WATER DROP PATCH

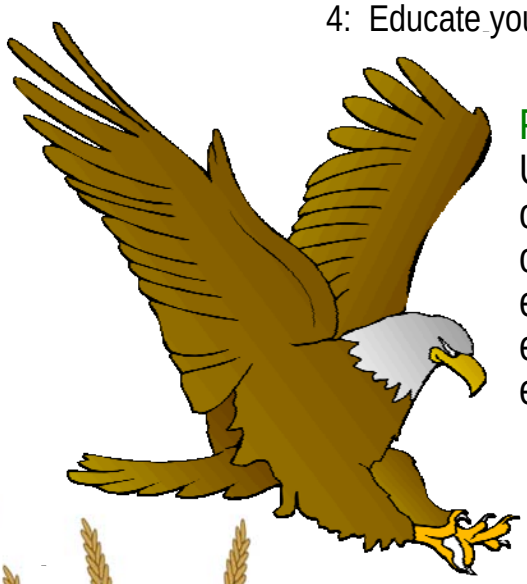
HOW$_2$ OBSERVE:
LAWS & ETHICS

Water Drop Patch
for Seniors & Ambassadors

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

GOALS:

1: Explore the condition of your local waters, and why water is important to you
2: Explore careers in water
3: Learn about Water Laws and Ethics
4: Educate younger girls, local politicians, and the public



PURPOSE:

Upon completion of this patch, you will be active in the field of water stewardship. You will have explored the condition of waters around you and why water is important to you, explored careers in water, learned about water laws and ethics, and created awareness about water issues by educating those around you.

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

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LEADERS:

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

STEP 1:

Why is water important and what do I know about water?

Water is essential for the survival of all living things! The Water Drop Patch will inspire you and show you how to protect, promote and become active in the protection of water in the environment!

USE THE MOBILE APP *HOW'S MY WATERWAY*

Use the Mobile app *How's My Waterway* to find out whether your local stream, creek, lake etc. has been monitored and, if so, what the quality of the water is. Use this app to find out where your drinking water comes from.

How much water should you drink in a day? _____
Why is water so important for your body to stay healthy?

_____
Where does your water come from?

_____
What percentage of your body is water? _____%
What does the water molecule look like?

What does a saltwater molecule look like?

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STEP 2:
Careers in Water

Did you know that the United States Environmental Protection Agency employs about 15,000 people? Did you know that each of the states and most of the territories have comparable positions to manage water resources in their states and territories? Did you know that degrees in law, economics, engineering, environmental protection, and policy, etc., can all have a water focus?

1. Make a list of all the jobs you can think of related to the protection of water and water resources and then create a "Water Careers Wordle". A Wordle is a way to generate "word clouds" from text that you provide (see *www.wordle.net*).

