

# Used Oil Recycling Education Ideas

FOR SCHOOL RECYCLING GRANTS



Provided by the S.C. Department of Health and Environmental Control's  
Office of Solid Waste Reduction and Recycling

**1-800-768-7348 • [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle)**

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## Introduction

This lesson, "Oil and Water," is taken from "Action for a Cleaner Tomorrow: A South Carolina Environmental Curriculum Supplement" ("Action"). "Action" is an activity-based, interdisciplinary curriculum supplement that introduces basic environmental education in the classroom. The curriculum supplement is the centerpiece environmental education and outreach program of the S.C. Department of Health and Environmental Control (DHEC).

For schools and teachers who have received funding through DHEC's Office of Solid Waste Reduction and Recycling's (Office) Recycling Education Grant Program, this lesson can be used to meet the used motor oil awareness requirement of the grant.

For more information about the program, please visit [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle), select "K-12 School Recycling," then "K-12 Recycling Grant."

## Other Ideas to Consider

In addition to teaching the lesson, there are a variety of ways to promote used motor recycling. Here are some other assignments students have been given:

- Visiting local recycling facilities
- Participating in poster and essay contests;
- Conducting science fair projects;
- Researching what can be recycled in their community;
- Writing and performing plays or skits;
- Developing board and video games; and
- Making presentations, videos and public service announcements.

## Additional Resources

For additional used motor oil recycling fact sheets, PSAs, reports and information, visit [www.scdhec.gov/HomeAndEnvironment/Recycling/UsedOilRecycling](http://www.scdhec.gov/HomeAndEnvironment/Recycling/UsedOilRecycling).

DHEC's **Green Driver Project** targets high school driver education classes on the environmental impact of driving. For fact sheets, green driving tips or to schedule a free Green Driver presentation for your classroom, visit [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle) and selection "Action for a Cleaner Tomorrow (K-12)," then "The Green Driver Project."

DHEC offers an interactive map and the **RecycleHere app** to help South Carolinians learn what can be recycled in their community. To find local recycling information, please visit [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle) and select "RecycleHere Application."

## About 'Action'...

"Action" is an award-winning, activity-based, interdisciplinary curriculum supplement. Developed in 1993 by teachers and DHEC in conjunction with the S.C. Department of Education, "Action" is the centerpiece environmental education program of the Office.

By any account, "Action" has been a success. About 53,000 teachers and other educators have been trained on "Action" since its introduction. "Action" lessons have been taught in classrooms to thousands of students throughout the state.

Correlated to the latest South Carolina science standards, the subjects covered include recycling, landfills and hazardous household waste as well as conserving natural resources. When possible, South Carolina-specific information is provided that will help bring the environmental issues home.

Each lesson includes hands-on activities that help students get the facts, think for themselves, form opinions, make decisions and take "Action" for a cleaner tomorrow.



# OIL AND WATER

**PREPARATION TIME:**

**MODERATE**

## Learning Objectives

Students will:

- See how oil pollutes water;
- Test water samples for oil residue; and
- Perform an experiment to determine one part per 10 million.

## Background

Have you ever heard the saying “Oil and water don’t mix?” It’s true. Improperly disposed of oil can be a major threat to the environment, particularly to our water supplies.

Most of us probably think that spills from oil tankers are the No. 1 source of oil dumped improperly into the environment. That’s not the case. The U.S. Environmental Protection Agency (EPA) estimates that the largest single source of oil pollution harming our nation’s waters is from people who change their own oil – **do-it-yourselfers** (DIYers). Overall, about 200 million gallons of used oil are disposed of improperly each year – poured down storm drains or the sewer, dumped on the ground or tossed in the trash – according to the EPA.

In South Carolina, **used motor oil** must be recycled – it’s the law. The S.C. Solid Waste Policy and Management Act of 1991 (Act) prohibits the disposal of used motor oil in **Class 3 landfills**, sewers, drainage systems, septic tanks and surface water. The Act also prohibits using used motor oil on roads as dust control, for weed abatement and other uses that can potentially harm the environment. Used motor oil *must* be recycled. If you have your oil changed for you (at a car dealership or quick lube), your used motor oil is recycled by that business. If you are a DIYer, you must recycle the used motor oil.

