



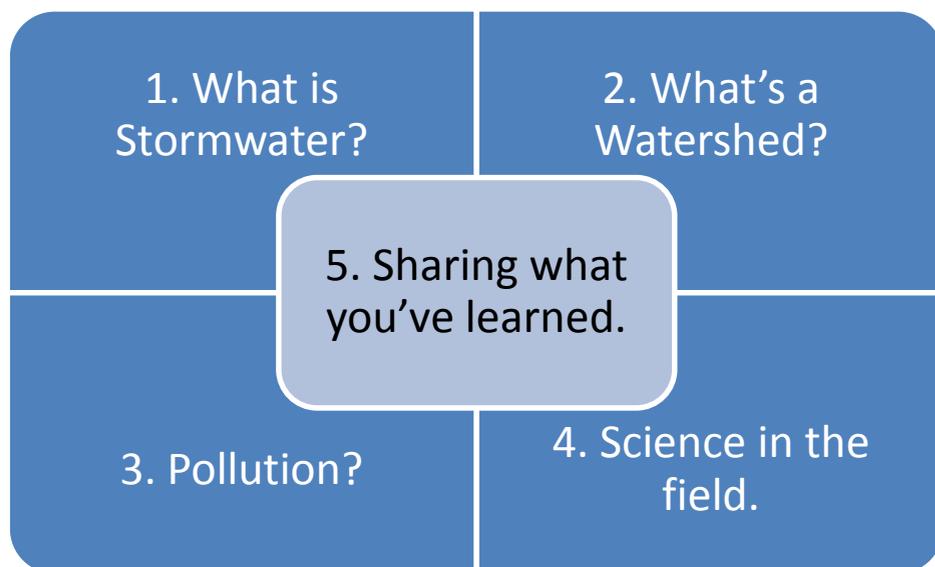
# Girl Scouts are Storm Water Smart

Girl Scout Leader Edition

Created for the *Girl Scouts of Greater Atlanta*  
By the DeKalb County Department of Roads and Drainage

The Girl Scouts are Storm Water Smart patch is here to help you learn about storm water in your community and the role you play in keeping your streams and rivers healthy and clean.

There are five steps to completing this patch:



*"I will do my best to ... use resources wisely ...make the world a better place."*

Your girls can do steps 1-3 in any order, but should finish with steps 4 and 5.

The goal of the Storm Water Smart Patch is to help girls grow in their awareness, understanding and appreciation of the watersheds they live in, and the stormwater systems that serve to benefit their communities.

Some of the Girl Scout Outcomes, girls will benefit from as they complete these activities include:

**Discover Outcome #4:** Girls develop positive attitudes toward learning, seek opportunities for expanding their knowledge and skills, set challenging goals for themselves, and take appropriate risks.

**Connect Outcome #5:** Girls feel that they are part of a larger community and recognize the importance of building diverse, supportive, social networks for their personal and leadership development.

**Take Action #1:** Girls learn to identify issues in their local and global communities and come up with realistic possibilities for action.

**Take Action #4:** Girls learn to effectively explain their ideas to others and motivate them to get involved in community service and action.

## Connections to Girl Scout Badges:

### Brownies- WOW! Wonders of Water Journey

Brownie Girl Scouts working on their WOW! Wonders of Water Journey, will find connections throughout this patch program.

### Juniors- Do it Yourself Gardner Badge

Rain gardens and rain barrels are increasingly used in storm water management. Steps 2, 3, and 5 of the gardener badge, can be related to the design and planting of a rain garden in your community.

### Cadettes- Girl Scout Way Legacy Badge

Step 4 of the Girl Scout Way badge is Leaving Your Camp Better Than You Found It. Girl Scout Camp, with approval and maybe help from the Ranger, is a great place to follow the path of stormwater and compare how it works in a natural environment as opposed to a more urban or developed environment. Perhaps your camp could use a BMP or a clean up event for storm water that comes in from upstream in the watershed.