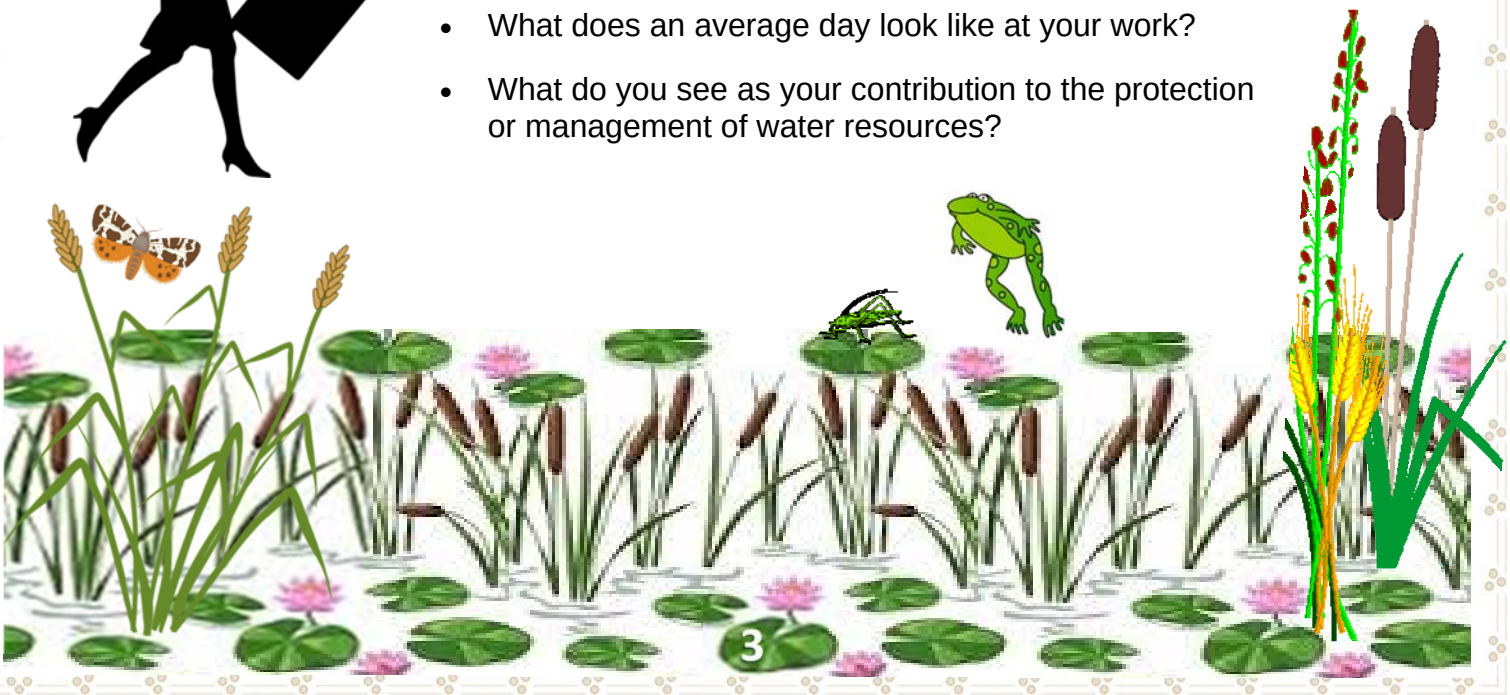
2. Find a career that interests you in the water protection/water resources field and use online resources to learn more about it.

3. Explore interning with a Federal/State/Local Environmental or Natural Resource Department or similar agency.

4. Find a woman who holds a job related to the protection of water resources and interview her about her work. (This can be in person, by email, by phone, etc.) Be creative!

POSSIBLE INTERVIEW QUESTIONS:

- How did you find your current job?
- What training did you receive in school or work for your position?
- What education did you need?
- What does an average day look like at your work?
- What do you see as your contribution to the protection or management of water resources?



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STEP 3:
Water Laws: The Clean Water Act and the Safe Drinking Water Act

Water and water resources are mostly covered by two United States laws: the Clean Water Act and the Safe Drinking Water Act, and the regulations declared by the Environmental Protection Agency. Regulations interpret the laws and explain how the law is to be followed.

- Have you ever seen people dumping anything down a storm drain or into a creek or stream or lake? These acts may be violations of the Clean Water Act.
- Have you ever read through information provided by your local drinking water supplier about the source of and quality of your drinking water? If you have a well, do you know the quality of the water?

SUPER SLEUTHS GAME:

Can you identify what's wrong with the following scenarios?

