

“You are the Solution to Pointless Pollution” Education Kit



*Interactive Lessons, Hands-on Activities, and
Information about Nonpoint Source Pollution...
The #1 Cause of Water Pollution*



Teach Students to Become the Solution to Pollution!



TO THE INSTRUCTOR

Each day, pollution enters our waterways from many sources. Pollutants and litter from streets, driveways, parking lots, and lawns wash into nearby storm drains with every rainfall or snowmelt. Excess fertilizers, herbicides, pesticides, and insecticides from the land, as well as bacteria and nutrients from pet waste, livestock, and faulty septic systems, wash into our waterways. Additionally, raw or partially treated sewage enters our waters from leaking sewer pipes and antiquated infrastructure. Nonpoint source or “pointless” pollution is the mix of pollutants, litter, and debris that enters our storm drains, which empty into bodies of water that may eventually reach the ocean, resulting in harm to the ecosystem and aquatic life.

Today, pointless pollution is the number one source of water pollution.

Fortunately, there is a solution. Pointless pollution can be eliminated primarily through education. Although people are the source of this pollution, they **are** the solution. For this reason, Clean Ocean Action targets awareness of pointless pollution as an essential campaign to improve and protect the ocean.

This Pointless Pollution Education Kit includes information, interactive lessons, and hands-on activities that may be incorporated into your plans in the classroom, school yard, and community. Similar in structure, these lessons and activities include the same basic elements: grade level, reference to the New Jersey Core Curriculum Content Standards (NJ CCCS), goal(s), objective(s), materials list, activity description, activity evaluation(s), activity extension(s), and useful websites*. Key words used throughout this kit are defined in the Glossary of Terms on page 15.

This kit was developed to be informative, helpful, and enjoyable. Please share any thoughts or suggestions about our education materials by contacting our main office at:

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POINTLESS POLLUTION

Fact Sheet

What is Pointless Pollution?

Pointless pollution originates not from not one source, but from many different, independent sources, and all are related to people. Every rainfall or snowmelt carries pollution to waterways, including the ocean. Pointless pollution, also called nonpoint source pollution, is the #1 cause of water quality problems in the United States. Importantly, we all play a role in creating pointless pollution, and solving this problem.

How Do We Cause It?

Automobiles: Leak oil, gasoline, antifreeze, and grease.

Litter: Improper disposal of any kind of garbage.

Homes and Businesses: Improper use or disposal of fertilizers, pesticides, insecticides, litter, animal wastes, leaves, grass clippings, car washing detergents, hazardous chemicals, car oil, pollutants from machinery, leaking or overflowing septic systems, and toxic waste.

Farms: Improper use or disposal of animal wastes, ammonia, fertilizers, pesticides, insecticides, dirt or sediment, and pollutants from farm equipment.

Leachate: Old unlined landfills, leaky septic systems, and other highly concentrated areas of waste products contaminate local water supplies when rainwater flushes chemicals from them, forming a contaminated liquid sludge called leachate. Landfills are particularly troublesome sources of leachate because they contain industrial, automotive, and household hazardous wastes. Common components of landfill leachate are lead, mercury, cadmium, and other cancer-causing or harmful chemicals such as cyanide, toluene, and benzene.

Overdevelopment: An increase in the amount of paved surfaces in a community contributes to pointless pollution. For every inch that is paved, an inch of filtering vegetation is removed. Paved surfaces forces rainwater, and the pointless pollution that it transports, to move quickly across an area, delivering the pollution directly to adjacent waters, thereby preventing natural infiltration into the ground. Sediment, (dirt and grit from construction sites or streets) washes into nearby waterbodies; too much sediment can destroy aquatic habitats. Specifically, as waterways are clogged and clouded by sediments, plant growth is affected and aquatic life can suffocate.

Where Does It Go?













All the pointless pollutants listed above have a high chance of making their way into a stream, brook, creek, river, lake, and eventually the ocean. Pollutants are washed by rainfalls and snowmelts either directly into the nearest waterbody or into a storm drain, which empties into the nearest waterbody. Most of the time, this “stormwater” does not get treated before reaching our waterways.



CONTROLLING POINTLESS POLLUTION

Every Drop Counts

Pointless pollution is extremely difficult to manage due to the magnitude of the problem. Here are some actions that everyone can take to reduce or eliminate pointless pollution.

-  Never litter!
-  Make sure your outdoor garbage and recycling receptacles are covered.
-  Reduce or eliminate your use of disposable items (such as plastics) when alternatives are available; recycle, reuse, or refill items that may be used more than once.
-  Aggressively comply with the law, by ensuring that the recycling programs at your school, business, and home are correctly implemented and followed.
-  Participate in “household hazardous waste” collection days to properly dispose of electronics, cleaning chemicals, and other materials containing hazardous substances. Contact your local public works department for the schedule.
-  Do not sweep dirt, leaves, and grass clippings onto the street and into storm drains.
-  Urge your community to pass and enforce ordinances against littering and ordinances that require owners to clean up their pets’ wastes.
-  Encourage your municipality or county authority to implement regular street cleaning programs.
-  Reduce or eliminate outdoor car washing(s). If needed, use biodegradable products or go to a car wash that recycles wash water.
-  Eliminate your use of synthetic chemicals on the playground, lawn, or garden. Natural alternatives (also known as Integrated Pest Management - IPM!) are available, and are often more effective.
-  Organize or attend regular cleanups of school grounds, parks, beaches, or other outdoor areas where litter accumulates.
-  Take used motor oil, antifreeze and transmission oil to service stations for recycling.



