HOW$_2$ OBSERVE:
WATER CAREERS

Water Drop Patch
for Cadettes

The **WATER DROP PATCH** Project inspires Girl Scouts to learn about water quality and to take action in their communities to protect and restore local water resources, including their local rivers, lakes, streams, wetlands, estuaries, coastal waters, and groundwater. The project supports the Girl Scout Leadership Experience Program by promoting the following **GOALS** for Cadettes:

GOALS:

1: Study climate change and human impacts on water resources
2: Explore careers in water
3: Work with other Girl Scouts to save water

PURPOSE:

When you have completed this patch, you will have learned the roles of water in Earth's history, systems, and surface processes including water cycles, movement, and changes. You can connect what you have learned to global climate change, and explore careers in water resources.

Developed in partnership with the United States Environmental Protection Agency and National Aeronautics and Space Administration and the Smithsonian Institution.

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LEADERS:

The following guide is to help Cadettes complete the Water Droplet Patch. You don't need to be an expert in watersheds to help your Cadettes with this journey! All of the requirements are simple and include many hands-on activities for both you and your Cadettes to explore.

STEP 1:

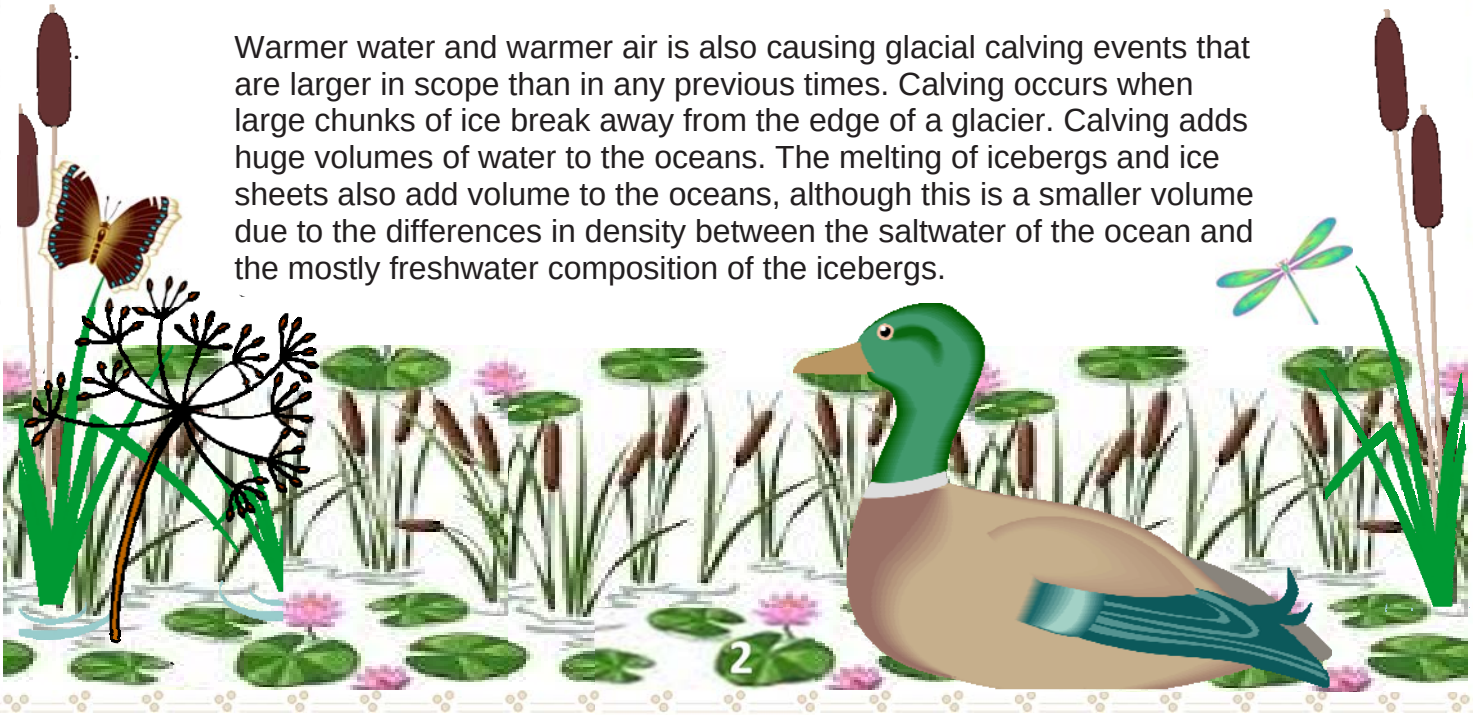
Learn about climate change and human impacts on water resources

Scientists are concerned that climate change is affecting sea levels. According to the EPA, sea surface temperatures have risen 1.3°F per decade since 1901. In the past three decades, water temperatures have been higher than any other period since 1880. This rise has been attributed to the excess greenhouse gases in the atmosphere caused by the burning of fossil fuels. As water warms it increases in volume, contributing to higher water levels.