### Seniors- Girl Scout Way Legacy Badge

Step 4 of the Girl Scout Way badge is Leaving Your Environment Better Than You Found It. This is a great connection to Step 5's, Sharing What You've Learned.

### Ambassadors- Water Legacy Badge

Connections can be found throughout this patch to the Ambassadors Water badge. Visiting water in its natural state includes looking at how storm water plays a role in what you see, the optional storm water art suggestion provides examples of starting points for Celebrating Water Art. Steps 3 and 4 of the Water badge match with learning about how your community handles storm water, as well as water and waste water, and shadowing a professional. The final steps of both this patch and the Water badge are taking time to share what the girls have learned with others.



## A few brief notes,

- Mention of commercial products, publications, or Websites does not constitute an endorsement or recommendation for use by DeKalb County or its contractors, and shall not be used for advertising or product endorsement purposes.
- Always consult with the Volunteer Essentials: Activity Checkpoints to ensure Girl Scout safety guidelines are followed when working with girls.
- Please take a moment to discuss with girls that while it is important to learn about stormwater features in their communities, it is just as important to be safe when interacting with those features. Girls should be sure to never play in storm drains, culverts, etc. You never know when someone might slip or if there is a not so friendly creature living inside.
- Activities for the Girl Scouts are Storm Water Smart Patch are suggestively grouped into two age groups, Girl Scout Brownies and Juniors, and Girl Scouts Cadettes, Seniors, and Ambassadors. However, girls are welcome to complete activities from either grouping as you feel most appropriate for your group.
- You'll notice that some activities are the same for both older and younger scouts, and that the suggestion is sometimes for older scouts to assist the younger scouts in completing the same or similar activity.
- Although DeKalb County Roads and Drainage worked to create this patch program, we hope that it will be used by girls across the region to increase their knowledge of storm water in their communities. Because this means a wide variety of locations and municipalities we have attempted to compile a list of contacts and resources at the end of this booklet. By reaching out to your local county or city services, we hope you will receive additional resources and assistance in helping your scouts become Storm Water Smart.

DeKalb County Public Works Department,  
Roads and Drainage Division, Stormwater Section  
727 Camp Rd. Decatur, GA 30032  
(404) 294-2878



*It might be helpful to make a **Storm Water Friendly Glossary and Guidebook** to use during this patch. We've included the following words to help you get started, and lots of space for notes and sketches.*

**Leader Tip:** While not one of the 5 steps girls need to take to complete this patch, this activity is suggested at the front of both guides for girls. The first listing below includes suggested terms that might come up for Brownies and Juniors, while the second listing is for older girls. You might provide these terms for the girls, have them do them all at once, or fill them in as they come up. The girl guides have extra pages in the rear for taking notes, making sketches, etc.



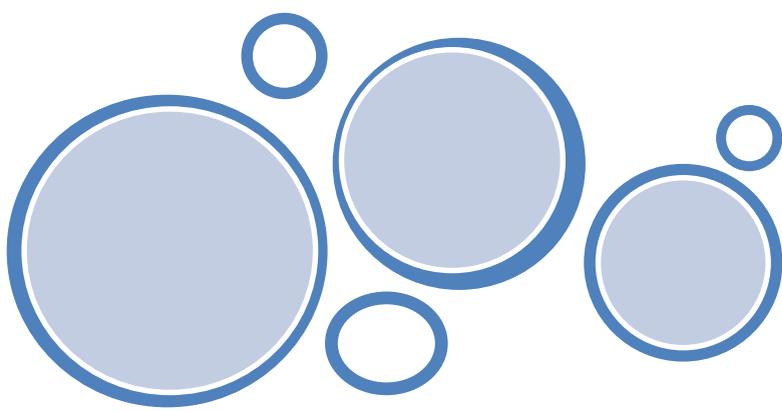
- Best Management Practice (BMP)
- Catch Basin
- Combined Sewer System
- Detention Pond
- Erosion
- Fecal Coliform Bacteria
- Hazardous Waste
- Impervious Surface
- Land Use
- Municipal Separate Storm Sewer System (MS4)
- Non-point Source Pollution