JOURNAL ON CONSUMER ISSUES

Language Arts/Science/Social Studies: Grades 6-12

NJCCCS

3.2, 5.1, 5.10, 6.2

Goal: To make students aware of how their everyday activities affect the environment.

Objective: Students will keep a detailed journal of their everyday activities (including use and disposal of consumer products) for one week to understand how each individual can contribute and be the solution to pointless pollution in his/her own small way.

Activity: Instruct students to describe, in journal form, all activities throughout their day that may contribute to pointless pollution. This should include transportation, energy use, garbage produced, recreation, and any other activities or habits that could contribute to pointless pollution. Instruct students to be specific; for instance, students should list everything they threw in the garbage. After one week, prompt them with questions such as:

What was the most common garbage item?

How many pieces of packaging were in your garbage? What types of materials were they?

How was your lunch packaged? What types of materials were the packaging? Was all the packaging necessary?

How many beverage bottles were in your recyclables? What types of materials were they?

Were the items recyclable? Which ones?*

Did you recycle or reuse anything during the week?

How long will your trash last? Review the chart on page 13 to discuss the long term implications of trash.

Did you clean up after your pets?

Did you help wash the family car? What kind of soap did you use? Was it biodegradable?

Did you notice any oil or grease marks in your garage or on the driveway?

Did you drop or leave any litter on the ground?

Did you throw anything in a storm drain?

How did you travel to school?

What did you use that required electricity?

Evaluation: Students should make a plan describing changes in behavior that they will make over the next week to reduce their contribution to pointless pollution. At the end of the week, students should write an essay about how they followed their plan, what impact their changes may have had on pointless pollution, and what laws could be made and enforced (on a local, state, or federal level) that could potentially help the problem.

Extension: Students organize and conduct a local cleanup (see page 14) and compare their journal observations with the common items found during the cleanup.

* Students should visit <http://www.dnr.ohio.gov/recycling/plastics/> for an excellent tutorial on plastics and recycling.



DO YOU KNOW WHAT YOU'RE SWIMMING IN?

Water Quality

Healthy water is necessary to sustain all life on earth. Water is used for drinking, bathing, swimming, boating, irrigating crops, and countless other uses. Water quality is a term used to describe the physical, chemical, and biological properties of water with respect to its suitability for a specific purpose. For example, water that is fine to use for bathing may not be safe for human consumption. The quality of water cannot be determined by looking, tasting, or smelling it. In order to determine if water quality is good for a specific purpose, chemical tests must be done.

Water can be tested to determine temperature, salinity, and levels of oxygen, nitrogen, phosphorus, and other characteristics. Sewage and runoff, which include fertilizers, pesticides, bacteria, and chemicals, can cause poor water quality, harm to marine life, and illness in humans. When the ocean has healthy water quality, marine life thrive, and people are able to swim without getting ill. Nationally, thirty-five percent the coastal waters and estuaries are impaired, and forty-four percent are threatened for aquatic life use or human use.

Marine Debris

Marine debris, often called litter, has become a problem along shorelines, and in coastal waters, rivers, estuaries, and oceans throughout the world. Marine debris is defined as any man-made, solid material that enters our waterways. Although some marine debris comes from ships illegally dumping waste, almost 80% of the debris can be traced to land-based sources such as people littering and runoff of rainwater and snowmelt through storm drains². Marine debris is tossed, blown, or washed into a waterbody or storm drain, and eventually makes its way to the ocean.

Debris is harmful to marine life and birds through ingestion and entanglement. Often, these adverse effects are lethal. Specifically, plastic marine debris affects at least 267 species worldwide, including 86 percent of all sea turtle species, 44 percent of all sea bird species, and 43 percent of marine mammal species². Birds, fish, and mammals often mistake plastic for food. Some birds even feed it to their young. With plastic items filling their stomachs, animals can die of starvation. Sea turtles mistake plastic bags for jellyfish, one of their favorite foods. Gray whales have been found dead with plastic bags and sheeting in their stomachs³. Also, a variety of marine life and birds become entangled in fishing lines and nets, balloons, and six-pack beverage holder rings. As many as 30,000 northern fur seals per year get caught in abandoned fishing nets and either drown or suffocate. Plastic constricts animals' movements and can kill marine animals. The bottom line: marine debris will stop being a problem when people stop pointless pollution.

For more information on water quality and marine debris, contact these organizations:

Water Quality:

America's Clean Water Foundation
750 First Street NE Suite 1030
Washington, DC 20002
(202)898-0908
www.worldwatermonitoringday.org

Healthy Water, Healthy People
1001 West Oak St.,
Suite 210,
Bozeman, MT 59717-0575
(866)337-5486
www.healthywater.org

Marine Debris

US Environmental Protection Agency
Oceans and Coastal Protection Office
1200 Pennsylvania Avenue, NW
Mail Code 4504T
Washington, DC 20460
www.epa.gov/owow/oceans/treasure

Surfrider Foundation USA
P.O. Box 6010
San Clemente, CA 92674-6010
(949)492-8170
www.surfrider.org/a-z/marine_debris.asp

1. US Environmental Protection Agency, National Coastal Condition Report II Fact Sheet, <http://www.epa.gov/owow/oceans/nccr/2005/nccr2-factsheet.pdf>.
2. US Environmental Protection Agency, Marine Debris Abatement, <http://www.epa.gov/owow/oceans/debris>.
3. California Coastal Commission, <http://www.coastal.ca.gov/publiced/marinedebris.html>.



WHAT IS A WATERSHED?