Photo courtesy of NOAA

Higher atmospheric temperatures and warmer seas cause glaciers to melt at an increased rate. Glaciers contain 69% of the world's freshwater. This water flows into rivers, lakes and the ocean. In the past, winter snows balanced out this water loss. However, melting is beginning earlier in the spring and snowfall is starting later in the fall, and the majority of glaciers worldwide are retreating at rates never before recorded.

Warmer water and warmer air is also causing glacial calving events that are larger in scope than in any previous times. Calving occurs when large chunks of ice break away from the edge of a glacier. Calving adds huge volumes of water to the oceans. The melting of icebergs and ice sheets also add volume to the oceans, although this is a smaller volume due to the differences in density between the saltwater of the ocean and the mostly freshwater composition of the icebergs.



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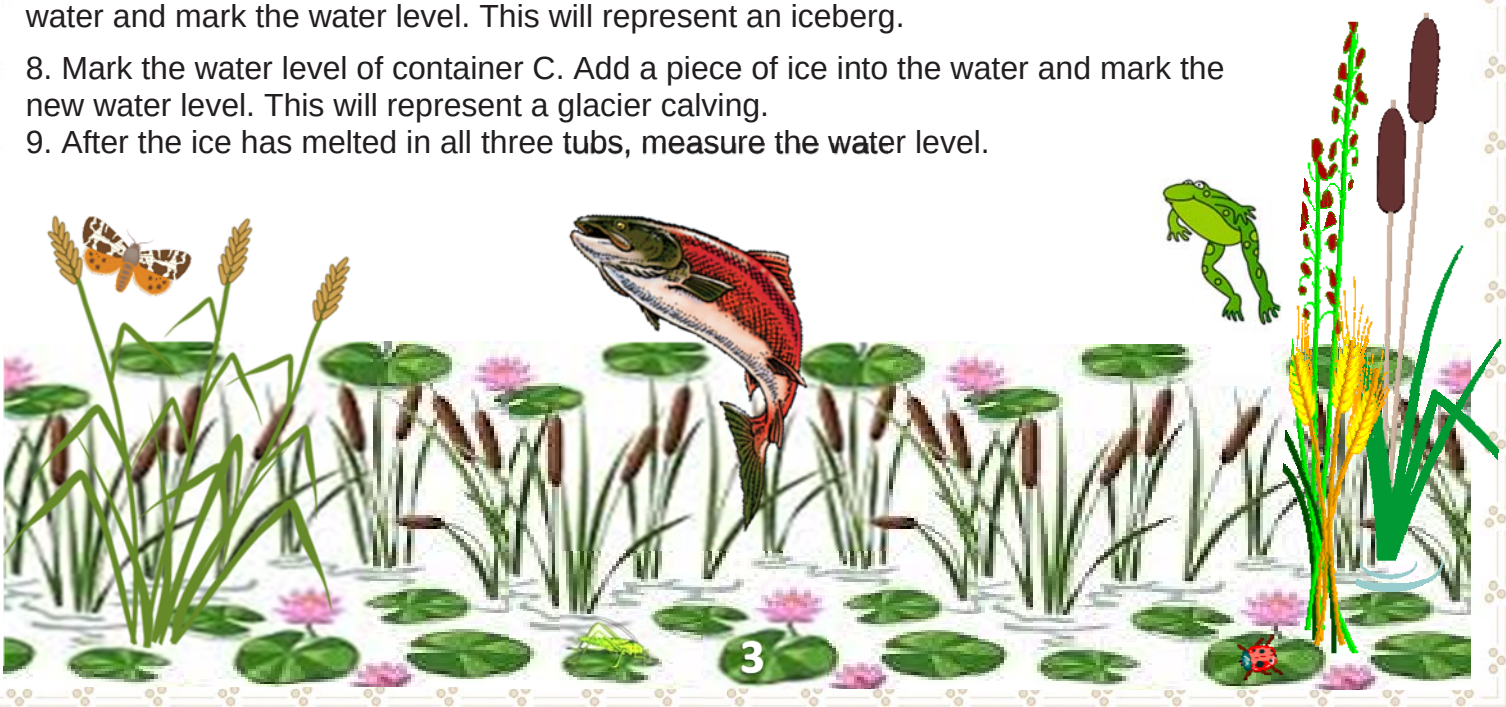
DEMONSTRATE HOW CLIMATE CHANGE AFFECTS SEA LEVELS

