United States Environmental Protection Agency
Office of Water (4501F) Washington, DC 20460
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Water Drop Patch Program

Girl Scout Council of the Nation's Capital
4301 Connecticut Avenue, N.W.
Washington, D.C. 20008
(202) 237-1670
(202) 274-2160-TDD (Telecommunications Device for the Hearing Impaired)

This Patch program was jointly developed by the Environmental Protection Agency and the Girl Scout Council of the Nation's Capital. The purpose of the program is to encourage girls to:

- Make a difference in their communities by becoming watershed and wetlands stewards
- Use their skills and their knowledge to educate others in their community about the need to protect the nation's valuable water resources
- Explore the natural world to gain an interest in science and math
- Use the Internet as a source of information

TROOP LEADERS SHOULD CONSULT WITH SAFETY WISE BEFORE CONDUCTING ANY OF THESE ACTIVITIES. ANY PROJECTS IN OR NEAR THE WATER MAY POSE SERIOUS SAFETY HAZARDS.

GIRL SCOUTS®

Thanks to the passage of the Clean Water Act 25 years ago, America has seen much progress in cleaning up the nation's rivers, lakes, streams, 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 fail to meet state water quality standards, which means that they do not support basic uses like swimming and fishing. Although wetlands losses have slowed, the nation continues to lose about 100,000 wetlands acres per year. A disturbing number of freshwater fish species are now threatened or endangered.

Many of the remaining pollution problems come from many different sources—not just from a 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. But Girl Scouts can help make a difference by becoming watershed stewards in their communities.

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Background Information

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 groundwater. 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.

What is Nonpoint Source Pollution?

Unlike pollution from factories and sewage treatment plants, nonpoint source pollution comes from many different areas with no particular 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 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, crop and forest lands, and eroding streambanks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems

Acid rain and changes to stream flow, such as dams and concrete channels, are also sources of nonpoint source pollution. Acid rain, much of which comes from 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.

What is a Wetland?

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

What are the Basic Characteristics of Wetlands?

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

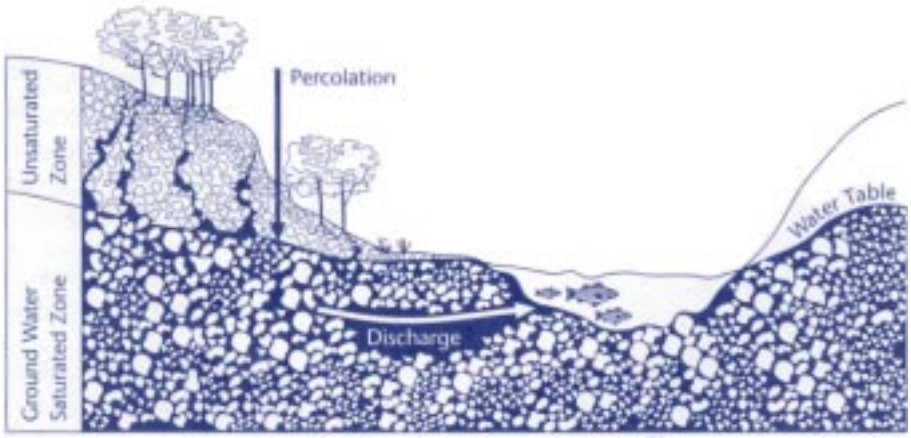
Wetland Benefits

These complex ecosystems play an important role in the health of our environment and the quality of our water. Wetlands provide support for:

- Fish and wildlife habitats
- Complex food webs
- Water absorption to reduce storm flooding and damage
- Sediment traps
- Erosion control
- Water quality
- Groundwater replenishment; maintaining flows in streams by releasing water during dry periods
- Open space and aesthetic value

What is Groundwater?

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 zone in most cases.



The term "groundwater" refers to water in the saturated zone. This water is an important natural resource and used for many purposes, including drinking water, irrigation and livestock uses.

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

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

Did You Know?

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

The Environmental Protection Agency is requiring water suppliers to put annual drinking water reports in the hands of their customers. Between April and October 1999, and by July 1, thereafter, water suppliers will be providing "Consumer Confidence Reports." These reports, which will be issued in utility bills, will 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.

Girl Scout Patch Requirements

Brownies—Do any **four** of the first nine requirements
Juniors—Do any **five** of the first nine requirements
Cadettes—Do any **six** of the first thirteen requirements
Seniors—Do any **seven** of the twenty requirements

1. Using the list of "Do's and Don'ts in the Home (pages 10 and 11) identify three to five things you and your family can do to prevent polluted runoff from your home and lawn. Develop a plan based on what you know your family has done in the past. Share your plan with your troop.

2. Wetlands provide many benefits. They help reduce flooding, sustain stream flow, filter polluted waters, provide habitat for wildlife, and support biological diversity. Visit the new Wetlands Exhibit at the National Zoo or another wetland sanctuary (see page 7). Using the list on page 4, how many wetland characteristics can you find?

3. Enter the international "River of Words" Poetry and Art contest. The contest, open to youth between the ages of 5 to 19, invites children to explore and interpret their local watershed through the arts. To obtain an entry form or more information, contact International Rivers Network,1847 Berkeley Way, Berkeley, CA 94703; Tel: (510) 848-1155 or download an entry form from the internet: www.irn.org/row/row.html

4. The Chesapeake Bay is home to more than 27,000 species of plants and animals. How many kinds of wildlife can you identify that live in the Bay watershed (e.g., crabs, oysters, waterfowl and fish)? Why are underwater bay grasses (SAV) important? Check your answers by calling the Chesapeake Bay Program Office at 1(800)YOUR-BAY or visit their web page at www.chesapeakebay.net/bayprogram/index.htm. Click on "bay and ecosystem."

5. Go on a hike with your troop and follow a local creek or stream. Where does the stream ultmately drain? What does it pick up along the way? What happens when it rains? How does the stream change? What insects, birds, plant or aquatic life do you observe? Use a United States Geological Survey (USGS) map or draw your own to illustrate your local watershed. USGS maps can be obtained by calling 1(800)435-7627 (cost $4.00 each). Share with others what you have learned.

6. Create an attractive wall mural about how water is used by coloring posters from the United States Geological Survey (USGS). Call 1-800-435-7627 or send a fax to (303) 202-4693. (Posters are available in both color and black & white—the color version includes activities on the back). Put up your mural where others in the community can see it.

7 Visit a local aquarium to see specimens of aquatic life. Share your experiences with your troop and family. The Baltimore Aquarium (Pratt Street, Baltimore; (410) 576-3800) and the National Aquarium in Washington, D.C. (14th and Constitution, NW; (202) 482-2825) offer some wonderful exhibits.

8 Visit a local sewage 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 wetlands activity during the month of May to help celebrate American Wetlands Month. Visit the Terrene Institute's Web Page for more ideas for special wetland activities at http://www.terrene.org/awm.htm. Or call the Terrene Institute at (703) 548-5473.

Examples of Wetlands and Wildlife Sanctuaries in the Washington, D.C. Metropolitan Area

National Zoo Wetlands Exhibit
Washington, D.C.
(202) 673-4821

Discovery Creek Children's Museum of Washington
Glen Echo Park, Washington
(202) 364-3111

Huntley Meadows Park
Alexandria, VA
(703) 768-2525

Woodend Sanctuary
Chevy Chase, MD 20815
(301) 652-9188 ext. 3008

Jug Bay Wetlands Sanctuary
Lothian, MD 20711
(410) 741-9330

Mason Neck National Wildlife Refuge
Lorton , VA
(703) 490-4947

Occoquan Bay
Woodbridge, VA (open on weekends)
(703) 490-4947

Patuxent Wildlife Research Refuge
Laurel, MD
(301) 497-5760

Call to inquire about educational programs. Some may require reservations and admisson fees.

