



Water Drop Patch Project



Photo courtesy of GSUSA

Making a Difference



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A great big thanks also goes out to the following people and organizations for their contributions, including images, photographs, text, formatting, and overall general knowledge:

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This resource is updated periodically and is available for free through the National Service Center for Environmental Publications (NSCEP) by calling toll-free (800) 490-9198 or e-mailing nscep@bps-limit.com. It is also available online at www.epa.gov/adopt/patch. Inquiries or suggestions related to the project should be directed to Patricia Scott, United States Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460 (Mail Code 4501T). Questions about Linking Girls to the Land Partnership should be directed to Manager, Linking Girls to the Land, Elliott Wildlife Values Project, 420 Fifth Avenue, New York, NY 10018-2798; (800) 223-0624; linkinggirls@girlscouts.org. Web sites: www.girlscouts.org; www.epa.gov/linkinggirls.

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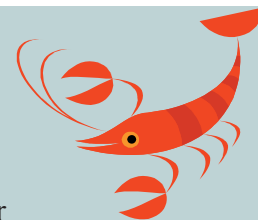
Introduction

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** and **ground water**. The project supports the Girl Scout Leadership Development Program by promoting the following goals for girls:

- **Discover** — Explore the natural world to learn about watersheds and water pollution
- **Connect** — Use their skills and their knowledge to work with others to educate their communities about the need to protect the nation’s valuable water resources
- **Take Action** — Make a difference in their communities by becoming watershed and **wetlands** stewards

This manual is designed for adult facilitator’s use with Girl Scouts and Brownies through Ambassadors (grades 2–12) and is divided into grade-level, age-appropriate activities. This is **nationally recognized** as part of Girl Scouts of the USA’s Linking Girls to the Land (LGTTL) Program. LGTTL is a national interagency partnership between Girl Scouts of the USA’s Elliott Wildlife Values Project and federal natural resource conservation agencies, initiatives and partner organizations. Each year LGTTL encourages more than 35,000 Girl Scouts to work with federal and state conservation agencies to become leaders of national and local projects focused on environmental education, outdoor skills, community service, careers, and more. The LGTTL partnership offers travel opportunities, funding, awards and training to support this vision. Visit the LGTTL Web site at www.epa.gov/linkinggirls to learn more. **Adults should consult with Safety-Wise to ensure Girl Scout safety guidelines are followed when working with girls.**

Thanks to the passage of the Clean Water Act 35 years ago, America has seen much progress in cleaning up the nation’s rivers, lakes, stream, and coastal waters. In 1972 the Potomac River was too dirty for human contact, aquatic life in Lake Erie was dying, and Ohio’s Cuyahoga River was so polluted it caught fire. Many rivers and beaches were little more than open sewers. Conditions in these and thousands of other waterbodies are much better today. The nation has made tremendous progress in addressing pollution from sewage treatment plants and industrial facilities.



Despite these accomplishments, many challenges remain, including threats to human health. Approximately 40 percent of **monitored** waters still fail to meet state water quality standards, which means that they do not support basic uses like swimming and fishing. A disturbing number of freshwater fish species are now threatened or endangered.

The remaining pollution problems come from many different sources, not just from a sewage pipe. Polluted **runoff** from city and suburban streets, construction sites and farms is the primary reason many of our waters are not fishable or swimmable. Tackling these problems will not be easy. However, Girl Scouts can help make a difference by becoming watershed stewards in their communities.

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Background Information

Welcome to the Water Drop Patch Project! Throughout this manual, you will find activities and resources to help your council and Girl Scouts better understand how we are all connected to the environment and how much of what we do every day, from brushing our teeth to maintaining our lawns, can affect the quality of our water. We hope you enjoy your journey!

What Is a Watershed?

A watershed is a land area from which water drains into a receiving body of water. Receiving bodies of water can include streams, lakes, **wetlands**, estuaries and **ground water**.

Watersheds come in different shapes and sizes, and local watersheds are subwatersheds (or subbasins) of larger, regional ones. The Potomac watershed, for example, is a subbasin of the larger Chesapeake Bay watershed.

A watershed's ecological processes help sustain life. For example, a healthy watershed provides

- **Habitat** for fish and other life
- Food sources for animals and people
- Temporary living quarters for migratory birds
- Drinking water for people and other living organisms

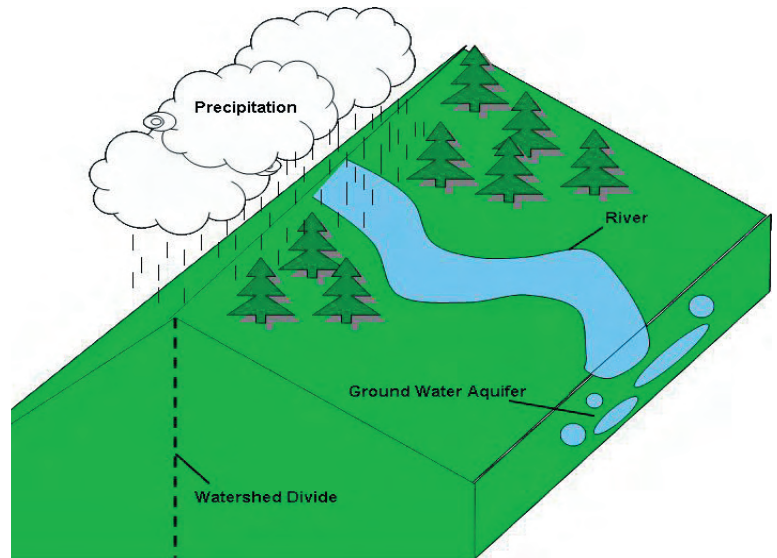


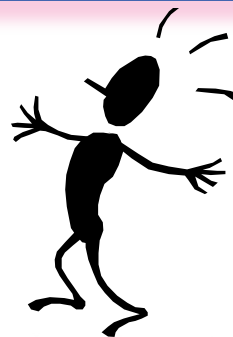
Image by Scott Morello



Image courtesy of USEPA

Did You Know?

The Mississippi River Basin is the largest watershed in the United States. Draining 41 percent of the continental United States, it is composed of 31 states.



Since we all live in a watershed, human activities can directly impact the health of our watersheds. Human forces interact with the natural forces to directly shape the condition of the land and water. For example,

- Increasing impervious surfaces (paved areas and land covered with buildings) in urban areas leads to increased water and contaminant **runoff**.
- Removing vegetation along drainage areas and increased storm flows lead to erosion of soils, which can change the landscape to more arid conditions.
- Increasing the velocity of the water and contaminants in the **runoff** can be lethal to living things and create health hazards, thereby reducing our quality of life.

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. **Channelization** reduces the ability of streams to assimilate or absorb waste and disturbs fish breeding areas.

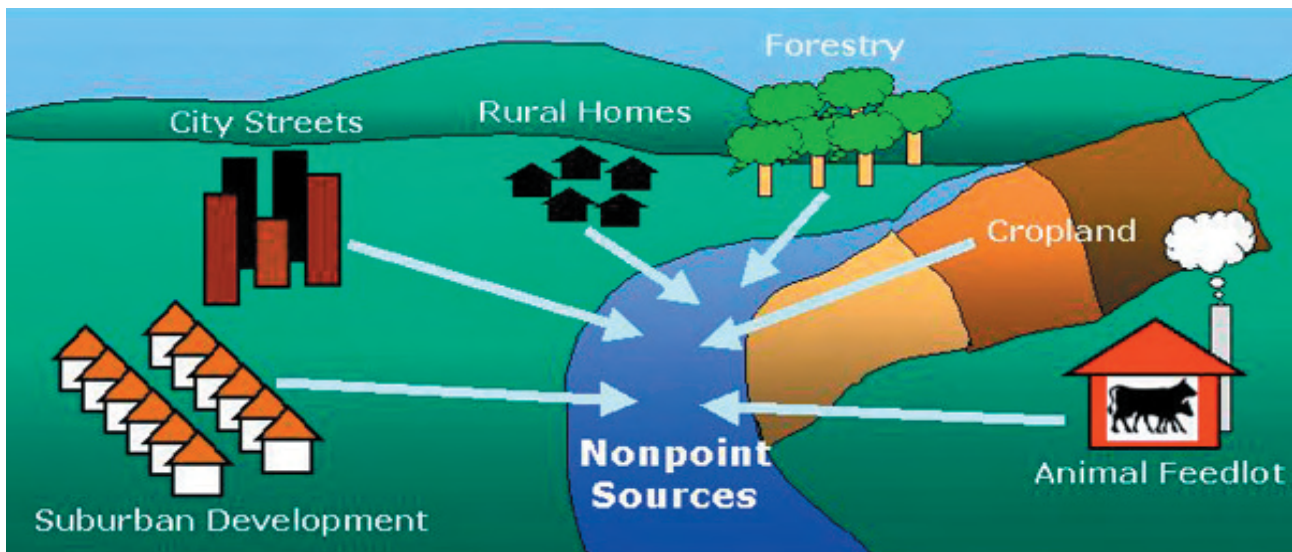


Image courtesy of NOAA

What Is a Wetland?

Wetlands are areas of land that are wet at least part of the year. They are populated by plants well adapted to growing in standing water or saturated soils. There are many different types of wetlands, including marshes, bogs, ferns, swamps, prairie potholes, and bottomland hardwood forests. **Wetlands** might not always appear to be wet. Many dry out for extended periods. Others might appear dry on the surface but are saturated underneath.

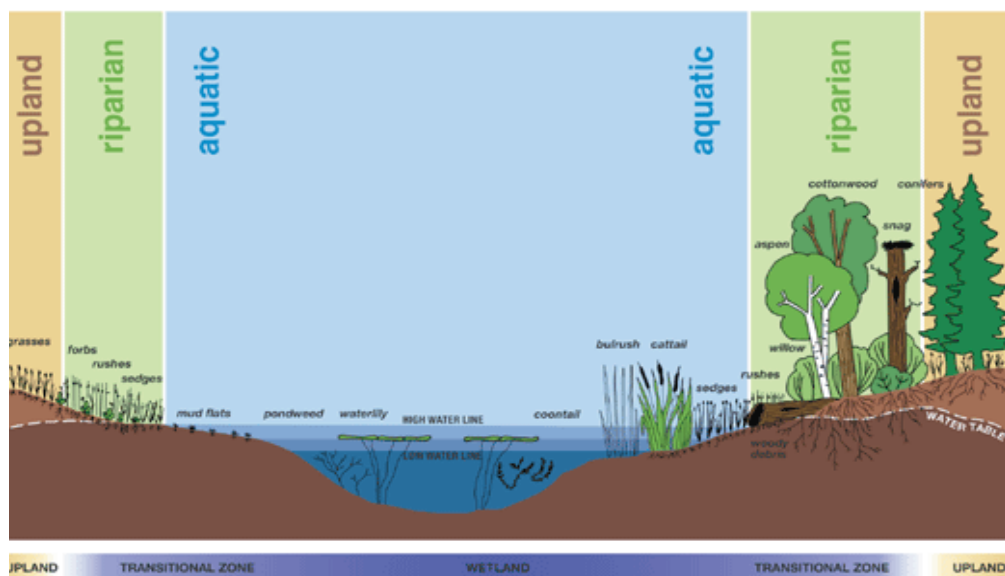


Image courtesy of: Ducks Unlimited, CA



What Are the Basic Characteristics of Wetlands?

Wetlands share three basic characteristics: (1) hydrology (water), (2) hydric soils (soils that form due to the saturating presence of water), and (3) hydrophytic vegetation (plants adapted to living in saturated soils).

Wetland Benefits

These complex ecosystems play an important role in the health of our environment and the quality of our water. For example, **wetlands**

- Provide fish and wildlife habitats
- Support complex food webs
- Act as **sediment** traps
- Improve water quality by filtering out pollution
- Offer open space and aesthetic value
- Absorb water to reduce storm flooding
- Replenish **ground water**
- Maintain flows in streams by releasing water during dry periods



Photo courtesy of NOAA

What Is Ground Water?

Beneath the land's surface, water resides in two general zones, the saturated and the unsaturated. The unsaturated zone lies directly beneath the land surface, where air and water fill in the pore spaces between soil and rock particles. Water saturates the zone beneath the unsaturated one.

The term **ground water** refers to water in the saturated zone. This water is an important natural resource. It is used for many purposes, including drinking water, irrigation and livestock raising.

Half the water used in the United States for drinking water comes from **ground water**.

Surface water replenishes (or recharges) **ground water** when it percolates through the unsaturated zone. Therefore, the unsaturated zone plays an important role in **ground water** hydrology and can act as a pathway for **ground water** contamination. **Ground water** can move laterally and emerge at discharge sites, such as springs on hillsides, or seep in from the bottoms of streams, lakes, **wetlands**, and oceans. Therefore, **ground water** affects surface water quantity and quality because polluted **ground water** can contaminate surface waters. Conversely, some surface waters, such as **wetlands**, hold floodwaters and allow them to soak slowly into the **ground water**. When **wetlands** are filled or drained, **ground water** might dry up.

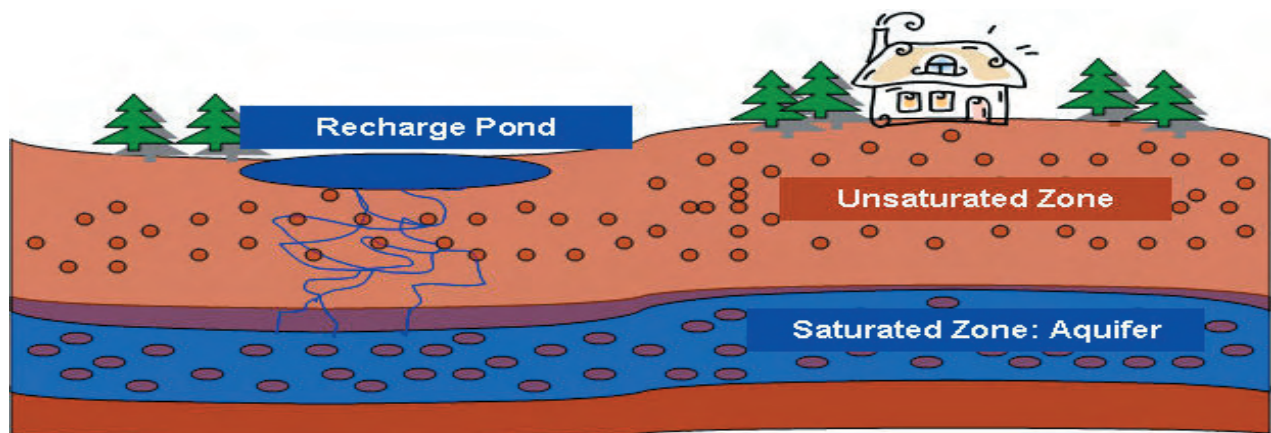
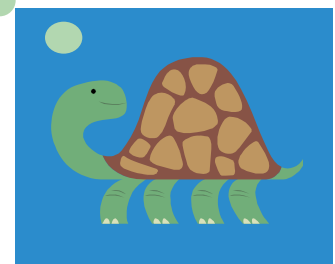


Image by Meghan Klasic, ORISE/USEPA

The Environmental Protection Agency requires public water suppliers to put annual drinking water reports in the hands of their customers. These “Consumer Confidence Reports,” which are issued with utility bills, provide fundamental information, including, for example, the source of your local drinking water (lake, river, **aquifer** or other source), its susceptibility to contamination, and the level or range of any contaminants found.

Did You Know?

- Half the drinking water in the United States comes from **ground water**.



Girl Scout Patch Requirements

Girl Scout Brownies (Grades 2 and 3)	Do any 4 of the first 10 requirements
Girl Scout Juniors (Grades 4 and 5)	Do any 5 of the first 11 requirements
Girl Scout Cadettes (Grades 6–8)	Do any 6 of the first 17 requirements
Girl Scout Seniors (Grades 9 and 10)	Do any 7 of the first 20 requirements
Girl Scout Ambassadors (Grades 11 and 12)	Do 2 of the following: 18, 19, 20, 21, 22, 23, 24 plus any other 5 requirements

1 After answering the questions on the Home and Lawn Care checklist (pages 9–12), 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 use the *Give Water a Hand Action Guide* to identify changes you can make on your farm, at your school or in your community (page 12).

2 **Wetlands** provide many benefits. They help reduce flooding, sustain stream flow, filter polluted waters, provide **habitat** for wildlife and support biological diversity. Visit a U.S. Fish and Wildlife Service National Wildlife Refuge (NWR) or a locally protected wetland. Using the information on page 3, see how many wetland characteristics you can identify. Call EPA’s **Wetlands Helpline at (800) 832-7828** or e-mail wetlands.helpline@epa.gov for help in finding the nearest NWR or wetland resource.

3 Enter the international River of Words Poetry and Art Contest. This contest, open to youth between the ages of 5 and 19, invites children to explore and interpret their local watershed through the arts. To obtain an entry form or more information, contact **River of Words, 2547 Eighth St., 13B, Berkeley, CA 94710** **Tel: (510) 548-POEM** or download an entry form at riverofwords.org.