1. You see someone dumping used motor oil from their car down a storm drain.

   _____

   _____

   _____

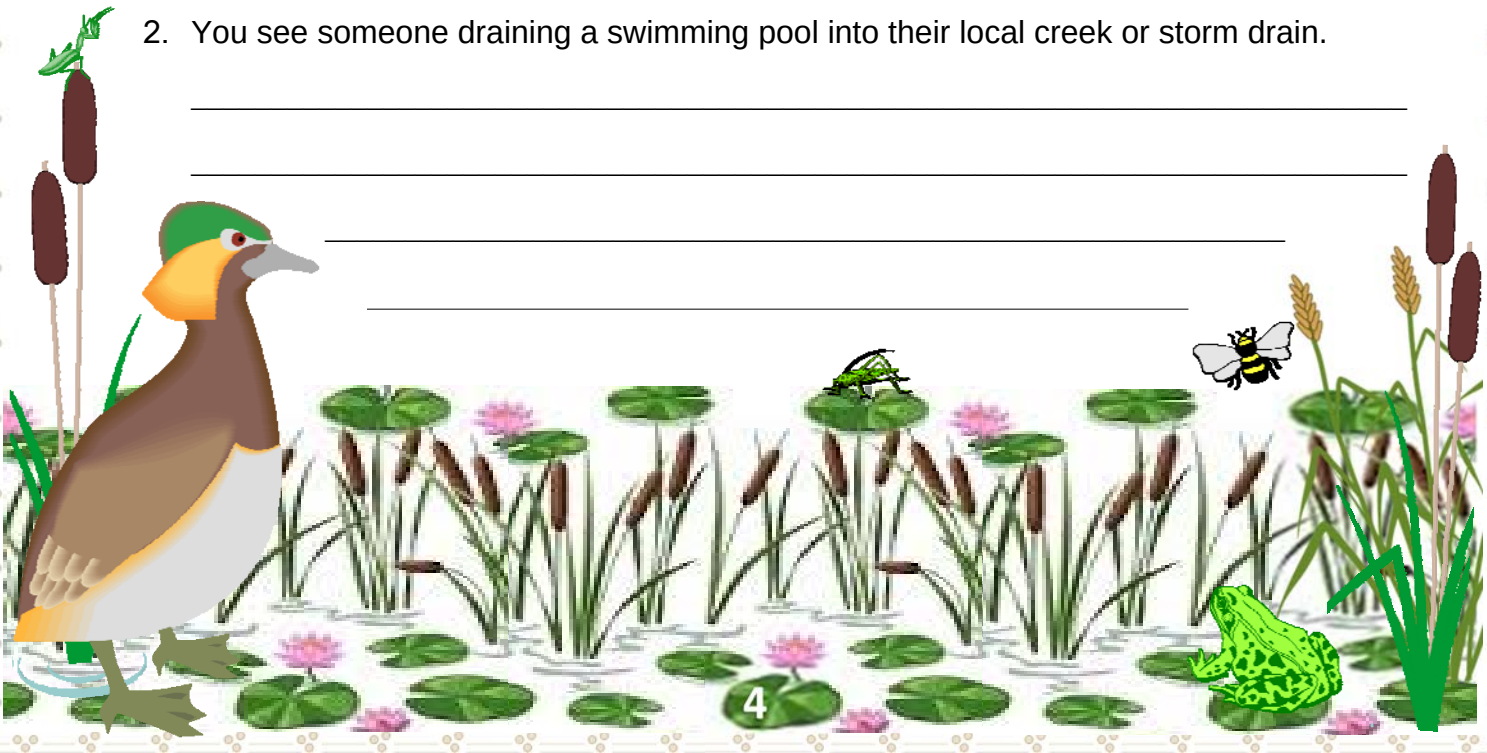
2. You see someone draining a swimming pool into their local creek or storm drain.

   _____

   _____

   _____

   _____



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STEP 4:
What Can I Do? (Pick 2 of the following 7 projects)

HELP A WATERSHED GROUP IN YOUR COMMUNITY:

Find a watershed group in your community and volunteer to help with a project. Watershed groups take community-level action to safeguard water sources. These groups are community, volunteer-based partnerships actively engaged in environmental stewardship of their watershed. They include individuals, organizations, agriculture, industry, municipalities and other forms of local government and set common goals to achieve shared outcomes. Consider applying for a Five Star Wetlands Restoration Grant with four other community partners. Visit www.epa.gov/owow/wetlands/restore/5star.