10 Work with your troop to organize a Storm Drain Stenciling 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 12-13.

11 Go on a stream, wetlands, or lake walk and make observations and assessments of waterbody conditions. See Page 16 for streamwalk guidelines. Call EPA's Region 10 Office at (206) 553-1200 to request a teacher's guide, other manuals, and data collection sheets.

12 Do a display or presentation on groundwater and 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/surf2/locate/. Click on "Where does my drinking water come from?") Make an Aquifer Model (See Pages 28-29) part of your presentation.

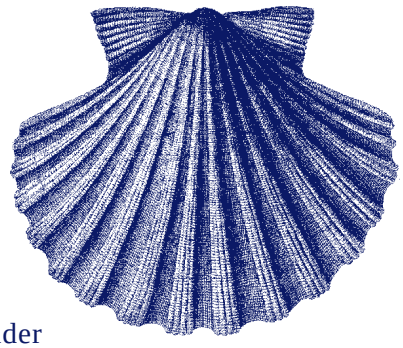
13 Design a "mock-up" of your watershed. Share it with younger groups. Use EPA's Locate Your Watershed (www.epa.gov/surf) and Index of Watershed Indicators web sites (www.epa.gov/surf/iwi/) or resources list to create it.

14 Share your knowledge of water pollution with younger children, perhaps Daisy or Brownie Girl Scouts or a local elementary school class. Consider doing a presentation about the Chesapeake Bay. Discuss threats to the Bay, including excess nutrients and habitat loss. Highlight things that Girl Scouts and their families can do to protect water quality (e.g., Do's and Don'ts on pages 10 and 11) Visit the Chesapeake Bay Program's web page at www.chesapeakebay.net/bayprogram/index.htm or call the Bay Office at 1(800)YOUR-BAY. The web page has a set of slides and talking points you can download.

Did you Know?

- **The Chesapeake Bay is an estuary where salt and fresh water mix.**
- **The Bay receives about half of its water volume from the Atlantic Ocean (salt water). The rest (fresh water) drains into the Bay from an enormous 64,000-square-mile drainage basin or watershed.**
- **The watershed includes parts of six states (DE, MD, NY, PA, VA, and WV) and the District of Columbia.**
- **Ninety percent of the fresh water entering the Bay comes from five major rivers: the Rappahannock, the Susquehanna (responsible for 50%), 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.**

15 Work with troops in your service unit and your local government and organize a stream, wetland or beach cleanup. Consider joining the annual International Coastal Cleanup sponsored by the Center for Marine Conservation (CMC) held every September. See resources list on pages 32-33. Be sure to follow safety guidelines on page 14.



- Keep track of the kinds of trash collected. If it is primarily coming from fast food restaurants, consider working with local restaurant owners to put up signs encouraging people not to litter in their community.
- If possible, separate the trash for recycling. Have different colored bags for paper, plastic, glass, and aluminum
- Take before and after photos of your efforts. Send them to a local paper to publicize your efforts.

16 Create a Wildlife Habitat in your Backyard or Troop Meeting location. Contact the Natural Resources Conservation Service to obtain a free, 28-page booklet that outlines 10 conservation projects for backyards or neighborhoods. Call 1-888-LANDCARE or download a copy at www.nhq.nrcs.usda.gov/CCS/Backyard.html.

17 Find a watershed group active in your community (or in the Chesapeake Bay watershed) and volunteer to help with a project (e.g., tree planting, oyster restoration project, etc.) Use the Environmental Protection Agency's Adopt Your Watershed Internet site (www.epa.gov/surf/adopt) to find a group or see pages 32-33 for a list of some local organizations.

18 Sponsor a Groundwater 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 32-33).

19 Identify several women working in water resource protection and invite them to come to speak to your troop about their career.

20 Become a Volunteer Water Quality Monitor. Help collect quality data and build stewardship for your local waterbody. Attend a training workshop to learn proper monitoring techniques and safety rules (See resources list on pages 32-33). Or work with your troop to construct a "stream sentinel" and conduct biological monitoring at a local outfall, pond or lake (See page 15).

Safety First!!!

Any activities in or near the water can pose serious safety hazards. Carefully read *Safety-Wise* pages 23, 86-88, 102, and 109 before beginning any of the field activities described in this guide. Heavy rubber gloves are strongly recommended for all cleanup activities. Stream walks, debris cleanups, and water quality monitoring activities, including the Stream Sentinel, require Council Approval. **Send the Request for Council Permission Form to GSCNC Program Department, 4301 Connecticut Avenue, NW, Washington, D.C. 20008.**

Do's and Don'ts Around the Home (All Ages)

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 runoff flows directly into rivers, streams, bays and lakes. Pollutants in this runoff can affect fish and other aquatic animals and make water unsafe for drinking and swimming.

What can you do to help protect surface and ground waters from polluted runoff? Start at home. Take a close look at practices around your house that might contribute to polluted runoff. The following are some do's and don'ts to help you become part of the solution, instead of part of the problem.

Household Products

- Properly dispose of household hazardous waste. Many common household products (oven cleaners and bleach, paint thinners, moth balls, charcoal lighters, wood stain, furniture cleaners, bug sprays, and herbicides, etc.) contain toxic ingredients. Carefully read labels to determine which products are hazardous.

- **Never pour unwanted household hazardous wastes on the ground or down the drain or toilet.** The chemicals will poison the soil and water. Take unwanted household chemicals to hazardous waste collection centers. **Call your County Solid Waste Management Office to find out collection dates and times.**

- Select less toxic alternatives or use non-toxic substitutes wherever possible. Baking soda, distilled white vinegar, lemon juice and ammonia, are safe alternatives to caustic chemicals. **And they save you money.**

- Buy chemicals only in the amount you expect to use, and apply them only as directed.

- Use low-phosphate or phosphate-free detergents. Excess nutrients overstimulate the growth of aquatic weeds and algae, which can deplete oxygen and kill aquatic life.

- Never indiscriminately spray pesticides, either indoors or outdoors, where a pest problem has not been identified. **Dispose of excess pesticides at hazardous waste collection centers.**

- **Recycle used oil , antifreeze, and car batteries by taking them to service stations and other recycling centers.** Never put used oil or other chemicals down stormdrains or in drainage ditches.

Do-It-Yourself Home Cleaning Products

General, multi-purpose 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.

Furniture polish: Use beeswax, or beeswax and olive oil. Or mix 2 teaspoons of lemon oil and 1 pint of mineral oil in a spray can.

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

Landscaping and Gardening

- Select plants with low requirements for water, fertilizers, and pesticides.

- Preserve existing trees and plant trees and shrubs to help prevent erosion and promote infiltration of water into the soil.

- Leave lawn clippings on your lawn so that nutrients in the clippings are recycled and less yard waste goes to landfills.

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

- Use compost and mulch (such as grass clippings or leaves) to reduce your need for fertilizers and pesticides. Compost is a valuable soil conditioner which gradually releases nutrients to your lawn and garden. In addition, compost retains moisture in the soil and thus helps you conserve water. Information about composting is available from your county extension agent.

- Spread mulch on bare ground to help prevent erosion and runoff.

- Limit fertilizer use. Over-fertilization is a common problem, and the excess can leach into groundwater or contaminate rivers or lakes.

- Do not apply pesticides or fertilizers before or during rain. If they run off into the water, they will kill fish and other aquatic organisms.

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, by decreasing your water usage you can help prevent your system from overloading and contaminating groundwater and surface water.

- Use low-flow faucets, shower heads, reduced-flow toilet flushing equipment, and water saving appliances such as dish and clothes washers.

- Wash your car only when necessary; use a bucket to save water. Alternatively, go to a commercial carwash that uses water efficiently and disposes of runoff properly.

Did You Know?