How Pollution Gets from the Hills to the Ocean

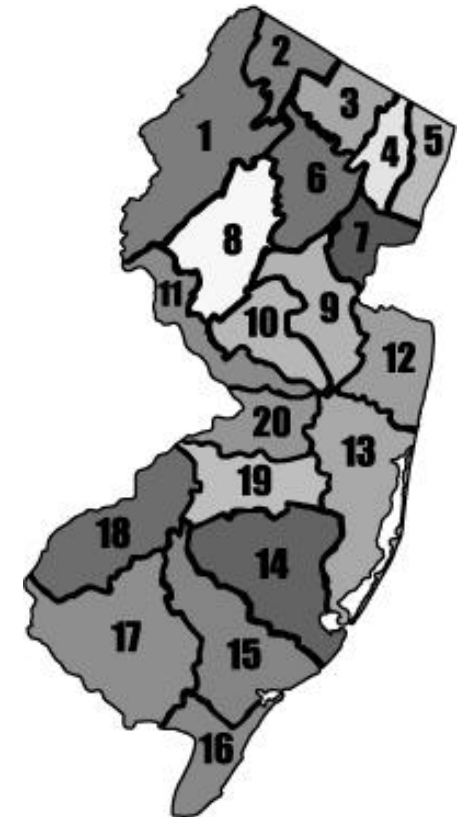
A watershed is an area of land that catches rain and snow melt and drains or seeps into a common marsh, stream, river, lake or aquifer¹. All land is part of a watershed. The defining characteristic of a watershed is elevation. Naturally, the precipitation flows to the lowest point due to gravity and wind. The lowest point can be a body of water (including the ocean), and a storm drain.

Watersheds vary in shape and size, and can cross town, county, state, and national boundaries. They can be hilly and mountainous, or flat and low¹.

When precipitation flows on land toward the nearest body of water, it will collect pointless pollution. In watersheds, rain, snowmelt, wind, and gravity all help pointless pollutants travel into a waterbody. For example, if a piece of litter was dropped on the top of a mountain, there is a chance that the litter will be washed by precipitation or blown by wind into a stream, which may eventually flow to the ocean. Similarly, if a cigarette filter is thrown out a car window, it will most likely be washed or blown into a storm drain and emptied into the nearest waterbody.

Aquifers are part of a watershed. Instead of flowing into streams or waterbodies, some precipitation is absorbed into the ground and becomes part of an underground reservoir, or aquifer. As water is absorbed into the ground, it is filtered. As a result, the water in an aquifer is typically much cleaner than water on the surface (e.g., a lake). Also, aquifers help to recharge lakes and streams. Eighty-nine percent of the United States depends on aquifers for drinking water². When marshes and wetlands are destroyed and replaced by parking lots and highways, less water reaches the aquifer, and pollutants are no longer filtered, but are washed directly into the ecosystem. In addition, oil and road salt from paved roads may trickle down with rain and snowmelt and pollute an aquifer³.

To locate your watershed, refer to USEPA's EnviroMapper for Water, an interactive mapping utility.



*New Jersey has
20 different
watershed areas.
This map depicts the
areas by numbers
and boundaries⁵.*

1. United States Environmental Protection Agency, "What is a Watershed?", <http://www.epa.gov/owow/watershed/whatis.html>.
2. United States Environmental Protection Agency, Safe Drinking Water Act, www.epa.gov/safewater/sdwa/30th/factsheets/uic.html.
3. Gulf of Maine Aquarium, Aquifers, www.gma.org/katahdin/aquifer.html.
4. USEPA EnviroMapper for Water, <http://www.epa.gov/enviro/html/em/>.
5. New Jersey Department of Environmental Protection, Division of Watershed Management, <http://www.state.nj.us/dep/watershedmgt/>.



THE WONDROUS WATERSHED

Visual Arts/Language Arts/Science/Technological Literacy
Grades 3-12

NJCCCS

1.2, 3.3, 5.1,
5.4, 5.7, 5.10, 8.1

Goal: To demonstrate to students how pollution moves through a watershed into waterways.

Objective: Students will learn how pollution affects our waterways by creating their own model of a watershed.

Materials List:

- Large tupperware container or deep aluminum tray
- 2lbs of modeling clay
- 3lbs of sand
- 2lbs of aquarium gravel (to represent aquifer)
- Sheet of waterproof paper (wax paper, plastic film)
- 1/4 cup of cocoa mix
- Green scouring pad (cut into thin rectangular strips; represents trees)
- Tooth picks
- Glue
- Wood Blocks (small and various sizes; represents buildings)
- 1 spray bottle of water

ACTIVITY: Students may want to work in cooperative groups of four for this activity. Fill 2 inches of the container with gravel. Slope the gravel slightly, so one end is about a ½ inch deep and the other end is about 3 inches deep. Mix the clay and the sand to a gritty consistency, with slightly more clay than sand (do not use all at once; save some clay and sand for later in the exercise). Without disturbing the slope, add 2 inches of this mixture to the container. To represent the main river, carve a channel in the middle of the clay/sand layer, about ½ inch deep and about 1 inch wide. Near the top of the slope, split the channel into two or three separate channels to represent tributaries. Build little hills between the tributaries with extra clay/sand mixture. Attach trees to watershed by inserting toothpicks to the upright strips of your scouring pad. Place blocks of wood on the model in several places to represent buildings. Along the main river, flatten out a small area. Cut out a piece of wax paper to cover this area, and stick this on the sand/clay mixture. Explain to students that this wax paper represents the surface of a parking lot. Add water to your container. The water should fill all of the gravel and should just reach up to the lowest extent of the clay/sand mixture. Explain to students that the aquifer captures and transports water that seeps down through the soil. Sprinkle rain over the flattened soil area and the parking lot, with the spray bottle. Ask the students to observe how the rain seeps through the soil, but runs off the parking lot to the river. Sprinkle some cocoa over the sides of one of the hills. Tell the students that the cocoa represents pollution. Spray rain over the polluted area. Ask the students to note how the pollution travels through the watershed, contaminating all downstream areas.