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 will begin to realize that much of what happens in the environmental world is done on a small budget.

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. Girl Scouts will help to implement a solution to a problem, and 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.

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CONSTRUCT A RAIN GARDEN:

Help your community by constructing a rain garden. Be sure to tell community members about your efforts and explain to them what a difference it can make.

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 offer many benefits such as:

- Provide landscapes in which other Girl Scouts and community members can come and learn
- Provide a sense of ownership and pride while encouraging environmental stewardship
- 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
- Provide aesthetically pleasing landscaping and natural habitat for birds and butterflies

The Low Impact Development Center's Website (*www.lowimpactdevelopment.org*), funded in part by EPA, includes step-by-step instructions on how to construct a rain garden The website includes 12 key steps along with a budget spreadsheet that can be downloaded for free. Make sure that you contact your local community before constructing a rain garden as different communities have different regulations on rain gardens. Also, you need to have a long-term plan with the property owner to maintain your rain garden.

More helpful websites for constructing rain gardens:

Using Rain Gardens to Reduce Runoff – Slow it Down, Spread it Out, Soak it in! *Webcast*
http://water.epa.gov/learn/training/wacademy/upload/raingardens_dec10_2slides-2.pdf

Experimental Rain Garden
Greening EPA Website
http://www.epa.gov/oaintrnt/stormwater/edison_rain_garden.htm

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SPONSOR A GROUNDWATER FESTIVAL OR WATERSHED FESTIVAL:

Sponsor a Groundwater Festival or Watershed Festival in your community to raise awareness about the importance of clean water and watershed protection. Work with younger Girls Scouts to accomplish this. Check out the website www.groundwater.org for more information.

Girl Scouts seek challenges in the world. They will discover what exactly is entailed in a groundwater 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.

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.

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.

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MAKE A WATERSHED PRESENTATION:

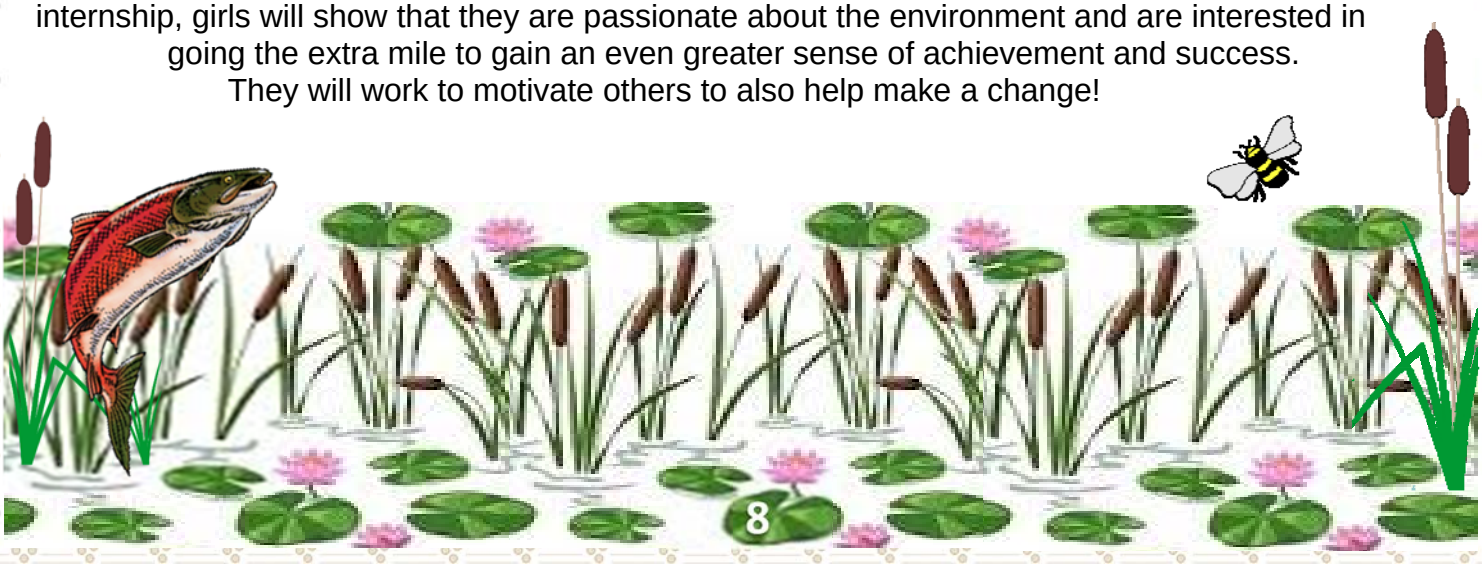
Make a presentation to your local Rotary Club, Chamber of Commerce, or locally elected officials about your watershed and potential issues of concern. Use EPA's websites (www.epa.gov/waters) and other resources to learn about existing conditions and potential threats. Girl Scouts seek challenges in the 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.