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

- Use dishwashers and clothes washers only when fully loaded.

- Take short showers instead of baths and avoid letting faucets run unnecessarily.

- Repair leaking faucets, toilets, and pumps.

- Do not over-water your lawn or garden. Over-watering may increase leaching of fertilizers to groundwater.

- When your lawn or garden needs watering, use slow-watering techniques such as trickle irrigation or soaker hoses, such devices reduce runoff and are 20-percent more effective than sprinklers.

Other Areas Where You Can Make a Difference

- Clean up after your pets. Pet waste contains viruses and bacteria that can contaminate surface and groundwater.

- Drive only when necessary. Driving less reduces the amount of pollution your car generates. Cars and trucks emit tremendous amounts of airborne pollutants, which increase acid rain. They also deposit toxic metals and petroleum byproducts into the environment.

- Write or call your elected representatives to inform them about your concerns and encourage legislation to protect water resources.

- Become involved in local planning and zoning in your community. That is where the decisions are made that shape the course of development and the future quality of the environment.

Storm Drain Stenciling Project Guidelines

(Recommended for Cadettes and Seniors)

A storm drain stenciling project consists of stenciling a message next to the street drain reminding people **"Dump No Waste- Drains to River"** with the image of a fish. (Stencils are also available for lake, stream, bay, groundwater, ocean or simply "protect your water" with the image of a glass and faucet.) Steps to consider when conducting a stenciling project:

First, Call for Permission. For public streets, call the city or County Public Works Department (stormwater or road maintenance division). In some cases, the State Highway Administration has jurisdiction (see adjacent box for help). Public Works will probably issue a permit or letter of approval. They may even help by providing storm drain maps, traffic safety cones, flags and vests. Check to see if they prefer that you stencil on the side walk, or on the street next to the drain. For some drains on private property (e.g., business or apartment parking lots), get the permission of the property owner.

Consider Safety. Especially when stenciling with children, seriously consider traffic safety issues when you select your site. Neighborhoods are usually safer than downtown city streets (many nonpoint sources go down storm drains in residential neighborhoods). Place traffic safety cones and assign at least one person with a traffic flag to watch traffic at all times.

Prepare Materials. Before using stencils for the first time, "weed" remaining letters from the die cuts. This avoids small plastic or oilboard pieces washing into drains while you are stenciling. "Stencil weeding" is a good activity for a short training meeting before going out to paint. For painting, an aerosol can or traffic-zone latex paint (without chlorofluorocarbons (CFCs) that harm the ozone) is a good option. Some stencilers use a small roller or stencil brush with recycled latex based paints. Be careful that younger stencilers do not apply the paint too thickly, as it will run under the stencil or smear the letters.

Call the Media. Notifying the media of a stenciling event can get your watershed protection message out to the whole community. Young people in the project enhance media photo opportunities. Remember to take your own pictures, too.

Help for Storm Drain Stenciling Projects

Many local watershed groups and county governments offer help with stenciling projects. The Chesapeake Bay Foundation in Annapolis provides stencils on loan, guidelines on how to conduct a project, and tips on who to contact to obtain permission. Call Heather Tuckfield at 410-268-8816.

The Friends of Four-Mile Run in Arlington County has offered to help Girl Scouts in Virginia. The Friends can help troops obtain necessary permission and can help with press releases and community brochures. Call Don Waye at 703-503-9462.

The Center for Marine Conservation (CMC) sponsors a "Million Points of Blight" national storm drain stenciling campaign. Call Ron Ohrel at (757) 496-0920 to request stencils on loan and project guidelines. CMC's address: 1432 North Great Neck Road, Suite 103, Virginia Beach, VA 23454. (fax 757-496-3207).

Avoid a Mess. Remind stencilers to wear old clothes. Rubber gloves and protective eye gear are helpful, as are plastic bags worn over expensive shoes. Bring rags to cleanup unexpected paint on your arms or fingers. Also include big litter bags to bring back used gloves and rags as well as any garbage you pick up which otherwise could go down the storm drain. Paint spray can drift onto nearby parked cars, so bring a large box opened flat to use as a shield around the stencil as you spray.

Work in Teams of Four to Six. The team should include a traffic look-out. Another two team members accompanied by an adult may go together door-to-door explaining the watershed drainage, your monitoring findings, local river fish and wildlife, and actions neighbors can take to avoid pollution (see flyer information below). Rotate jobs for maximum enjoyment.

Tips for Applying Stencils. Scrub the area briskly with a wire brush and dust it off with a wisk broom. Lay the stencil on the sidewalk or street next to the storm drain. If using spray paint, shake the can and hold it about six to eight inches from the stencil. Use a series of short back and forth motions to spray one line at a time until the letters are uniformly covered. Do not use too much paint as it will run underneath and blur the letters. When finished, carefully lift the stencil up off the street. It may take a little experience in the beginning to adjust the amount of paint. After finishing all the stenciling for the day, lay the stencils out flat to dry in a warm place. When the paint is completely dry, gently roll the mylar stencils to chip off the paint. This works best if the paint does not build up a thick layer between cleanings.

Prepare a Flyer or Doorhanger. After stenciling a message that tells neighborhood people what not to do (Dump No Waste), Girl Scouts can hand out and discuss a flyer or door hanger explaining:

- recycle used oil at nearby listed locations
- use fewer chemicals on lawns & gardens
- save household hazardous chemicals for collection days (give dates and location)
- pick up waste that would otherwise wash down storm drains
- other stewardship opportunities

Add local information for a sense of place:

- Where do neighborhood drains go—into what river, bay, lake or aquifer
- If drains connect to combined sewer overflows (CSOs), how do they work? What happens with overflows during stormwater events? (They go straight to the river.)
- Who lives near or in the river? (Names of local species of fish, birds, and other critters.)
- What restoration projects are underway to clean up or replant streamsides, build and install bird or bat boxes, maintain local trails, etc.
- How can community members help with projects?

These guidelines were adapted and reprinted with permission from Rhonda Hunter, the founder of Earthwater Stencils, 4425 140th Avenue, SW, Dept. V, Rochester, WA 98579-9703. Phone: (360)-956-3774. On the WEB at www.earthwater-stencils.com. The article was adapted from a story that appeared in **The Volunteer Monitor** ***newsletter, Volume 7, No. 2, Fall 1995.***

Stream/Beach Cleanup Safety Checklist

(Cadettes and Seniors only—should not be done by Brownies or Juniors)
Please read Safety Wise before beginning this activity

Before the cleanup...

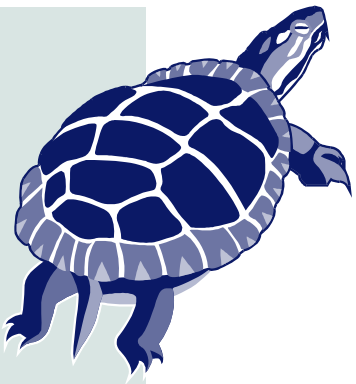
- Check with your local Department of Health or State Environmental Office about potential health concerns with the waterbody (e.g., *pfiesteria*, poor water quality, currents, mosquitos, rats, etc.)
- Ask for necessary permission to cleanup at your site. Make arrangements with the appropriate local officials to let them know the location, days, and times of your cleanup so they can come haul away the trash. They may be willing to give a talk about the history, wildlife, or environmental conditions.
- Make sure that someone knows where, when, and for how long you will be out.
- Develop a safety plan. Find out the location and telephone number of the nearest phone. Locate the nearest medical center and write down directions.
- Have each member of the cleanup team complete a permission slip and a medical form that includes emergency contacts, insurance information, and pertinent health information such as allergies, diabetes, epilepsy, etc.
- Listen to weather reports. Never conduct a cleanup if severe weather is predicted or a storm occurs while at the site.
- Have a first aid kit handy. **See SAFETY WISE.** It's best if at least one team member has first aid/ CPR training.