EVALUATION: Initiate a roundtable discussion with students about how litter and other pollutants travel throughout the watershed, how to reduce or eliminate impacts on local waters, and how to educate people within the community about pollution in their watershed.

EXTENSIONS: Students should read the tutorial on Making Water Quality Connections¹. Students can record observations of their town and how physical characteristics might impact water quality. Additionally, students can observe a local waterbody over a period of time for observable signs of pollution.

1. Making Water Quality Connections (from page 6 to end), http://www.green.org/files.cgi/212_Making_Water_Quality_Connections.pdf.



STORM DRAINS, SEWERS, COMBINED SEWERS, AND SEPTIC SYSTEMS: WHAT'S THE DIFFERENCE?

Storm Drains

Storm drains are the metal grates on roads and in parking lots and fields that are connected to drains that collect rainwater and snowmelt (“stormwater”), leaves, silt, and litter (*see picture to left*). Unfortunately, people pour motor oil and throw litter, pet waste, and other debris into storm drains, thinking they are “sewers” and that the contents will go to the wastewater treatment plant. Instead, contents in a storm drain often empty directly into the nearest waterbody.

Sanitary Sewers

Sanitary sewers transport wastewater (anything that goes down the toilet, sink, shower, washing machine, and dishwasher) to a wastewater treatment plant. A wastewater treatment plant removes solid waste and treats the water so that it meets legal requirements and can be discharged into a waterbody or be reused for a specific purpose.

Combined Sewers

In the United States, some urbanized areas have older infrastructure (e.g., pipelines) for gathering and carrying both raw sewage and stormwater. These systems, called Combined Sewer Overflows (CSOs), combine and treat the contents from storm drains and sanitary sewers. However, CSOs are additional sources of water pollution at times of wet weather. When an abundance of water overwhelms the treatment system, such as during a rainstorm or a snowmelt, the combined stormwater from storm drains and sewage from homes, schools, and businesses is diverted around the treatment plant and discharged “raw” into the nearest waterway. Hence, with many rainfall events in areas with CSOs, raw sewage is discharged into our waters, posing a considerable threat to the health of humans and marine life, and to the viability of our waters for harvesting fish and shellfish¹. Bacteria-polluted waters can cause significant human illnesses.

The combined stormwater and sewage is diverted around the treatment plant and discharged “raw” into the nearest waterway.

Septic Systems

In areas where houses are far apart and connecting to a sanitary sewer line would be too expensive, septic systems are installed. Septic systems are individual wastewater treatment areas. All the wastewater from a house goes through pipes into a holding tank buried in a yard. In the tank, bacteria breaks down the waste product, so that after the waste product leaches through the “fields” or parts of the system, the resulting water will contain few nutrients and minimal harmful bacteria. If septic systems are not installed or maintained properly, raw sewage can leach into the surrounding watershed.

1. New York/New Jersey Harbor Estuary Program, www.seagrant.sunysb.edu/hep/pdf/hep_cso.pdf.



INTRODUCTION TO YOUR UNDERGROUND COMMUNITY

Visual Arts/Language Arts/Geography/Technology Literacy
Grades K-8 (teacher-led), 9-12 (student-led)

NJCCCS

1.2, 3.3, 6.1, 6.2, 6.6, 8.1

Goal: To learn where and how the community's storm drain system operates.

Objective: Students will identify the locations of storm drains near their school or home, as well as potential sources of pointless pollution that may affect the waterbody into which the storm drains empty.

Materials List:

- Obtain a map of school grounds or town (i.e., use street map, topographic map, telephone book map, watershed map, Google Earth map¹, or USEPA's EnviroMapper for water². The EnviroMapper (EM) for Water is a web-based, interactive mapping application that allows you to create a map, displaying various types of surface water information for your area of interest. (For a tutorial on using EnviroMapper, please visit www.cleanoceanaction.org and click on "Education Programs" and "Resources for Educators").
- Locate a storm drain on/near school property.

Activity: Have students mark the approximate location of the nearest storm drain on their map. Using their map, instruct students to locate the nearest waterbody. Using the map and physical characteristics of the area, brainstorm on the various sources of pollution that may wash into this storm drain.

Evaluation: Students should expand their knowledge of EnviroMapper by producing a more detailed map of the town surrounding the chosen storm drain. Using EnviroMapper, instruct students to produce a map of impaired waters in their town. (These waters will be highlighted in red on the map.) If impaired waters do not exist in the immediate area of interest, have students produce a map for a larger expanse until a nearby impaired body of water is located. Use the *Identify* tool to identify the waterbody. A Feature identifier, such as the two letter state abbreviation, followed by a number should appear in the map window. You can click on the Impaired Water ID to learn more about the impairment. Students should perform further research on this impaired waterbody by looking at the demography and topography of the area, and other pertinent information, such as farming and industry. Students should produce a report on the causal relationship between the possible sources of environmental pollution and water quality.

Extensions: Much of the water in rivers comes directly from surface (or stormwater) runoff, which is precipitation that travels over a land surface into the nearest waterbody. Instruct students to research the factors that affect surface runoff in their area of interest and the effects of surface runoff into the nearest stream/river. For background information, the United States Geological Survey provides a good tutorial on the water cycle³, and information for mapping soil types is available. Students should produce a report on their findings.