South Carolina has one of the nation’s best and most comprehensive recycling programs targeting DIYers. What began in the early 1990s to

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## Learning Essentials

**Focus:** How oil pollutes water

**Subject:** Science

**Extension:** Social Studies

**Materials:** See list provided

**Teaching Time:** Two class periods

**Vocabulary:** Carcinogens, do-it-yourselfers, Class 3 landfills, oil, photosynthesis, plankton, used motor oil

**Lesson Resources:** “Used Motor Oil Recycling”



conserve resources and to stop illegal dumping of used motor oil, has grown into a one-stop program that also accepts motor oil bottles, filters and oil/gasoline mixtures from DIYers as well as used motor oil from small farming operations.

The program – primarily funded by DHEC through the Petroleum Fund – has grown to nearly 900 collection sites across the state. In addition, the program serves as a model of how convenience and participation go hand in hand. Part of this growth and subsequent success can be attributed to retail outlets, quick lubes and auto parts stores that accept used motor oil from DIYers. In fiscal year (FY) 2014 (July 1, 2013 to June 30, 2014), DIYers recycled 951,931 gallons of used motor oil. Since 1990, DIYers in South Carolina have recycled about 22 million gallons of used motor oil. Used motor oil generated and recycled by DIYers is counted as part of the state’s municipal solid waste (household garbage) recycling rate.

Just what does happen when oil ends up in water? When oil ends up in water, a film of oil on the surface can block **photosynthesis** and slow the production of oxygen. The reduced oxygen supply then causes stress to the point of death in aquatic organisms. Large organisms such as mammals and birds are the most familiar victims of oil pollution because of their visibility and emotional appeal to people. Feathers and fur stick together, become matted and lose the ability to insulate animals against cold. Death may result from temperature shock or from swallowing oil as the animals try to clean it from their coats.

Oil in water also can affect other organisms. Some of the components of oil may evaporate into the air or dissolve into the water. Many of them are **carcinogens**. Some of the oil spilled into an aquatic environment settles to the bottom affecting the organisms living there. Oil can clog breathing structures or be absorbed into tissues and then passed up the food chain, even to humans who eat fish or shellfish. Oil may harm bacteria or **plankton**, the basis of the food chain.

One gallon of used oil can potentially destroy 1 million gallons of fresh water – enough to supply 50 people with drinking water for an entire year. One pint of oil can produce a slick on water about 1 acre in size and will kill floating aquatic organisms.

It’s not just the oil that poses a threat to the environment. As much as 20 percent of automotive oil is composed of substances that are added to improve performance, inhibit rust or prevent foaming

– many of these substances are toxic. Oil also will pick up sediment and gasoline components and additives from the engine during combustion. High levels of lead – as well as other toxins including benzene, cadmium, zinc, magnesium and polychlorinated biphenyls (PCBs) – may be present in oil and may contaminate the environment if not properly handled.

Used motor oil should never be emptied into sewers or storm drains or dumped directly onto the ground to kill weeds or to suppress dust on dirt roads. Used motor oil also should never be thrown into the trash where it will end up in landfills. Improper disposal of used oil is illegal and carries penalties that include jail and fines of up to \$10,000 per day.

## Why recycle oil?

It is clear that recycling used motor oil protects human health and the environment, but there are other reasons why we should recycle it.

- **Recycling used motor oil also saves valuable energy.** Two gallons of used motor oil can generate 36-kilowatt hours of electricity. That’s enough to run an average household for a day.
- **Recycling used motor oil also helps reduce dependency on foreign oil.** According to the American Petroleum Institute (API), oil is the No. 1 source of energy for the United States, supplying more than one third of the nation’s overall energy needs. About 43 percent of the oil we use is produced in the United States while the rest is imported.

