

Day 5

Protecting our water

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Introduction

This day explores the many ways that our local government and our citizens are working to protect and clean up our rivers and river ecosystems, and make sure our water sources are healthy.

Questions to guide explorations and experiments

- What do storm drains have to do with the water we drink?
- Why is too much stormwater a problem?
- How can people reduce stormwater runoff in their own homes and communities?
- How does oil or chemicals get into our rivers and waterways? Why is it harmful?
- How can we clean up our rivers?

Books and activities

- **Books:** pollution, conservation, and cleaning up our waterways.
- **Activities:** pollution, conservation, and cleaning up our waterways.





Children's Books

Fiction

- *Bartholomew and the Oobleck* by Dr. Seuss (Gr 1-3)
- *Cloudy With a Chance of Meatballs* by Judi Barrett (Gr 1-3)
- *Flotsam* by David Wiesner (Gr 1-3)
- *Flush* by Carl Hiaasen (Gr 4-5)
- *Grandfather's Dream* by Holly Keller (Gr 4-5)
- *Luz Makes a Splash* by Claudia Davila (Gr 3-5)
- *Pickles to Pittsburgh* by Judi Barrett (Gr 1-3)
- *Prince William* by Gloria Rand (Gr 1-3)
- *River* by Debby Atwell (Gr 1-5)

Poetry

- *Earth Verse: Haiku from the Ground Up* by Sally Walker (Gr 2-4)
- *River of Words: Young Poets and Artists on the Nature of Things* edited by Pamela Michael (Gr 1-5)
- *Thank You, Earth: A Love Letter to Our Planet* by April Pulley Sayre (Gr K-3)

Nonfiction

- *The Exxon Valdez Oil Spill (Scholastic)* by Peter Benoit (Gr 2-4)
- *Make a Splash! A Kid's Guide to Protecting Our Oceans, Lakes, Rivers, and Wetlands* by Cathryn Berger Kaye and Philippe Cousteau (Gr 3-5)
- *Meadowlands: A Wetlands Survival Story* by Thomas R. Yezerski (Gr 2-5)
- *Oil Spill* by Melvin Berger (Gr 1-3)
- *One Well: The Story of Water on Earth* by Rochelle Strauss (Gr 3-5)
- *A River Ran Wild: An Environmental History* by Lynne Cherry (Gr 1-4)
- *Simple Steps Toward a Healthier Earth* by Molly Smith (Gr 1-5)
- *Water Wow! An Infographic Exploration* by Antonia Banyard and Paula Ayre (Gr 1-5)
- *Why Should I Save Water?* by Jen Green (Gr K-3)
- *You Wouldn't Want to Live Without Clean Water!* by Roger Canavan and David Antram (Gr 3-5)



Water Words

Acid rain

Rain, hail, or snow that is polluted as a result of certain chemicals and waste being released into the air. Acid rain is harmful to the environment.

Conservation

The protection of natural resources, including soil, water, or forests, from loss, pollution, or waste.

Contamination

To make dirty, polluted, or unusable by adding something harmful to another substance or system. Example: some rivers have high contamination levels from chemical spills.

Erosion

Wearing away of the land by wind, ice, and water.

Impervious surfaces

Surfaces that don't allow water to be absorbed, including many rooftops, driveways, and parking lots.

Indicator species

Plants or animals whose health confirms the health of the surrounding environment.

Pervious (or permeable) surfaces

Surfaces that allow water to be absorbed, such as grass, groundcover, green roofs, and paver stones.

Pollution

Damage to the environment caused by chemicals or dirty waste products.

Rain garden

A sunken garden bed that collects and treats storm-water runoff from impervious surfaces, including rooftops, driveways, sidewalks, parking lots, and streets.

Runoff

Extra rainwater that is not absorbed by the ground.

Wastewater

Water that has been used, either in homes or in industry, and contains contaminants.



Anacostia & Potomac Connections

When kids see the connections between what they read about and their own local communities, the information is more relevant to them and expands their background knowledge about the world. Browse these links to learn more about organizations in the DC area that are working to keep our rivers and wetlands clean and healthy.