1. Google Earth, <http://earth.google.com/>.

2. USEPA's EnviroMapper for Water, <http://www.epa.gov/enviro/html/em/>.

3. USGS - water cycle, <http://ga.water.usgs.gov/edu/watercycle/>.

4. Information on soil types, <http://websoilsurvey.nrcs.usda.gov/app/>.



COMMUNITY STORM DRAIN AWARENESS

*Visual Arts, Language Arts, Social Studies
Grades 3 and Up*

NJCCCS

1.2, 3.3, 3.5, 6.1, 6.2

Goal: To determine local awareness about the connection between storm drains and pointless pollution.

Objective: Students will conduct a survey of their neighbors to find out how many people in their community are aware of the role and function of storm drains and how they relate to pollution of local waters. Based on the survey results, students will design educational materials about storm drains and pointless pollution to distribute to their neighbors.

Activity: Instruct students to survey five friends/family members to find out what they know about storm drains and pointless pollution. Students should ask:

1. Do you know what a storm drain is? If yes, do you know the location of the one nearest your house?
2. Do you know what happens to the materials that go into the storm drain? Where do they go?
3. Have you ever discarded an item or dumped anything in a storm drain? Have you seen anyone else do this?
4. If you change the motor oil in your vehicles yourself, where do you dispose it?
5. Do you regularly clean sidewalks, driveways, and lawn areas of litter?
6. How do you think litter on the street and in storm drains affects the environment?
7. What can you do to prevent litter from entering our waterways, including the ocean?

Evaluation: After students collect the answers to their surveys, initiate a classroom discussion about their findings. Were there common misconceptions about storm drains? Did many people find neighbors who used storm drains to dispose of things? Based on classroom discussion, students should brainstorm ideas for an educational brochure (or other item) to be designed and distributed to members of their community. Create and distribute posters and factsheets based on ideas provided by students.

Extensions: Students remind people about the connection between storm drains and pollution of our waterways by marking storm drains with an anti-pollution message. Clean Ocean Action has a storm drain stencil kit available for purchase that includes a stencil with the words "No Dumping-Drains to Waterway," a fish-shaped stencil, instruction cards, and 50 educational door hangers to be distributed in the area of the stenciling project. For more information on storm drain stenciling, or to order a Storm Drain Stenciling Kit, contact Clean Ocean Action or visit www.CleanOceanAction.org (click on "Education Programs" and "Storm Drain Stenciling.")



MOTOR OIL RECYCLING

Oil And Water Don't Mix

Every eight months 10.9 million gallons of petroleum wash into our coastal waters from pointless pollution sources¹. Carried by waterways and storm drains to the sea, this amount is equal to the amount of oil spilled by the Exxon Valdez in Alaska in 1989. It only takes one gallon of motor oil to taint one million gallons of fresh water – a year's supply of drinking water for 50 people².

People working on their cars at home often do not realize the implications of dumping used motor oil in nearby storm drains. In addition, oil that leaks from vehicles, lawn mowers, leaf and snow blowers, and other motorized machinery washes off streets, parking lots, and lawns into storm drains and consequently our local waters.

Once oil enters the marine environment, it can be deadly. It has chronic and toxic health effects on marine life, birds, and humans. Humans are impacted when oil pollutes drinking water supplies and soil. Marine animals die from becoming smothered or trapped in the oil, or ingesting it. When birds become oil-covered, they lose their ability to regulate their body temperature, and often freeze to death.

Important Facts:

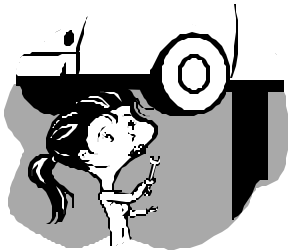
It is illegal to dispose used motor oil in a sink or toilet, storm drain, septic system, or waterway. Each state may have their own laws, but the New Jersey Recycling Act mandates that all used motor oil must be recycled. Motor oil can be reprocessed into boiler fuel and lubricating oil. By recycling motor oil, you are conserving nonrenewable resources.

How To Recycle Your Oil:

Put all used motor oil in a clean leak-proof container with a screw-on top. Do not mix any other automotive chemicals with the oil. Take the oil to a service station or other facility that sells oil (all businesses that sell oil are required to recycle it), or to your local oil recycling drop-off location. Contact your municipal or county recycling coordinator to find out if they accept used motor oil, or visit www.earth911.org to search for recycling facilities using your zip code.

1. United States Environmental Protection Agency, www.epa.gov.

2. Earth 911, <http://www.earth911.org/master.asp?s=lib&a=oil/default.asp>.



MOTOR OIL RECYCLING SURVEY

Language Arts/Math: Grades 7 and Up

NJCCCS

3.3, 4.1, 4.4, 4.5

Goal: To determine how and in what quantity motor oil is recycled, as well as what impact motor oil recycling has on the environment.

Objective: Students will conduct a survey to determine the amount of motor oil that is recycled in their communities. They will use the data collected in the survey to determine the impact on the environment of recycling used motor oil.

Activity: Instruct each student to survey five oil collection facilities* to find out how many gallons of used motor oil they collect in one year. Using the data collected from the survey, and the following facts, students will answer the following questions and will determine the positive impact of motor oil recycling on the environment.

A. *One gallon of motor oil can spoil four acres of soil, rendering it unusable for decades¹. The hydrocarbon components of the oil adhere to the soil and do not move through the soil². They remain there a long time because they do not dissolve in water and do not break down.*

? How many acres would be affected if the amount of motor oil collected by the contacted facilities was not recycled and disposed properly?