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 and show the members of the audience how they affect and are affected by the issue of concern. 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.

BECOME AN INTERN WITH A NATURAL RESOURCE AGENCY:

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. Girl Scouts seek challenges in the world. An internship with a natural resource agency is challenging. It will help girls gain skills and knowledge that they will use throughout the rest of their lives. Internships are great learning experiences.

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. 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!



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PRODUCE A VIDEO OR PUBLIC SERVICE ANNOUNCEMENT:

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 website or share the broadcast with your local television station or community cable network and the audio portion as a podcast with a local radio station.

Girl Scouts seek challenges in the world. Creating an inspiring video to educate others on the importance of watershed projection is a challenging activity. It will help girls gain skills 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.

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.

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!

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BECOME A TRAINED VOLUNTEER WATER QUALITY MONITOR:

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. The website earthforce.org has good information on volunteer monitoring and how to become active. There is also a *Streamwalk Project* attachment at the end of this document with more information on how to collect data etc.

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.

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.

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.

Photos courtesy of USEPA

Water Drop Patch: Streamwalk Project

This activity goes along with Step 4 Requirement (Volunteer Water Quality Monitor)

By completing this activity, Seniors and Ambassadors will achieve the following outcomes:

1. By learning about local water bodies, girls will gain opportunities to expand their knowledge and skills.

2. By completing a streamwalk, girls will begin to understand why and how much of what we do every day affects our local streams.

3. By using what they learn from the streamwalk, girls can learn how to set up and implement creative and effective action plans to improve stream health and to promote awareness.

By going on a stream, **wetlands** or lake walk, you can make observations and assessments about your water body's condition. By **filling** out a simple form, you can get an idea of what might be polluting your water body 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 13-15. 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 2 -11). It is important that you go through the instructions and the tips on page 12 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 13-15.