At the cleanup site ...

- Leave syringes and needles alone! 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, treacherous, and even contain deep pools. Do not attempt to walk across streams that are swift and above the knee in depth. These can be extremely dangerous.
- Look out for poisonous plants, such as poison ivy, poison oak, sumac. These can cause rashes and skin irritation.
- Watch for wildlife—snakes, ticks, hornets, and wasps. Also beware of large animals like dogs, alligators, snapping turtles, and farm animals.
- **Wear rubber gloves (like dishwashing gloves) to protect hands and arms.** Be careful with broken glass and rusty cans.
- Always stay with a buddy. Teams of three or four are probably best.
- **If you see anything abnormal (such as dead fish, oil spills, leaking barrels, and other pollution) 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 & support.
Rubber gloves (like dishwashing gloves) to protect hands and arms.
Safety vests (brightly colored)
Hats
Large Plastic Bags
Heavy sacks for sharp objects
Sunscreen
Medications (e.g. for bee allergies, diabetes, if needed)
Insect repellant
List of emergency contacts, including a telephone number nearest to the site
Cell Phone



Low-Cost Biological Monitoring—The Stream Sentinel

(Seniors only)

The Stream Sentinel

This article was reprinted and adapted with permission. It appeared in The Volunteer Monitor *Newsletter, Vol. 7, No. 2,Fall,1995.*

The device pictured at right costs less than one dollar and is used by the city of Forth Worth Department of Environmental Management (DEM) for biological monitoring of storm drainage systems, especially in outfalls. Outfalls are pools of water located where a storm drain pipe discharges to surface waters. The unit was originally designed by former DEM staff John Falkenbury, and redesigned by staff members Gene Rattan and Brian Camp, who dubbed it the "stream sentinel." Basically, the sentinel is a 2-liter plastic soft-drink bottle with holes, attached to a Styrofoam float and tied to an anchor (a brick).

The stream sentinel is placed in an outfall pool, stocked with six fathead minnows, and checked at regular intervals. (Fort Worth DEM usually checks their sentinels once or twice a week). If the fish die, it is likely that a pollutant is present at some time since the last check. If they don't die, they are released after two weeks. The device can be placed in any outfall that has enough water to keep it afloat and can be left in place indefinitely, as long as it's restocked with fresh minnows every two weeks. Rattan says, "If you don't see toxicity after 2 months, you have a very good urban site. If you don't see any toxicity after 6 months, you've got an excellent urban site."

The big advantage of the stream sentinel is that it permits round-the-clock monitoring. As Camp explains, "Storm drain pollution is mostly intermittent and transitory, so the odds of identifying toxic discharges with one-time sampling are low. But the fish stay in the water 24 hours a day."

Because the unit is so cheap and easy to make and use, it has great potential for monitoring groups and class room teachers. It can be used in creeks and ponds as well as storm drain outfalls. Fort Worth DEM staff raise their own fathead minnows, and they say this is the trickiest part of the whole procedure. Most volunteer groups will probably opt to obtain their minnows from a bait shop or local university biology department. If fatheads are not available, Rattan says other minnows can be substituted, as long as they are not too pollution tolerant, and not overly sensitive to natural conditions in your area. A state or federal wildlife agency should be able to suggest appropriate minnow species.

Troop leaders should read Safety Wise before beginning this activity. It is also recommended that troop leaders visit the outfall beforehand.

An operational guide on the stream sentinel can be downloaded from the Internet at ***www.epa.gov/earth1r6/6wq/ecopro/watershd/monitrng/tools/index.htm***. For additional information, contact Gene Rattan, Fort Worth DEM, 5000 Martin Luther King Fwy, Fort Worth, TX 76119; 817/871-5450. (A limited number of videos are also available).

Girl Scouts should contact their city or county environmental department if they suspect pollution. If the minnows die, this indicates that a pollution problem may be present. Possible causes: low dissolved oxygen, toxic pollution, or another waterbody stressor.

Streamwalk
(Cadettes and Seniors)

Before the Streamwalk

1. We encourage you to contact local groups involved in environmental issues in your area. This serves two purposes: one, these groups may be able to provide you with information and background on your Streamwalk site; and two, you may be able to piggyback on some an existing program. Visit EPA's Adopt Your Watershed web page at *www.epa.gov/surf/adopt* to find a group in your watershed or see pages 32-33 for a list of some local groups.

2. Choose the general area for your Streamwalk. **It is strongly recommended that Troop Leaders visit the stream walk site in advance.** You may wish to collect data along a familiar stream, one that is close to your troop meeting location, or one that does not cascade down a steep mountain side. You may decide to do a series of streams in a watershed to collect baseline data, or to concentrate your efforts in areas suspected of being polluted. It is recommended that streamwalks be done four times a year (once each season) at your site.

3. Find a U.S. Geological Survey (USGS) topographic map of your area. These "topo" maps are an excellent resource because they show such things as buildings, elevations, waterways and roads. Topo maps are useful for identifying the latitude and longitude of your site. Help in defining longitude and latitude is provided on Page 22. We recommend a 7-1/2 minute quad map (1:24,000 scale where 11 inches = 4 miles), which are available at local sporting goods stores. The cost is approximately $4. You may also find a copy to photocopy at your local library, or you can order them directly from USGS. For assistance, call **1-800-USA-MAPS**.

4. Now, find your specific Streamwalk site on the topo map. It will be easier for future streamwalkers to locate your site if it is near landmarks (roads, highways, and tributaries), especially those marked on the map. For purposes of Streamwalks, you will be characterizing 100 feet in either direction from your site. You may do as many sites on the stream as you wish, just be sure that sites are at least 200 feet apart.

5. Finally, pull out a copy of the Streamwalk survey data form. It is best if you have gone through the form before you begin your Walk. You will use your map and one survey data sheet per Streamwalk site.

Note: *Several citizen groups and agency representatives worked with EPA's Region 10 office (Seattle, Washington) to develop Streamwalk. It is intended to be an easy to use screening tool for monitoring stream corridor health.*

Streamwalk Tips

Please consider the following precautionary tips:

- Get the permission of landowners to cross any 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 and campgrounds).
- Only record what you see, not what you have previously seen. For example if you think fish are present but you can't see them, mark your sheet "no fish present."
- Always work with someone.
- Do not put yourself in danger to gather survey information.
- Be careful of ticks, poison oak, nettles, insects. Bring repellent. Wear long pants and boots: wind breakers help to block nettles.
- Watch out for dogs.
- Do not drink the water—it is unsafe.
- Do not walk on unstable banks; your footsteps could speed erosion.
- Be alert for spawning areas (redds) in the stream. Do not 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 stream bed might be the easiest route for conducting your streamwalk. Be aware that the stream bed can be very slippery, uneven, and unpredictable.
- **Do not 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, please stop your Streamwalk. You and your safety are much more valuable than the Streamwalk!**

Recommended list of items to take along:

Photocopies of topo map of stream to be walked
Comfortable rubber boots
Snag and thorn-proof clothing that is appropriate for the weather
Clip board with waterproof cover
Streamwalk data forms
Two pencils
Folding ruler or tape measure
Camera and film in waterproof bag
Leather gloves
Whistle
First Aid Kit (SEE SAFETY WISE for what to include)
Cell Phone
If you are away from urban or residential areas, the following are also recommended for safety:
Extra clothes in a waterproof bag
Fire starter (candle and cheap lighter)
Flashlight and extra batteries
Global Positioning Device

Instructions for Filling out Streamwalk Survey Data Sheets

Below are directions on how to fill out the Streamwalk Survey Data sheet. Please read these 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 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. Please read Safety Wise before beginning this activity.***

Location

Give the stream name, county and state of your site, preferably as it appears on the topo map. Note: there are some streams that are unnamed, in these cases you can indicate the stream, lake or water body into which your streamflows 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 longitude and latitude of your site(s). Computing this may present a challenge. See pages 22-23.