Supplies:
- 3 clear 2-quart tubs (rectangular food containers are ideal)
- 2 cups of medium-sized rocks (1-3 inches in size)
- 3 yogurt or similar-sized plastic containers
- Water
- Wet erase marker

Preparation:
Fill yogurt containers ¾ full of water and freeze.

Steps:
1. Label clear tubs A, B, and C.
2. Pile rocks on one end of container A.
3. Pour 2 cups water into each container.
4. Remove ice from yogurt containers.
5. Arrange and/or add rocks to container A so that part of the pile is above the water and can hold the ice.
6. Mark the water level on the outside of container A. Arrange ice on top of rocks. This represents a glacier.
7. Add 1 tablespoon salt to container B and stir until dissolved. Add a piece of ice into the water and mark the water level. This will represent an iceberg.
8. Mark the water level of container C. Add a piece of ice into the water and mark the new water level. This will represent a glacier calving.
9. After the ice has melted in all three tubs, measure the water level.



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ANSWER THE FOLLOWING QUESTIONS:

Which container showed higher water levels after melting?_____

Which events add significant amounts to the volume of the ocean?_____

_____

Each melting glacier or iceberg leads to a relatively small change in sea level, but these small changes add up over time! Why are accumulative sea levels of concern? _____

_____

Who or what could be affected by high sea levels? _____

_____

DEFINE:

