [ ] Syringes
- [ ] Tampons/Tampon Applicators

DEBRIS ITEMS OF LOCAL CONCERN

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

- [ ]
- [ ]
- [ ]

Page 2, Options A and B
Shoreline Cleanup Data Card

Beach Section (circle one): Water line Upper shore

Name(s)_____

School_____

Teacher_____

Age_____ Today's Date_____

Shoreline cleaned _____

City/Location _____

Number of people working on this data card _____

Number of trash bags filled_____ Number of recycling bags filled_____

SAFETY TIPS

1. Do not go near any large metal drums.
2. Do not pick up any sharp objects (inform your teacher where the sharp object is located.
3. Notify an adult if you find a syringe.
4. Wear gloves.
5. Stay out of dunes and any protected areas.
6. Watch out for wildlife and do not approach any animals you encounter.
7. Don't lift anything too heavy.
8. If you begin to feel very hot, dizzy or tired, drink some water and notify an adult.
9. If you are walking near the surf, never turn your back to the ocean.

What is the most peculiar item you collected?_____

Comments: _____

_____

_____

Activity for All Grades

Activity CA4
Preventing Pollution at the Source

From taking part in previous activities in this chapter, students now are familiar with how debris can pile up on the beaches. Now they will develop solutions to the problem of marine pollution.

Science skills
- Analyzing
- Problem solving

Concepts
- A specific problem definition will facilitate the development of effective solutions.
- Brainstorming is an effective approach to begin the problem solving process. It can be used to explore marine debris issues and solutions.

Objectives
- Students will be able to utilize a cooperative problem solving process designed to reduce marine debris.
- Students will implement their solution.

Time to complete
One hour

Mode of instruction
Students develop ideas to reduce marine pollution, analyze and evaluate the best ideas, and select the best one for actual implementation.

Materials
Overhead transparency of brainstorming tips

Preparation
Prepare overhead transparency.

Outline
Before class
Prepare overhead transparency.

During class
1. Divide students into small groups.
2. Assign or have students choose roles.
3. Display brainstorming tips overhead transparency. Students hold small group discussions. Each group reports on their solutions to the class.

Background
Students will learn how research and data collection can be used to develop solutions to environmental problems. Students will develop and try to implement solutions to the marine debris problem. No matter how young or old we are, we can all make a difference!

Activity
The Problem Solving Process
1. Hold a class discussion on the problem solving process (see page 140).

2. Tell students that they are now going to use the problem solving process to address the issue of marine debris. Write on the board the different steps and explain them:
   a. Understand and define the problem(s)
   b. Brainstorm solutions
   c. Analyze the solution suggestions
   d. Evaluate which solutions would be most effective and select the best solution.

3. Divide students into small groups (3-4 students). In the groups, assign roles or have students choose a role: recorder, discussion leader, spokesperson.

4. Display "Brainstorming Tips" on the overhead projector for students to refer to in their groups. Tell students they will now use the problem solving process discussed earlier to create solutions to problems associated with marine debris.

Results and reflection
1. Each group presents their problem definition and solution plan to the class. Ask for questions and comments. Ask that students note the ways their proposal could be improved.
2. The class selects the best plan by voting.
3. Elaborate on the best solution—describe it clearly. Would graphs, charts, or time lines help? Help the students design a graphic presentation of the classes' chosen solution. Then, have students create an action plan with timeline for implementation of their class solution.
4. Help students implement the action plan or send the recommendation to the appropriate city, county, or state agency. Consider the following for implementation: Which groups need to know about the proposal? Which groups will initially oppose it and how can their concerns be satisfied? What persuasive and educational techniques will be needed? Who will perform each task? Depending upon the age of your class, you may need to have suggestions ready for them to choose (e.g., local

Department of Public Works, EPA, California Coastal Commission, Harbormaster, etc.). Assist students in defining tasks and draw up a plan of action with names, tasks, and dates. Refer to Appendix D, *Make Your Views Known*, for ideas on effective letter writing techniques.

Conclusions

Humans are the source of marine debris, and we are also the solution. There are many ways we can work to reduce the marine debris polluting our oceans.

Extensions and applications

Invite someone from the school administration or community to class to help evaluate the class's proposed solutions.

Adapted from

Save Our Seas, A Curriculum for Kindergarten through Twelfth grades. The Ocean Conservancy (formerly known as Center for Marine Conservation) and California Coastal Commission, 1993.

WHAT IS THE GOVERNMENT DOING?

For centuries it was common practice for ships to dump their garbage at sea. The United Nations administers a treaty that provides a comprehensive approach to dealing with ocean dumping. The International Convention for the Prevention of Pollution from Ships is known as MARPOL 73/78 (MARine POLlution) and contains Annexes that deal with specific discharges: Annex I oil, Annex II hazardous liquids, Annex III packaged hazardous materials, Annex IV sewage, and Annex V garbage (including plastics). In order to implement MARPOL Annex V, the U.S. Congress passed the Marine Plastic Pollution Research and Control Act of 1987, which applies to both U.S. vessels and foreign vessels in U.S. waters.

Recently, it has become more and more evident that marine debris is also coming from land-based sources. Among these sources are combined sewer overflows. Usually found in older cities, these sewer systems are combined with stormwater drainage systems. When it rains, and too much water goes into the system, overflows of raw sewage and untreated pollutants from the streets are discharge *directly* into waterways. Discharges from land-based sources are subject to regulation under a federal law called the Clean Water Act.

Land-based sources also include urban runoff from storm drains. It is a common misconception that the pollutants and debris washed down storm drains are removed at a treatment plant. In most cases, this runoff is discharged directly into local streams, rivers, and bays with no treatment whatsoever. The U.S. Environmental Protection Agency (EPA) requires cities with separate storm sewer systems to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Cities must apply for this permit to ensure that their stormwater systems are operating as efficiently and cleanly as possible and that they are educating their citizens about the hazards of dumping debris and other substances down storm drains.

Other laws protecting coastal water quality include the federal Coastal Zone Management Act of 1972, the Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act), and the California Coastal Act of 1976, which guides the actions of the California Coastal Commission.

From: *Pocket Guide to Marine Debris*,
The Ocean Conservancy

Brainstorming Tips

1. Don't Criticize Others' Ideas
They will lose their train of thought and stop generating ideas.

2. More is Better
Write down as many ideas as you can. At this stage, don't worry about spelling, repetition, etc.

3. Connect Ideas When Possible
If something someone says sparks a thought, say your idea. Connect parts of your ideas with theirs when possible.

4. Be Free Wheeling and Don't Be Afraid to Express Crazy Ideas
A crazy idea now may seem plausible and original after more thought and research.

The Problem Solving Process

(Format for a class discussion)

Why is it important to understand and define the problem(s) before beginning to explore solutions? The more accurately and specifically a problem is defined, the easier it is to come up with effective solutions.

What are some examples of how different problem definitions might lead to different solutions? One problem definition might focus on the large numbers of cigarette butts found on beaches; another might focus on a lack of trash receptacles at a beach. If your students have participated in a shoreline cleanup, remind them about the data they gathered and analyzed during the cleanup, and the problems they identified. Is there anything else you observed at the shoreline that could help define the problems? If your students did not do a shoreline cleanup, discuss the problems they identified and learned about in CA1: *Marine Debris—It's Everywhere*, and CA2: *Searching Out Nonpoint Sources of Pollution.*

As a group, identify some examples of problem definitions for which the students will explore solutions. Discuss some possible solutions. The solutions could be as simple as initiating a letter writing campaign or as complex as working to get a law passed. For example, students in Massachusetts helped pass a law banning mass balloon releases.