What happens to collected motor oil? It can be used in a variety of ways. Most of the oil collected in South Carolina is burned for energy recovery to generate electricity.

At Winyah Generating Station near Georgetown, the used motor oil collected through Santee Cooper’s GOFER (Give Oil For Energy Recovery) Program is sprayed into the boiler and is burned along with the coal. Since used motor oil has a higher heating value than coal, this is an excellent supplemental fuel source for making electricity. These Winyah units have modern emission controls that remove SO<sub>2</sub> (sulfur dioxide) and (NO<sub>x</sub> nitrogen oxides).

If the Winyah units are not operating and collections exceed storage tank capacity, the used oil is taken to a refining facility. The percentage of used motor oil burned at Winyah varies depending on electrical demand and the amount of oil collected.



## Lesson Materials

If possible, assemble several sets of these materials so that the class can perform the experiment in small groups. Otherwise use one set of materials and perform the experiment as a class.

One set of materials includes:

- Seven test tubes (OPTIONAL: Seven same-sized jars, such as baby food jars);
- Test tube rack;
- 10 ml graduated cylinder;
- Olive oil;
- 250 ml beaker;
- Brown paper bag (cut in strips);
- Blue food coloring;
- Wax pencil; and
- Eye dropper (or calibrated straw).

## Learning Procedure: Day 1

1. Review the background material with the class on the impact that improperly disposed of used motor oil has on the environment, especially water.
2. Have students perform the following experiment to demonstrate how small quantities of oil can pollute large amounts of water. Perform the following experiment.
  - A. Add a few drops of blue food coloring to a large bowl of water.
  - B. Measure 100 ml of blue water from your bowl and place it into your 250 ml beaker.
  - C. Add 9 ml of blue water to each test tube in your test tube rack.
  - D. Calibrate the eyedropper to measure 1 ml. This can be done by adding 10 ml of this solution to your cylinder and then drawing out the water, using the eyedropper until the level in the cylinder reaches the 9 ml mark.

Use the wax pencil to mark the water level in the dropper.

- E. Pour out unused water from your cylinder and measure out 1 ml of olive oil. Add this to test tube #1.
- F. Shake the test tube thoroughly. Quickly, before the oil and water separate, remove 1 ml of this solution with your calibrated dropper and add it to the next test tube (#2).
- G. Repeat step F until you feel that there is no oil left, checking either visually or by smell. Repeat step F no further than test tube #7. At this point, you will have a dilution of one 10-millionth.
- H. Check for oil in your solution by dipping a strip of brown paper 5 inches long by 1/2-inch wide into the test tube. If you don't observe the oil immediately, label your strip and set it aside to dry overnight.
- I. Clean the lab area and materials. Use warm water and soap to remove all traces of oil in all the test tubes.

## Learning Procedure: Day 2

1. Check the brown paper strips for oil spots.
2. Have students answer the "Questions for the Class" individually or as a group.

## Questions for the Class

1. Did you find oil spots on the brown paper strips the next day? (Yes)
2. Where do you think this oil would go in nature? (It may end up in lakes, rivers and groundwater. It may be swallowed by fish, animals and by people.)
3. What are some of the contaminants found in used oil? (Used oil contaminants include heavy metals such as lead, cadmium, zinc, barium, chemical additives, dirt, iron and steel particles.)
4. Did the water dilute the oil completely? (No)

- List items you or your family own that use motor oil and have the capability of contaminating the environment. (This list may include lawn mowers, cars, boats and gasoline-powered tools such as chain saws, string trimmers and leaf blowers.)
- What can you do with used motor oil to prevent it from becoming a source of pollution? (Take it to a used oil collection site. Please visit [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle) and click on WHERE TO RECYCLE LOCALLY or call 1-800-768-7348 for the location nearest you.)

EPA also offers detailed used oil recycling information on its website – [www.epa.gov/wastes/conserve/materials/usedoil/](http://www.epa.gov/wastes/conserve/materials/usedoil/) – including downloadable materials like the brochure below.