The Anacostia River: Swimmable and Fishable by 2025 (Anacostia Watershed Society)

The Anacostia Watershed Society offers a variety of programs designed to achieve three primary goals: (1) Stop pollution now; (2) Restore the river's natural systems; and (3) Rebuild the community's relationship with the river. <https://www.anacostiaws.org/>

River of Resilience: an Anacostia Watershed Story Map

Take a journey from the headwaters to the confluence on the Anacostia River in this interactive online exhibit. <https://www.anacostiastrust.org/storymap>

Anacostia Rising (WAMU Radio)

The Potomac has often been acclaimed as “the Nation’s River.” The Anacostia, however, has been known by less illustrious nicknames: “the forgotten river,” or simply “one of the most polluted rivers in the United States.” Now D.C. is rediscovering the long-neglected waterway. Rowers, kayakers and stand-up paddlers are taking to the river, after years of dedicated cleanup efforts and a multi-billion-dollar sewer upgrade that just went online.

<https://wamu.atavist.com/anacostia-rising>

Clean Rivers Project (DC Water)

The Clean Rivers Project is DC Water's ongoing program to capture and clean wastewater during rainfalls before it ever reaches the District's waterways — the Anacostia and Potomac Rivers and Rock Creek. The project is designed to protect our drinking water and our region's wildlife.

<https://www.dewater.com/clean-rivers-project>

RiverSmart Program (DC Department of Energy and Environment)

DOEE's RiverSmart programs help to reduce stormwater runoff that harms DC's waterways and the Chesapeake Bay. RiverSmart programs provide financial incentives to help DC property owners install green infrastructure such as rain barrels, green roofs, rain gardens, permeable pavers, shade trees, and more. These practices allow rainwater to stay on site and soak into the ground, where natural processes help remove pollutants.

<https://doee.dc.gov/service/get-riversmart>



Anacostia & Potomac Connections

More information

New Sewage-Storing Tunnel to Transform Polluted Anacostia River (Chesapeake Bay Magazine)

<https://www.chesapeakebaymagazine.com/baybulletin/2018/3/25/new-sewage-storing-tunnel-to-transform-polluted-anacostia-river>

Overnight Storm First Major Test of DC Water's New Anacostia River Tunnel (DC Water)