4 Find out what different plants and animals live in your watershed. The Chesapeake Bay, for example, is home to more than 27,000 species of plants and animals. How many kinds of wildlife can you identify (e.g., crabs, oysters, waterfowl and fish)? Why are underwater bay grasses important?

5 Go on a hike with your troop or group and follow a local creek or stream. Where does the stream drain? What does it pick up along the way? What happens when it rains? How does the stream change? What insects, birds, plants or aquatic life do you observe? Use a United States Geological Survey (USGS) map or draw your own to illustrate your local watershed. USGS topographic maps can be obtained by calling **(888) ASK-USGS** or online at www.topomaps.usgs.gov. Share with others what you have learned.

6 Create an attractive wall mural for your school or community with messages about clean water. Some ideas for themes might be “We all live downstream,” “What is a watershed?” “Where does my drinking water come from?” or “The Wonders of Wetlands.” You might take a look at a poster series developed by the USGS at www.water.usgs.gov/outreach/OutReach.html for some ideas. Display your mural where others in your community can see it!



7 Visit a local aquarium or a natural history museum to see specimens of aquatic life. Share your experiences with your troop or group and family. Consider visiting one of *Coastal America's* Coastal Ecosystems Learning centers if there is one near you. Check out Coastal America's online at www.coastalamerica.gov or call (202) 401-9928. Find out how Coastal America, a partnership of eleven federal agencies and the Executive Office of the President, is helping to protect the manatee, the whooping crane, salmon and the right whale.

8 Visit a local wastewater treatment plant or water filtration plant to see how wastewater is treated or drinking water is purified. Look at the treated water as it is being discharged into your river, stream or estuary. Is it clear? Does it stink?

9 Participate in a special activity during May to celebrate American **Wetlands** Month. For **wetlands** ideas, see the list below or visit www.epa.gov/owow/wetlands/awm.

10 Identify one or two women working in water resource protection 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 idea is to ask the girls if they have any particular water careers that they'd like to hear about and then try and find speakers from those fields.

11 Work with other Girl Scouts in your service unit to organize or join in a World Water **Monitoring** Day event. Visit www.worldwatermonitoringday.org to register or find a site and order an easy-to-use **monitoring** kit. Be sure to learn and follow safety instructions. See "World Water **Monitoring** Day" on pages 13 and 14.

How Can I Help Protect Wetlands?

Before you can protect them, you have to understand them... This goes with Patch Requirement #2

1. **BE A WETLANDS DETECTIVE!** Investigate why **wetlands** are unique. Research what kinds of animals and plants live in the **wetlands** in your state. Start a journal to record the names of birds, frogs, insects and plants that you might find in a local wetland. Try to draw them! Go to the library or use the Internet to uncover the mysteries of **wetlands**. Don't forget to investigate how **wetlands** function to keep a healthy watershed. Call the **Wetlands** Helpline (800) 832-7827 for a list of Web sites and educational materials.

Now that you have learned about **wetlands**, go explore one...

2. **VISIT A PUBLICLY ACCESSIBLE WETLAND AND DESIGN A PHOTOGRAPH POSTERBOARD DISPLAY.** Girl Scouts can form teams of 2 or 3, each team carrying its own camera (digital or disposable cameras work well). Using a field guide, each team photographs 4 or 5 items, such as insects, birds, plants and trees. Teams then label/describe the photos and mount them onto posterboard (laminating posters is recommended). Finally, display the posters in a public location such as a library, church or school!

3. **VOLUNTEER AT YOUR LOCAL WETLAND!** Call your county's agricultural extension agent or the local/state natural resource management agency and get a list of ongoing **wetland** and stream restoration projects.



- 12 Organize a Storm Drain Marking Project in your neighborhood. 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 waterbody. Guidelines for the project are on pages 15–18.
- 13 Go on a stream, **wetlands** or lake walk and make observations and assessments of waterbody conditions. See “Streamwalk Project,” pages 19–33, for details, assessment forms and further information.
- 14 Do a display or presentation on **ground water** and explain how pollutants threaten its purity. Show where your drinking water comes from. Girl Scouts can check their family water utility bill or visit EPA’s Web page at www.epa.gov/ow/states.html. Click on the map and link to information about local drinking water. Consider using an **aquifer** model (pages 34–36) as part of your presentation. Or visit www.epa.gov/ogwdw/ for additional information.
- 15 Organize a showing for younger Girl Scouts of *After the Storm*, a free video program co-produced by EPA and The Weather Channel. Share your knowledge of watersheds and water pollution. Highlight things that young people can do to help protect water quality (see checklist on pages 10–12). Use EPA’s Locate Your Watershed (www.epa.gov/surf) or resources list (pages 62 and 63).
- 16 Create a wildlife **habitat** or another conservation project in your backyard or Girl Scout meeting location. Call the **Natural Resources Conservation Service at (888) LANDCARE** for a free backyard conservation booklet. See “Backyard Wildlife **Habitat** Project,” pages 37–40 for guidelines. Or consider joining the National Wildlife Federation’s Backyard **Habitat** Program and receive a certificate and sign for your project (page 40).

Did You Know?

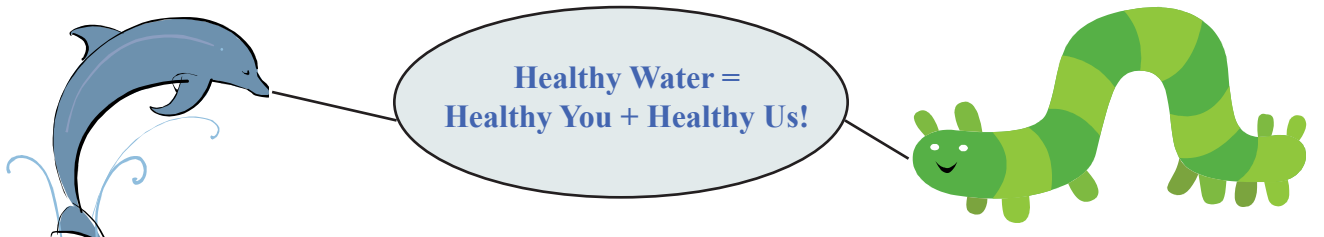
- The Chesapeake Bay is an estuary where saltwater and freshwater mix.
- The bay receives about half of its water volume from the Atlantic Ocean (saltwater). The rest (freshwater) drains into the bay from an enormous 64,000-square-mile drainage basin or watershed.
- The watershed includes parts of six states (Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia) and District of Columbia.
- Ninety percent of the fresh water entering the bay comes from five major rivers: the Rappahannock, the Susquehanna (responsible for 50 percent), the Potomac, the James, and the York.
- The bay is the largest estuary in North America.
- The bay is home to 27,000 species of plants and animals.



Do you know your full watershed name? If not, visit Surf Your Watershed at www.epa.gov/surf. Find your watershed and a list of local watershed groups, and check out your watershed profile page for more information!



- 17 Work with Girl Scouts in your service unit and your local government to organize or join in a stream, wetland or beach cleanup. Consider participating in the annual International Coastal Cleanup sponsored by the Center for Marine Conservation (CMC) and held every September. See “Stream or Beach Cleanup Safety List” on pages 41 and 42 for further information, as well as the resources list on pages 62 and 63.
- 18 Find a watershed group in your community and volunteer to help with a project. Use EPA’s Adopt Your Watershed Web site (www.epa.gov/adopt) to search for an organization active in your watershed. Consider applying for a Five Star **Wetlands** Restoration Grant with four other community partners. Visit www.epa.gov/owow/wetlands/restore/5star.
- 19 Construct a rain garden. Help your community deal with stormwater pollution by doing your part. Be sure to tell community members about your efforts and explain to them what a difference it can make. See pages 43–45 for more information on developing a plan and executing the project.
- 20 Become a trained volunteer water quality **monitor**. Help collect data and build stewardship for your local waterbody. Attend a training workshop to learn proper **monitoring** techniques. Share your knowledge and experience with younger girls and community leaders. See pages 46 and 47 for general information on how to become a water quality **monitor**.
- 21 Sponsor a **Ground Water** Festival or Watershed Festival in your community to raise awareness about the importance of clean water and watershed protection (see list of resources on pages 62 and 63).
- 22 Make a presentation to your local Rotary Club, Chamber of Commerce, or locally elected officials about your watershed and potential issues of concern. Use EPA’s Web sites (www.epa.gov/waters) and other resources to learn about existing conditions and potential threats.
- 23 Intern with a federal, state or local natural resource agency to learn more about water quality issues. Remember, even if an agency isn’t advertising that they have internships, they will often be more than happy to take someone on! Share your knowledge and experience with younger Girl Scouts or community leaders.
- 24 Produce a video or public service announcement that highlights the importance of watershed protection. Illustrate ways that Girl Scouts and others can get involved in protecting your local stream, river, wetland, lake or estuary. Share your video with your friends, fellow students and community. Consider posting it on You Tube or another video-sharing Web site. If the production quality is good, explore other ways to broadcast it, including your local television station or community cable network. Also consider broadcasting the audio portion on a local radio station.



Home and Lawn Care Checklist



This activity goes with Patch Requirement 1 (Girl Scout Brownies–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. They will do so by learning what simple activities their families can change that can add up to make a big difference.
- Connect.** Girls should feel connected to their communities, locally and globally. By comparing answers with other girls in their troop or group, girls will begin to understand how great a problem certain activities can become when a lot of people make the same mistakes.
- Take Action.** Girls should be able to identify some community needs. The first step in fixing the problem is understanding the problem. After that, girls can take action by fixing the problem. By actively doing their part, girls can help their community see and understand how little changes can add up to make a big difference.

When rain falls or snow melts, the seemingly small amounts of chemicals and other pollutants in your driveway, on your lawn, and on your street are washed into storm drains. In many older cities, the stormwater **runoff** is not treated and flows directly into rivers, streams, bays and lakes. Pollutants in this **runoff** can poison fish and other aquatic animals and make water unsafe for drinking and swimming. What can you do to help protect surface and **ground water** from polluted **runoff**? Start at home. Take a close look at practices around your house that might contribute to polluted **runoff**. The following page has a checklist to help you and your family become part of the solution instead of part of the problem.



Do-It-Yourself Nontoxic Home Cleaning Products

General, multipurpose cleaner

(for ceramic tiles, linoleum, porcelain, etc.):

Measure 1/4 cup baking soda, 1/2 cup white vinegar, and 1 cup ammonia into a container. Add to a gallon of warm water and stir until baking soda dissolves.

Window cleaner: Combine 3 tablespoons of ammonia, 1 tablespoon of white vinegar, and 3/4 cup of water. Put into a spray bottle.

*Make sure you have adult supervisor permission



Home and Lawn Care Checklist Activity Sheet

Print pages 10–12 and make copies for the Girl Scouts completing this activity.

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 **ground water** 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 ground water 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 Web Site 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.

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 **ground water**.

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

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 **ground water**.

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



World Water Monitoring Day

This activity goes along with patch Requirement 11 (Girl Scout Juniors–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girl Scouts seek challenges in the world. By learning about local waterbodies, girls will seek opportunities to expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. Getting involved in World Water **Monitoring** Day will help girls to form new connections with other girls, community members and partnerships.
- Take Action.** Girls should be able to identify some community needs. By contacting and working with local watershed groups, girls will be able to identify environmental issues in their community and come up with realistic possibilities for action. Taking part in World Water Monitoring Day, testing a local waterway, and recording the data are ways to *take action*. Girls will educate others and inspire them to act. Strength in numbers is always important. By getting involved and **monitoring** a waterway, Girl Scouts will show others that anyone and everyone can make a difference. They will motivate others to get involved.

World Water **Monitoring** Day, celebrated annually on September 18, is a month-long international event designed to educate people of all ages, in all nations, about the value of clean water and the role of water quality **monitoring**. World Water **Monitoring** Day offers participants an opportunity to use a simple test kit to take water quality samples in their local streams, lakes, bays or **wetlands**; enter their data into an international database; and take part in activities that educate us all about our role in protecting clean water. October 18 was selected as the end date because it is the anniversary of the landmark 1972 Clean Water Act.

Why Is Monitoring Important?

We need to **monitor** to answer basic questions about our waters. Can we safely swim in them? Can fish and other aquatic animals live in them? Can we safely eat the fish we catch? Is the quality of our waters improving? Today we can't always answer these questions. EPA is working to build partnerships with other federal agencies, states, local governments, watershed groups, the private sector and the public to improve the comprehensiveness and effectiveness of water **monitoring** programs.



Photo courtesy of GSUSA



Who Organizes This Event?

World Water **Monitoring** Day is planned and coordinated by the Water Environment Federation (WEF), in partnership with a number of other organizations, including EPA. Local **monitoring** and educational activities are organized by participating watershed organizations, schools, government agencies and individual citizens.

How Can Girl Scouts Participate?

Beginning in mid-July of each year, schools, Girl Scout troops or groups, other organizations and individuals can order an easy-to-use water testing kit from the **World Water Monitoring Web site at www.worldwatermonitoringday.org**. The kit contains instructions on how to test for four key parameters: dissolved oxygen, water temperature, pH, and water clarity. Troops and groups or councils need to select an appropriate site for **monitoring** and then **monitor** the site between September 18 and October 18. The kit includes safety instructions, which should be followed carefully. Once Girl Scouts have recorded their data, they enter their findings in the international database available on the World Water **Monitoring** Day Web site. Troops and groups or Councils may also want to get involved in other fun activities in their area, such as water festivals and stream cleanups.



Image courtesy of www.worldwatermonitoringday.org



Photo by Jodi Schwarzer, GSUSA

Be a Part of Something Big!

Visit www.worldwatermonitoringday.org for more information, to order test kits (international orders and bulk orders accepted), register your site(s), enter your data, and find out what's going on in your area and around the globe. Girl Scout troops or groups and councils may also wish to team up with Water Environment Federation partnering organizations.

Visit the Web site above to see a list of wastewater utilities that might be willing to help with a local event. Some may be willing to provide free test kits. To learn more about volunteer environmental **monitoring**, visit www.epa.gov/owow/monitoring/volunteer.



Storm Drain Marking Project Guidelines

This activity goes along with Patch Requirement 12 (Girl Scout Cadettes–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girl Scouts seek challenges in the world. By learning how what goes into storm drains eventually ends up in local waterbodies, girls will discover how simple activities (e.g., selecting the cleaning products they use) can affect their nearby waterbodies.
- Connect.** Girls should feel connected to their communities, locally and globally. By marking storm drains, girls will understand and demonstrate how everyone is connected to local waterbodies, and how everyone’s actions directly affect water quality.
- Take Action.** By marking storm drains, girls will actively do something about pollution. They will also go a step further by motivating others to adopt more environmentally friendly behaviors. Girls will make a difference in their communities.

Unfortunately, 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 area 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**, see page 2), ultimately end up in your local waterbody because of careless dumping. Communities across the country are working to reduce **nonpoint source pollution**. Many include storm drain marking as part of their education and outreach efforts.

Storm drain marking involves labeling storm drains with plaques, tiles or painted or precast messages warning citizens not to dump pollutants into the drains. The message typically includes a simple phrase like “No Dumping, Drains to Water Source,” “Drains to River,” or “You Dump It, You Drink It. No Waste Here.” Often, the message includes a simple graphic of a shrimp, crab or fish. The graphic usually adds a visual connection to the words, making the connection easier to comprehend.

The goal is to remind people that the storm drains connect directly to local waterbodies and that dumping will pollute the water. Storm drain marking projects can be undertaken throughout the entire community, especially near sensitive waters or where trash or nutrients are major pollutants. However, regardless of the condition of the waterbody, markers can alter littering, excess fertilizer use, oil dumping, and other careless practices that pollute.



Photo courtesy of GSUSA



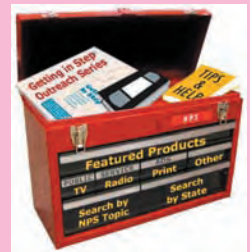
The Basics of Storm Drain Marking

- 1. Permission first.** Once you have decided to get involved with a storm drain marking project, you have to seek permission first. In certain areas, city governments believe that their own crews will produce better results if they do all the work. In most areas, however, volunteer groups and organizations are welcome to help out. You should get in contact with your municipality. Once you explain what you are interested in doing, your municipality should be able to provide you with all the materials, safety guidelines and maps that you will need to successfully complete your mission.
- 2. The setup.** Now that you have established a contact with your public works department and decided on areas to do your storm drain marking, take a step back. Ask your municipality if you can setup a time to be trained in the safest way to mark storm drains. In addition, take a look at the areas that your public works department has chosen for you to mark. Visit those areas to get an idea of the surroundings that you'll be working in and, if necessary, determine whether further safety measures are needed. If you feel that the area needs traffic cones or barrels, request that they be setup. In a worst-case scenario, tell your public works department that you do not feel it is safe to mark in the area(s) that they designated. Remember: safety first!
- 3. Make your list and check it twice.** Before the big day or days of storm drain marking, make a list of all the materials that you will need. In addition, make a schedule or outline of your "plan of attack." Decide the route you are going take, what time(s) you are going to be marking, and where you plan to be throughout the day. Have you decided to split into groups?
- 4. Lights, camera, action!** Notifying the media (e.g., newspaper/television) can help get your watershed protection message out to the whole community. Girls can also draft press releases, newspaper stories, and public service announcements.