## Extension Activities

- Have students prepare posters promoting used motor oil recycling and how to collect used motor oil for recycling. Ask local service stations and automotive parts stores to display them.
- Have students investigate what your school district does with used motor oil, used motor oil filters and motor oil bottles from school buses and other maintenance equipment. Have students calculate how much used oil your school district must handle during the school year. (Calculate how many vehicles X how much oil per oil change X how many oil changes per year.)
- Have students research and prepare reports on how used motor oil is used for energy recovery in South Carolina.

**You dump it, you drink it.**  
Recycle Used Motor Oil

**Be part of the solution:**  
Recycling makes more sense today than ever. Recycling saves money and protects our environment. Improper waste management costs money — your money. You pay through consumer prices, taxes for environmental cleanups and increased health care costs.





**Here's what you can do:**

- Protect our environment and conserve our resources by taking your used oil to the nearest used oil collection center, such as a service station or automotive store.
- Look for the oil drop. It is an international symbol signifying used oil is collected for recycling and reuse.

**To find used oil collection centers in your area, call 1-800-CLEANUP or visit [www.cleanup.org](http://www.cleanup.org).**

**For more information on managing used motor oil, visit EPA on the Web: <http://www.epa.gov/epaosr/hazwaste/usedoil/index.htm>**

**Recycling your used motor oil is easy.**

- REMOVE.** Do not spill any oil on the ground. 
- CONTAIN.** Put your used motor oil in a clean plastic container with a tight lid. Never store used oil in a container that once held chemicals, food or beverages. 
- DO NOT MIX.** 
- RECYCLE.** Take used motor oil to a service station or other location that collects used motor oil for recycling. 



## Lesson Resources

# Used Motor Oil Recycling

We love to drive. To the supermarket, to the mall, to school, to see friends, to get a pizza, to our job, to the beach or mountains and to a million places in between. We get in the car, buckle up and hit the road every day.

There are many responsibilities related to that privilege. Safety, for example. Buckle up. Slow down. Be careful. Another responsibility often forgotten is the environmental impact of driving. Cars and trucks, for example, release pollutants into the air. Cars and trucks use energy. And they use motor oil. It's driven into you the moment you begin to drive: you have to change your oil periodically to maintain your vehicle and ensure that it runs properly. That's a lot of oil.

What do you do with your used motor oil after you change it? What can you do with it? What happens to it?

## Why recycle oil?

- Recycling used motor oil protects human health and the environment by keeping it: from contaminating soil; out of rivers, lakes, streams and groundwater; and away from the beach, aquatic life and wildlife. The potential harm that improperly disposed of used oil may cause is staggering. One gallon of used motor oil improperly disposed of may contaminate 1 million gallons of fresh water – enough to supply 50 people with drinking water for one year. One pint of used motor oil improperly disposed of can create a one-acre slick on the surface of a body of water and kill floating aquatic organisms.
- Recycling used motor oil also saves valuable energy. Two gallons of used motor oil can generate 36-kilowatt hours of electricity. That's enough to run an average household for a day, cook 36 meals in a microwave, blow dry your hair 216 times, vacuum your house for 15 months or run your TV for 180 hours.
- Recycling used motor oil also helps to reduce dependency on foreign oil. Oil is the No. 1 source of energy for the United States, supplying more than one third of the nation's overall energy needs according to the American Petroleum Institute. About 43 percent of the oil we consume is produced here in the United States while the rest is imported.

## What happens to recycled motor oil?

Recycled motor oil can be used in a variety of ways. Most is processed for use in asphalt plants, industrial and utility boilers, steel mills and other facilities. Some is re-refined for use as a new generation of motor oil or as fuel oils. The rest is used in specially designed space heaters in automotive bays and municipal garages. The oil helps these types

## Recycling motor oil is the LAW in South Carolina.

That's right. In South Carolina, it's the law.