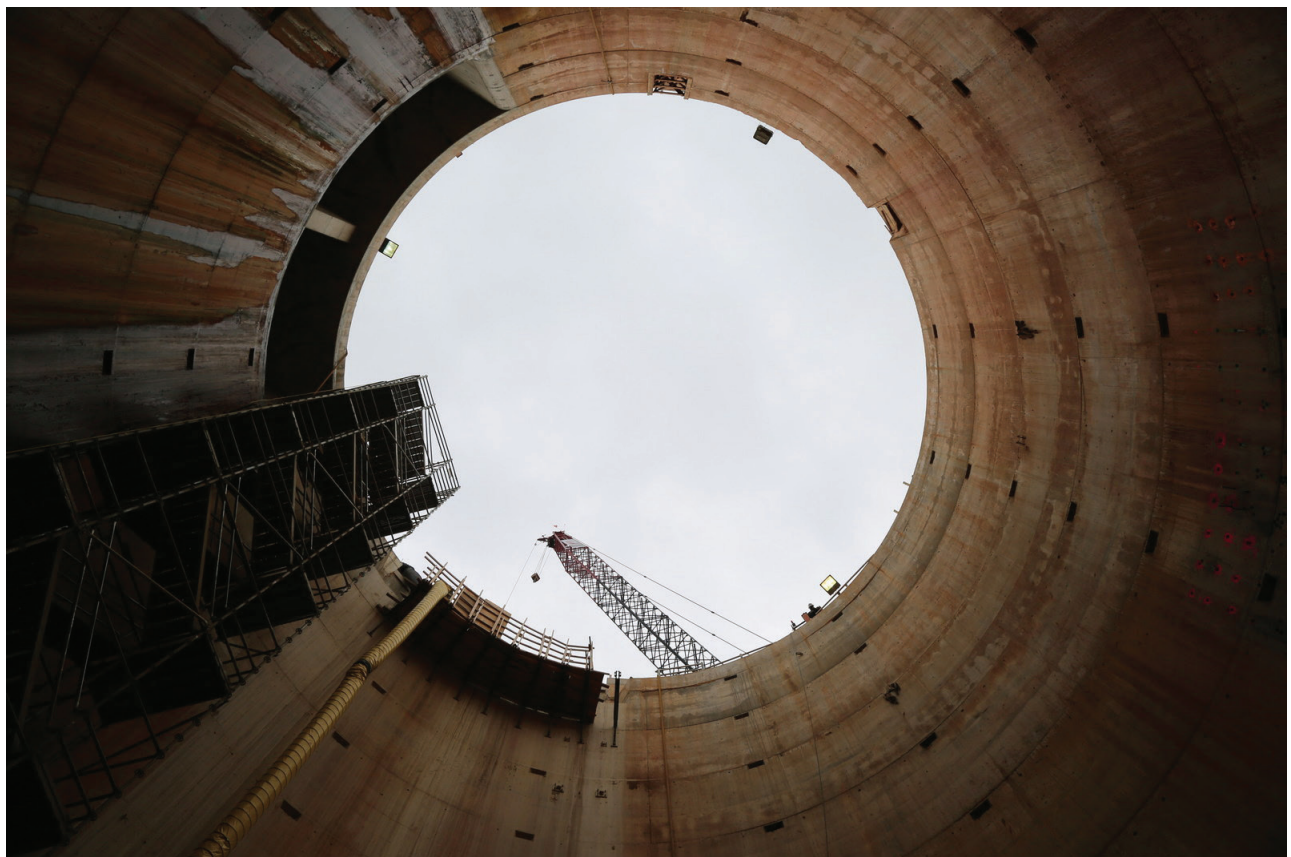
<https://www.dewater.com/whats-going-on/news/overnight-storm-first-major-test-dc-water%E2%80%99s-new-anacostia-river-tunnel>

Anacostia River Tunnel Time-Lapse Tour (DC Water)

<https://www.youtube.com/watch?v=L0QHHR8deU&feature=youtu.be>

Get current water quality data for DC (U.S. Geological Survey)

<http://ow.ly/3HiG30jFTn9>



Anacostia River Tunnel photo © DC Water



Activity 1: Design a rain garden

Introduction

New construction in many towns and cities is increasing the amount of impervious surfaces — surfaces that don't allow water to be absorbed. Too many rooftops, driveways, and parking lots result in an increase of storm water runoff and a greater chance for pollution to enter our waterways through storm sewer systems. Kids can learn more about how to help stop runoff when they design a rain garden to help direct water through the soil.

Supplies

- Books and guides to plants native to your region or materials from your local Cooperative Extension Service
- Database for native plants in your area: <https://www.epa.gov/watersense/what-plant>
- Pencil and journal
- Tape measure

If you build a rain garden:

- Soil mix: 50% sand, 30% compost, 20% topsoil
- Seeds, seedlings, or starter plants. Remember to choose native plants if possible, and plants that attract pollinators like butterflies and bees

Get kids thinking ...

Get kids thinking back to what they've learned about the water cycle and your local watershed. Rain has to go somewhere. **Ask the kids:** Where does it go when it can't soak into the soil? Have kids head outside and take notes about all the pervious and impervious surfaces they see. Have kids draw a picture (aerial view if possible) of the current space. Talk about where they see water collect or travel when it rains. Have them identify natural drainage patterns and talk about how rainwater could be filtered into the surrounding soil. **Ask the kids:** Why is it important for rain to be directed to the soil rather than the storm drain?



Pervious or impervious?