Caution: Adhesives in some storm drain marker kits can contain toluene or other toxic chemicals, which are not recommended for use by children under the age of 18. Therefore, EPA recommends that participants under 18 limit their participation in storm drain marking programs to distributing informational brochures and other associated outreach activities. Only adults should handle glue or adhesives.

EPA's Nonpoint Source Digital Toolbox offers a collection of more than 800 Public Service Announcements that can be tailored or adapted for your local community to use in publications, television, or flyers. Some of the materials require permission, so check the Web site for contact information.

Visit www.epa.gov/owow/nps/toolbox.




5. **Track pollution and progress.** Be sure to keep a record of progress that your markings have made. One way to do this is to inquire about pollutant-tracking forms to collect data on dumping. Your municipality should be able to help you out by supplying forms or helping you to create your own. While you travel from storm drain to storm drain making your mark, simply note the **current** status of the storm drains. Are they clogged with debris? Do they show obvious signs of dumping? Any information recorded (along with the location of the specified storm drain) will help the city keep track of what's going on and which points need more attention. You might want to meet with your city or state officials after the event is over to discuss your findings.

6. **Get to it.** Have fun marking storm drains, and be sure to reiterate and discuss the importance of your work. Have your Girl Scouts explain to others why you are marking drains and what you hope to accomplish from it. Following Step 5, make sure you track your progress.

7. **Get the written word out.** Girl Scouts who are too young to do the marking or are looking for an alternate group or even troops who have marked and want to do more should be encouraged to go from door to door passing out flyers or doorhangers (be sure to have an adult accompany them). These informational papers can 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/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).

- Marking kits containing all materials and tools needed to carry out a marking project
- A map and/or directions to the storm drains to be marked. Please remember that it is best to avoid high-traffic areas when marking with children and that safety should be the primary concern. Neighborhoods are usually safer than downtown city streets (and many nonpoint sources go down storm drains in residential neighborhoods).
- Training on marking safety procedures, including affixing signs
- Safety equipment (traffic cones, safety vests, masks or goggles and gloves if glue is used)
- Incentives and rewards for volunteers (badges, T-shirts, certificates)



Ask your municipality for help with these things.



Important References for Storm Drain Marking



Image courtesy of USEPA

Materials

Storm drain markers vary in cost depending on materials, design requirements, and the amount purchased. Check with your state, county, municipality, or a local watershed group to see if they can secure materials for you and offer help with your project.

References for Developing Programs

EPA's Office of Wastewater Management www.epa.gov/npdes/stormwater/menuofbmps. Click on "public involvement" when you reach the national menu of best management practices Web page and scroll down.

Chesapeake Bay Foundation Storm Drain Stenciling "How-To"
www.cbf.org/site/PageServer?pagename=action_outdoors_stencil

The Rivers Project, Southern Illinois University at Edwardsville. Gateway Area Storm Sewer Stenciling Project. www.siu.edu/OSME/river/stenciling/stencil1.htm

Watershed Activities to Encourage Restoration (W.A.T.E.R.)'s Storm Drain Project Information and Outline
www.watershedactivities.com/projects/fall/sdstencil.html

Some Sources for Purchasing Markers

ACP International. Storm Drain Markers. www.acpinternational.com/stormdrain.php

Clayworks Storm Drain Marking Program. www.clayworks.net/stormwater.html

States and Communities with Storm Drain Marking Web Sites

Connecticut Department of Environmental Protection, Office of Long Island Sound Programs.

www.ct.gov/dep/cwp/view.asp?a=2705&q=323820

Brevard County, Florida. www.brevstorm.org/edu_stormdrain_markers.cfm

North Carolina Storm Drain Stenciling.

www.bae.ncsu.edu/bae/programs/extension/wqg/smp-18/stormdrain/



Image by Kelly Brzezinski



Streamwalk Project

This activity goes along with Patch Requirement 13 (Girl Scout Cadettes–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girl Scouts seek challenges in the world. By learning about local waterbodies, girls will seek opportunities to expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. By completing a streamwalk, girls will begin to understand why and how much of what we do every day affects our local streams. By working with a watershed group, girls will make even stronger connections with their community.
- Take Action.** Girls will be able to use what they learn from the streamwalk to set up and implement creative and effective action plans to improve stream health or to promote awareness.

By going on a stream, **wetlands** or lake walk, you can make observations and assessments about your waterbody's condition. By **filling** out a simple form, you can get an idea of what might be polluting your waterbody and even how to help clean it up. The following pages provide a streamwalk form that's easy to understand and complete. In addition, you will find helpful information on how to make the most of your "expedition." There are many different types of stream, **wetlands** and lake walk assessment forms; the one provided should be suitable for your scouts.

Before you get started, **be sure to make copies of all the walk assessment forms.** In addition, it would probably be helpful to gather the following equipment to take with you:

- Clipboard
- Field guides (birds, plants, animal tracks)
- Binoculars
- Hand lens
- Camera(s) for seasonal documentation



Steps to Take for a Successful Streamwalk

1. Contact local groups in your area that work on environmental issues.

Not only will these groups be able to provide you with information and background on your streamwalk site, but you might also be able to piggyback on an existing program. Visit EPA's Adopt Your Watershed Web page at www.epa.gov/surf/locate/index.cfm to see if there is a group in your watershed.

2. Choose a general area for your streamwalk. You might wish to collect data on a variety of streams in your watershed to collect baseline data, or perhaps you want to concentrate your efforts in areas suspected of being polluted. Ideally, you should do streamwalks four times a year (once a season).

3. Find a U.S. Geological Survey (USGS) topographic map of your area. Topo maps show buildings, elevations, waterways and roads. They can also identify the latitude and longitude of your site. Help in defining longitude and latitude is provided on pages 31–33. The cost of these maps is approximately \$6. You can order them directly from USGS by calling (888) ASK-USGS. You might also find one to photocopy at your local library.



4. Once you get your topo map, find your specific site on it. For the purpose of this streamwalk, you want to do about 100 feet in both directions from your site. If you choose to do multiple sites, be sure to choose them at least 200 feet apart.

5. Finally, when you are ready to do your streamwalk, pull out copies of the streamwalk data form, as well as the step-by-step guide that explains each category on the data form (located on pages 20–29). It is important that you go through the instructions and the tips on page 30 before you begin your walk. Be sure to have a complete set of data sheets for each site.

Instructions for Filling Out Streamwalk Survey Data Sheets

Please read these directions thoroughly before you begin your walk. If, while conducting your streamwalk, you are not able to determine what the response should be, or if the question itself is unclear, just leave that space blank—but don't stop your walk. Remember that this is not a test. There are no right or wrong answers. Walks can be done along the stream. You do not need to enter the water.

Location

Give the stream name, county and state of your site, preferably as they appear on the topo map. Note: There are some unnamed streams; in these cases you can indicate the stream, lake or waterbody into which your stream flows and the name and number of the topo map. If you want to share your information with a local or state environmental agency, it is useful to include the latitude and longitude of your site. Computing this presents a challenge, so detailed information explaining the terms, as well as useful links to help you on your way, is provided on pages 31–33.

Weather

The concern with weather relates to the amount of rainfall, which potentially can affect the flow, clarity and amount of water in a stream. Weather/rainfall reports are available in the daily newspaper or by calling the local weather service. Definitions of weather conditions established by the Weather Service are:

Rain: 1/3 inch in 24 hours; light steady rainfall.

Showers: 1/3 inch–1 inch in 24 hours; intermittent and variable in intensity.

Storm: 1 inch or more rain in 24 hours; usually accompanied by high winds.



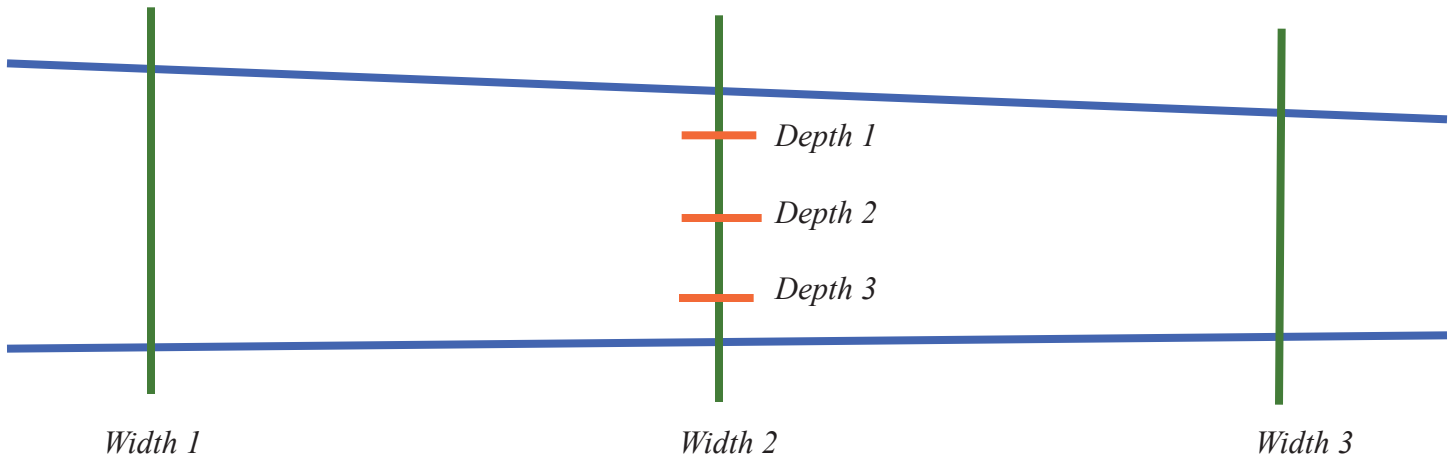
Stream Description

Depth and Width Measurements (Item 1 on Data Sheet)

This information describes the stream water at your site. Please indicate whether your data are estimated or measured. Remember, it is best to estimate if taking measurements will disturb **habitat**, require that you wade in deep water, or disturb stream banks.

Note: If you are going to measure by going into the stream, it is helpful to get an average measurement because a stream is usually not one uniform depth or width. For depth, take measurements at three or four locations across the stream. Add the measurements and divide by the total number of measurements you took. For width, measure at three or four different locations in about a 10-yard length and again average the measurements by calculating the sum of the measurements and then dividing by the number of measurements taken. See example on page 21.





Example: $Width\ 1 + Width\ 2 + Width\ 3 = Width\ Sum$ $Width\ Sum/3 = Width\ Average$

Water Clarity (Item 2 on Data Sheet)

The **clarity** of the water is observed to determine whether **sediment** pollution is entering the stream. Cloudy or colored water can be a result of natural processes or of land use in the surrounding watershed. Sediments can adversely affect **habitat** conditions such as food, health or fish, and breeding environment for **macroinvertebrates**. In some areas, grey or white water can be a result of natural processes such as glacial sources for streams.

Water Flow: Pools and Riffles (Item 3 on Data Sheet)

The variety of flow in relation to depth creates **habitat** to support fish and invertebrate (no backbone) life. **Pools** are deeper than adjacent areas. They provide feeding, resting and spawning areas for fish. **Riffles** and **runs** are flows swift in comparison to surrounding areas. **Riffles** are shallow and fast water, **runs** are deep and fast water, and **pools** are slow and deep water.

Stream Channel Cross-Section Shape (Item 4 on Data Sheet)

Check the box that matches the shape of the stream channel. If you are unable to see the shape of the bottom and banks, you may estimate. You can base your estimate on the flow of water. The slower the water in the middle of the stream, the flatter the bottom.

Stream Cross Section Examples

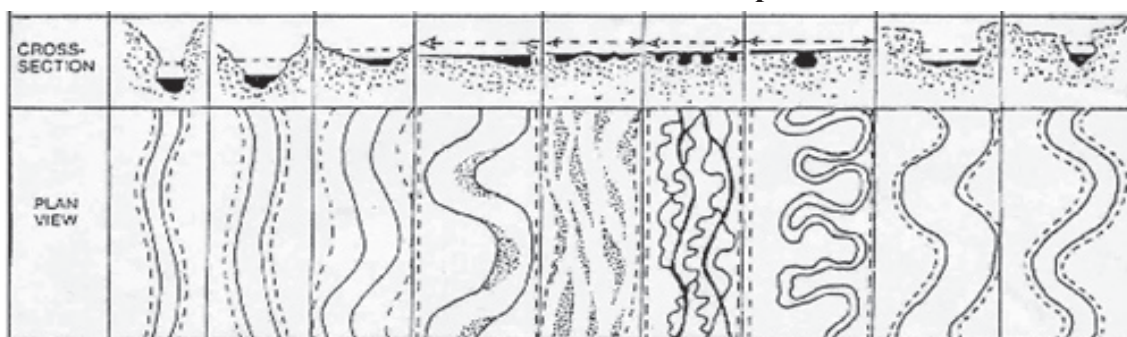


Image courtesy of USEPA



Stream Bottom—**substrate** (Item 5 on Data Sheet)

Indicate the most common type of material on the stream bottom.



Silt/Clay/Mud: This **substrate** has a sticky, cohesive feeling. The particles are fine. The spaces between the particles hold a lot of water, making the sediments behave like ooze.

Photo courtesy of Friends of the Rouge Watershed



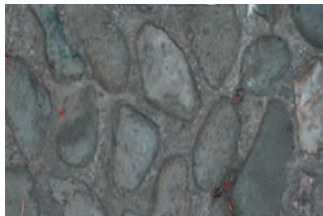
Sand (up to 1 inch): Sand is made up of tiny particles of rock. It feels soft underfoot.

Photo by Matthew Boone



Gravel (0.1–2 inches): A gravel stream bottom is made up of stones ranging from tiny quarter inch pebbles to rocks of about 2 inches.

Photo courtesy of USGS



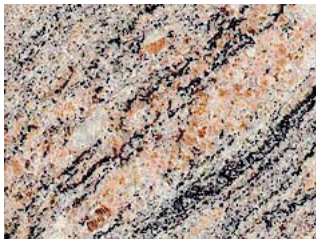
Cobbles (2–10 inches): Most rocks on this type of stream bottom are between 2 and 10 inches. The average size is about that of a grapefruit.

Photo courtesy of USGS



Boulders (greater than 10 inches): Most of the rocks on the bottom are large, greater than 10 inches.

Photo courtesy of FWS



Bedrock: This kind of stream bottom is solid rock.

Photo courtesy of USGS



Width of Natural Streamside Corridor (Item 6 on Data Sheet)

Streamside corridor, **riparian area** and *zone of influence* are terms that describe the natural vegetated area on either side of the stream. Along with the stream, this area forms the **habitat** of the river. It includes vegetation that shades the water, holds the soil in place, adds nutrients to the stream in the form of leaves and during flooding, and provides living quarters for streamside wildlife. Estimate as best you can the width of the corridor at your site, and indicate it with an “x” on the bar graph. Note: Left and right are based on looking downstream. If the vegetation is pasture or landscaping, this is not a natural state, so mark “0.”

Streamside Vegetation (Item 7 on Data Sheet)

Vegetation acts as a filter for **sediment** and pollutants coming in from the land nearby. It provides **habitat** for the many creatures that are dependent on and influence the stream. Branches, logs and leaves enter the stream from this region. Vegetation also provides shade, which keeps the water cool. On the data sheet mark all the categories that apply.

Deciduous tree: A tree that sheds its foliage at the end of the growing season



Photo by Meghan Klasic, ORISE/USEPA

Conifer: A cone-bearing evergreen tree or shrub (e.g., a pine tree)



Photo by Meghan Klasic, ORISE/USEPA

Small trees or Shrubs: Conifers or deciduous bushes less than 20 feet high



Photo courtesy of FWS

Grasses: Any of numerous plants with narrow leaves, jointed stems, and spikes or clusters of inconspicuous flowers



Photo by Meghan Klasic, ORISE/USEPA

Overhead Canopy—stream cover (Item 8 on Data Sheet)

The overhead canopy is the vegetation that overhangs the stream. It offers protection and refuge for fish and other organisms, shades the stream and keeps the water cool, and provides “launching” areas for insects that might fall into the river. Estimate as best you can, about how much of the river is overhung by vegetation and whether the vegetation is grasses, shrubs or trees. Check the category that is appropriate for the current condition of your site. For example, if in the winter there are no leaves on the trees in your segment, you might check 0%–25%. However, in the summer when the trees have leaves, you might check 50%–75%.



Artificial Bank Protection (Item 9 on Data Sheet)

This category includes streamside modifications like **riprap** (a retaining wall built of rocks or concrete) and bulkheads. It might also include deliberately placed auto bodies, refrigerators and washing machines. In the past people thought that such modifications helped stabilize stream banks. Unfortunately, they not only drastically degrade **habitat** for streamside and in-stream dwellers, but they also can cause bank erosion in flood conditions. Mark the categories that best describe the condition of the stream bank within your 100-foot segment.