Weather

The concern with weather relates to amount of rainfall which potentially can affect 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" in 24 hours - light steady rainfall.
Showers - 1/3" - 1" in 24 hours, intermittent and variable in intensity.
Storm - 1" or more rain in 24 hrs, usually accompanied by winds.

Stream Description

Depth and Width Measurements

This information will give a description of the stream water at your site. Please indicate if your response is 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. Do not attempt to cross in high flows. **If it feels even slightly unsafe, do not try it at all. Please read Safety Wise.**

Water Clarity

The clearness of the water is observed to determine if sediment pollution is entering the stream. Cloudy or different 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 of 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 & Riffles

The variety of flow in relation to depth creates habitat to support fish and invertebrate life. This variety can be seen by looking for pools and riffles. Pools are deeper than adjacent areas. They provide feeding, resting and spawning areas for fish. Riffles and/or 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

Please check the box which matches the shape of the stream channel. If you are unable to see the shape of the bottom and banks, please 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 Bottom (substrate)

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.

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

Gravel (.1- 2 inches): A gravel stream bottom is made up of stones ranging from tiny quarter inch pebbles to rocks of about 2 inches.

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

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

Bedrock: This kind of stream bottom is solid rock.

Width of Natural Streamside Corridor

The streamside corridor, riparian area or zone of influence are terms that describe the natural vegetated area on either side of the stream. It, along with the stream, 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 habitat for streamside wildlife. Estimate as best you can width of the corridor at your site**. Indicate with an "x" on the bar graph the width. Note:** Left and right are based on looking down stream. If the vegetation is pasture or landscaped, this is not a natural state, so mark "o."

Streamside Vegetation

A description of the presence and type of streamside vegetation provides much information about the stream due to its important role in molding the stream environment. Vegetation acts as a filter for sediment and pollution coming in from the near land. 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 watercool. On the data sheet mark all the categories that apply.

Conifer: A cone bearing, evergreen tree or shrub (e.g. a pine tree)
Deciduous: A tree which sheds its foliage at the end of the growing season
Small trees or Shrubs: Either conifers or deciduous bushes less than 20 feet high.
Grasses: Any of numerous plants with narrow leaves, jointed stems and spikes or clusters of inconspicuous flowers.

Overhead Canopy (Stream Cover)

This is the amount of vegetation that overhangs the stream. It focuses on several important values of streamside vegetation: offering protection and refuge for fish and other organisms, shading the stream and keeping the water cool, and providing"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, whether it be grasses, shrubs or trees. Please 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

This category includes such streamside modification as riprap (a retaining wall built of rocks or concrete) and bulkheads. It may also include placed wrecked auto bodies, refrigerators, and washing machines. People in the past have thought that such modifications helped stabilize stream banks. Unfortunately, not only do they drastically degrade habitat for stream side and instream dwellers, they can cause bank erosion in flood conditions. Mark the categories which best describe the condition of the stream bank within your 500 foot segment.

Presence of Logs or Woody Debris in Stream

Logs and woody debris (not twigs and leaves) can slow or divert water to provide important fish habitat such as pools and hiding places. So please mark the general amount of logs and woody debris in the stream. DO NOT REMOVE LOGS OR DEBRIS.

Organic Debris in Stream

The presence of other organic matter in the stream can be both good and bad. If there are dumped grass clippings, it is not good for stream health. On the other hand, naturally failing leaves and twigs can be beneficial.

Fish in Stream

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

Adjacent Land Uses

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

Conditions

This section is designed to get information about potential problem conditions at your Streamwalk site. Enter a "1" if the condition is present and "2" if it is severe.

Stream Banks

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

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

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

Garbage or junk adjacent to stream: Indicate if human-made materials 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 fishes' ability 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 the 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 judgement.

Artificial Stream modifications: Please note if the stream water has been dammed, dredged, filled, or channelized through culverts or if other large scale activities such as log removal are apparent.
***Algae/scum floating/covering rocks*:** Evidence of algae (very tiny plants that can color the water green or can resemble seaweed) or scum in the water can point to a problem such as an upstream source adding too much nutrient (fertilizer) to the water.
Foam or sheen: This is a bit of a tricky category because this type of thing can be naturally occurring or a problem. For example, an iridescent or shiny sheen on the water might be from rotting leaves or it might be from some upstream pollutant. If you are not sure, mark it on the checklist.
Garbage or junk in stream: This is your chance to point out very straightforward problems: litter, tires, hot water heaters, car bodies, and garbage dumps.

Other
Organic debris or garbage: The purpose is to determine if the stream is being used as a dump site for materials which would not be present naturally. Debris can be anything from a pop 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 stream-side degradation caused by access?
***Actively discharging pipes*:** Are there pipes with visible openings dumping fluids or water into the stream? Please note, even though you may not be able to tell where they come from or what they are discharging.
Other pipes: Are there pipes which are entering the stream? Please mark even if you cannot find an opening or see matter being discharged.
Ditches: Are there ditches, usually draining the surrounding land, which lead into the stream?

Sick Stream Symptoms

Shiny Surface or Rainbow colors – If you see rainbow color on the water's surface or if you smell oil (a gas station smell), then 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 much algae. Algae are small plants that are found in the water. Fertilizers from farms and lawns can get into streams and cause too much algae to grow. When algae break down, oxygen is used up and fish don't have enough oxygen.

Brown or Muddy Water– Too much dirt or sediment in the water. Dirt clogs fish gills to fish can't breathe. Dirt kills stream critters when it settles to the bottom and buries them. Dirt blocks light to under-water 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 meant that the water is acid from runoff from mining activities. Acid 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 may be in the stream. Soap can come from people's homes, factories or car washes. Soap harms stream critters because it breaks the surface tension of the water and insects, like water striders, 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 can make people and animals sick.

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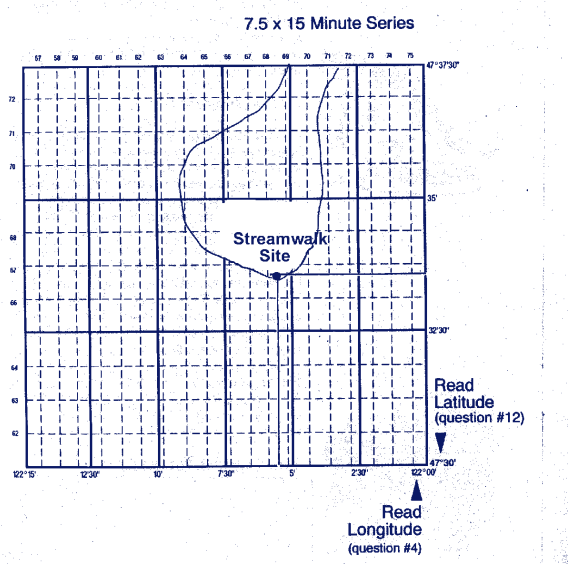
Instructions for Defining Latitude and Longitude

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 ° = degree, ‘= minute and “ =seconds. The following example may help you determine the Latitude and Longitude for your Walk.