B. *One gallon of motor oil can spoil one million gallons of drinking water, the amount necessary to support 50 people for one year¹.*

? How many gallons of drinking water would be spoiled if the amount of motor oil collected by the contacted facilities was not recycled and was dumped into a waterbody that is a drinking water supply? How many people would be affected?

C. *Used motor oil can be reprocessed into boiler fuel, which provides electricity. Two gallons of used motor oil can provide electricity for one home for 24 hours¹.*

? How many homes would be affected if the amount of motor oil collected by the contacted facilities is is recycled? How many hours of electricity would be generated?

D. *Two gallons of used motor oil can provide electricity to heat 48 meals in a microwave¹.*

? How many meals would be gained if the amount of motor oil collected by the contacted facilities is is recycled?

Evaluation: Students should write an essay on the results and implications of their survey.

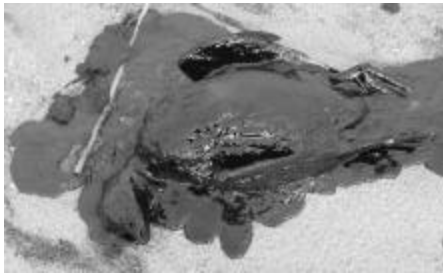
Extensions: Students can investigate the school's bus fleet's service company to determine how much motor oil they recycle annually. Students can also survey their parents and neighbors to find out if and how they recycle their used motor oil. Similar math problems can be formulated with this data. Students can use the calculations from the activity and information from the "Motor Oil Fact Sheet" (see page 10) to develop written recommendations for oil collection facilities, local businesses, family members, and neighbors.

**Any business that sells oil or performs oil changes must collect used motor oil. Many municipal and county solid waste or public works departments also provide used motor oil collection facilities. Students may survey any of these businesses or agencies.*

1. Earth 911, "Motor Oil Recycling," <http://www.earth911.org/master.asp?s=lib&a=oil/importance.asp>.

2. Agency for Toxic Substances and Disease Registry, <http://www.atsdr.cdc.gov/toxprofiles/tp102-c1.pdf#search=%22what%20does%20motor%20oil%20do%20to%20soil%22>.

3. City of San Juan Capistrano, California, Environmental Newsletter, <http://www.sanjuancapistrano.org/uploads/winter2005envnewsletter.pdf>.



OIL: A DEADLY BIRD BATH

Language Arts/Science: Grades 4-8

NJCCCS

3.3, 5.1, 5.5, 5.6, 5.10

Goal: To understand how oil in waterways affects the environment

Objective: Students will learn how oil affects seabirds' ability to survive.

Materials List:

- natural feathers (3 per group)
- plastic gloves (1 pair per group)
- magnifying glasses (1 per student or group)
- rags for cleanup
- 12 oz jar filled with water (1 per group)
- 12 oz jar filled with water/dish soap mixture (1 per group)
- jar (12 oz) filled with a cooking oil/water mixture (1 per group)
- magic marker

Activity:

(1) Organize the class into groups of three or four students. Hand out the feathers and magnifying glasses and have the students examine the feathers. The groups should discuss and record the answers to the following questions:

- (a)** How are feathers used by a seabird (have them think beyond flying)?
- (b)** How do you think oil affects a bird's feathers?
- (c)** Is it possible to clean oil off a bird's feather?

(2) Hand out the materials for the experiment. Each group should drop a feather into the *jar with water* and record what happens to the feather. Then, students should take the feather out of the jar, shake it off, and let it dry. Using the marker, students should label this feather "water" and set it aside. Student should label the other feathers "water/oil/soap" and "water/oil." Next, have a student in each group put on gloves and drop the last two feathers into the *jar with the oil/water* mixture. Instruct students to observe and record what happens to the feathers. Next, have the students with the gloves shake the excess water off the feathers and record what happens. Next, students will only put the feather labeled "water/oil/soap" into the *jar with the water/dish soap* mixture, try to clean it off, and then dip it in the *jar with water* to wash off the excess soap. Examine all three feathers with the magnifying glass and discuss and record the differences.

(3) Explain to the students that feathers keep birds alive. Feathers provide insulation, buoyancy, waterproofing, and give birds the ability to fly. Explain to the students that the feather labeled "water" represents a feather from a bird that has not been exposed to oil; the "water/oil" feather represents a bird that swam in water polluted with oil; and the "water/oil/soap" feather represents a bird that swam in oil, but has been cleaned.

Evaluation: Engage the students in a discussion within and between their groups with the following: **(1)** Explain the differences you observed while looking at the feathers with the magnifying glass. **(2)** How would a bird be affected if it swam in water polluted with oil? How would it affect a bird's ability to fly? Keep warm? Float? Be waterproof? **(3)** Do you think putting soap on a bird covered in oil helps the bird? Is it possible to wash all the birds affected by an oil spill? **(4)** You cleaned one feather; how long do you think it takes to clean an entire bird? **(5)** What are some things you can do to stop or prevent oil spills?

Extensions: Discuss with the students ways that oil gets into waterways. Instruct groups of students to create convincing Public Service Announcements (PSA) explaining how oil gets into waterbodies, how it affects seabirds, and what the public can do to help solve the problem. The PSA can either be acted out and videotaped at home, or acted out live during class.

TRASH THAT LASTS

How long does it take for debris to decompose* in the environment?