Weather

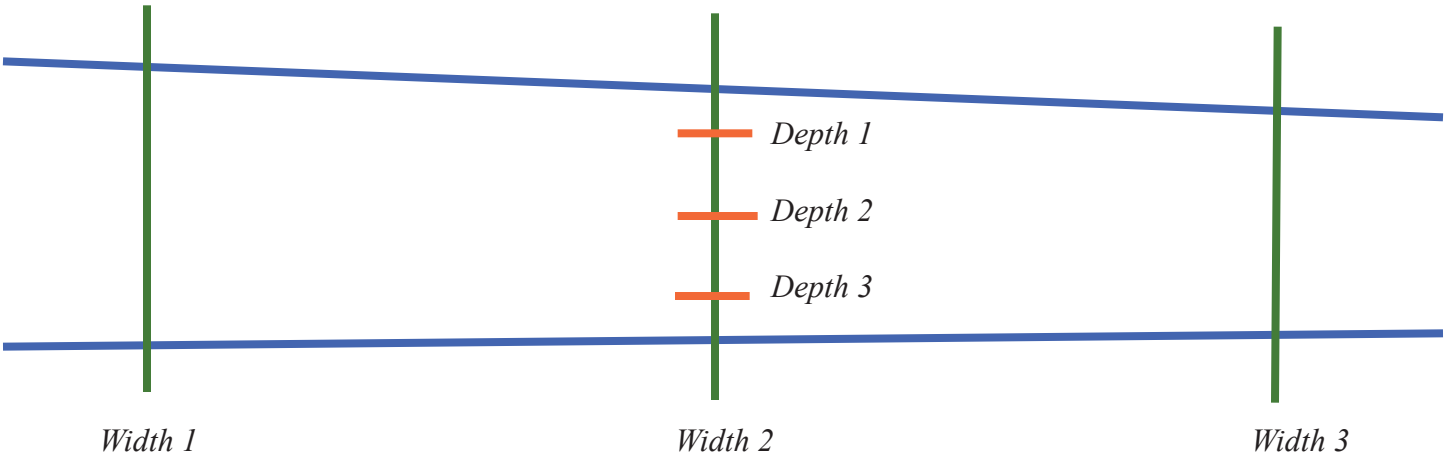
The concern with weather relates to the amount of rainfall, which potentially can affect the flow, clarity and amount of water in a stream. Weather/rainfall reports are available in the daily newspaper or by calling the local weather service. Definitions of weather conditions established by the Weather 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: 1inch 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 3.



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

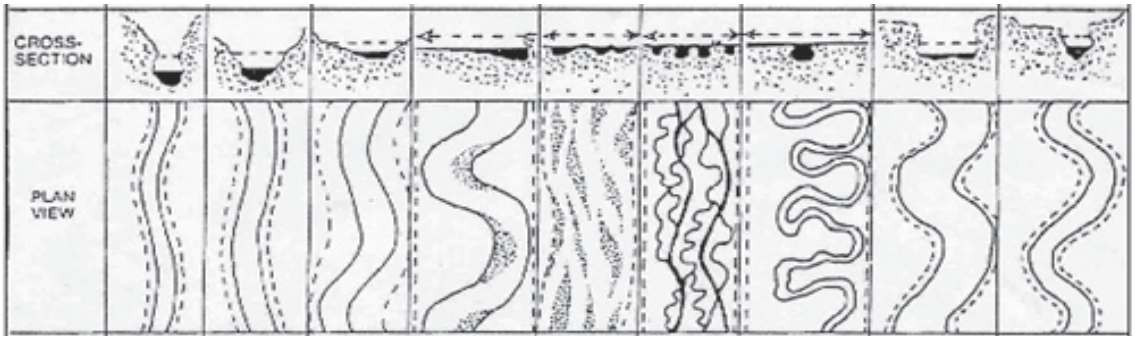


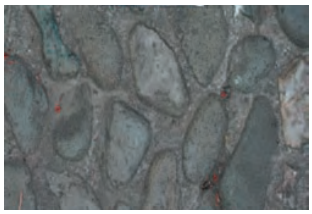
Image courtesy of USEPA

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

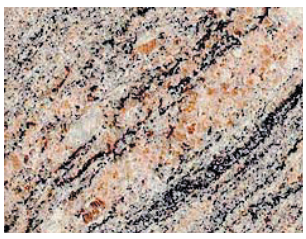
Sand (up to 1 inch): Sand is made up of tiny particles of rock. It feels soft underfoot.
Photo by Matthew Boone

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 inconspicicuous 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!