Longitude

Look at the right side (upper or lower corner) under the map name, or the second of two numbers separated by “x”, to find the width scale (longitude) of the map:

		Your Work	Example
1)	If “7.5 Minute Series,” enter 450. If “15 Minute Series,” enter 900. If “7.5x15” Minute Series,” enter 900. If “15x30 Minute Series,” enter 900.	_____	900
2)	Using a ruler, measure the width of your map east to west (exclude borders).	_____ cm	10 cm
3)	Divide #1 by #2 to the nearest whole number	_____ sec/cm	90 sec/cm
4)	Enter the Longitude located in the lower right hand corner.	_____	122°00'
5)	Using a ruler, measure (centimeters) from your site, straight across, to the right hand side of the map.	_____ cm	3.7 cm
6)	Multiply #5 by #3 (to the nearest whole number).	_____	3.7x90=333
7)	Convert #6 to minutes and seconds by dividing by 60. Your whole number after division is the number of minutes, and the remainder is the number of seconds. (Do not use a calculator.) For example, 215 can be dividedby 60 three times. 215-180=35. So 215 converts to 3’35".	_____	333/60=5 (300 with 33 left over, or 5'33"
8)	Add #4 to #7.	_____ _____ _____	122° 5' 33'

The Answer for #8 is the Longitude of your site.

Latitude

Look at the right side (upper or lower corner) under the map name, or the second of two numbers separated by "x", to find the height scale (latitude) of the map:

	Your Work	**Example**
9) If "7.5 Minute Series," enter 450. If "15 Minute Series," enter 900. If "7.5x15" Minute Series," enter 450.	_____	450
10) Using a ruler, measure the length of your map north to south (exclude borders).	_____ cm	10 cm
11) Divide #9 by #10 to the nearest whole number	_____ sec/cm	45 sec/cm
12) Enter the Latitude located in the lower right hand corner.	_____	47°30'
13) Using a ruler, measure (centimeters) from your site, straight down, to the bottom of the map.	_____ cm	4.8 cm
14) Multiply #13 by #11 (to the nearest whole number).	_____ .	4.8x45=216
15) Convert #14 to minutes and seconds by dividing by 60. Your whole number after division is the number of minutes, and the remainder is the number of seconds. (Do not use a calculator.) For example, 215 can be dividedby 60 three times. 215-180=35. So 215 converts to 3'35".	_____	216/60=3 (180 with 36 left over, or 3'36"
16) Add #15 to #12.	_____	47°
The Answer for #16 is the Latitude of your site.	_____	33'
	_____	36'

Site Survey Data Sheet (Complete One Sheet per Site)

Location

Stream name: _____ Date: _____

County: _____ State: _____

Troop Name: _____

Contact Name: _____ Phone: _____

Site (name, description or number): _____

_____

Latitude: _____ ° _____ ′ _____ ″ **N**

Longitude: _____ ° _____ ′ _____ ″ **N**

(See instructions on pages 22-23.)

Weather *(see instructions on page 18)*

❑ Clear ❑ Overcast ❑ Rain ❑ Showers ❑ Storm

Stream Description *(see instructions on pages 18-20)*

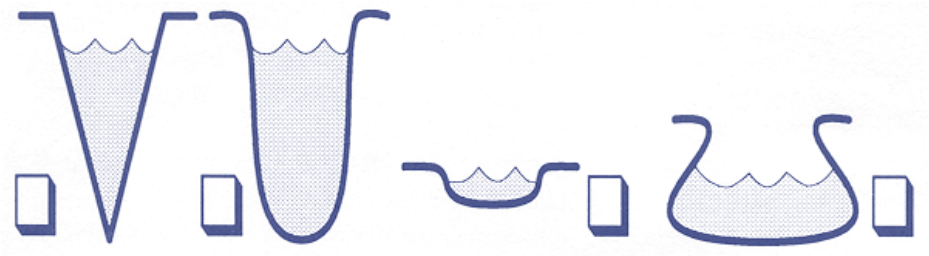
1. **Depth:** _____ feet ❑ measured (at site) ❑ estimated

   Width: _____ feet ❑ measured (at site) ❑ estimated

2. **Clarity:** Does water appear ❑ Clear ❑ Cloudy

3. **Water Flow:** (check all that apply): ❑ Pools ❑ Riffles ❑ Runs

4. **Stream Channel Cross-Section Shape:** (at site)



Site Survey Data Sheet (Complete One Sheet per Site)

4. **Stream bottom:** (check the most common)

❑ Clay/Mud ❑ Cobbles (2 - 10”)

❑ Sand (up to .1") ❑ Boulders (over 10”)

❑ Gravel (.1- 2") ❑ Bedrock (Solid)

5. **Width of Natural Streamside Corridor:** (average)

Left looking downstream: _____ Feet Right looking downstream: _____ Feet

6. **Streamside Vegetation:**

	None/Sparse	Occasional	Common
Conifers	❑	❑	❑
Deciduous	❑	❑	❑
Small trees and Shrubs (<20')	❑	❑	❑
Grasses	❑	❑	❑

Vegetation appears ❑ natural ❑ cultivated

7. **Extent of Overhead Canopy:**

❑ 0-25% ❑ 25-50% ❑ 50-75% ❑ 75-100%

8. **Extent of Artificial Bank Protection:**

❑ 0-25% ❑ 25-50% ❑ 50-75% ❑ 75-100%

9. **Presence of Logs or Large Woody Debris in Stream:**

❑ None ❑ Occasional ❑ Common

10. **Presence of Other Organic Debris in Stream:**

❑ Occasional ❑ Common

11. **Any fish present?**

❑ Yes ❑ No

Other Comments? _____

_____

Site Survey Data Sheet (Complete One Sheet per Site)

Adjacent Land Uses

(see instructions on page 20)

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

1	2	
		Residential
❑	❑	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 20-21)

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

1	2	
		Stream banks
❑	❑	Natural stream side cover degraded
❑	❑	Banks collapsed/eroded
❑	❑	Banks artificially modified
❑	❑	Garbage/junk adjacent to stream
		Stream channel
❑	❑	Mud, silt, or sand in or entering stream
❑	❑	Artificial stream modifications (dams, channels, culverts, etc.)
❑	❑	Algae or scum floating or coating rocks
❑	❑	Foam or Sheen
❑	❑	Garbage/junk in stream
		Other
❑	❑	Organic debris (garbage, grass clippings, etc.)
❑	❑	Livestock in or with unrestricted access to stream
❑	❑	Actively discharging pipe(s)
❑	❑	Other pipe(s) entering
❑	❑	Ditches entering

Other Comments?

_____

_____

_____

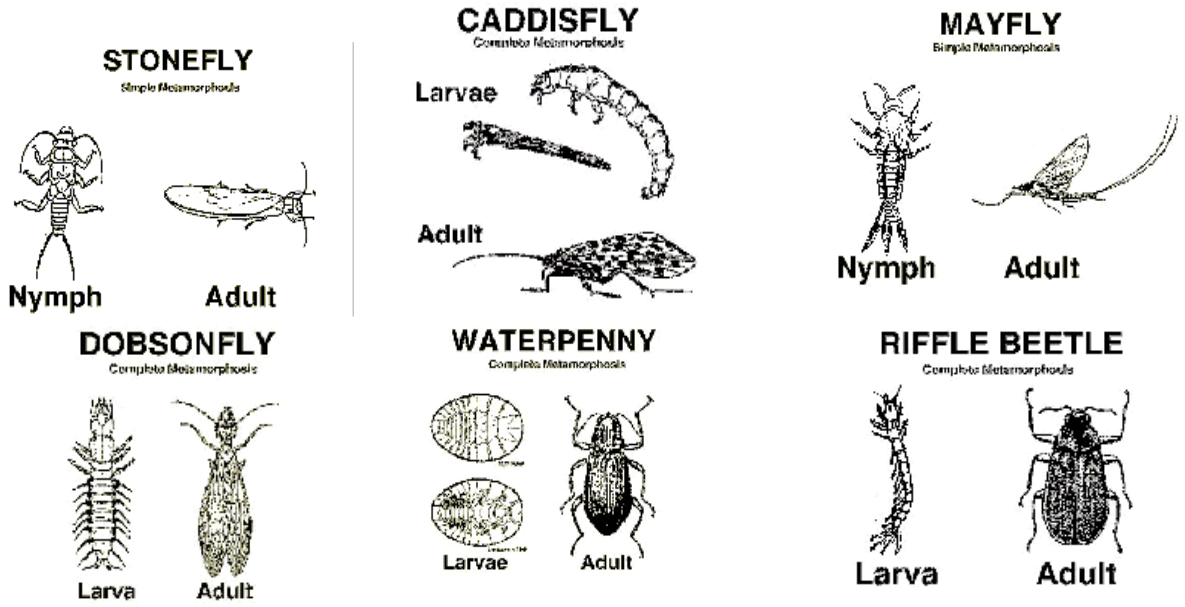
_____

Healthy Stream Critters (Cadettes & Seniors)

This activity can be done in conjunction with the Streamwalk. Be sure to observe the Streamwalk tips (page 17) and Safety-Wise Manual before conducting this activity.