Photo courtesy of: NOAA

Riprap: a retaining wall built of rocks or concrete

Presence of Logs or Woody Debris in Stream (Item 10 on Data Sheet)

Logs and woody debris (not twigs and leaves) can slow or divert water to provide important fish **habitat** such as pools and hiding places. Mark the general amount of logs and woody debris in the stream. **DO NOT REMOVE THEM.**

Presence of Other Organic Debris in Stream (Item 11 on Data Sheet)

The presence of other organic matter in the stream can be both good and bad. Dumped grass clippings are not good for stream health. On the other hand, naturally falling leaves and twigs can be beneficial.

**Don't put grass clippings
in the stream!**

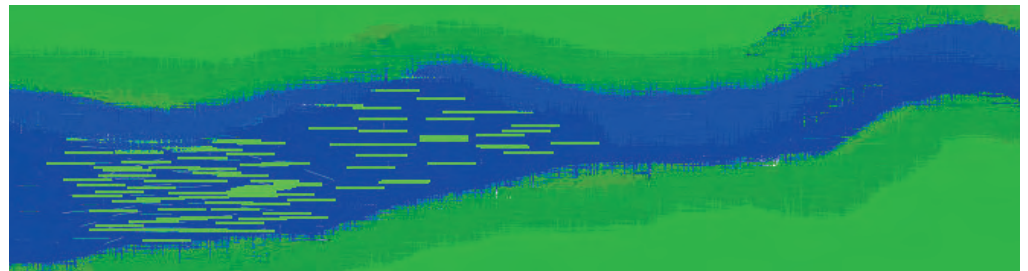


Image by Meghan Klasic, ORISE/USEPA

Fish in Stream (Item 12 on Data Sheet)

Can you see any fish? Mark it down! If you know what kind of fish it is, say so in the space next to the question. If you think there are fish but you can't see them, mark "no."

Adjacent Land Uses (Third Data Sheet in Series)

Adjacent land use has a great impact on the quality and state of the stream and **riparian areas**. Enter a "1" if the specific land use is present or a "2" if it is **clearly** impacting the stream. If you can't determine the type of housing, industry or development, make your best estimate.

Conditions (Third Data Sheet in Series)

This section is designed to get information about potential problems at your streamwalk site. Enter a "1" if the condition is present or a "2" if it is severe.



Stream Banks

Natural plant cover degraded: Indicate if the streamside vegetation is trampled, missing, or replaced by landscaping or cultivation.

Banks collapsed/eroded: Note if the banks or parts of the banks have been washed away or worn down.

Banks artificially modified: Indicate if the banks have been artificially modified by construction or placement of rocks, wood, or cement supports or lining.

Garbage or junk adjacent to stream: Describe any human-made materials that are present.

Stream Channel

Mud/silt/sand on bottom/entering stream: Excessive mud or silt entering the stream and clouding the water can interfere with the ability of fish to sight potential prey. It can also clog fish gills and smother eggs in spawning areas on the stream bottom. Mud/silt/sand can be an indication of poor construction practices in the watershed, where **runoff** coming off a site is not adequately contained. It can also be a perfectly normal occurrence, especially if, for example, a muddy bottom is found along a very slow moving segment or a wetland. Use your best judgment.

Artificial stream modifications: Note if the stream has been dammed, dredged, filled, or channelized through culverts or if other large-scale activities (such as log removal) are apparent.

Foam or sheen: This is a tricky category because this foam and sheen can be naturally occurring or due to a problem. For example, an iridescence or a sheen on the water might be from rotting leaves, or it might be from some upstream pollutant. If you are not sure, write that you are unsure on the checklist.

Garbage or junk in stream: This is your chance to point out straightforward problems like batteries, tires, home appliances, car bodies and garbage.

Other

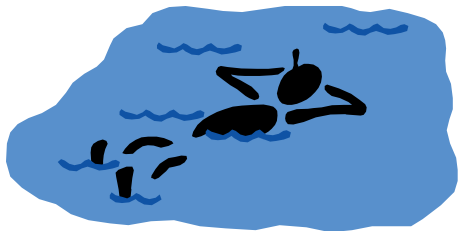
Organic debris or garbage: The purpose is to determine if the stream is being used as a dump site for materials that would not be present naturally. Debris can be anything from a soda can to vegetation brought from outside the **stream corridor**.

Livestock in or with unrestricted access to stream: Are livestock present, or is there an obvious path that livestock use to get to the water from adjacent fields? Is there streamside degradation caused by access? Cattle with unrestricted access to the stream can increase bacteria levels and trample stream banks.

Actively discharging pipes: Are there pipes with visible openings dumping fluids or water into the stream? Note that you might not be able to tell where the pipes come from or what they are discharging. **DO NOT TOUCH THIS EFFLUENT!**

Other pipes: Are there pipes entering the stream? Mark this even if you can't find an opening or see matter being discharged.

Ditches: Are there any ditches draining into the stream?



For Your Information

If you decide to go into the water during your streamwalk and there are rocks present in the **riffle** area, pick a few up, turn them over, and take a look. You might find some little critters, referred to as **macroinvertebrates**. See pages 46 and 47 for more information on these aquatic creatures. While you're on page 47, take a look at the other information on volunteer **monitoring!**



Symptoms of a Sick Stream

Shiny surface or rainbow colors. If you see rainbow color on the water's surface or if you smell oil (a gas station smell), oil might be polluting your stream. Oil can come from a pipeline leak, a storm sewer or illegal dumping. Oil kills fish and can make kids who play in the water sick.

Green water. Too many **algae** can turn the water green. **Algae** are small plants found in the water. Fertilizers from farms and lawns can get into streams and cause too many **algae** to grow. When **algae** break down or decompose, oxygen is used up and fish don't have enough to breathe.

Brown or muddy water. Too much dirt or **sediment** in the water is another symptom. Dirt clogs fish gills so fish can't breathe. Dirt kills stream critters when it settles to the bottom and buries them. Dirt blocks light to underwater plants, and they die, too.

Orange water. Orange water can indicate the presence of iron in the water. Iron can be naturally present where the soils are high in iron. This is not a pollution problem. However, orange water can indicate acidic **runoff** from mining activities or abandoned mines. Acidic water kills fish and other stream life.

Foam or suds. Some foam or suds in the stream is natural. If you see foam in the stream that is more than three inches tall, looks like bubble bath, and doesn't break apart easily, detergent might have entered the stream. Soap can come from homes, factories or car washes. It harms stream critters because it breaks the surface tension of the water, causing insects like water striders to sink and drown.

Strange odors. A chemical smell can mean harmful chemicals are polluting your stream. A rotten egg smell can mean sewage is getting into the stream from cows, sewage treatment plants, or people's homes. Sewage or chemicals in the water can make people and animals sick.

Adapted from the Izaak Walton League Save Our Streams Program



Photo by Jodi Schwarzer, GSUSA



Site Survey Data Sheet (Complete One Sheet per Site)

Location

Stream name: _____ Date: _____

County: _____ State: _____

Troop or Group Name: _____

Contact Name: _____ Phone: _____

Site (name, description or number—page 20): _____

Latitude (pages 34–36): _____ degrees _____ minutes _____ seconds N

Longitude: _____ degrees _____ minutes _____ seconds N

Weather (see instructions on page 20)

Clear Overcast Rain Showers Storm

Stream Description (see instructions on pages 23–28)

- Depth** (pages 20 and 21): _____ feet measured (at site) estimated
Width: _____ feet measured (at site) estimated
- Clarity** (page 21): Does water appear clear cloudy
- Water Flow** (page 21): (circle all that apply) pools riffles runs
- Stream Channel Cross-Section Shape at site** (page 21)



Site Survey Data Sheet (Complete One Sheet per Site)

5. Stream Bottom (page 22): (check the most common)

Clay/Mud Cobbles (2–10in.) Sand (up to 0.1in.)
 Boulders (over 10in.) Gravel (0.1–2in.) Bedrock (solid)

6. Width of Natural Streamside Corridor (page 23): average

Left looking downstream: _____ meters Right looking downstream: _____ meters

7. Streamside Vegetation (page 23):

	None/Sparse	Occasional	Common
Conifers	_____	_____	_____
Deciduous trees	_____	_____	_____
Small trees and shrubs	_____	_____	_____
Grasses	_____	_____	_____
Vegetation appears	natural	cultivated	mixed (with weeds)

8. Extent of Overhead Canopy (page 23):

0%–25% 25%–50% 50%–70% 75%–100%

9. Extent of Artificial Bank Protection (page 24):

0%–25% 25%–50% 50%–70% 75%–100%

10. Presence of Logs or Large Woody Debris in Stream (page 24):

None Occasional Common

11. Presence of Other Organic Debris in Stream (page 24):

Occasional Common

12. Any Fish Present (page 24)?

Yes No



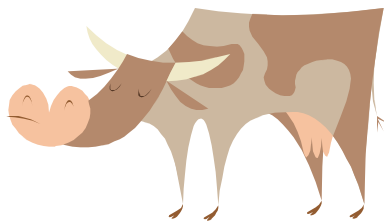
Site Survey Data Sheet (Complete One Sheet per Site)

Adjacent Land Uses

(see instructions on page 24)

Check "1" if present, "2" if clearly impacting stream:

1	2	
___	___	Residential/Industrial
___	___	Single family housing
___	___	Multi-family housing
___	___	Commercial development
___	___	Light industry
___	___	Heavy industry
___	___	Road/bridge construction
		Roads, etc.
___	___	Paved roads or bridges
___	___	Unpaved roads
		Construction Underway on:
___	___	Single family housing
___	___	Multi-family housing
___	___	Commercial development
___	___	Light industry
___	___	Heavy industry
		Agricultural
___	___	Grazing land
___	___	Feedlots or animal holding areas
___	___	Cropland
		Other
___	___	Mining or gravel pits
___	___	Logging
___	___	Recreation



Conditions

(see instructions on pages 24 and 25)

Check "1" if present, "2" if impact seems severe:

1	2	
___	___	Stream Banks
___	___	Natural streamside cover degraded
___	___	Banks collapsed/eroded
___	___	Banks artificially modified
___	___	Garbage adjacent to stream
		Stream Channel
___	___	Mud, silt, or sand in or entering stream
___	___	Artificial stream modifications (e.g., dams)
___	___	Algae or scum floating or coating rocks
___	___	Foam or sheen
___	___	Garbage/junk in stream
		Other
___	___	Organic debris (grass clippings, etc.)
___	___	Livestock in or with unrestricted access to stream
___	___	Actively discharging pipe(s)
___	___	Other pipe(s) entering
___	___	Ditches entering

Other Comments?



Streamwalk Tips

Consider the following precautionary tips:

- Get the permission of landowners to cross private land, posted or not. **DO NOT ENTER AREAS WITHOUT PERMISSION.** It is recommended that you use public access points (such as city/county/state parks/campgrounds).
- Record only what you see, not what you have previously seen. For example, if you think fish are present but you can't see them, mark "No" for "Any fish present?"
- Always work with someone.
- Don't put yourself in danger to gather survey information.
- Be careful of ticks, poison oak, nettles and insects. Bring repellent. Wear long pants and boots. Wind breakers help to fend off nettles.
- Watch out for dogs.
- Don't drink the water. It is unsafe.
- Don't walk on unstable banks. This could be dangerous, and your footsteps could speed erosion.
- Be alert for spawning areas (**redds**) in the stream. Don't walk on them. They will look like a round or elliptical area of clean gravel about 1–3 feet long. During fall through spring, when redds are evident, try not to walk in the stream. In the summer, if you are careful, the streambed might be the easiest route for conducting your streamwalk. Be aware that the streambed can be very slippery, uneven, and unpredictable.
- Never attempt to walk across streams that are swift and above the knee in depth. You can be swept away in an instant!
- Be careful of streamside vegetation. Disturb it as little as possible.
- If for any reason you feel uncomfortable about the stream conditions or surroundings, stop your streamwalk. You and your girls' safety are much more valuable than the streamwalk.



Recommended list of items to take along:

- Photocopies of topo map of stream to be walked
- Snag- and thorn-proof clothing
- Streamwalk data forms
- Folding ruler or tape measure
- Leather gloves
- First aid kit
- Comfortable rubber boots
- Clipboard with waterproof cover
- Two pencils
- Camera and film in waterproof bag
- Whistle
- Cell phone

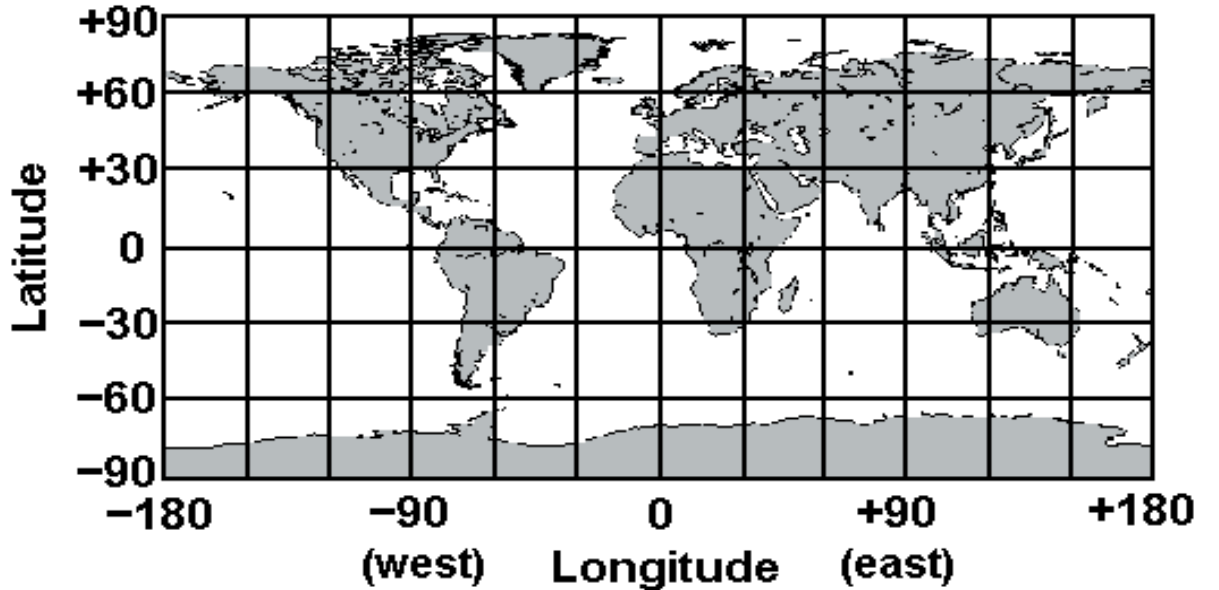
If you are away from urban or residential areas, the following are also recommended for safety:

- Extra clothes in a waterproof bag
- Flashlight and extra batteries
- Aluminum-foil blanket (for winter excursions)
- Fire starter (candle, cheap lighter, tinder)
- Global Positioning System, compass



Instructions for Defining Latitude and Longitude

Every location on earth can be defined using two coordinates, latitude and longitude. These coordinates are on the surface of the earth and together they create an imaginary grid used to pinpoint locations. Latitudes are lines or *parallels* that run east and west around the globe. They indicate how far north or south the location is from the equator. Lines of longitude, which appear vertical and run between the North Pole and South Pole, are called *meridians*. They indicate how far east or west a location is from Greenwich, England.



Another important term to know is the *equatorial plane*. The equatorial plane is pretty easy to visualize. Imagine slicing the earth directly in half, along the equator. The equatorial plane is that slice of earth that divides the globe and is perpendicular to the earth's axis. If you split the earth in two along the equatorial plane, you divide the world into two hemispheres—the northern and the southern.

Latitude

Lines of latitude are the angles created by a perpendicular line from the surface of the earth to the above-described equatorial plane. If you divide the earth into latitudes, lines of equal latitude are parallel to each other and are often referred to as parallels. Again, they run east to west and indicate how far north or south of the location is from the equator. Negative latitudes represent south, whereas positive latitudes represent north.

Longitude

One of the best ways to visualize longitude is to use an orange. Take your orange and draw lines on the outside peel as if you were going to cut the orange into wedges, making sure to go from top to bottom. Take a look at the orange. Each of the lines that you have drawn is a line of longitude or a meridian. The 0 degree meridian is referred to as the prime meridian. Lines of longitude run north to south and are measured west or east of the prime meridian (in Greenwich, England).