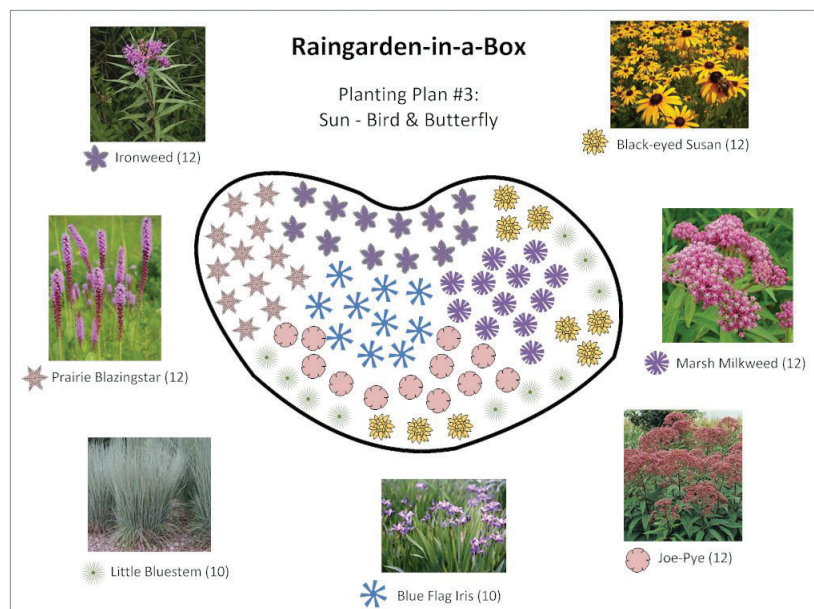
Activity 1: Design a rain garden

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Let's get started!

As kids see drainage patterns and how drainage could be improved, have them start mapping out their rain garden. Gardeners make and use maps to plan what, where, and when to plant. Together, you'll need to think, talk about, and investigate:

- If this is a real or imaginary garden (if you can't plant, it is still fun to imagine and plan)
- How much water you will have to drain (measure the specific drainage area of the surface — roof, driveway, etc.)
- What kind of soil you have (sandy, clay, loamy, or mixed)
- How much space you need for your rain garden (sandy soil, a rain garden should be 20-30% of the drainage area; or clay soil, a rain garden should be about 60% of the drainage area)
- What's already in or near the space (the house, patio, deck, paths, driveway, existing plants and lawn)
- Natural depressions in the landscape (a rain garden can be up to six inches deep)
- Native plants (plants that typically have deep root systems with water holding capacity)





Activity 1: Design a rain garden

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Encourage kids to take good notes as they research plants for their garden, keeping in mind what they've learned about soil types and availability of sun. Have kids develop garden plan details using their aerial view sketch.

If you are able to actually plant the garden kids have planned, be sure you have accurate information about underground utilities before you start digging. Since plants can be expensive, consider planting seeds or using seedlings grown in trays. It may take longer to fill in the space in the garden, but can help keep costs down. And kids love to plant seeds!



As the garden grows, kids can continue to add details to their map such as birds, insects, and animals that have visited or plant growth charts. The links below offer detailed guides to building a rain garden.

More rain garden activities

What Is a Rain Garden (WGPU Curious Kids, video)

<http://www.wgcucuriouskids.org/what-is-a-rain-garden/>

How-to Guide: Rain Garden in a Box (City of Edmonton, Canada)

https://www.edmonton.ca/city_government/environmental_stewardship/rain-garden-in-a-box-pilot-project.aspx

https://www.edmonton.ca/city_government/documents/Rain%20Garden%20in%20a%20Box%20Handbook.pdf

Raingarden-in-a-Box Designs

<https://www.plslwd.org/2013/05/raingarden-in-a-box-designs/>

Create a Rain Garden (Bay Backpack)

http://baybackpack.com/schoolyard_projects/project/create_a_rain_garden

What Is a Rain Garden?