There is a whole world of life in rivers and lakes. Some of the tiny animals living in the water are **benthic,** meaning they live in the bottom of the waterbody. Some are **MACROINVERTEBRATES** because they are large and easy to see (macro) and because they have no backbone (invertebrate). The most common of these creatures include insects, clams, snails, crayfish, and worms. Some live their whole lives in the water, and other leave the water as adults to feed and reproduce.

Macroinvertebrates are important as food to all the creatures living in the water. Some are considered by scientists to be **indicator species** and are a way of telling whether or not a river or lake is polluted. In rivers, macroinvertebrates live attached to rocks and plants where there is fast-flowing water. They are good indicators of water quality because they do not move around and are easy to collect. The moving water gives them food and oxygen. If the stream is polluted, there is less food and oxygen for the aquatic macroinvertebrates. If the water has pollutant-intolerant macroinvertebrate species in it, that is a good indication that the water is clean and of high quality. If there are mostly pollutant-tolerant macroinvertebrates in the water, there is a chance that the water is polluted and only those types of species can survive. Below are a few examples of macroinvertebrates that are very sensitive to pollution.



Girl Scout Troops interested in conducting biological stream monitoring may want to contact the Izaak Walton League of America (IWLA) at 1-800-BUG-IWLA to find out about training, workshops, and organizations active in their watershed. ***The Save Our Streams Monitor's Guide to Aquatic Macroinvertebrates,* by Loren Larkin Kellogg (IWLA, 1992 ($5)** may be a useful resource. In addition, Troops may want to contact their State Biologist. A list of State contacts is available on the Internet at http://www.epa.gov/owow/monitoring/bio/toc.htm or by calling the National Service Center for Environmental Publications at 1-800-490-9198. Ask for EPA Publication # 230-R-96-007.

Build Your Own Aquifer

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 groundwater to supply the public with drinking water. Home owners who cannot obtain their drinking water from a public water supply will have their own private wells drilled on their property. Unfortunately, groundwater can become contaminated by harmful chemicals, including household chemicals such as lawn care products, paints, and cleaners; agricultural fertilizers and pesticides; and oil. These chemicals can percolate down through the soil and rock and into the aquifer—and eventually the well. Such contamination can pose a significant threat to human health. The measures that must be taken by well owners and operators to either protect or clean up contaminated aquifers are quite costly.

NOTE: This demonstration should follow a troop discussion on potential sources of pollution to drinking water supplies.

OBJECTIVE: To illustrate how water is stored in an aquifer, how groundwater can become contaminated, and how this contamination ends up in the drinking water well. Ultimately, students should get a clear understanding of what happens above the ground can potentially end up in the drinking water below the ground.

MATERIALS NEEDED:

- 1 6"x8" clear plastic container that is at least 6-8" deep (shoe box or small aquarium)
- 1 lb. of modeling clay or floral clay
- 2 lbs. of white play sand
- 2 lbs. of aquarium gravel (natural color if possible) or small pebbles (As any small rocks may have a powdery residue on them, you may wish to rinse them and dry on a clean towel prior to use. It is best if they do not add cloudiness to water.)
- 1 drinking water straw
- 1 plastic spray bottle (be sure the stem that extends into the bottle is clear)
- 1 small piece (3 x 5) of green felt
- 1/4 cup of powered cocoa
- red food coloring
- 1 bucket of clean water and small cup to dip water from bucket
- scotch tape

PROCEDURE:

1. To one side of the container place the small drinking water straw, allowing approximately 1/8 of an inch clearance with the bottom of the container. Fasten the straw directly against to the long side of the container with a piece of tape. Explain to the students that this will represent two separate well functions later in 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 “ deep. Pour water into the sand, wetting it completely, but there should be no standing water on top of sand. Let students 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 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 “con-

fining layer" that keeps water from passes through it. Pour a small amount of water onto the clay. Let the students see how the water remains on top of the clay, only flowing into the sand below 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 girl scouts see the water around the rocks that is stored within the aquifer. They will also notice a "surface" supply of water (a small lake) has formed. This will give them a view of both the ground and surface water supplies which can be used for drinking water purposes.

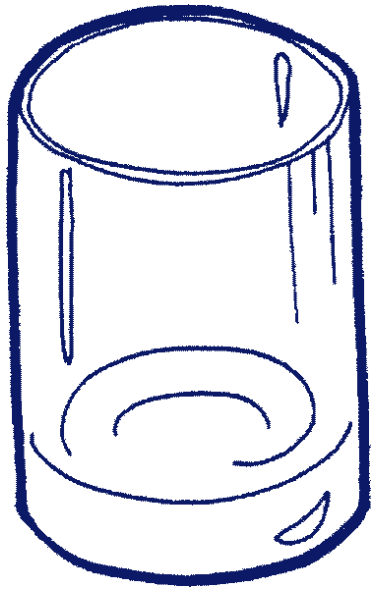
5. Next, place the small piece of green felt on top of the hill. If possible, use a little clay to securely fasten it to the sides of the container it reaches.

6. Using the cocoa, sprinkle some on top of the hill, while explaining to students that the cocoa represents improper use of lawn chemicals or fertilizers, etc.

7. Use the food coloring and put a few drops into the straw, explaining to students that often old wells are used to dispose of farm chemicals, trash and used motor oils. They will see that it will color the sand in the bottom of the container. This is one way pollution can spread through out the aquifer over time.

8. Fill the spray bottle with water. Now make it rain on top of the hill and over the cocoa. Quickly students will see the cocoa (fertilizer/pesticide) seep down through the felt and also wash into the surface water supply.

9. Take another look at the well you contaminated. The pollution has probably spread further. Now remove the top of the spray bottle and insert the stem into the straw, depress the trigger to pull up the water from the well. (Water will be colored and "polluted.") Explain that this is the same water a drinking water well will draw up for them to drink.



Glossary

Algae: A chlorophyll containing plant ranging from one to many cells in size, that lives in fresh or salt water.

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

Aquatic Insect: Insect species whose larval and/or juvenile forms live 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. The plant and animal life whose habitat is the bottom of a sea, lake, or river.

Channelized: 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.

Conifers: A cone-bearing Evergreen tree or shrub (a pine tree for example).

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

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

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

***Ecosystem*:** The interacting system of a biological community (plants, animals) and it's non-living environment.

Effluent: The wastewater from a municipal or industrial source that is discharged into the water.

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

EPA: Environmental Protection Agency.

***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.

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

Habitat: The specific environment in which an organism lives and depends on 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.

Mass Wasting: Downward movement of dry soil and rock caused by gravity (often called slides or avalanches).

Monitor: To measure a characteristic, such as streambank

condition, dissolved oxygen, or fish population, over a period of time using uniform methods to evaluate change.

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.

Nutrient: Any substance, such as fertilizer, phosphorous, and nitrogen compounds, which enhances the growth of plants and animals.

Point Source Pollution: A discharge of water pollution to a stream or other body of water, via an identifiable pipe, vent, or culvert.