Putting Longitude and Latitude Together

If you know a latitude and longitude, you can pinpoint a location anywhere on earth:

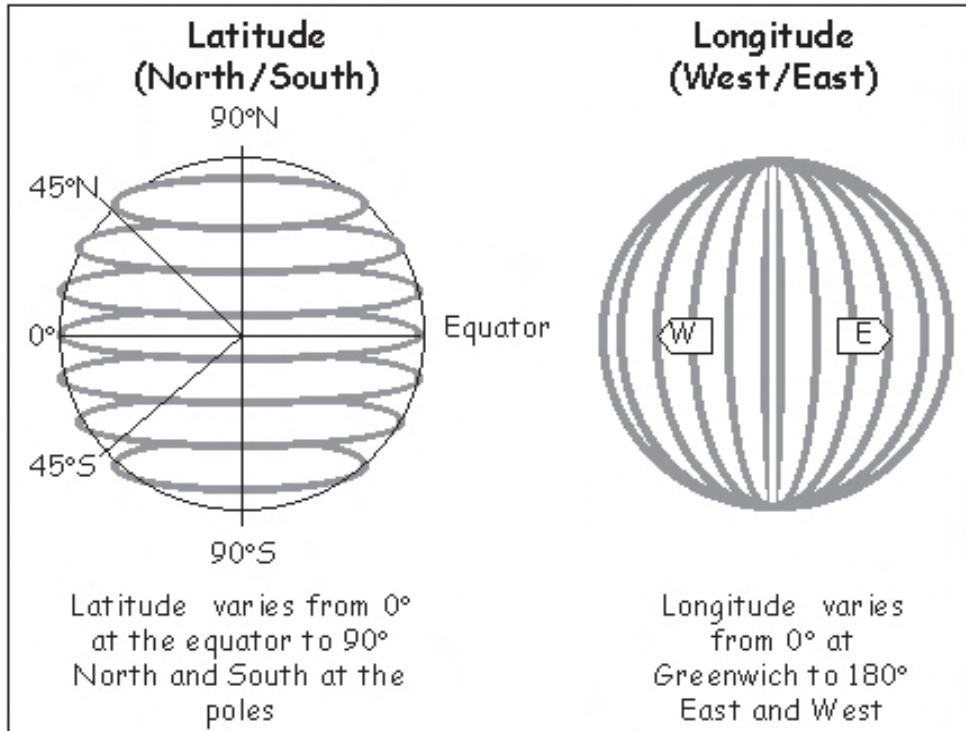


Image courtesy of fedstats.gov

Latitude and longitude are defined in degrees, minutes and seconds. There are 60 seconds in a minute and 60 minutes in a degree. The symbols are as follows:

° = degrees ' = minutes '' = seconds

Because lines of latitude are measured from the equator, all locations on the equator are at 0° 0' 0" latitude. Because lines of longitude are measured from a location in Greenwich, England (the Prime Meridian), all locations directly north and south of Greenwich, England, are at 0° 0' 0" longitude.

Finding the Latitude and Longitude of Your Location

Both latitude and longitude can be calculated using topographic maps; however, thanks to technology and the World Wide Web, looking up the longitude and latitude for a particular location is as easy as typing in your ZIP Code or town/city and state. It is important to remember that positive numbers represent the north and east directions, while negative numbers represent the south and west directions. The following links will be of great help.

1. ZipInfo.com: zipinfo.com/search/zipcode.htm

By simply entering your ZIP Code or city and state, you can get the latitude and longitude of your location. To better understand the location, however, you must convert the decimals into degrees, minutes, and seconds (see above explanations of these terms). Simply multiply the decimal portion by 60 to get the minutes and then multiply the resulting decimal portion by 60 again to get the seconds. For example, 38.8565 for latitude means:



- A. 38 degrees
- B. Multiply 0.8565 by 60 = 51.39 minutes
- C. Multiply 0.39 by 60 = 23 seconds
- D. Latitude = **38° 51' 23"N** (because it is positive, it is north)

2. Lat-Long.com: lat-long.com

By entering your location name, state and county (leave the feature blank), you can find latitude and longitude in both degrees/minutes/seconds and decimal degrees.

3. CalculatorCat.com: calculatorcat.com/latitude_longitude.phtml

This site provides a converter. If you have degrees/minutes/seconds that you would like to convert to decimal degrees, you can do so. If you have decimal degrees that you wish to convert to degrees/minutes/seconds, you can do so. This site also provides helpful instructions and additional latitude/longitude sites.

4. SteveMorse.org: stevemorse.org/jcal/latlon.php

This site allows you to enter the full address of your location. It then provides a number of sources' results for latitude and longitude in both decimal degrees and degrees/minutes/seconds. You can also enter latitude and longitude information to find an address.

5. Robogeo.com (Powered by Google): robogeo.com/latlonfinder/map.asp

This site is setup much like Google Maps or Google Earth. It allows you to use the tools on the left side of the page to zoom into a particular location anywhere in the world. You can also use the tools on the right side (after you have zoomed in enough) to switch the map to hybrid. When on hybrid, the map shows you all map attributes from streets and buildings to trees and streams. This allows you to focus in on the exact location of your site. Finally, if you double-click on one spot on the map, the yellow box in the upper left corner displays the latitude and longitude in decimal degrees. Again, if you would like to convert decimal degrees to degrees/minutes/seconds, see either resource 1 or resource 3.



Build Your Own Aquifer

This activity goes along with Patch Requirement 14 (Girl Scout Cadettes–Ambassadors)

By completing this activity, Girl Scouts will achieve the following objectives:

- Discover.** Girl Scouts seek challenges in the world. By understanding that what happens above the ground can potentially end up in the drinking water, girls will expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. By discovering where their drinking water comes from and by creating a model to see how that drinking water is potentially affected by pollution, girls will begin to understand how important it is for communities to prevent pollution from entering our drinking water supplies.
- Take Action.** Girls will be able to use what they learn about drinking water to take action, inspire others to take action, and make others in their community aware of this connection. As described in requirement 14, girls can create a display or make a presentation to show their community what they learned. They can help ensure that their community's drinking water is healthy and clean.

Background

Many communities obtain their drinking water from underground sources called **aquifers**. Water suppliers or utility officials drill wells through soil and rock into **aquifers** to obtain **ground water** for drinking water purposes. Homeowners who cannot obtain their drinking water from a public water supply have private wells drilled on their property. Unfortunately, **ground water** can become contaminated by harmful chemicals, including household and lawn care products, paints, bleach, cleaners, fertilizers, pesticides, and oil. These chemicals can percolate down through the soil and rock, into the **aquifer**, and eventually into wells. Such contamination can pose a significant threat to human health. The measures that well owners and operators must take to clean up contaminated **aquifers** are quite costly. See page 4 for more on **ground water**.

Purpose

This activity illustrates how water is stored in an **aquifer**, how **ground water** can become contaminated, and how this contamination ends up in the drinking water well. Ultimately, girls should get a clear understanding that what happens above the ground can potentially end up in the ground water or drinking water.

Materials

- 1 clear plastic container that is the size of a shoe box or small aquarium
- 2 lb. aquarium gravel, rinsed and dried
- 1/4 cup powdered cocoa
- scotch tape
- 1 lb. modeling clay
- 1 drinking water straw
- 1 3in. by 5in. piece green felt
- 1 bucket of clean water
- 2 lb. white sand
- 1 spray bottle
- red food coloring
- small cup to dip in bucket



Hi! I'm Thirstin. Visit epa.gov/safewater/kids for more activities and information on drinking water.

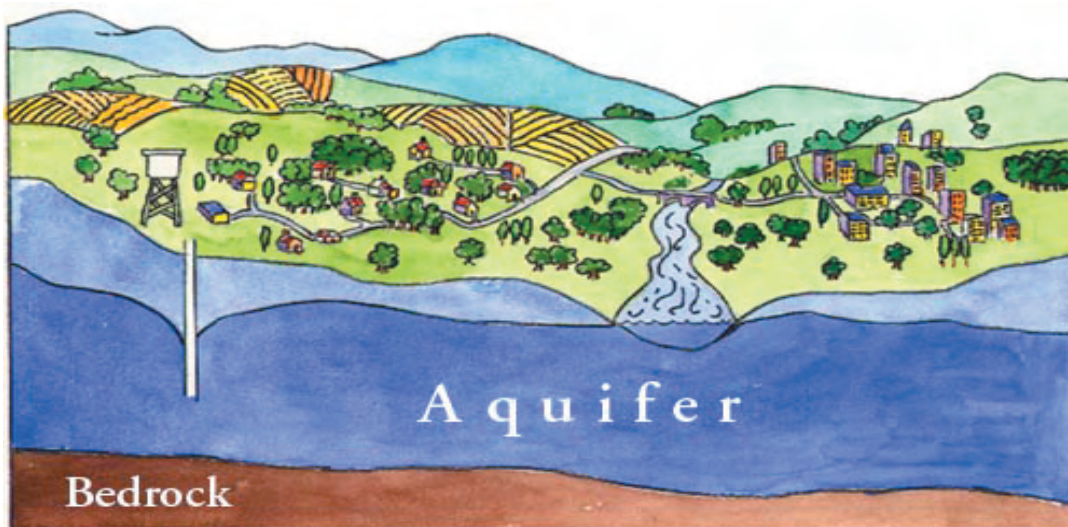


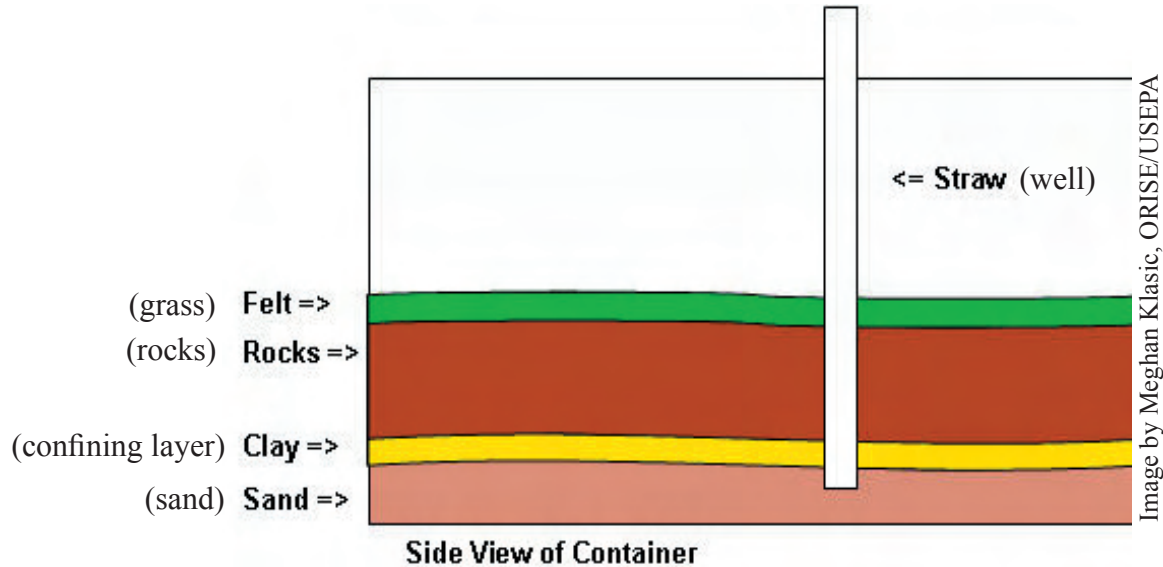
Photo courtesy of USEPA

Procedure

1. **To one side of the container place the small drinking water straw, allowing approximately 1/8 inch clearance with the bottom of the container.** Fasten the straw directly against the long side of the container. This will represent two separate well functions later in the presentation (if not placed at this time, sand will clog the opening).
2. **Pour a layer of white sand completely covering the bottom of the clear plastic container, making it approximately 1 inch deep.** Pour water into the sand, wetting it completely, but there should be no standing water on top of sand. Let the girls see how the water is absorbed in the sand but remains around the sand particles as it is stored in the ground and ultimately in the **aquifer**.
3. **Flatten the modeling clay (like a pancake) and cover half of the sand with the clay (try to press the clay into the three sides of the container in the area covered).** The clay represents a “confining layer” that keeps water from passing through it. Pour a small amount of water onto the clay. Let the girls see how the water remains on top of the clay, flowing into the sand below only in areas not covered by the clay.
4. **Use the aquarium rocks to form the next layer of earth.** Place the rocks over the sand and clay, covering the entire container. To one side of your container, slope the rocks, forming a high hill and a valley. Now pour water into your **aquifer** until the water in the valley is even with your hill. Let the Girl Scouts see the water around the rocks that is stored within the **aquifer**. They will also notice that a “surface” supply of water (a small lake) has formed. This will give them a view of both the ground and surface water supplies that can be used for drinking water purposes.
5. **Place the small piece of green felt on top of the hill.** If possible, use a little clay to securely fasten it to the sides of the container it reaches.
6. **Sprinkle some of the cocoa on top of the hill.** Explain that this represents improper use of lawn chemicals or fertilizers.



7. **Put a few drops of food coloring into the straw.** Explain to the girls that often old wells are used to dispose of farm chemicals, trash and used motor oil. They will see that it will color the sand in the bottom of the container. This is one way pollution can spread throughout the **aquifer** over time.
8. **Fill the spray bottle with water.** Make it “rain” on top of the hill and over the cocoa. The Girl Scouts will quickly see the cocoa (fertilizer/pesticide) seep down through the felt and also wash into the surface water supply.



Other Ideas and Activities

EPA’s Ground Water and Drinking Water Kids’ Stuff

This Web site contains projects and activities (including the Build Your Own **Aquifer** project) for girls at different grade levels. In addition, it provides activities and detailed background information on various **ground water**/drinking water topics that are directed to teachers. Again, they are organized by grade level. Visit epa.gov/safewater/kids.

The Groundwater Foundation

The **Groundwater** Foundation is a nonprofit education foundation dedicated to educating the public about the conservation and management of **ground water**. Check out the Kid’s Corner for a great edible aquifer project! Contact the **Groundwater** Foundation, PO Box 22558, Lincoln, NE 68542-2558. (402) 434-2740. Fax (402) 434-2742. Visit groundwater.org.

The National Ground Water Association’s Educator Resources

This Web page and its associated pages (in the blue sidebar to the left) provide lesson plans and materials for educators teaching grade levels K–12. Any of the resources can be easily modified for use with Girl Scouts. Visit ngwa.org/PROGRAMS/educator/index.aspx.



Create a Backyard Wildlife Habitat

This activity goes along with Patch Requirement 16 (Girl Scout Cadettes–Ambassadors)

By completing this activity, Girl Scouts will achieve the following objectives:

- Discover.** Girl Scouts seek challenges in the world. They will learn about native plants, shrubs and trees; how to attract common types of wildlife and how the right combination of food, water and shelter makes up a healthy **habitat**. Girls seek opportunities to expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. By researching types of vegetation and wildlife that are native to their area, girls will have a better understanding of how they are connected to their local environment.
- Take Action.** Girls will be able to use what they learn to create effective backyard wildlife habitats that not only will be environmentally friendly but also will be a source of pride and enjoyment for their families and community.

Habitat is a combination of food, water, shelter and space arranged to meet the needs of wildlife. A small yard can be landscaped to attract birds, butterflies, beneficial insects and small animals. Even window boxes can be altered to attract certain types of wildlife, such as butterflies. For example, trees, shrubs and other plants provide shelter and food for wildlife. The plants you use for food and **cover** will help determine the wildlife species attracted to your back yard. Nesting boxes, feeders and watering sites can be added to improve the **habitat**.

In this activity, you will first get information on the key steps to planning and creating your wildlife **habitat**. Because different climates, soils and terrains affect the types of vegetation and ultimately the type of wildlife that can be found, links are provided so you can tailor this project to your own region.

Planning Your Wildlife Habitat

Planning is necessary for an attractive and productive wildlife **habitat**. You have both a horizontal area to work with—the size of your lot—as well as a vertical area that stretches from your soil to the top of your vegetation. The vertical area is composed of the canopy, formed by the tallest vegetation; the understory, the vegetation consisting of smaller trees, shrubs and vines; the floor, which is often dominated by ground cover; and the basement, where a variety of organisms exist in the soil. Different wildlife species live in each of these zones, so numerous habitats can be provided on a small piece of land.

Proper selection of plant material can meet both the aesthetic needs of the homeowner and the food and shelter needs of wildlife. Remember that you are part of the **habitat**!

See page 40 on how to get your **habitat** certified by the National Wildlife Federation.



Steps to Create **Habitat** for Wildlife

1. Identify all existing plants, if any. It is important to first do a little research into what is already in your back yard. If you have a digital camera, use it! Take pictures of the different types of vegetation that you have growing. If you don't have a digital camera, collect a sample (e.g., needle, leaf, small branch) of the tree, shrub or plant. By using sites online, talking to a local nursery, getting books out of the library, or purchasing plant identification books, identify the different types of vegetation. Make a note of them along with other pertinent information, such as what types of wildlife they attract (if any), whether or not they provide food, and whether they grow year-round, once a year, or twice a year. Note the condition of the plants and their locations.

2. Make a sketch of your yard noting all existing plants, buildings, utilities and pathways. Some species might be of little wildlife value and might not be particularly attractive. Once you have identified existing vegetation types that you want to save, start exploring options for types of vegetation that will work well with your backyard **habitat**. The existing plants around your yard might be adequate to attract some wildlife, but a few changes can effectively enhance the existing **habitat**. Diversity in the landscape is necessary. Some plants provide food but very little **cover**; others provide **cover** but little food. Refer to the notes you took in step 1 to see what and how much vegetation is present. Since you have already identified the types, you can also take the list to a local nursery for further help.