Cardboard box		2 weeks	Tin can		50 years
Orange peel		2-5 weeks	Foam plastic cup		50 years
Banana peel		2-5 weeks	Aluminum can		80-200 years
Newspaper		6 weeks	Disposable diaper		450 years
Apple core		2 months	Plastic bottle		450 years
Wool sock		1-5 years	Fishing line		600 years
Cigarette filter		1-5 years	Glass		1 million years
Plastic bag		10-20 years	Rubber tire		infinity

**When these items are not exposed to light and air (buried in a landfill) they take longer to decompose.*

1. Pocket Guide to Marine Debris, The Ocean Conservancy © 2003, page 10.



CLEAN UP YOUR COMMUNITY

Language Arts/Math/Science: Grades 6-12

NJCCCS

3.2, 4.4, 5.3, 5.10

Goal: To learn and understand the prevalence and type of litter in local communities and how it affects our waterways.

Objective: Students will collect and sort litter from a nearby area to learn the type and quantity of litter in waterways and to consider the impacts.

Materials List:

- pencils
- gloves
- bags for collecting litter (preferably paper bags with/without handles)
- calculator (optional)
- data card with columns: plastic, paper, polystyrene (foam plastic), glass, rubber, metal, cloth, and wood (or request Clean Ocean Action's datacard)

Activity: **(1)** Explain to students the sources of and danger from litter in our waterways (or see lessons and activities earlier in this education kit). Inform students of the major sources of litter and its properties (i.e., is it biodegradable?), as well as any laws and ordinances in place regarding litter management. **(2)** Assign students to various areas of the school grounds. Groups of two or more students pick up and record the debris found on the street and near storm drains on their datacards. Students tally their datacards and combine their results with those from the entire class for a grand total; **(3)** Using the grand totals, students create an informative display of charts, tables, lists, and samples of litter from their cleanup to be exhibited in the classroom, library, or main office area to be viewed by peers.

Evaluation: By using the "Trash That Lasts" chart (see page 13), students should estimate how long each item they found will take to break-down or "biodegrade." Students should write an essay or a letter to the mayor or the local newspaper about the type, location, and amount of litter, as well as how long it will take for items collected during the cleanup to biodegrade in the environment. Students should urge the mayor to help stop pointless pollution in the community through ordinances and litter law enforcement.

Extensions: **(1)** Students may graph (e.g., line or bar graph) the results of their cleanup to determine the most frequently found items. Results may also be compared with national and international cleanup efforts. The Ocean Conservancy's International Coastal Cleanup reports are available at www.coastalcleanup.org, and Clean Ocean Action's Beach Sweeps reports for New Jersey are available at www.cleanoceanaction.org; **(2)** The teacher and class may organize a larger cleanup* of a local stream, river, lake or beach and involve groups and citizens in the community.

* For step-by-step instructions on organizing a cleanup, visit www.cleanoceanaction.org, and click on "Beach Sweeps."

GLOSSARY OF TERMS

AQUIFER: An underground bed or layer of earth, gravel, or porous stone that holds water.

BIODEGRADABLE: Decomposes naturally into organic matter.

-CIDE: This suffix means “killer”. Example: pesticide.

COMBINED SEWERS: An older system of pipes that carries both stormwater and wastewater to a treatment facility. During heavy rains, the pipes divert the stormwater and wastewater directly into a nearby body of water.

HOUSEHOLD HAZARDOUS WASTE: Products and materials used in a household that contain dangerous ingredients and chemicals that must be disposed separately from the regular waste.

IMPAIRED: Water that does not meet the standards for its designated use.

INFILTRATION: To pass into or through a substance.

INFRASTRUCTURE: The system of public works of a country, state, or region, such as underground sewer and water pipes.

INTEGRATED PEST MANAGEMENT (IPM): an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices; uses information on the life cycles of pests and their interaction with the environment; methods used to management pests with the least possible hazard to people, property, and the environment; applicable to farms, home, schools, garden, and workplace.

LEACHATE: A chemical solution created by water passing through another substance and taking on its qualities.

NONPOINT SOURCE POLLUTION: Pollution that contains contaminants originating from not one source, but from many different and independent sources and no defined point of entry (i.e., rainwater, snowmelt); may also be called pointless pollution.

NONRENEWABLE RESOURCE: A natural resource that may only be used until it is gone. Example: petroleum that is refined into oil and burned for energy may not be used again – once it’s used up, it is gone.

NUTRIENT: Substances found in the environment that plants and animals need to survive; in high concentrations they can be considered a type of pollution.

ORDINANCE: A law or regulation set forth from a government authority.

POINTLESS POLLUTION: Pollution that contains contaminants originating from not one source, but from many different and independent sources and no defined point of entry (i.e., rainwater, snowmelt); may also be called nonpoint source pollution.

PRECIPITATION: Water such as rain, snow, sleet or hail that falls to earth’s surface.

RECYCLABLE: Material that can be reprocessed for reuse; also, the ability to be recycled.

RECYCLE: To pass through a series of changes or treatments in order to regain material for reuse.

RENEWABLE RESOURCE: A natural resource that may be reused. Example: the sun may be used as a source of energy in perpetuity.

SEPTIC SYSTEM: A method of sewage disposal that utilizes an on-site treatment system that is built underground.

SEWAGE: Liquid or solid waste (e.g., from toilets, sinks, bathtubs, washing machines, and dishwashers) that is carried in drains and pipes usually to a treatment plant.

SEWER: A system of pipes used to carry wastewater or sewage to a treatment facility.

STORM DRAIN: A method of channeling stormwater off streets to stormwater pipes underground.

STORMWATER: Water, including rain or snowmelt, that runs off streets, parking lots, lawns, farms, and other surfaces and washes into storm drains and nearby waterways, often containing nonpoint source pollutants.