The S.C. Solid Waste Policy and Management Act of 1991 (Act) banned the disposal of motor oil in municipal solid waste (MSW) landfills after May 27, 1992.

The Act prohibits the disposal of oil into sewers, drainage systems, septic tanks, surface water or groundwater and on the ground.

The Act also prohibits the use of oil for road oiling, dust control, weed abatement and other uses that have the potential to harm the environment.

It must be recycled. If you have your oil changed for you (at a car dealership, garage or quick lube), your used motor oil is recycled by that business. If you change your own oil, you must recycle that used motor oil.

For more information about the recycling of used motor oil, filters or bottles in South Carolina including the nearest collection site, please call the Office at 1-800-768-7348 or visit [www.scdhec.gov/recycle](http://www.scdhec.gov/recycle).

of facilities reduce their heating costs. This practice, however, is not recommended for home use.

Most of the oil collected from DIYers in South Carolina is burned for energy recovery to generate electricity by Santee Cooper, the state-owned utility. Santee Cooper estimates that it has collected more than 25 million gallons of used motor since 1990 (collected from DIYers and businesses) – enough to provide electricity to every average-sized home in South Carolina for six days.

## **South Carolina has a slick program targeting DIYers.**

The U.S. Environmental Protection Agency (U.S. EPA) estimates that the largest single source of oil pollution harming our nation's waters is from DIYers. In fact, it is estimated that about 185 million gallons of used motor oil are improperly disposed each year – poured in storm drains or the sewer, dumped on the ground and tossed in the trash.

The good news – no, great news – in South Carolina is that the state has developed one of the nation's best and most comprehensive programs targeting DIYers. A used oil recycling program for DIYers began in South Carolina in 1990 when Santee Cooper collected nearly 3,000 gallons of used oil from eight locations. In 1991, Santee Cooper expanded the Give Oil for Energy Recovery (GOFER) program throughout the state. Following the passage of the Act, DHEC's Office of Solid Waste Reduction and Recycling (Office) began providing grant funding and technical assistance to local governments to set up used motor oil recycling centers. The combined efforts have resulted in one of the nation's top overall programs.

In FY14, DIYers in South Carolina recycled 951,531 gallons of used motor oil at more than 920 collection sites throughout the state. Since 1990, more than 21 million gallons of used motor oil have been collected from DIYers.

Used motor oil filters and bottles also are collected from DIYers in most counties. Used motor oil filters are banned from MSW landfills unless "hot drained" or crushed to their smallest practical volume. The used motor oil filter recycling program began in 1994 with just three counties collecting filters. This is an important part of the overall recycling program because filters can contain from 4 ounces to 1 quart of oil. Most of the filters recycled in South Carolina are sent to several steel mills located in the state and made into new steel products.

South Carolina became one of the first states to collect used motor oil bottles, beginning a program in 1995 with two counties. Bottles are an important target for recycling for two reasons. First, oil bottles are made from a plastic that is recyclable in most local programs. Second, each bottle can contain as much as one ounce of oil that should be recovered before recycling. In addition the program offers recycling locations for farmers and for oil/gasoline mixtures.

## **S.C. USED MOTOR OIL RECYCLING PROGRAM: A SUCCESS!**

- **951,531 GALLONS** of used motor oil were collected for recycling in FY14.
- **ABOUT 21 MILLION GALLONS** of used motor oil have been collected for recycling since 1990.
- **MORE THAN 920 USED MOTOR OIL COLLECTION SITES** are throughout the state.
- **MOST COUNTIES COLLECT USED OIL FILTERS AND BOTTLES** for recycling in addition to used motor oil.

### **USED OIL FACT**

Local governments run the majority of the more than 920 used motor oil collection sites in South Carolina. Retail stores – including Advance Auto Parts, Auto Zone, Tractor Supply Company and Walmart stores – also collect used motor oil from DIYers.

### **DID YOU KNOW?**

There were more than 212 million licensed drivers in the United States who drove on average more than 14,000 miles in 2013 (the most recent data available) according to the U.S. Department of Transportation.