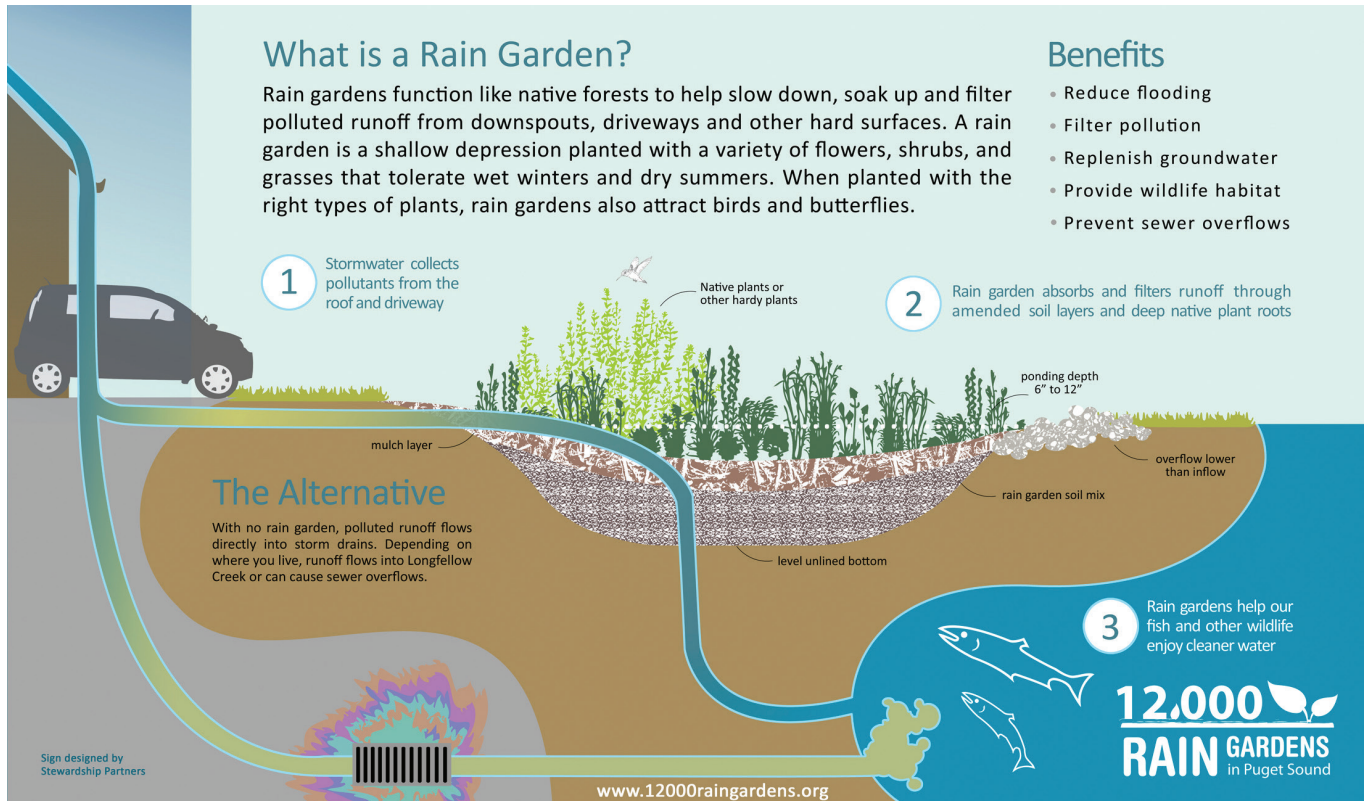


Diagram © 12,000 Rain Gardens



Activity 2: Storm Drain Cleanup

Introduction

Storm drains carry excess water from rain away from our streets — and into our local waterways. But what happens if the water we send down our storm drains isn't clean? In this activity, kids will explore how the water from storm drains can impact the water quality of local streams, rivers, and bays.

Supplies

"Waterway"

- Aquarium tank or large clear plastic recycled container (like those big pretzel containers from Walmart or Costco)
- Rectangular cardboard box (to fit over aquarium or plastic container)
- Water
- Watering can or spray bottle

"Pollutants"

- Green food coloring (pesticides and fertilizer)
- Vegetable oil (motor oil)
- Soil, sand, pebbles (erosion)
- Grass clippings or shredded paper and twigs
- Cafeteria waste or trash

Get kids thinking ...

When rain falls or water runs off from sprinklers where do you think the water goes? Some of the water flows downhill to the nearest creek or ditch — that's called stormwater runoff. In cities and towns, the water can't soak through the pavement, rooftops, and concrete (because they are impervious surfaces).





Activity 2: Storm Drain Cleanup

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Let's get started!