SURFACE RUNOFF: Precipitation runoff which travels over the soil surface into the nearest stream channel.

WATER QUALITY: The chemical, biological, and physical characteristics of water.

WATERSHED: The area that drains to a common waterway, such as a stream, lake, estuary, wetland, or, ultimately, the ocean.

FOR MORE INFORMATION

Organizations and sources that provide information to stop pointless pollution:

Adopt-A-Watershed

P.O. Box 1850
Hayfork, CA 96041
(530) 628-5334
www.adopt-a-watershed.org

Cacapon Institute

Route 1 Box 326
High View, WV 26808
(304) 856-1385
www.cacaponinstitute.org/high.htm

Earth 911

7301 E. Helm, Building D
Scottsdale, AZ 85260
1-877-EARTH911
www.earth911.org

U.S. Environmental Protection Agency

Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
(202) 566-1155
www.epa.gov/owow/nps

National Oceanic and Atmospheric Administration

14th Street & Constitution Avenue, NW
Room 6217
Washington, DC 20230
Phone: (202) 482-6090
Fax: (202) 482-3154
www.oceanservice.noaa.gov/education/kits/pollution/welcome.html

New Jersey Audubon Society

NJAS Department of Education
Center for Research and Education
600 Route 47 North
Cape May Court House, NJ 08210
(609) 861-0700
www.njaudubon.org/Education/NJWaters.org

New Jersey Department of Environmental Protection

PO Box 402
Trenton, NJ 08625
(609) 777-3373
www.nj.gov/dep/seeds

Smithsonian Ocean Planet

Smithsonian Information
PO Box 37012
SI Building, Room 153, MRC 010
Washington, D.C. 20013-7012
(202) 633-1000
http://seawifs.gsfc.nasa.gov/ocean_planet.html

Stony Brook-Millstone Watershed Association

31 Titus Mill Road
Pennington, NJ 08534
(609) 737-7592
www.thewatershed.org

Surfrider Foundation USA

P.O. Box 6010
San Clemente, CA 92674-6010
(949) 492-8170
www.surfrider.org

Discovery Schools

<http://school.discovery.com/lessonplans>

Visit www.CleanOceanAction.org for additional educational programs, materials, and activities related to pointless pollution.

10 TIPS FOR REDUCING YOUR IMPACT

Clean Ocean Action developed a series of “tip cards” designed to educate distinct groups of people. These cards teach people how to minimize their contribution to the problem of pointless pollution. Aimed at specific user groups (e.g., kids, drivers, boaters, homeowners, to name a few), the cards are excellent educational tools to broadcast the pointless pollution message and urge people to change their behavior to improve the environment. The cards are available for municipalities to reproduce and distribute in town mailings, print in the community newspaper, or posted on community bulletin boards. To order copies of the cards, please complete and return this form to **Clean Ocean Action, PO Box 505, Sandy Hook, NJ 07732.**

Please indicate by check mark the tips you would like to receive:

- | | | | |
|---|---------------------------------------|--|---|
| <input type="checkbox"/> Anglers | <input type="checkbox"/> Beach | <input type="checkbox"/> Boaters | <input type="checkbox"/> No Butts About It: Use Your Ashtray |
| <input type="checkbox"/> Cleaning | <input type="checkbox"/> Daily Living | <input type="checkbox"/> Drivers | <input type="checkbox"/> If You See It...Report It |
| <input type="checkbox"/> Kids | <input type="checkbox"/> Kitchen | <input type="checkbox"/> Lawn & Garden | <input type="checkbox"/> Personal Watercraft Operators (i.e., jet skis) |
| <input type="checkbox"/> Shore Visitors | | | |

In addition, I would like to receive information about COA:

- | | | | |
|--|--|--|---|
| <input type="checkbox"/> Beach Sweeps | <input type="checkbox"/> Storm Drain Stenciling | <input type="checkbox"/> Educational Materials | <input type="checkbox"/> Monthly Newsletter |
| <input type="checkbox"/> Presentations | <input type="checkbox"/> Volunteer Opportunities | <input type="checkbox"/> Educational Programs | <input type="checkbox"/> Special Events/Fundraisers |

Name: _____

Address: _____

Phone: _____

E-mail: _____



The 10 Tips Card Series is also available at www.CleanOceanAction.org by following the links for “Education Programs” and “10 Tips.”

“OUR HABITAT IS DOWN THE DRAIN”

COA Education Programs & Materials

Clean Ocean Action (COA) offers several interactive programs and informative materials to schools and groups to educate students of all ages about ocean pollution. Many of COA’s activities and resources provide students with ways to become the solution to ocean pollution. To order materials and to schedule programs, contact COA’s main office at (732) 872-0111, and ask for the Education Coordinator.



ABOUT CLEAN OCEAN ACTION

“Our goal is to improve the degraded water quality of the waters off the New Jersey/New York coast.” - Mission Statement

Clean Ocean Action identifies the sources of pollution and mounts an attack on each source by using research, education, and citizen action to convince our officials to enact and enforce measures which will clean up and protect our ocean. COA is the only fully-time regional coalition that works exclusively and effectively for a clean ocean.

Organized in 1984, COA is a broad-based coalition of over 150 active boating, business, community conservation, diving, environmental, fishing, religious, service, student, surfing, and women’s groups, and hundreds of businesses, and thousands of citizens concerned with water pollution in the New York Bight (the area of water from Cape May, New Jersey to Montauk Point, New York).

Clean Ocean Action
18 Hartshorne Drive
Sandy Hook, NJ 07732
732-872-0111
www.CleanOceanAction.org