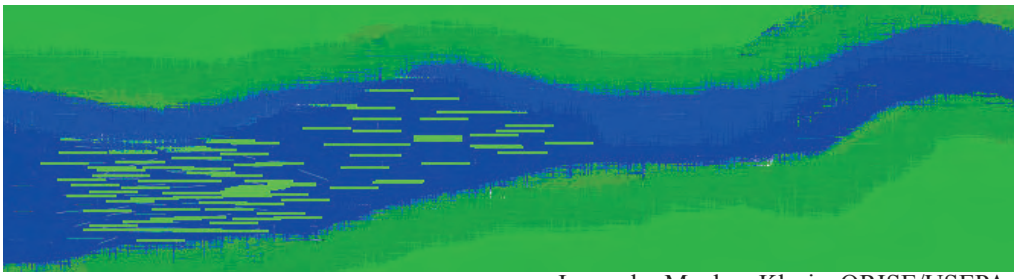


Image by Meghan Klasic, ORISE/USEPA

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 16 and 17 for more information on these aquatic creatures. While you are on page 17, 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 2): _____

_____

Latitude (pages 13–15): _____degrees _____minutes _____seconds N

Longitude: _____degrees _____minutes _____seconds N

Weather (see instructions on page 2)

Clear Overcast Rain Showers Storm

Stream Description (see instructions on pages 5–10)

1. **Depth** (pages 2 and 3)**:** _____ feet measured (at site) estimated

   Width: _____ feet measured (at site) estimated

2. **Clarity** (page 3)**:** Does water appear clear cloudy

3. **Water Flow** (page 3)**:** (circle all that apply) pools riffles runs

4. **Stream Channel Cross-Section Shape at site** (page 3)

Site Survey Data Sheet (Complete One Sheet per Site)

5. **Stream Bottom** (page 4): (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 5): average

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

7. **Streamside Vegetation** (page 5):

	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 5):

0%–25% 25%–50% 50%–70% 75%–100%

9. **Extent of Artificial Bank Protection** (page 6):

0%–25% 25%–50% 50%–70% 75%–100%

10. **Presence of Logs or Large Woody Debris in Stream** (page 6):

None Occasional Common

11. **Presence of Other Organic Debris in Stream** (page 6):

Occasional Common

12. **Any Fish Present** (page 6)?

Yes No

Site Survey Data Sheet (Complete One Sheet per Site)

Adjacent Land Uses

(see instructions on page 6)

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 6 and 7)

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:

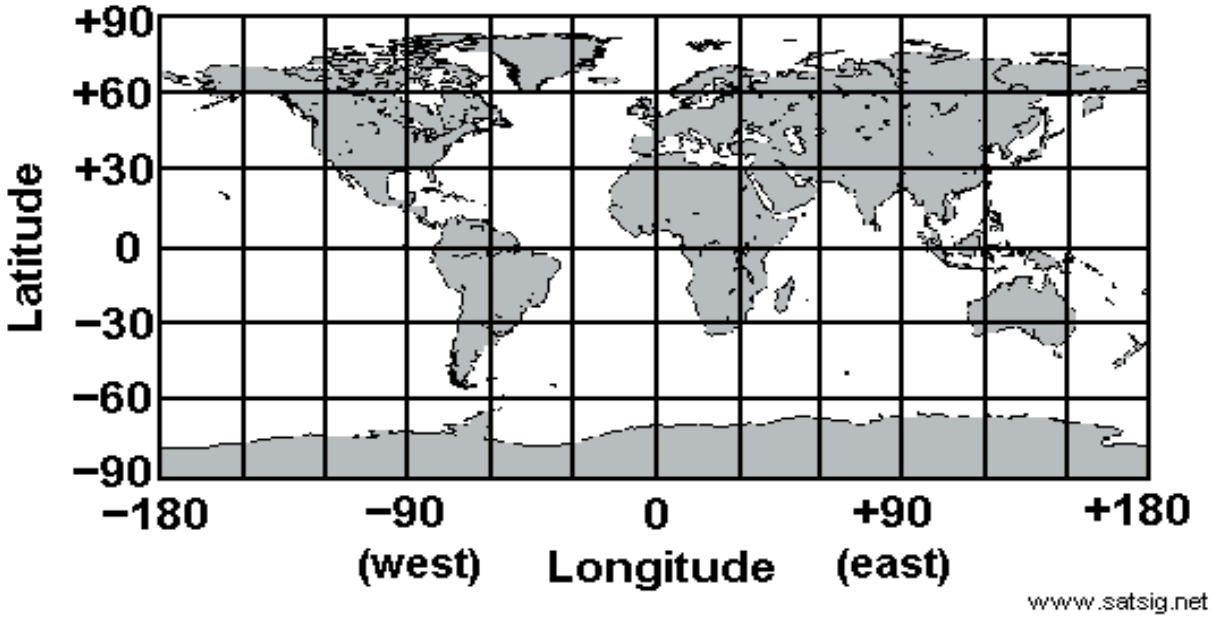
- Photocopies of topo map of stream to be walked
- Snag- and thorn-proof clothing
- Streamwalk data forms
- Folding ruler or tape measure
- Leather gloves
- First aid kit
- Comfortable rubber boots
- Clipboard with waterproof cover
- Two pencils
- Camera and film in waterproof bag
- Whistle
- Cell phone