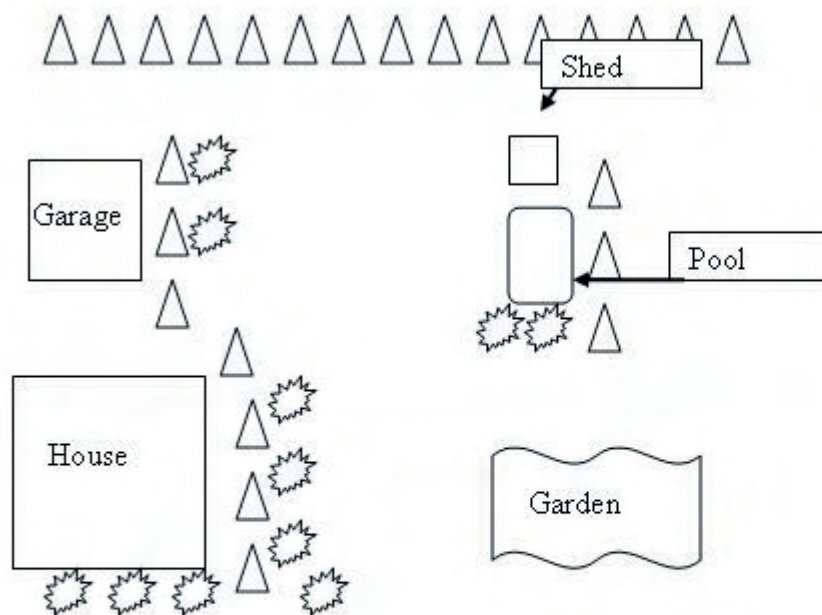


Image by Meghan Klasic, ORISE/USEPA

3. Look at the big picture. At this point it is important to take a step back and identify or determine the ultimate goal(s) for your backyard **habitat**. Are you trying to attract more birds? Would you like to create a butterfly-rich **habitat**? Perhaps you're interested in an aquatic environment. Maybe you want to re-create a reptile-friendly environment? Write down what you would like to achieve, and post it somewhere visible so that you can reference it to see your progress.



4. Determine how will you meet your goals. Before you begin planting vegetation you must determine what types of vegetation, and landscaping will help you reach your ultimate goal(s). This step involves more research. Again, use online resources, talk with your local nursery, take books out of the library, and/or purchase guides or other resources on plants that grow in your specific area. Take notes on each type of vegetation that you would like to plant, making sure that you note the following: does it bear fruits or nuts, or is it another source of food? Does it provide shelter and, if so, for what type of wildlife? what is its growth pattern (e.g., how long will it take to grow, how large will it get, is it a seasonal variety? How much shade does it/will it provide? What are its water and light needs? Once you have determined the types of vegetation you would like to plant, call local nurseries to make sure that all types are available. Remember that seasonal or monetary restrictions might prevent you from purchasing everything at once, so be sure to prioritize. Girls should be sure to check with their parents or the property owners as they make their plans. Also, make sure the plants and products you use are safe for animals and kids if they will have access to it (such as avoiding poisonous plants and cocoa products).

5. Develop a plan of action for your ideal environment. You've identified the types of vegetation currently in your yard, you've determined your final goal(s), and you've prioritized your list of vegetation. It's time to pull out that sketch that you made earlier in the process. Take a look at where things are on your property and select an ideal location to begin. Based on the types of vegetation you decided to use, perhaps you need an area that has more direct sunlight or one that is more shaded. Refer to your notes to help you with this planning. Now take the time to sketch out exactly where you would like to put each patch of vegetation (including how many of each type of plant). Be sure to note how much space will be left for growth (based on your notes from previous steps). Visit www.epa.gov/ointrnt/stormwater/ars_plantplan.htm for an example.

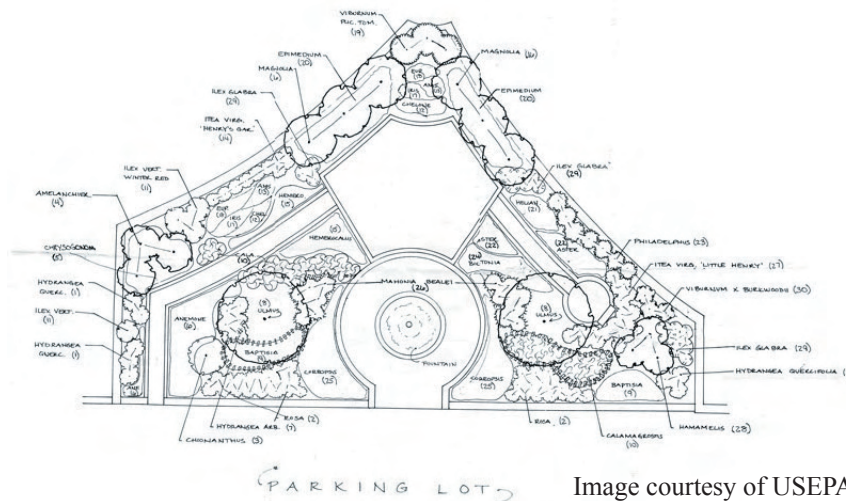


Image courtesy of USEPA

6. Take the step from potential to reality. It's time to get down to business! You've put a lot of time and planning into this effort, so it's time to see what you are made of! Be sure to gather the necessary gardening and planting tools before you start. Also, be sure to wear work gloves while you pull, plant or adjust things in your backyard **habitat**. Once you have everything planted, it's time to wait and watch. Changes in wildlife might not happen overnight. Have patience and remember that if you have pets, such as dogs and cats, they may prevent wildlife from coming around as often! Congratulations! Great work!

7. Maintenance is the key to success. Once you have everything in place, be sure to maintain your wildlife **habitat**. Keep it clean. As the seasons change, be sure to check your plant list and keep the appropriate plants growing. Maybe you'll want to plan another **habitat** with a different goal. The possibilities are endless!



Web Sites that Will Assist You on Your Journey

1. **USDA Natural Resources Conservation Service's *Backyard Conservation*** is a 28 page guidebook to help people in rural, suburban and city settings put their hands in backyard conservation.
www.nrcs.usda.gov/Feature/backyard
2. **National Wildlife Federation's Certified Wildlife **Habitat** Program** is a program designed to help people plan and apply a wildlife **habitat** plan for a home site or small acreage. On request, NWF will send you an application package and instructions. If your application and plan meet the criteria, you will receive a certificate and, if you wish, a sign to show your commitment to wildlife conservation.
www.nwf.org/backyard/food.cfm
3. **Virginia Cooperative Extension's Backyard Wildlife Habitats** is a Web page that provides a quick overview of creating, planning, executing and managing backyard habitats.
www.ext.vt.edu/pubs/wildlife/426-070/426-070.html
4. **The University of Texas at Austin's Lady Bird Johnson Wildflower Center** is an online resource center that lets you choose your own state on a clickable map. You are then provided with information on common plants for your area. Once you get to your state's search results, you can refine your search by location, growing conditions and other factors.
www.wildflower.org/collections
5. **eNature's Native Gardening and Invasive Plants Guide** is an online searchable database that allows you to search your state for particular types of vegetation.
www.enature.com/native_invasive



Photo courtesy of GSUSA



Stream or Beach Cleanup Safety List

This safety list goes along with Patch Requirement 17 (Girl Scout Seniors–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girl Scouts seek challenges in the world. Through this activity, they will discover how actions like littering may not seem to be a big deal (“It’s just one person and one piece of trash.”) when in fact they can add up to have large environmental impacts. As girls find trash along their stream or beach, they will increase their knowledge and comprehension of how the small things they do can be part of the problem—or part of the solution.
- Connect.** Girls will connect with the community where they are doing the stream or beach cleanup. They will help by inspiring others in their community to get involved, building partnerships and increasing awareness.
- Take Action.** By conducting a stream and/or beach cleanup, girls will make a difference and creatively implement a solution to a very large problem. Whenever trash is not thrown away properly, it can get washed into the ocean where it becomes marine debris. Marine debris, including plastic bags, ropes, soda rings, fishing lines and other items, can harm or kill marine life like dolphins, whales, seals, sea turtles, and birds. Trash in and around water also makes our waters and beaches ugly, deters tourism, and costs money to cleanup. Some marine debris harm people, too.

Before the Cleanup...

- Check with your local department of health or state environmental office and Girl Scout Council about potential health concerns with the waterbody (e.g., *Pfiesteria*, poor water quality, currents, mosquitoes, rats).
- Ask for necessary permission to clean up at your site. Make arrangements with the appropriate local officials to let them know the location, days and times of your cleanup so they can come and haul away the trash. They might be willing to give a talk about the history, wildlife or environmental conditions.
- Develop a safety plan. Find out the location and telephone number of the nearest phone. Locate the nearest medical center and write down directions. Carry a first aid kit and cell phone.
- Have each member of the cleanup team complete a permission slip and a medical form that includes emergency contacts, insurance information, and health information such as allergies and diabetes.
- Listen to weather reports. Never conduct a cleanup if severe weather is predicted or a storm occurs.



At the Cleanup Site...

- Leave syringes and needles! Notify someone in charge and mark the spot with a flag or a large rock so someone can find it later.
- Don't walk on unstable stream banks. This could be dangerous as well as cause erosion. Stay off dunes and avoid nesting areas.
- If you must walk across the stream, use a walking stick because the stream bottom could be slippery or treacherous and could even contain deep pools. Do not attempt to walk across streams that are swift and above the knee in depth. They can kill.
- Look out for plants like poison ivy, poison oak, and sumac. They can cause rashes and skin irritation.
- Watch for wildlife—snakes, ticks, hornets and wasps. Also beware of large animals, including dogs.
- Wear rubber gloves (like dishwashing gloves) to protect your hands and arms. Be careful of glass, nails and other sharp objects.
- Always stay with a buddy. Teams of three or four are even better.
- If you see anything abnormal (e.g., dead fish, oil spills), contact your city or county environmental department right away and report the nature and location of the problem.

Suggested Items to Bring or Wear

- Shoes or boots that offer coverage and support, at least over the ankle
- Heavy rubber gloves (like dishwashing gloves) to protect hands and arms
- Safety vests (brightly colored)
- Large plastic bags
- Digital camera (for media coverage)
- Heavy sacks for sharp objects
- Sunscreen
- First aid kit including medications (e.g., for bee allergies, diabetes, if needed)
- Insect repellent
- Cell phone(s)

Volunteer coastal cleanups and public education efforts can help reduce the amount of debris in our waterways and coastlines. Recycling and proper disposal can significantly reduce the amounts of **marine debris** reaching oceans and coastal waters. A great deal more can be done. You can be part of the solution! For more information, visit:

www.epa.gov/owow/oceans/debris.



Rain Gardens— A Solution to Stormwater Pollution

This activity goes along with Patch Requirement 19 (Girl Scout Seniors–Ambassadors)

By completing this activity, Girl Scouts will achieve the following outcomes:

- Discover.** Girls Scouts seek challenges in the world. Girls will learn about the concept of Low Impact Development and how to deal with stormwater pollution in a creative and fun way. Girls will seek opportunities to expand their knowledge and skills.
- Connect.** By researching, learning and planning where, how and why to build a rain garden, girls will feel more connected to their communities, locally and globally.
- Take Action.** Girls will creatively plan and build a rain garden. By doing so, they will take a step toward creating a better environment for their communities. They will help address the problem of stormwater pollution. They will become a part of the solution.

Under natural conditions, most rain and snowmelt soaks into the ground, filtering slowly through the soil on its way to lakes and rivers. In developed areas, this natural cleansing process is blocked by roofs, pavement and compacted soil. During rain storms, large volumes of water enter storm drains or drain directly from the land. Pollutants (e.g., **sediment**, motor oil, metals and bacteria) are carried untreated into rivers, reservoirs, streams, and other waterbodies. Increased volumes of stormwater also cause erosion of stream banks and destruction of wildlife **habitat**. These impacts pollute rivers, streams, **aquifers**, estuaries and **wetlands**.

It would be helpful to complete patch requirement 15 before you complete this activity because the *After the Storm* DVD or VHS offers a quick look at stormwater pollution (it is also available online—see resources section). It explains what stormwater is and what contributes to the problem in a format that is easy to understand.

Another helpful activity to increase understanding of stormwater pollution is the EnviroScape model. The model is an imitation of a small watershed, complete with agriculture, industry, and suburban land uses. The model shows various types of everyday pollution (e.g., fertilizers, pesticides, animal waste, industrial discharge, automobile leakage). Once all of these different types of pollution are described and placed onto the watershed model, the audience is asked what will happen when a storm comes. Spray bottles are then used to simulate rainstorms. All the pollution that was added to the watershed washes into the stream and ends up in the final holding tank (bay, lake or ocean). Because these models tend to be very expensive, do some research online to see whether there is an organization, business or environmental group that has already purchased an EnviroScape model that you can use.



Photo courtesy of USEPA

Note: If you do create or purchase such a model, consider making it available for checkout through your Girl Scout Council.



Low Impact Development

Low Impact Development (LID) is a way to manage stormwater using natural processes to treat and retain water on a site. Soil and plants are used to promote infiltration, evapotranspiration and treatment of stormwater.

Typical LID practices include:

- Rain gardens
- Cisterns
- Pervious pavement
- Tree plantings
- Green roofs
- Porous concrete
- Grassed channels

EPA is using these and other LID practices throughout its regional offices and headquarters complex in Washington, D.C. Visit www.epa.gov/owow/nps to learn more about this effort.

Constructing Your Own Rain Garden

A simple, yet effective method to control stormwater is through the use of rain gardens. Rain gardens are small vegetated depressions that collect, store and infiltrate stormwater **runoff**. They contain various soil types from clays to sands, and their size varies depending on the area drained and available space. In addition, the soils are both water- and drought-tolerant. Rain gardens are designed to act as sponges that filter stormwater **runoff** and retain as much stormwater as possible on the land, rather than letting it **run** into storm drains. They help to increase infiltration and keep pollutants out of our streams and rivers.

Beyond their use for stormwater control, rain gardens provide aesthetically pleasing landscaping and natural **habitat** for birds and butterflies. Rain gardens promote sustainable design practices while encouraging environmental stewardship and community pride.

The Low Impact Development Center's Web site (www.lowimpactdevelopment.org), funded in part by EPA, includes step-by-step instructions for teachers and other educators on how to construct a rain garden under the Sustainable Schools Project. Visit www.lowimpactdevelopment.org/school/teacher1.html.

The Web site includes 12 key steps, along with a budget spreadsheet, that can be downloaded for free. Please note that we have added one additional but crucial step to the process—Maintenance!

- Step 1- Let's Begin
- Step 2 - Goals/Objectives and Budget
- Step 3 - Gather Information
- Step 4 - Location and Size
- Step 5 - Designing
- Step 6 - Selecting Plants
- Step 7 - Design Review and Obtaining Permission
- Step 8 - Preliminary Plans for Construction Day
- Step 9 - Construction
- Step 10 - Advertise
- Step 11 - Develop Timeline
- Step 12 - Construction Day
- Step 13 - Maintenance**

(Make sure that you have a long-term plan with the property owner to maintain your rain garden.)



Photo courtesy of Robert Goo, USEPA



Guidance on Constructing Rain Gardens on School Properties

The Low Impact Development Web site, www.lowimpactdevelopmentcenter.org/school/bioret/br13.html, explains how to construct a rain garden on a school property. However, Girl Scout Councils and leaders can potentially apply the same process for other sites, including Girl Scout camps, properties, and meeting locations, and possibly even state and federal resource lands and properties. In fact, the project might be ideal for a *Linking Girls to the Land* (LGTTL) partnership activity with a federal or state resource agency. To learn more about LGTTL, visit GSUSA's Web site, www.girlscouts.org or epa.gov/linkinggirls. Local Cooperative Extension Agents and Master Gardeners can also be helpful resources. Visit www.ahs.org/master_gardeners/index.htm or www.csrees.usda.gov/Extension/index.html to locate horticultural experts in your county.



Photo courtesy of American Horticultural Society

It is important to keep in mind that permits might be required, so be sure to obtain all necessary approvals before you begin construction. Site placement is also a very important consideration. For example, it will be critical to determine where underground utilities are buried so that they can be avoided. Long-term care and maintenance of the rain garden should also be discussed with all project partners at the outset.

Other Useful Web Sites

Friends of Sligo Creek (Maryland) Web site:
www.fosc.org/StormwaterHomeowner.htm

Montgomery County, Maryland Web site and brochure:

www.montgomerycountymd.gov/Content/DEP/Rainscapes/garden.htm

www.montgomerycountymd.gov/Content/DEP/Rainscapes/pdf/rain_gardens.pdf

Kansas City 10K raingardens campaign:

www.rainkc.com/GARDENS/INDEX.ASP

www.rainkc.com/home/index.asp

Rain Gardens provide many benefits:

- Serve as a remedy for some stormwater **runoff**
- Provide landscapes in which other Girl Scouts and community members can come and learn
- Provide a sense of ownership and pride because you have done your part to help fight water pollution
- Enhance community awareness by peaking people's interest and provoking questions
- Offer a low-cost project for a school or community that can bring students and faculty together



Reference: Healthy Stream Critters

The information on the following two pages can be used in conjunction with the streamwalk activity (patch requirement 13) on pages 19–33 or with becoming a trained water quality **monitor** (patch requirement 20).