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

Quality Control (QC): The system of checks that are used to generate excellence, or quality, in a program (a monitoring program for example. QC asks if we are doing things right).

Quality Assurance (QA): Quality Assurance is the larger system to see that QC is maintained. A asks if we are doing the right things (in our case are we monitoring the right things to detect changes in water quality).

Reach: A stream section with fairly homogeneous characteristics.

Redd: Shallow depression in the streambed gravel in which a female salmonid deposits her eggs.

Riffle: A shallow, gravely area of streambed with swift current. Used for spawning by salmonids and other fishes.

Riprap: A sustaining wall built of rocks.

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

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

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

Salmonid: Fish that are members 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 the water.

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

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

Stream Corridor: A perennial or intermittent stream, it's lower and upperbanks.

Stream Mouth: The beginning of a stream, where it empties into a lake, ocean, or another stream.

Suspended Sediments: Fine material or soil particles that remainsuspended by the current until deposited in areas of weaker current. They create turbidity and, when deposited, can smother fish eggs or alevins. Can be measured in a laboratory as "Total Suspected Solids" (TSS).

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

U.S.G.S.: U.S. Geological Survey.

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

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

RESOURCES

Learn about Your Watershed

Environmental Protection Agency (EPA)'s Locate Your Watershed (www.epa.gov/surf), Index of Watershed Indicators (www.epa.surf/iwi) & Adopt Your Watershed (www.epa.gov/surf/adopt) Web sites. Through these on-line services, you can locate your watershed and discover its condition and the partnerships that are working to protect it. Use Adopt Your Watershed Internet Database (www.epa.gov/surf/adopt) to find out about watershed groups active in your community. If you do not have Internet access, you can call 1-888-478-2051.

National Water Quality Inventory, 1996 Report to Congress. Published by EPA, this report includes detailed information about the condition of the nation's waters. Available by calling the National Service Center for Environmental Publication and Information (NCSEP) at 1-800-490-9198 or by faxing a request to (513) 891-6685. EPA841-R-97-008
http://www.epa.gov/305b.

Get Involved in a Local Watershed Project

Examples of groups that maintain extensive lists of volunteer opportunities throughout the Chesapeake Bay:

1) The Anacostia Watershed Society (AWS) Call 301-699-6204 or visit the AWS Web Page at http:\\www.anacostiaws.orgor. (Select the button "volunteer action schedule)"

2) The Chesapeake Bay Foundation (CBF) is also looking for volunteers of all ages to help with oyster restoration and other projects. Call 410-268-8816 or visit the CBF Web Page at http://www.savethebay.cbf.org/

3) The Alliance for the Chesapeake Bay (ACB) Call 804-775-0951 or visit ACB's Web Page at http://www.acb-online.org/involve.htm for an extensive list of volunteer opportunities in the Bay area.

Wetlands Information

Call the Wetlands Hotline 1-800-832-7828 (Fax 703-525-0201) to obtain free fact sheets, coloring books, and other useful materials on wetlands.

Visit EPA's Wetlands KIDS Web PAGE with lots of fun projects and links to other sites and activities. http://www.epa.gov/OWOW/wetlands/scinfo.html#Kids

The Izzak Walton League,707 Conservation Lane,Gaithersburg, MD 20878 (1-800-BUG-IWLA).

Bill Nye " the Science Guy" Video on Wetlands. Available from the Disney Corporation.

River of Words Poetry and Art Contest

Visit River of Words Web Page or call below to get contest details, entry forms & tips:
International Rivers Network
Attention: ROW Contest
PO Box 4000-J
Berkeley, CA 94704 USA
Tel: 510-433-7020 (voice mail) Fax: 510-848-1008
email: row@irn.org; Internet: http://www.irn.org

Cleanups/International Coastal Cleanups

Call the Center for Marine Conservation's toll-free hotline 1-800-CMC-Beach or visit the CMC Web Page—www.cmc-ocean.org—for information about sponsoring a beach cleanup or participating in the annual International Coastal Cleanup every September.

Turning the Tide on Trash: A Learning Guide on Marine Debris. Learn about marine debris and sponsor a local cleanup of marine of other water debris (free). Call NSCEP at 1-800-490-9198, 1-513-489-8190, 1-513-489-8695 (fax). Ref. EPA842-B-92-003. On the web at http://www.epa.gov/OWOW/OCPD/Marine/contents.html

Volunteer Monitoring
Several local organizations sponsor training on water quality monitoring in Maryland, Virginia and the District of Columbia, including:

1) Maryland Save Our Streams 1-800-448-5826
2) Audubon Naturalist Society (DC) 301-652-9188
3) Virginia Save Our Streams 540-377-6179
4) Izaak Walton League of America (IWLA) 1-800-BUG-IWLA (www.iwla.org/SOS/)

The following publications by IWLA may also be useful. Call 1-800-BUG-IWLA to order:

1) *Save Our Streams Monitor's Guide to Aquatic Macroinvertebrates,* by Loren Larkin Kellogg (IWLA, 1992)
2) *Save Our Streams Volunteer Trainer's Handbook,* by Karen Firehock (IWLA, 1994)
3) *Hands on Save Our Streams, the Save Our Streams Teacher's Manual for Grades One Through Twelve,* by Karen Firehock (IWLA, 1995)

Environmental Protection Agency's *Getting Started in Volunteer Monitoring*. EPA 841-B-98-002. www.epa.gov/owow/. Call (202) 260-7040 if you do not have Internet access.

The Volunteer Monitor Newsletter. www.epa.gov/owow/monitoring/volunteer/vm_index.html

EPA's Volunteer Monitoring HomePage www.epa.gov/owow/monitoring/vol.html

Wetlands, Lake and Stream Walk Manuals
Call US EPA's Region 10 Office at (206) 553-1200. Also ask for the "Teacher's Guide to Streamwalk." Wetland and Lake Walk Manuals and survey sheets are available on the Web at www.epa.gov/OWOW/wetlands/wqual.html#Volunteer. Click on "Wetlands Walk Manual and Supplement Worksheets" under Volunteer Monitoring.

Groundwater Protection
EPA's Groundwater/Drinking Water Web Page at www.epa.gov/ogwdw/kids/index.html has great science projects that can be downloaded.

Groundwater 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 at info@groundwater.org or call 1-800-858-4844.

Walk Your Watershed Festival
The Water Environment Federation (WEF) has a step-by-step guide to hosting a Watershed Festival. Available from WEF at 1-800-858-4844. Order No. ZS1603WW ($8.00 each)

Water Use/Wetlands Posters:
To order, specify poster titles and grade levels. Call or write:
U.S. Geological Survey, Branch of Distribution
Box 25286
Denver Federal Center
Denver, CO 80225
Telephone: 1-800-435-7627

Nonpoint Source Pollution
EPA's Nonpoint Source Kids Web Page: www.epa.gov/OWOW/NPS/kids/

Alliance for the Chesapeake Bay Fact Sheet on Nonpoint Source pollution www.epa.gov/owowwtr1/NPS/abc.html

This is not a complete list of available resources and mention of these products does not constitute endorsement by EPA. Visit the Adopt Your Watershed (www.epa.gov/surf/adopt) or Office of Water web page (www.epa.gov/ow) for a more complete list or call toll-free 1-888-478-2051.

Application for Troop Recognition

Watershed or Waterbody Name: _____
Troop Name: _____
Contact Person/phone: _____
Address: _____
Number of Girl Scouts: _____
Brief Description of Troop Activities: (100 words or less). Should demonstrate an ongoing commitment to the protection or restoration of a watershed.

Project Highlights/Successes:

Return to: Patty Scott, Adopt Your Watershed Project
US EPA, 401 M Street, S.W. (4501F), Washington, D.C. 20460