Set up the activity: Place the aquarium on a table and fill it half-way with water. Cut a hole in the bottom of the box and place the box on top of the aquarium. The box represents the storm drain and the aquarium represents the waterway that the storm water mixes into after entering the storm drain.

Talk with the kids about the purpose of storm drains and where the water and objects that float down into a storm drain go. If you have time for a short walk outside, you might look for the

closest storm drain. **Ask the kids:** What are all the things you can think of that might enter a storm drain during a rain storm?

Talk about each of the “pollutants” and ask the kids how each might get into the storm drain. Have the kids take turns adding a pollutant into the storm drain. Use the watering can or spray bottle to create rain to wash the pollutant into the waterway.

After adding all of the pollutants, examine the contents of the waterway. **Ask the kids:** How the waterway has changed? How do these changes make you feel?

Reflection questions

- What types of the pollution are natural?
- What types of pollution are added by people living in the local communities?
- What could be done to stop pollutants from entering storm drains?





Activity 2: Storm Drain Cleanup

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More stormwater activities

Stormwater Sleuth: How Much Water Runs Off? (University of Nebraska Extension)

<https://water.unl.edu/documents/How%20Much%20Water%20Runs%20Off%20opt.pdf>

Stormwater Sleuth: Stormwater Walk (University of Nebraska Extension)

<https://water.unl.edu/documents/Stormwater%20Walk%20opt.pdf>

Build Your Own Rain Barrel

<https://water.unl.edu/documents/Build%20Your%20Own%20Rain%20Barrel%20opt.pdf>

Storm Drain Stenciling Toolkit (Think Blue Maine)

https://cfpub.epa.gov/npstbx/files/stencil_toolkit%20FINAL.pdf

Learn more about stormwater

Only Rain Down the Drain (interactive)

<http://www.onlyraindownthedrain.com/interactive-model/>

H2O Jo Takes a Ride Through the Storm Drain (City of Boulder WASH Project)

<https://www.youtube.com/watch?v=ytq7DP9ENhU>

Freddy the Fish Teaches About Stormwater (North Central Texas Regional Stormwater Program)

<https://www.youtube.com/watch?v=jjPfLhJbdc0>

Stormwater Pollution and Green Infrastructure Solutions (New York State Department of Environmental Conservation)

<https://www.youtube.com/watch?v=ATNy-valPXI>



Activity 3: Oil Spill Challenge

Introduction

An oil spill can happen on the ocean when a ship carrying big containers of petroleum oil starts to leak. Or if an oil drilling rig malfunctions, as with the 2010 Deepwater Horizon accident off the coast of Louisiana.

Oil spills can also affect our rivers and other freshwater. If an oil pipeline that travels over land springs a leak, the oil can find its way into the local waterways and groundwater. Oil can also get into our rivers and waterways through stormwater.

Spilled oil sticks to the fur and feathers of birds and animals that live on or near the water, and is hard to remove. That's why animals are so affected by oil spills!

In this activity, kids will build a simple model of a river habitat (complete with "birds" and "mammals") and then create an oil spill. Then they will test different tools to clean up the river.

Supplies

Basics

- Aluminum roasting pan or plastic tub
- Water
- Vegetable oil
- Paper towels (for kids' hands)

Habitat materials

- Large rocks to create an island
- Sticks and moss or pieces of lettuce
- Fake fur or craft pompoms and feathers
- Blue food coloring (optional)

Cleanup materials

- Cotton balls
- Sponges, cut into small pieces
- Plastic spoons
- 12-inch pieces of string
- Dish soap (Dawn® works well)





Activity 3: Oil Spill Challenge

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Get kids thinking ...

Get everyone thinking about what happens when oil mixes with water. **Ask the kids:** How easy do you think it is to separate the oil from the water?

What happens to the fish, birds, and other animals that come in contact with the oil?

Let's get started!

First, kids create their habitats:

- Place the rocks in the pan or tub
- Add 2-3 inches of water, to mostly cover the rocks (bigger ones can be poking out). Add blue food coloring if you have it.
- Add the sticks and lettuce or moss (the “plants”) and the feathers and fake fur (the “birds” and “animals”) to the water.