There's a whole world of life in rivers and streams. Living alongside fish, amphibians, reptiles and wildlife are **macroinvertebrates**—creatures that are large (macro) enough to be seen with the naked eye and lack a backbone (**invertebrate**). **Aquatic insects**, clams, snails, crayfish, worms and leeches are all macroinvertebrates. Some, like snails, live their whole lives in the water; others, like dragonflies, leave the water as adults to feed and reproduce. In streams most macroinvertebrates live under or attached to submerged rocks, logs and plants. Like all living things, they need oxygen to breathe, water of the right temperature to thrive and reproduce in, suitable **habitat**, and the right kind of food. When these requirements aren't met, these creatures sicken and die.

Scientists and trained volunteers study macroinvertebrates to learn more about stream quality. The basic principle behind the study of macroinvertebrates is that some are more sensitive to pollution than others. Therefore, if you find lots of macroinvertebrates that can't tolerate pollution, you've found a pretty clean stream. On the other hand, if you find only macroinvertebrates that can live in polluted conditions, your stream might have a problem. Below are a few examples of macroinvertebrates that live in clean streams.



Photo courtesy of USEPA

Stonefly

The stonefly has six legs with strong claws, and its antennae are often long and easily seen. Stoneflies have two hair-like tails and a smooth abdomen, and their eyes are often big and widely separated. Many have strong color patterns. They range from 0.5 inch to 1.5 inches long.



Photo courtesy of USEPA

Caddisfly

Caddisflies have three pairs of segmented legs and two back hooks. Some have fluffy gill tuft on their abdomens and no tails. Their antennae are not visible, and they have rounded bodies and tiny eyes. They grow up to 1.5 inches. They tend to make their homes out of small sticks and mud.





Photo courtesy of USEPA

Mayfly

Mayflies can be brown, tan or mottled in color, and many have plate-like or feathery gills on their abdomens. They have six jointed legs, two long and delicate antennae, and three hair-like tails. The bodies of mayflies are 0.25 inch to 1 inch long.



Photo courtesy of USEPA

Dobsonfly

Dobsonflies are dark brown. They have six legs, large pinching jaws, and eight pairs of feelers on the lower half of their bodies with gill tufts below them. They have short antennae and two pairs of hooks at the end of the abdomen that anchor them to the stream bottom. Dobsonflies can reach up to 4 inches long.



Photo courtesy of USEPA

Riffle Beetle

The riffle beetle has a small oval body covered with tiny hairs. It has one pair of tiny antennae and six legs. It walks very slowly on the bottom and does not swim. **Riffle** beetles are about 0.25 inch long.

Getting Started in Macroinvertebrate and Other Volunteer Monitoring

Monitoring macroinvertebrates requires training in safety considerations, field methods, bug identification, and analysis of results. Girl Scouts interested in macroinvertebrate or other forms of stream **monitoring** should get in touch with a local program that trains volunteers. There are currently over 770 volunteer monitoring programs around the country, plus several that are national in scope. Check out EPA's National Directory of Volunteer Environmental **Monitoring** Programs to find a group near you that may help train you or your troop (visit www.yosemite.epa.gov/water/volmon.nsf/). EPA's Adopt Your Watershed Web page at www.epa.gov/adopt can also link you with groups.



Photo courtesy of USEPA



Meeting the Girl Scouts' Needs: Leadership Outcomes

The purpose of this section is to provide you, the troop or council leader, with a compact, easy-to-understand list of which Girl Scout Leadership Development Program Outcomes are met by completing each of the patch requirements described on pages 5–8. We hope you find this booklet easy to understand and useful when working to meet your Girl Scout outcomes.

Patch Requirement 1. Home and Lawn Care Checklist

Discover. Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. They will do so by learning what simple activities their families can change that cumulatively can add up to make a big difference.

Connect. Girls should feel connected to their communities, locally and globally. By comparing answers with other girls in their troop or group, Girl Scouts will begin to understand how great a problem certain activities can become when a lot of people make the same mistakes.

Take Action. Girls should be able to identify some community needs. The first step in fixing the problem is understanding the problem. After that, Girl Scouts can take action by fixing the problem. By actively doing their part, girls can help their community see and understand how little changes can add up to make a big difference.

Patch Requirement 2. Visit a Wetland or National Wildlife Refuge

Discover. Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. By visiting a wetland and identifying different characteristics of **wetlands**, as well as their role in supporting biological diversity, girls will discover the beauty and importance of **wetlands**.

Connect. Girls should feel connected to their communities, locally and globally. Girls will begin to understand how our environment is closely connected to ourselves and our neighbors. By visiting, discussing and exploring a wetland, girls will understand how all the different parts of our **ecosystem** (humans included) must work together.

Take Action. Once Girl Scouts discover the importance of **wetlands**, as well as how we are connected to **wetlands**, they will be able to take action to protect and possibly restore threatened wetland areas and habitats. By speaking with National Wildlife Refuge staff, girls can find out how to become more involved in wetland stewardship.



Patch Requirement 3. Enter the River of Words Poetry and Art Contest

- Discover.** Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. This contest will give girls a way to discover and learn about their watershed and then explain it through their own unique words or drawings.
- Connect.** Girls should feel connected to their communities, locally and globally. By creating poems or pieces of art that represent their watershed, Girl Scouts will express how they feel they are connected to their community and watershed.
- Take Action.** By becoming involved in this contest, girls will take action to express what they know about their connections with their watershed. They will take action simply by raising awareness.

Patch Requirement 4. Animals and Plants in Your Watershed

- Discover.** Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. This patch requirement will allow girls to explore their own watersheds and discover what types of plants and animals live in them.
- Connect.** Girls should feel connected to their communities, locally and globally. By discovering plants and animals in their watersheds, Girl Scouts will ultimately feel more connected to their community because they have a better understanding of the world around them.
- Take Action.** Girls should be able to identify some community needs. Perhaps Girl Scouts will be very excited about what they discover and will want to share it with others. By taking other troops to experience what they have seen or even by simply telling their families about what they learned and did, Girl Scouts will take action and increase awareness as well as interest.

Patch Requirement 5. Where Does Your Local Stream/Creek Lead?

- Discover.** Girl Scouts develop a strong sense of themselves and their values, and they use their knowledge and skills to explore the world. By exploring their communities and finding out where their local bodies lead and eventually end up, girls will discover how their everyday activities can affect their local stream or creek.
- Connect.** Girls should feel connected to their communities, locally and globally. By understanding that their local waterbody eventually drains to a larger waterbody, girls will see how they and their communities fit into the big picture. They will understand the connections between upstream uses and downstream impacts.



Take Action. Girls should be able to identify some community needs. Once Girl Scouts have discovered the connections between themselves, their community, and what happens downstream, they will feel empowered to think of creative solutions to problems that our waterbodies face, from litter control to illegal dumping to polluted stormwater **runoff**.

Patch Requirement 6. Create a Mural for Your School or Community

Discover. Girl Scouts develop a strong sense of themselves and their values and seek opportunities to expand their knowledge and skills. Girls will have to do a little research to expand their knowledge on a topic of interest that they want to share with their school or community.

Connect. Girls should feel connected to their communities, locally and globally. By creating a wall mural for their school or community, Girl Scouts will connect with their community because they will realize that everyone is responsible for what goes into the streams or onto/into the earth. They will do their part to raise awareness and motivate others to join them.

Take Action. Girls should be able to identify some community needs. There is a good chance their community is unsure what a watershed is. In that case, girls can address this lack of knowledge by creating a wall mural with a simple environmental message such as “What is a watershed?” Or maybe members of the community understand what a watershed is but don’t understand how they are connected. Girl Scouts can identify these community needs and raise awareness.

Patch Requirement 7. Visit an Aquarium or Museum

Discover. Girl Scouts develop a strong sense of themselves and their values and seek opportunities for expanding their knowledge and skills. Aquariums and museums are great places for girls to learn about all the aquatic life and natural processes where they live. A building full of facts and information is a great resource to discovering more about the world.

Connect. Girls should feel connected to their communities, locally and globally. By discussing what they see and learn at the aquarium or museum, Girl Scouts will connect with their families and other girls on environmental issues. By sharing their stories, they will spark excitement and interest, which will lead to increased motivation to become involved in protecting the environment.

Take Action. Girls should be able to identify some community needs. In this case, the taking action part is simply raising awareness. If Girl Scouts go to a museum and learn about a species that is endangered because of **habitat** loss due to increasing development and then they go home and tell their friends and families about it, they will be taking action. They will be doing their part to inspire others to become involved and to make a difference.



Patch Requirement 8. Visit a Local Wastewater Treatment Plant

- Discover.** Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. No matter how much you read in books or hear in lectures, you can't beat the learning experience of seeing and smelling. Girls will discover the intricate process that treats wastewater day in and day out.
- Connect.** Girls should feel connected to their communities, locally and globally. Once Girl Scouts have visited a wastewater treatment plant, they will be able to make the connection between where the wastewater from their house goes to be treated and into which stream or local waterbody it is ultimately discharged.
- Take Action.** Girls should be able to identify some community needs. Once Girl Scouts have made the connection between their community, the wastewater treatment plants, and the waterbody that eventually receives the discharge, they can begin to do their part to limit the amount of water going into the wastewater treatment plant. In addition, they will be able to begin thinking of creative solutions to the overuse of water. They can then implement their ideas and help to make a difference.

Patch Requirement 9. Participate in an American Wetlands Month Activity

- Discover.** Girl Scouts develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. Getting involved in a **wetlands** month activity is a great way to expand knowledge and gain new skills.
- Connect.** Girls should feel connected to their communities, locally and globally. Getting involved in a local restoration project can build partnerships. Girl Scouts will become connected with other groups concerned about environmental issues.
- Take Action.** Girls will get involved in a hands-on action project that is both helping to raise awareness and (hopefully) making a real difference (e.g., wetland plantings, pulling out invasives).

Patch Requirement 10. Identify and Listen to a Speaker(s) Working in Water Protection

- Discover.** Girl Scouts develop a strong sense of themselves and their values and seek opportunities for expanding their knowledge and skills. By listening to women who work in water protection, girls will discover possible future careers and courses of study.
- Connect.** Girls should feel connected to their communities, locally and globally. By discovering and listening to what career water professionals have to say, girls can take valuable lessons back to their everyday lives and share them with their friends, families and communities.



Take Action. Girls will feel empowered to make a difference. By hearing about the success of others and all the hard work they have put into the environmental movement, Girl Scouts will leave feeling empowered to create change and do good for their community.

Patch Requirement 11. Join a World Water Monitoring Day Event

Discover. Girls Scouts seek challenges in the world. By learning about local waterbodies, girls will seek opportunities to expand their knowledge and skills.

Connect. Girls should feel connected to their communities, locally and globally. Getting involved in World Water Monitoring Day helps girls to form new connections with other girls, community members and other partners.

Take Action. Girls should be able to identify some community needs. By contacting and working with local watershed groups, girls will be able to identify environmental issues in their community and come up with realistic possibilities for action. Taking part in World Water Monitoring Day, testing a local waterway, and recording the data are ways to *take action*. Girls will educate others and inspire them to act. Strength in numbers is always important. By getting involved and **monitoring** a waterway, Girl Scouts will show others that anyone and everyone can make a difference. They will inspire others to get involved.

Patch Requirement 12. Storm Drain Marking Project

Discover. Girl Scouts seek challenges in the world. By learning how what goes into storm drains eventually ends up in local waterbodies, girls will discover how simple activities (e.g., selecting the cleaning products they use) can affect their nearby waterbodies.

Connect. Girls should feel connected to their communities, locally and globally. By marking storm drains, girls will understand and show how everyone is connected to local waterbodies, and how everyone's actions directly affect water quality.

Take Action. By marking storm drains, Girls will actively do something about pollution. They will also go a step further by motivating others to adopt more environmentally friendly behaviors. Girls will make a difference in their communities.



Image courtesy of USEPA



Patch Requirement 13. Go on a Stream, Wetlands or Lake Walk

- Discover.** Girl Scouts seek challenges in the world. By learning about local waterbodies, girls will seek opportunities to expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. By completing a streamwalk, girls will begin to understand why and how much of what we do every day affects our local streams. By working with a watershed group, girls will make even stronger connections with their community.
- Take Action.** Girls will be able to use what they learn from the streamwalk to set up and implement creative and effective action plans to improve stream health or to promote awareness.

Patch Requirement 14. Build Your Own Aquifer

- Discover.** Girl Scouts seek challenges in the world. By working to understand that what happens above ground can potentially end up in the drinking water, girls will seek opportunities to expand their knowledge and skills.
- Connect.** Girls should feel connected to their communities, locally and globally. By discovering where their drinking water comes from and by creating a model to see how that drinking water is potentially affected by pollution, girls will begin to understand how important it is for communities to prevent pollution from entering our drinking water supplies.
- Take Action.** Girls will be able to use what they learn about drinking water to take action, inspire others to take action, and make others in their community aware of this connection. As described in requirement 14, girls can create a display or make a presentation to show their community what they learned. They can help ensure that their community's drinking water is healthy and clean.

Patch Requirement 15. Organize a Showing of *After the Storm*

- Discover.** Girl Scouts will develop positive attitudes toward learning and seek opportunities for expanding their knowledge and skills. This VHS, DVD, or online video is the perfect tool for girls to use to expand their knowledge of stormwater **runoff** and pollution. They will begin to understand ways to deal with this problem.
- Connect.** Girls should feel connected to their communities, locally and globally. After watching the video, Girls will be able to connect the message of the video to their own community, be it rural, suburban or urban. They will start to become more aware of the problem in their own community or neighborhood.



Take Action. Girls will be able to use what they have learned from the film, as well as the connections they have made with their own communities, to come up with creative solutions that (hopefully) they will be able to implement. They can also use this patch requirement along with patch requirement 12 or patch requirement 19.

Patch Requirement 16. Create a Backyard Wildlife Habitat

Discover. Girl Scouts will seek challenges in the world. They will learn about native plants, shrubs and trees; how to attract common types of wildlife; and how the correct combination of food, water, and shelter makes up a healthy **habitat**. Girls will seek opportunities to expand their knowledge and skills.

Connect. Girls should feel connected to their communities, locally and globally. By researching types of vegetation and wildlife that are native to their area, girls will have a better understanding of how they are connected to their local environment.

Take Action. Girls will be able to use what they learn to create effective backyard wildlife habitats that not only will be environmentally friendly but also will be a source of pride and enjoyment for their families and communities.

Patch Requirement 17. Stream or Beach Cleanup

Discover. Girl Scouts seek challenges in the world. Through this activity, they will discover how actions like littering might not seem like a big deal (“It’s just one person and one piece of trash”) when in fact they can add up to have large environmental impacts. As girls find trash along their stream or beach, they will increase their knowledge and comprehension of how the small things they do can be part of the problem—or part of the solution.

Connect. Girl Scouts will connect with the community where they are doing the stream or beach cleanup. They will help by inspiring others in their community to get involved, building partnerships, and increasing awareness.



Photo courtesy of GSUSA



Take Action. By conducting a stream and/or beach cleanup, girls will make a difference and creatively implement a solution to a very large problem. Whenever trash is not thrown away properly, it can get washed into the ocean where it becomes marine debris. Marine debris, including plastic bags, ropes, soda rings, fishing lines and other items, can harm or kill marine life like dolphins, whales, seals, sea turtles, and birds. Trash in and around water also makes our waters and beaches ugly, deters tourism, and costs money to cleanup. Some marine debris harm people, too.

Patch Requirement 18. Work with a Watershed Group on an Existing Project

Discover. Girl Scouts seek challenges in the world. By researching local watershed groups, Girl Scouts will discover how many dedicated volunteers have pledged to help make a difference in their watersheds. They will learn the intricate workings of the volunteer world and as they will begin to realize that much of what happens in the environmental world is done on a small budget.

Connect. Girls should feel connected to their communities, locally and globally. Girl Scouts will get the opportunity to work with local experts in water quality matters. They will create new partnerships and understand how an entire community must work together to get something done. Girls will learn the importance of teamwork and cooperation.

Take Action. Girl Scouts will help to implement a solution to a problem. They will get involved in an ongoing project in the real world. They will see their hard work and dedication come to life and will help the watershed group reach its ultimate goals whatever they might be. Girls will feel empowered to continue doing similar work to make a difference in their community.

Patch Requirement 19. Construct a Rain Garden

Discover. Girl Scouts seek challenges in the world. Girls will learn about the concept of Low Impact Development and how to deal with stormwater pollution in a creative and fun way. Girls will seek opportunities to expand their knowledge and skills.

Connect. By researching, learning and planning where, how and why to build a rain garden, girls will feel more connected to their communities, locally and globally.

Take Action. Girls will creatively plan and build a rain garden. By doing so, they will take a step toward creating a better environment for their communities. They will help address the problem. They will become a part of the solution.