DENSITY: _____

_____

VOLUME: _____

_____

GLACIER: _____

_____

GLACIAL MELT: _____

_____

GLACIER CALVING: _____

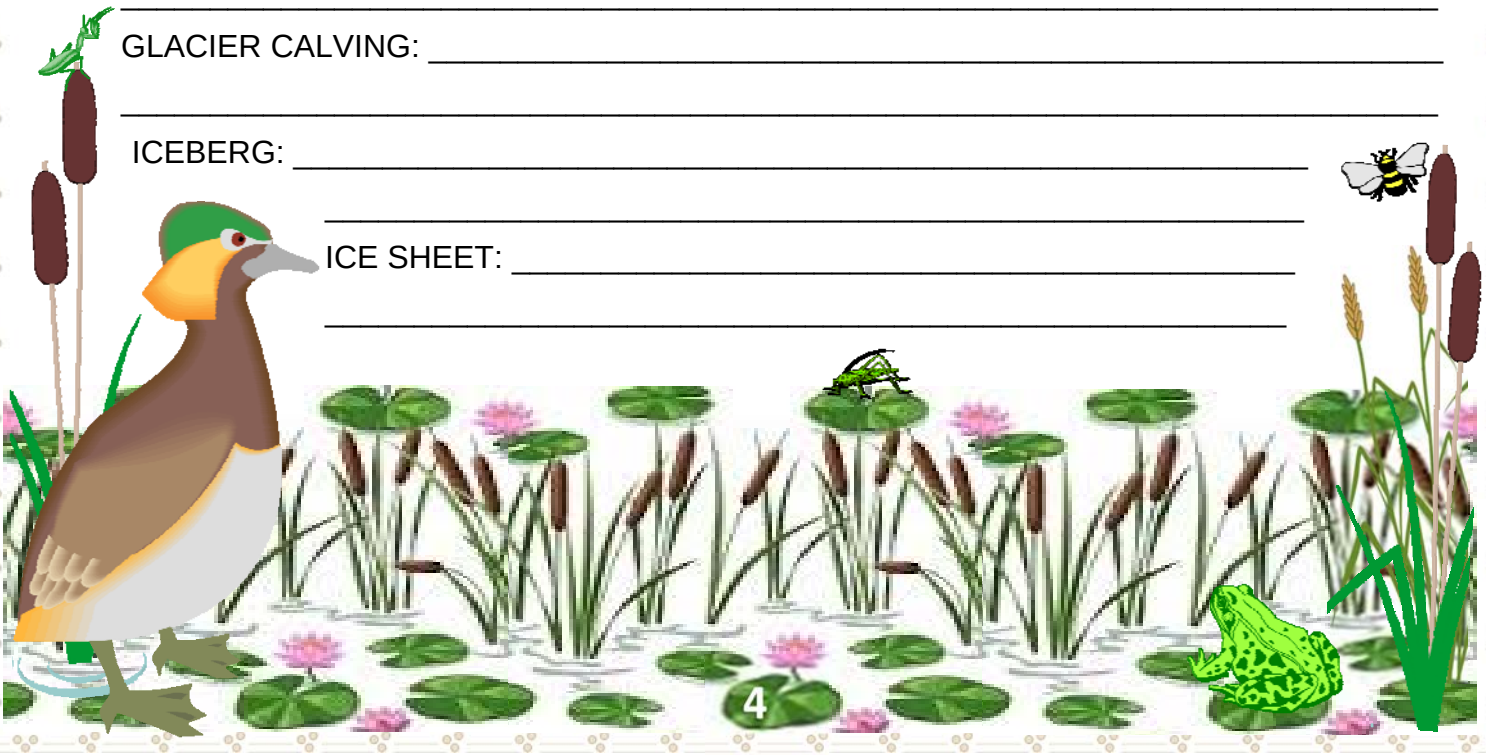
_____

ICEBERG: _____

_____

ICE SHEET: _____

_____



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STEP 2:
What careers will enable you to address climate change?

ASK A WOMAN WORKING IN WATER TREATMENT TO SPEAK ABOUT THEIR CAREER

Identify one or two women working in water treatment and invite them to come to speak to your troop or group about their careers. Before they come to speak, help the girls develop a list of questions that they may want to ask.

Another option is to ask the girls in your troop if they have any particular water career that they would like to explore and then find speakers from those fields.

OR VISIT A LOCAL WASTEWATER TREATMENT PLANT OR WATER FILTRATION PLANT

Visit a local wastewater treatment plant or water filtration plant to see how wastewater is treated or drinking water is purified. Be prepared to ask questions about how water characteristics and processes do or do not change at the treatment plants. Look at the treated water as it is being discharged into your river, stream or estuary. Is it clear? Does it stink?

DEFINE:

GROUNDWATER: _____

STORMWATER: _____

WASTEWATER: _____

DRINKING WATER: _____

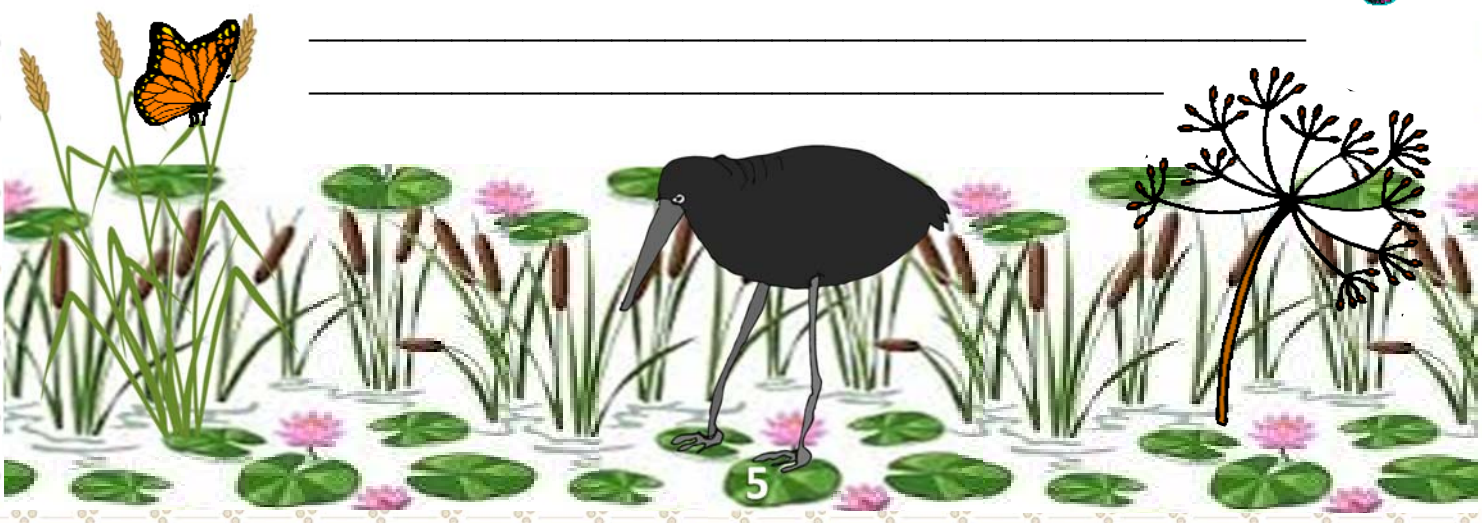
What careers could help address climate change and its effects? _____