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:

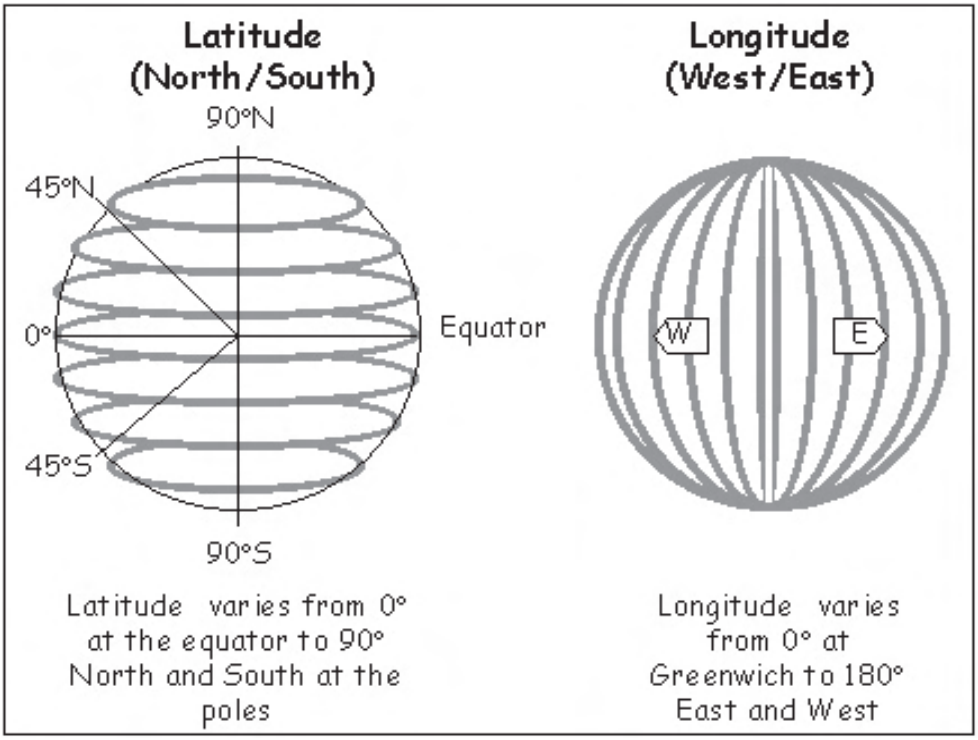


Image courtesy of *fedstats.gov*

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:

º = degrees ′ = minutes ″= seconds

Because lines of latitude are measured from the equator, all locations on the equator are at 0º 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 0º 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 = **38º 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.

Image courtesy of Google

Reference: Healthy Stream Critters

The information on the following two pages can be used in conjunction with the Streamwalk Project (Water Drop Patch Step 4 Requirement: Volunteer Water Quality Monitor).

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 macroinvetebrates 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 beetles have 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 Macroinvetebrate 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