Patch Requirement 20. Become a Trained Volunteer Water Quality Monitor

- Discover.** Girl Scouts seek challenges in the world. Becoming a trained volunteer water quality **monitor** will teach girls invaluable skills and knowledge. They will learn patience, persistence, and how to work with people. Girls will discover a whole new world full of calculations and comparisons.
- Connect.** Girls should feel connected to their communities, locally and globally. Girl Scouts will get to know local watershed groups and have the chance to work with them on projects and training. In addition, girls will build partnerships and healthy relationships that can help them in the future.
- Take Action.** By becoming volunteer water quality **monitors**, Girl Scouts will be involved in real-world data collection. They will get the chance to see how and why volunteers go out to test streams during all times of the year, regardless of weather. They will become empowered to make a difference and inspire others.

Patch Requirement 21. Sponsor a Ground Water or Watershed Festival

- Discover.** Girl Scouts seek challenges in the world. They will discover what exactly is entailed in a **ground water** festival. They will learn skills that don't pertain only to the environment. They will learn how to plan, organize, deal with last-minute issues, and establish a budget.
- Connect.** Girls should feel connected to their communities, locally and globally. By holding the festival in their community, they will connect with neighbors, friends and family. They will have the opportunity to form healthy relationships and partnerships for future activities and events.
- Take Action.** Girls will take action by creatively implementing a solution to the problem of awareness. By sponsoring a festival, girls will show others that they are serious about working to solve problems that their community faces. They will feel empowered to motivate others to share concerns and help brainstorm solutions.



Photo by Jodi Schwarzer, GSUSA

Patch Requirement 22. Make a Presentation on Your Issues of Concern

- Discover.** Girl Scouts seek challenges in the world. Before giving the presentations, girls will need to do adequate research and planning. They will show excitement and passion for their subject of interest. They will gain skills in researching, writing and communicating, as well as in-depth knowledge on their chosen area.
- Connect.** Girls should feel connected to their communities, locally and globally. To give an effective presentation, girls will have to connect with their audience and present information that is clear and concise. They will need to tailor their presentation to the particular audience. They will have to show the members of the audience how they affect and are affected by the issue of concern.
- Take Action.** Girls will take action to let local groups and officials know what they are passionate about and what they want to see changed. Girls will empower themselves to do their very best to inspire the audience to work for a better environment as well.

Patch Requirement 23. Intern with Federal/State/Local Natural Resource Agency

- Discover.** Girl Scouts seek challenges in the world. An internship with a natural resource agency is challenging. It will help girls gain skill and knowledge that they will use throughout the rest of their lives. Internships are great learning experiences.
- Connect.** Girls will connect with their community by interning in their area. They will learn steps that must be taken to see the change they are after. In addition, they will form partnerships and relationships that will be invaluable as they pursue other careers or schooling. Knowing people and being able to connect with them is probably one of the most important life lessons girls can learn.
- Take Action.** By doing an internship, girls will show that they are passionate about the environment and are interested in going the extra mile to gain an even greater sense of achievement and success. They will work to motivate others to also help make a change.

Patch Requirement 24. Produce a Video on the Importance of Watershed Protection

- Discover.** Girl Scouts seek challenges in the world. Creating an inspiring video to educate others on the importance of watershed protection is a challenging activity. It will help girls gain skill and knowledge in not only environmental issues but also other topics, including media, communications, technology, and marketing skills, that they will use throughout the rest of their lives.



Connect. Girls will connect with their community by tailoring the video to their area’s needs and interests. They will learn the steps involved in planning and organizing a media project, which are necessary to ensure a successful product. By working with others, they will form partnerships as well as discover what their community is willing to do to help make a change. They will also learn to adapt their message to the people in their community. Being able to adapt messages to different audiences will prove an invaluable skill later in their lives.

Take Action. By creating a video, girls will show that they are passionate about the environment and they are interested in taking on the challenge of creating an outreach product that will appeal to their particular audience (community). They will work to inspire others to also help make a change.



Photo courtesy of GSUSA



Links to Girl Scouts Try-Its, Badges, Interest Projects, and Participation Patches



• Try-Its (Grades 1–3)

Animals; Earth and Sky; Earth is Our Home; Eco-Explorer; Math Fun; Outdoor Adventurer; Plants; Senses; Water Everywhere; Watching Wildlife

• Badges (Grades 3–6)

Eco-Action; Ecology; Environmental Health; Geology; Math Whiz; Outdoor Creativity; Outdoor Fun in the City; Photography; Plants and Animals; Ready for Tomorrow; Science Discovering; Water Fun; Water Wonders; Weather Watch; Wildlife

• Interest Projects (Grades 6–12)

All About Birds; Backpacking; Digging Through the Past; Eco-Action; From Shore to Sea; Leadership; Math, Maps and More; Orienteering; Photography; Wildlife; Why in the World?

• Participation Patches

Get with the Land Patch—

www.girlscouts.org/program/gs_central/insignia/online/participation_patches/getwiththeland

Other Resources

Many of these Girl Scout publications can be purchased from your local Girl Scout council or found online at www.shop.girlscouts.org and www.girlscouts.org/program/gs_central/insignia. You may also call GSUSA Customer Service at (800) 221-6707.

- *From Sidewalks to Treetops: The Amateur's Guide to Exploring Nature in Your Neighborhood*, 2003 (video and booklet)
- *Fun and Easy Activities: Nature and Science*, 1996 (Bilingual Book)
- *Fun and Easy Nature and Science Investigations*, 2002 (English and Spanish versions available)
- *Linking Girls to the Land Resource Guide*
- *Linking Girls to the Land* video/DVD, 2002
- *Makin Waves* focus book, 2004
- *Outdoor Education in Girl Scouting*, 1996



Glossary

Algae: Chlorophyll-containing plants that range from one to many cells in size and live in freshwater or salt water.

Anadromous fish: Fish that return from salt water to freshwater to spawn (e.g., salmon, steelhead).

Aquatic insect: Insect species whose larval and/or juvenile form lives in the water.

Aquifer: Any underground geological formation containing water.

Bedrock: Unbroken solid rock, overlain in most places by soil or rock fragments.

Benthic: Bottom-dwelling. Describes plants and animal life whose **habitat** is the bottom of a sea, lake or river.

Channelization: The straightening and deepening of streams. Channelization reduces the ability of the stream to assimilate waste and disturbs fish breeding areas.

Clarity: The clearness of the water in the stream.

Conifer: A cone-bearing evergreen tree or shrub (a pine tree, for example).

Cover: Overhanging or in-stream structures (such as tree roots, undercut streambanks, or boulders) that offer protection from predators, shelter from strong currents, and/or shade.

Current: The velocity (speed) of the flow of water.

Deciduous tree: A tree that sheds its foliage at the end of the growing season.

Ecosystem: The interacting system of a biological community (plants, animals) and its nonliving environment.

Effluent: The wastewater discharge from a municipal or industrial source.

Erosion: The wearing away of the land surface by wind or water.

Filling: The process of depositing dirt and mud in marshy areas (**wetlands**) or in the water to create more land. **Filling** disturbs natural ecological cycles.

Gradient: The slope or steepness of the stream.

Ground water: The supply of freshwater under the earth's surface in an **aquifer** or soil.

Habitat: The specific environment in which an organism lives and on which it depends for food and shelter.

Headwaters: Small creeks at the uppermost end of a stream system, often found in the mountains, that contribute to larger creeks and rivers.

Macroinvertebrates: Organisms that are visible with the eye (macro) and have no backbone (invertebrates). These insects that live on, around, or in the water are helpful in determining water quality.

Marine debris: all objects found in the marine environment (consists of not only the ocean but salt marshes, estuaries, and beaches) that do not naturally occur there.

Monitor: To measure a characteristic, such as streambank condition, dissolved oxygen or fish population, using uniform methods to evaluate change over a period of time.



Nonpoint source pollution: “Diffuse” pollution generated from large areas with no particular point of pollutant origin, but rather from many individual places. Urban and agricultural areas generate nonpoint source pollutants.

Pool: An area of relatively deep, slow water in a stream that offers shelter to fish.

Quality control (QC): A system of checks used to ensure excellence, or quality, in a program (a **monitoring** program for example). QC asks if we are doing things right.

Reach: A stream section with fairly homogeneous characteristics.

Redd: A shallow depression in the streambed gravel in which a female **salmonid** deposits her eggs.

Riffle: A shallow, gravelly area of streambed with swift **current**. Used for spawning by salmonids and other fish species.

Riparian area: An area, adjacent to and along a watercourse, often vegetated and constituting a buffer zone between the nearby lands and the watercourse.

Riprap: A sustaining wall built of rocks.

Run: A stretch of fast, smooth **current**, deeper than a **riffle**.

Runoff: The portion of rainfall, melted snow or irrigation water that flows across the ground surface and eventually returns to streams. **Runoff** can pick up pollutants from the air or the land and carry them to streams, lakes and oceans.

Salmonid: Fish that is a member of the family Salmonidae (includes salmon, trout, char and whitefish).

Sediment: Fine soil or mineral particles that settle to the bottom of the water or are suspended in it.

Stormwater runoff: Water that washes off the land after a rainstorm. In developed watersheds it flows off roofs and pavement into storm drains that might feed directly into a stream; often carries concentrated pollutants.

Stream corridor: The lower and upper banks of a perennial or intermittent stream.

Stream mouth: The place where a stream empties into a lake, an ocean, or another stream.

Substrate: The material that makes up the bottom layer of a stream, such as gravel, sand or bedrock.

Suspended sediments: Fine material or soil particles that remain suspended by the **current** until deposited in areas of weaker **current**. They create turbidity and, when deposited, can smother fish eggs or young fish. Can be measured in a laboratory as total suspended solids (TSS).

Topography: The configuration of a surface area including its relief, or relative elevations, and the positions of its natural and man-made features.

Wetlands: Lands where saturation with water is the dominant factor determining the nature of soil development. **Wetlands** also can be identified by unique plants that have adapted to oxygen-deficient (anaerobic) soils. **Wetlands** influence stream flows and water quality.

Zone: To designate, by ordinance, areas of land reserved and regulated for specific uses, such as residential, industrial, or open space.



Resources

Polluted Runoff

Give Water a Hand Activity Guide includes activities for youth to learn about their watershed and ways to protect it. Download a free copy of the *Action Guide* and *Leader Guidebook* at www.uwex.edu/erc/gwah/. Or to order printed copies to purchase, call University of Wisconsin-Extension, (877) 947-7827. Ask for item #4H850 (*Leader Guide*) or #4H855 (*Action Guide*).

Splash (CD-ROM) is an interactive multimedia educational tool on nonpoint source pollution. It allows users to see what happens when it rains. Contact the Conservation Technology Information Center, 1220 Potter Drive, #170, West Lafayette, IN 47906. Phone: (765) 494-9555. Visit: www.conservationinformation.org.

Watersheds/General

After the Storm, a 30-minute video coproduced by EPA and The Weather Channel, is available for free from EPA. Phone: (800) 490-9198. Visit: www.epa.gov/weatherchannel. For VHS, ask for EPA 840-V-04-001. For DVD, ask for EPA 841-C-06-001.

National Water Quality Inventory, Report to Congress is published by EPA every two years. This report includes detailed information about the condition of the nation's waters. Contact the National Service Center for Environmental Publications (NCSEP). Phone: (800) 490-9198. Visit: www.epa.gov/305b.

EnviroScape models and watershed kits are available from EnviroScape. Phone: (703) 631-8810. Visit: www.enviroscares.com. Prices vary.

Project WET (Water Education for Teachers) promotes stewardship of water resources by developing classroom-ready teaching aids and establishing state- and internationally sponsored programs. Phone: (406) 585-2236; toll-free in the

U.S.: (866) 337-5486. Visit: www.projectwet.org.
E-mail: info@projectwet.org.

Water Posters

U.S. Geological Survey offers downloadable water education posters. Visit: www.water.usgs.gov/outreach/OutReach.html.

Wetlands Information

The Wetlands Helpline offers free fact sheets, coloring books, and other useful materials on wetlands. Phone: (800) 832-7828. Or visit EPA's **Wetlands Education** Web page for fun projects and links to other sites and activities. Visit: www.epa.gov/owow/wetlands/education.

The Izzak Walton League of America is one of the nation's oldest conservation organizations. Address: 707 Conservation Lane, Gaithersburg, MD 20878. Phone: (800) BUG-IWLA. Visit: www.iwla.org.

Bill Nye the Science Guy stars in DVDs and videos on science topics, available from the Disney Corporation. Visit: www.dep.disney.go.com/educational/billnye.

River of Words offers an annual international poetry and art contest for youth. Address: River of Words, 2547 Eighth Street, 13B, Berkeley, CA 94710. Phone: (510) 548-7636. Visit: www.riverofwords.org.



Photo courtesy of GSUSA

Coastal Cleanups

The Ocean Conservancy offers information about sponsoring a beach cleanup or participating in the annual International Coastal Cleanup held every September. Phone: (800) 519-1541.

Visit: www.oceanconservancy.org/icc.

Turning the Tide on Trash: A Learning Guide on Marine Debris is available from EPA.

Visit: www.epa.gov/OWOW/OCPD/Marine/contents.html

Volunteer Monitoring

Earth Force offers youth groups low-cost water quality monitoring kits and guidance in starting new watershed programs. For more information, write Earth Force, 1098 Mount Vernon Avenue, 2nd Floor, Alexandria, VA 22301. Phone: (800) 23-FORCE.

Visit: www.earthforce.org.

Izaak Walton League of America offers a variety of publications including guidebooks and videos, covering the topics of watershed stewardship and volunteer monitoring. Phone: (800) BUG-IWLA.

Visit: www.iwla.org/index.php?id=119.

EPA's Volunteer Monitoring program will provide *Getting Started in Volunteer Monitoring*, EPA 841-B-98-002.

Visit: www.epa.gov/owow/monitoring/vol.html. If you don't have internet access, call (800) 832-7828.

USGS' Water Science for Schools is a Web site which provides information on focused around water. It includes information, descriptions, pictures, and activities to complete. In addition, it includes a completion certificate that can be printed and handed out to your girls. Visit ga.water.usgs.gov/edu.

The Volunteer Monitor newsletter is available from EPA online.

Visit: www.epa.gov/owow/monitoring/volunteer/vm_index.html.

Ground Water Protection

EPA's Ground water/Drinking Water Program has great art and science projects that can be downloaded. Visit: www.epa.gov/ogwdw/kids/index.html.

Ground Water Festival

The Groundwater Foundation has a how-to book called *Making Waves: How to Put on a Water Festival*. To order *Making Waves* or to receive additional information on their Children's Groundwater Festival, contact the Groundwater Foundation. E-mail: info@groundwater.org. Phone: (800) 858-4844. Visit: www.groundwater.org.

EPA's Safe Drinking Water Act Hotline has information specialists who respond to questions about drinking water and ground water programs authorized under the Safe Drinking Water Act. Phone: (800) 426-4791.

This is not a complete list of available resources and mention of these products does not constitute endorsement by EPA. Visit the Office of Wetlands, Oceans, and Watersheds (www.epa.gov/owow) or the Office of Water (www.epa.gov/ow) for a more complete list, or call EPA's Water Resource Center toll-free at (800) 832-7828.



Photo courtesy of GSUSA



Patch Order Form

Water Drop Patch Ordering Form

The Water Drop Patch Project, developed by the Environmental Protection Agency (EPA), in partnership with the Girl Scouts of the USA, offers Brownies, Juniors, Cadettes, Seniors and Ambassadors, grades 2–12, hands-on activities focusing on watershed management and natural resource conservation. Once Girl Scouts complete the requisite activities, they can order the Water Drop Patch using the order form below. An electronic copy of the project booklet can be downloaded on the Linking Girls to the Land Web Site at www.epa.gov/adopt/patch/. Copies of the manual are also available for FREE by calling the National Service Center for Environmental Publications at 1-800-490-9198.



Actual Size 3" x 3"

Girl Scouts of the USA, NES 420 Fifth Avenue New York, NY 10018-2798 Call Toll-Free: 800-221-6707 Fax: 800-643-0639	Ship to: _____ _____ _____ Daytime Phone Number or e-mail address:
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Special Instructions:
Please use this form to order directly from NES.

UPC#	DESCRIPTION	Retail Price	Quantity	Total
26751	Water Drop Patch	\$1.00		

FOR CREDIT CARD USE FILL IN BELOW

Regular Shipping and Handling \$0 to \$25.00.....\$5.05 \$25.01 to \$50.....\$6.40 \$50.01 to \$75.....\$8.00 \$75.01 to \$100.....\$9.15 \$100.01 to \$150.....\$10.25 \$150.01 to \$200.....\$12.15 \$200.01 to \$250.....\$13.25 Over \$250.00.....\$25.00	Payment (Please check one) Check <input type="checkbox"/> Credit Card <input type="checkbox"/> (Circle one) Discover Visa MasterCard Amex Expiration Date _____ <table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 10%;">Account #</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table> Authorized Signature _____	Account #																				Total \$ _____ CA, GA & MD add applicable Sales Tax \$ _____ Shipping & Handling (see chart) \$ _____ Total Price \$ _____
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