Photo © Secondgradealicious.blogspot.ca

Next, create the oil spill! Pour 2-3 tablespoons of oil into the water and observe what happens.

How does the oil react with the water, the plants, and the animals. What happens when you blow on the oil in the water? **Record your observations on the chart on the next page.**

Now try each of the cleanup materials and see which ones work the best. **Ask the kids:** What are the best materials for cleaning the birds and animals? What effect did detergent have on the oil? What is the string best for? (The string can keep the oil in a smaller space but can't clean it up.)

Oil Spill Worksheet

How did the "habitats" interact with the oil?

Material	Reaction with oil
Water	
Rock	
Feather	
Stick	
Fur or pompom	
Moss or lettuce	

Which tools worked best for cleanup?

Cleaning tool	Pros	Cons	What habitat material does it clean the best?
Cotton ball			
Sponge			
Spoon			
String			
Dish soap			



Activity 3: Oil Spill Challenge

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More oil spill activities

Make an Oil Slick (San Diego Zoo)

<http://kids.sandiegozoo.org/activities/slick-art>

Simulating an Oil Spill Lesson Plan Video (Teaching Channel)

<https://www.teachingchannel.org/videos/natural-resources-lesson-plan>

Oil Spill Facts: Lesson for Kids (interactive)

<https://study.com/academy/lesson/oil-spill-facts-lesson-for-kids.html>

Oil Spill Activity Video (STEM etc.)

<https://www.youtube.com/watch?v=RhXwJtm4Jg0>

How do scientists clean up oil spills?

Cleanup teams respond to spills using one or more of these methods:

Containment: Floating barriers (called booms) as well as natural and synthetic absorbing materials help prevent the spreading of oil during spills.

Chemicals: Some chemicals make the oil more solid and keep oil from reaching shorelines and other sensitive habitats. Other chemicals break up the oil into smaller particles which mix with water more easily.

Physical methods: Boats skim the sea surface, removing oil from the water. On land, wiping with absorbent materials, pressure washing, and raking and bulldozing help absorb oil.

Cleaning up oil spills with magnets and nanotechnology (CNN)

<https://www.cnn.com/2012/09/21/tech/oil-spill-magnets/>

Deepwater Horizon Gulf Oil Spill Recovery Special Report (Scholastic Kids)

<http://www.scholastic.com/browse/collection.jsp?id=761>

58,000 gallon Oil Spill in San Francisco Bay (DOGO News)

<https://www.dogonews.com/2007/11/12/58-000-gallon-oil-spill-in-san-francisco-bay>



Writing about Rivers

Writing helps kids process and solidify new knowledge and gives them an opportunity to use new vocabulary and concepts. Offer one or more of these prompts or questions to get your River Rangers writing.

Journal writing

Take a walk around your neighborhood and look for all the features that help or prevent rain water from soaking into the ground. Make a map of your neighborhood and add the features you see to your map. Use your new water words — [pervious surfaces](#) and [impervious surfaces](#) — to categorize the features you see. Make a list of the things that your family could do to reduce rainwater runoff (Build a rain barrel? Plant a rain garden?)

Community drain stenciling project

To be added: persuasive writing exercise to organize your community.

Posters and PSAs

We all live in a watershed. Water constantly travels over the land's surfaces that include farmland, lawns and city streets, on its course to a waterway. When it rains, water runs over the surface picking up any pollutants that are on the way. Small amounts of motor oil, pet waste, pesticides or litter are multiplied along the journey to the nearest waterway.

These watersheds are a source of drinking water for homes and businesses. Learn about some things you can do to help keep the water clean in your watershed ([see the list on the next page](#)).

Choose one or more actions and create a poster that explains what every kid can do and why it's important. Include photos or drawings, and think about a headline that will grab people's attention. If you have access to an audio or video recorder, you can also make a Public Service Announcement (PSA) to share with family, friends, and neighbors.