_____

_____

_____

_____



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STEP 3:
Save water (Pick 1 of the following 3 projects)

ASSESS DAILY WATER USAGE :

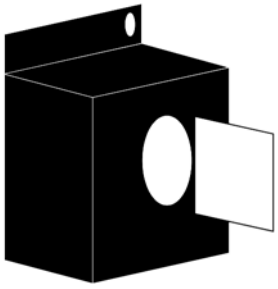
Organize one of the following two activities and discuss what you've learned with other Girl Scouts about daily water usage and assessment of local water resources.

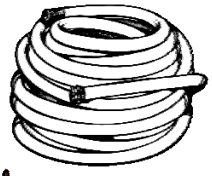
Activity #1: Answer the questions on the Home and Lawn Care checklist attachment at the end of this document. Next, plan how you and your family can change three to five "no" answers to "yes." Share your plan with your troop or group and members of your neighborhood. See how many "yes" answers other girls in your troop or group have.

OR Activity #2: Much of the water we use at home is supplied by groundwater. By paying close attention to exactly how much water your family uses, you can see how many opportunities to conserve water exist in your own home.

HOW MUCH WATER DOES IT TAKE TO:

Flush the toilet	**5-7 gallons**
Take a shower	**25-50 gallons**
Take a bath	**36 gallons**
Wash clothes	**35-60 gallons**
Run dishwasher	**10 gallons**
Brush teeth	**2 gallons**
Wash hands	**2 gallons**
Outdoor watering	**5-10 gallons per minute**





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Steps:

1. Record the amount of water used at home over a one week period. Read your water meter to find that information.
2. Record the number of toilet flushes, showers (including length), washing machine loads, dishwasher cycles, etc.
3. Make a pie-chart graph showing the percentage of your total water use in each activity.

What are some ways that your family could use less water?_____

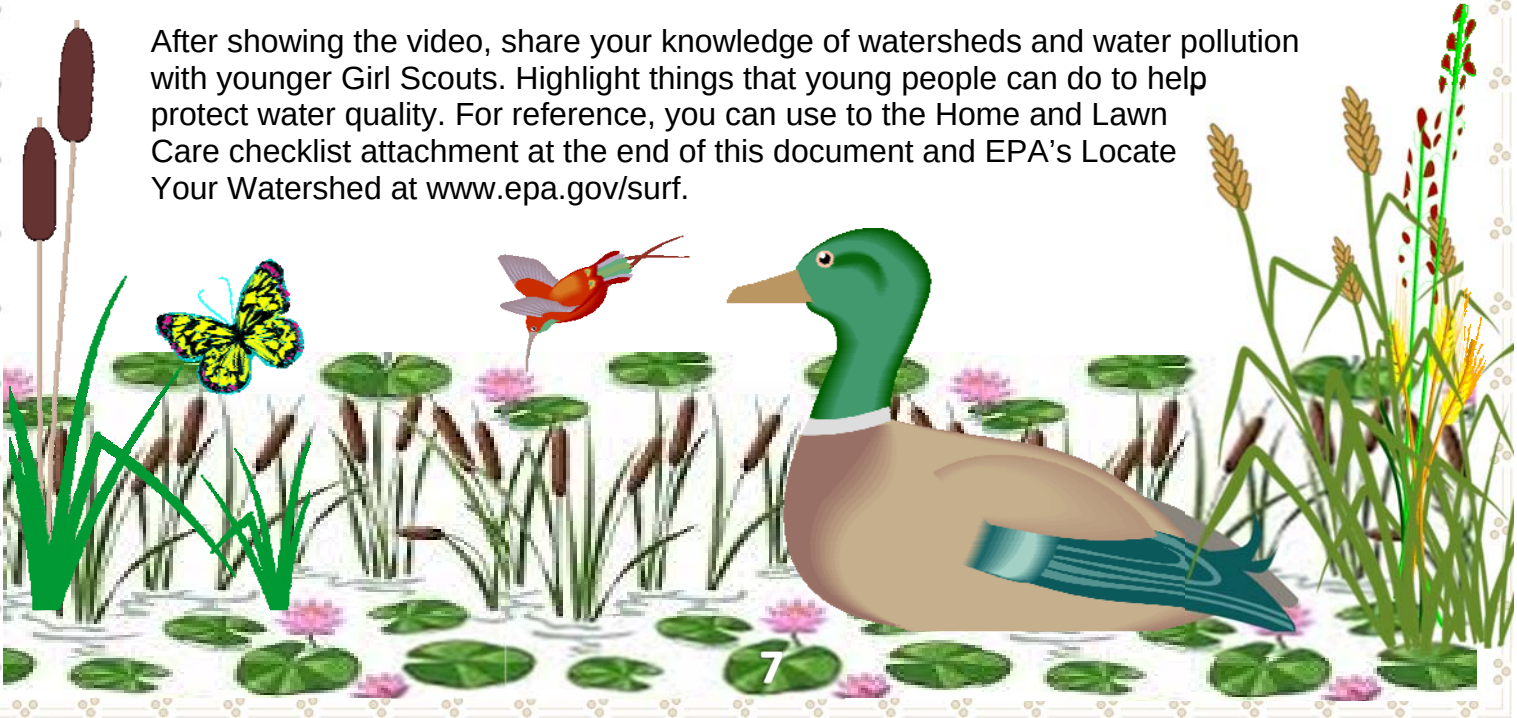
_____

_____

ORGANIZE A SHOWING AND DISCUSSION OF *AFTER THE STORM* VIDEO:

Organize a showing for younger Girl Scouts of *After the Storm*, a free video program co-produced by EPA and The Weather Channel. The video highlights three case studies—Santa Monica Bay, the Mississippi River Basin/Gulf of Mexico, and New York City—where polluted runoff threatens watersheds highly valued for recreation, commercial fisheries and navigation, and drinking water. Key scientists and water quality experts, and citizens involved in local and national watershed protection efforts provide insight into the problems as well as solutions to today's water quality challenges. *After the Storm* also explains simple things people can do to protect their local watershed-such as picking up after one's dog, recycling household hazardous wastes, and conserving water.

After showing the video, share your knowledge of watersheds and water pollution with younger Girl Scouts. Highlight things that young people can do to help protect water quality. For reference, you can use to the Home and Lawn Care checklist attachment at the end of this document and EPA's Locate Your Watershed at www.epa.gov/surf.



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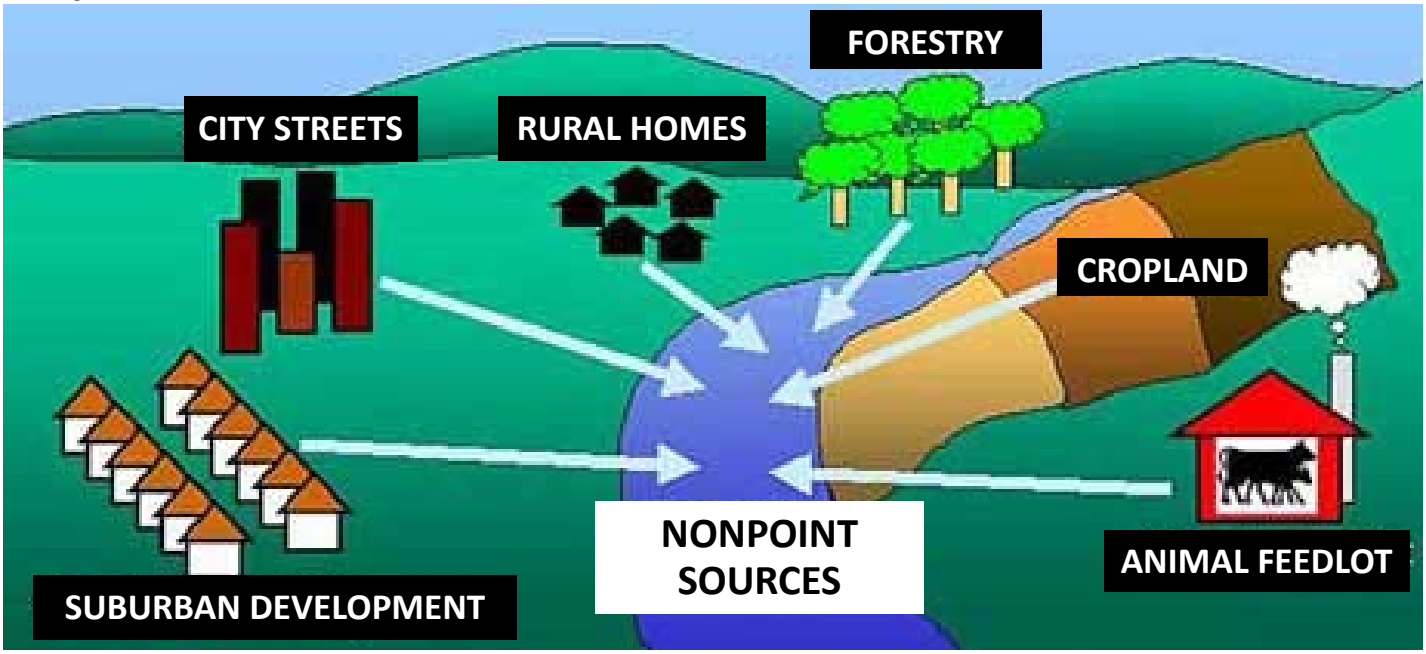
GET THE WORD OUT WITH FLYERS OR DOOR HANGERS:

Create informational flyers or door hangers to pass out door to door that explain a wide range of environmental topics from watershed drainage to actions neighbors can take to avoid pollution. They can encourage recycling oil, recycling plastic, not littering, or keeping grass clippings on the lawn rather than dumping them. They can also encourage limiting the amount of fertilizers and pesticides applied to yards. Finally, they can explain where things that go into the drain end up (e.g., local streams and rivers, affecting local wildlife and possibly drinking water).

Many people don't fully understand what happens when water and other pollutants get washed down a storm drain. They think that it is sent to a treatment plant or is cleaned before it reaches streams, lakes, bays or the ocean. The truth is that anything in most developed areas that is dumped into the storm drain is washed out directly to your local waterbody. All kinds of pollutants, including soil, litter, oil, fertilizers and pesticides (referred to as nonpoint source pollution) ultimately end up in your local waterbody because of careless dumping.

Nonpoint Source Pollution:



Courtesy of NOAA

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What is Nonpoint Source Pollution?

Unlike pollution from factories and sewage treatment plants (referred to as point source pollution), nonpoint source pollution comes from many different areas with no one specific place of origin. It is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

These pollutants can include:

- Excess fertilizers, herbicides, and insecticides from farms, cities, and suburban streets
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, cropland, and forestland, and eroding streambanks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet waste, and faulty septic systems

Acid rain and changes to stream flow can also be sources of nonpoint source pollution. Acid rain, much of which is caused by cars and power plants, is rich in nitrogen, which can overstimulate the growth of aquatic weeds and algae. This in turn can deplete oxygen and kill aquatic life.

Produce and distribute a flyer or door hanger for local households to make them aware of your project and to remind them that storm drains dump directly into your local waterbodies and that dumping will pollute the water. Be creative with graphics and catchy slogans. Graphics add a visual connection to the words, making the message more memorable. Your message can deter littering, excess fertilizer use, oil dumping, and other careless practices that pollute our waters.

Home and Lawn Care Checklist Activity Sheet

Household Products

1. Do you properly dispose of household hazardous waste such as leftover paint, excess pesticides, batteries, nail polish remover, and varnish by taking them to your city's or county's hazardous waste disposal site or by putting them out on hazardous waste collection days? Labels like WARNING, CAUTION and DANGER indicate that an item contains ingredients that are hazardous if improperly used or disposed of.

☐ Yes ☐ No

2. Do you select less toxic alternatives or use nontoxic substitutes when cleaning? Baking soda, distilled white vinegar and ammonia are safe alternatives to caustic chemicals. And they save you money.

☐ Yes ☐ No

3. Do you buy chemicals, fertilizers and pesticides only in the amount you expect to use and apply them only as directed on the label?

☐ Yes ☐ No

4. Do you use low-phosphate or phosphate-free detergents? Excess nutrients overstimulate the growth of aquatic weeds and **algae**, which can deplete oxygen in streams and lakes and kill aquatic life.

☐ Yes ☐ No

5. Do you recycle used oil, antifreeze, and car batteries by taking them to service stations and other recycling centers?