10 Simple Steps to Reduce Runoff and Keep Your Water Clean

- 1. Plant a rain garden.** Rain gardens use native plants and grasses to capture and absorb rainwater from rooftops and roads. They can reduce runoff pollution by 99%.
- 2. Add native plants to your garden.** They require less water and fertilizer and are more resistant to pests and disease since they are already adapted to local conditions. If you need to fertilize, use organic options such as garlic.
- 3. Compost it.** Recycle yard waste in a compost pile and use a mulching mower (borrow one from a neighbor if you don't have one)
- 4. Scoop the poop.** Keep pet waste out of streets and storm drains. It contains bacteria that can find its way into waterways through runoff.
- 5. Suds alert.** Wash your car at a car wash instead of doing it at home, unless you use non-toxic biodegradable soap on your car.
- 6. Use eco-friendly cleaning supplies.** Some soaps and shampoos aren't removed from the water when treated. Algae will grow where it's not supposed to and ruin the water quality.
- 7. Nix the Rx.** Don't throw old medicines down the drain. Most communities have safe disposal programs through their police departments, local drug stores, or other organizations.
- 8. Be careful with hazardous waste.** Find out about your local recycling centers for toxic household items like paint, motor oil, and batteries — and bring your items there rather than dumping or putting in the trash.
- 9. Be water wise!** Don't water your driveway when you water your lawn! The water that lands on a driveway or sidewalk washes pollutants into storm drains.
- 10. Volunteer.** Get involved in community activities to clean up waterways and monitor water quality.



Kid-friendly websites and apps

Websites

Water Quality Backyard Activity Guide (National Environmental Education Foundation)

<https://www.neefusa.org/resource/water-quality-backyard-activity-guide>

Waterkeepers

<https://waterkeeper.org/>

Maryland Association for Environmental and Outdoor Education: Clean Water Project Resources

<https://maeoe.org/resource-library/clean-water-project-resources>

How's My Waterway? (EPA)

<https://watersgeo.epa.gov/mywaterway/>

Our Fragile Environment: Water Supply (Brain POP)

<https://www.brainpop.com/science/ourfragileenvironment/watersupply/>

Storm Drain Stenciling Project (Chesapeake Bay Foundation)

<http://www.cbf.org/join-us/education-program/resources/storm-drain-stenciling.html>

1200 Rain Gardens (Washington State University)

<http://www.12000raingardens.org/>

Educational apps

Ansel and Clair's Little Green Island \$

<https://www.common sensemedia.org/app-reviews/ansel-and-clair-little-green-island>

Rain Garden App

<http://nemo.uconn.edu/tools/app/raingarden.htm>

SimCity EDU: Pollution Challenge! \$

<https://www.common sense.org/education/game/simcityedu-pollution-challenge>

WaterLife: Where Rivers Meet the Sea

<https://www.common sensemedia.org/game-reviews/waterlife-where-rivers-meet-the-sea>



Outings in the DC Area

Visiting a river or stream is a fun experience and a rewarding activity for both kids and grownups. But anyone visiting should be aware of potential hazards and follow safety guidelines. Before you head to the river, make time to review water safety.

Water Safety: Rivers and Streams provides helpful resources, hazards to avoid, and tips that could save your life.

https://www.recreation.gov/marketing.do?goto=acm/Explore_And_More/exploreArticles/water-safety-rivers-and-streams.htm

Places to visit and things to do

Anacostia River Discovery Series (Anacostia Watershed Society)

<https://www.anacostiaws.org/events-and-recreation/signature-events/anacostia-river-discovery-series.html>

Volunteer Opportunities at the Anacostia River (Anacostia Watershed Society)

<https://www.anacostiaws.org/how-to-help/volunteer.html>

Anacostia River Explorers: Educational Boat Tours (Anacostia Riverkeeper)

<https://anacostiariverkeeper.org/anacostia-river-explorers-tours/>

Blue Plains Advanced Wastewater Treatment Facility (DC Water)

<https://www.dewater.com/tours>

<https://www.youtube.com/watch?v=Nb16X8gb9ME>

Arlington County's Water Pollution Control Plant

<https://water.arlingtonva.us/sewer/wastewater-treatment/scheduling-tour/>

Year of the Anacostia Events (free and \$)

<https://www.yearoftheanacostia.com/events>