☐ Yes ☐ No

Landscaping and Gardening

6. Do you select plants with low requirements for water, fertilizers, and pesticides? (e.g. native plants)

☐ Yes ☐ No

7. Do you preserve existing trees and plant trees and shrubs to help prevent erosion and promote infiltration of water into the soil?

☐ Yes ☐ No

8. Do you leave lawn clippings on your lawn so that the nutrients in the clippings are recycled, less fertilizer is needed, and less yard waste goes to landfills?

☐ Yes ☐ No

9. Do you prevent trash, lawn clippings, leaves, and automobile fluids from entering storm drains? Most storm drains are directly connected to our streams, lakes, and bays.

☐ Yes ☐ No

10. If your family uses a professional lawn care service, do you select a company that employs trained technicians and minimizes the use of fertilizers and pesticides?

☐ Yes ☐ No

11. Do you have a compost bin or pile? Do you use compost and mulch (such as grass clippings or leaves) to reduce your need for fertilizers and pesticides? Compost is a valuable soil conditioner that gradually releases nutrients to your lawn and garden. In addition, compost retains moisture in the soil and thus helps conserve water and prevent erosion and **runoff**. Information about composting is available from your county extension agent.

☐ Yes ☐ No

12. Do you test your soil before fertilizing your lawn or garden? Overfertilization is a common problem, and the excess can leach into **groundwater** and contaminate rivers or lakes.

☐ Yes ☐ No

13. Do you avoid applying pesticides or fertilizers before or during rain? If they **run off** into the water, they can kill fish and other aquatic organisms.

☐ Yes ☐ No

Water Conservation

Homeowners can significantly reduce the volume of wastewater discharged to home septic systems and sewage treatment plants by conserving water. If you have a septic system, you can help prevent your system from overloading and contaminating groundwater and surface water by ensuring that it is functioning properly and decreasing your water usage.

14. Do you use low-flow faucets and shower heads and reduced-flow toilet-flushing equipment?

☐ Yes ☐ No

15. Do you use a bucket instead of a hose to save water when you wash your car? If you go to a commercial carwash, do you use one that uses water efficiently and disposes of **runoff** properly?

☐ Yes ☐ No

16. Do you use dishwashers and clothes washers only when fully loaded?

☐ Yes ☐ No

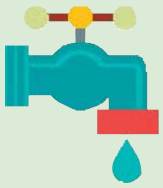
17. Do you take short showers instead of baths and avoid letting faucets **run** unnecessarily (e.g., when brushing your teeth)?

☐ Yes ☐ No

18. Do you repair leaking faucets, toilets and pumps to conserve water?

☐ Yes ☐ No

Did You Know?



One quart of oil can contaminate up to two million gallons of drinking water!

For More Water Conservation Tips,

Visit EPA's Watersense Website At:

www.epa.gov/watersense

Give Water a Hand

What is your city or town or school doing to prevent polluted runoff? *Give Water a Hand Action Guide* contains checklists for schools, communities and farms. This guide can help you and your troop identify potential problems in your community and help you take action.

You can download a free copy of *Give Water a Hand Action Guide* and *Leader Guidebook* at *www.uwex.edu/erc/gwah/*. Or to order and pay for printed copies call University of Wisconsin-Extension, (877) 947-7827. Item #4H850 (*Leader Guide*) or #4H855 (*Action Guide*). Price does not include shipping.

19. Do you conserve the amount of water you use on your lawn and water only in the morning and evening to reduce evaporation? Overwatering can increase leaching of fertilizers to **groundwater**.

☐ Yes ☐ No

20. Do you use slow watering techniques like trickle irrigation or soaker hoses? These devices reduce **runoff** and are 20 percent more efficient than sprinklers.

☐ Yes ☐ No

Other Things You Can Do

21. Do you always pick up after your pet (e.g., Rover's poop)? If so, be sure to put the waste in the trash, flush it down the toilet, or bury it at least 5 inches deep. Pet waste contains viruses and bacteria that can contaminate surface and **groundwater**.

☐ Yes ☐ No

22. Has your council, troop or group helped mark storm drains to alert people that they drain directly to your local waterbody? If not, get involved with a local conservation group or organize your own marking project.

☐ Yes ☐ No

23. Do you ride or drive only when necessary? Try to walk instead. Cars and trucks emit airborne pollutants, which contribute to acid rain and air pollution.

☐ Yes ☐ No

24. Do you participate in local planning and **zoning** decisions in your community? If not, get involved! These decisions shape the course of development and the future quality of your watershed.

☐ Yes ☐ No