- Pervious Surface
- Point Source Pollution
- Retention Pond
- Runoff
- Storm Drain
- Storm Water
- Waste Water
- Waste Water Treatment Facility
- Water
- Water Treatment Facility
- Watershed

B's & J's

- Best Management Practice (BMP)
- Bio-Swale
- Catch Basin
- Combined Sewer System
- Detention Pond
- Dry Well
- Erosion
- Fecal Coliform Bacteria
- Hazardous Waste
- Hydrologic Unit (HUC)
- Impervious Surface
- Land Use
- Municipal Separate Storm Sewer System (MS4)
- Non-point Source Pollution
- NPDES Permit (Phase 1 and Phase 2)
- Pervious Surface
- Point Source Pollution
- Retention Pond
- Runoff
- Sedimentation
- Storm Drain
- Storm Water
- Swale
- Waste Water
- Waste Water Treatment Facility
- Water Treatment Facility
- Watershed

C's, S's & A's



## 1. Water is everywhere, but what is Stormwater?

Choose one of the following:

We've all heard the saying, water, water, everywhere, but not a drop to drink. Stormwater is water we often don't think about after it initially appears. Unless of course, it decides to stick around. Girls should choose to either learn about the differences in Water, Waste Water, and Storm Water management in their community or if they feel confident in the differences between water and stormwater, go out and visit some storm water infrastructure in their community.

B's & J's

### **Learn about Storm Water features in your community.**

Learn the differences between a retention pond and a detention pond.

Try to find examples of both in your community. Find a storm drain where it is safe to walk around and view from all angles. Talk about how it works and sketch the drain in your guidebook; remember to include parts that might be hard to see, like the catch basin underground.



**Leader Tip:** This is an important time to discuss how to safely learn about and interact with storm water infrastructure.

C's, S's & A's

**Learn about Storm Water features in your community.** Learn about the following stormwater features, try to find as many as they can in your community. Some may be easier to find than others, and some may go by a different name. Talk about how each works and draw sketches in your guidebook; (remember to include parts that might be hard to see, like the catch basin underground).

- Storm Drain
- Catch Basin
- Swale
- Bioswale
- Dry Well
- Detention Pond
- Retention Pond

## Learn the difference in Water, Waste Water, and Storm Water.

Visit a Water Treatment and or a Wastewater Treatment facility. Create a list of questions to ask before the visit, some examples are:

- How does water come out of our faucets and where does this water come from?
- How is this water cleaned so it is safe for drinking purposes?
- Where does this water go when it goes down the drain?
- How does this differ from the stormwater in the streets?
- What type of water is treated at a wastewater treatment facility?
- Where does this water come from and where does it go after it is treated?
- Name some things not removed from the wastewater during the treatment process?
- What are combined sewers? Does my area have combined sewers?
- Where does stormwater come from and where does it go after it enters the street drains? Is stormwater treated?

## Learn the difference in Water, Waste Water, and Storm Water.



Conduct research online or at a library about the differences in a Water Treatment Facility and a Wastewater Treatment Facility. Reach out to your local city or county government and ask about their NPDES permit and if they are an MS4 system, try to find out if you can interview people whose work involves these permits and systems. You should:

- Find out who is in charge of the local NPDES permit, and some of the regulations they have to meet to keep their permit.
- Find out if your area operates as a MS4 System or if your area uses a combined system.
- If they have a MS4 system, is it a Phase 1 or Phase 2?
- Ask if they can describe some of the BMP's they have in place for stormwater.
- Come up with some of your own questions based on the definitions you find for your glossary.

## 2. What is a Watershed?

A watershed is like a bathtub. All of the storm water that falls within a single watershed will drain to one final location. Watersheds vary in sizes, with smaller watersheds draining to larger watersheds. Girls often know that all water “goes to the ocean”, but not how it travels there.

Included in the reference material for this patch, is a NRCS guide on how to read a topographic map and delineate (map) a watershed. If you can identify the high points and water ways in your area, then you’ll be good to go!

Girls should first map their watersheds and discuss what they see, then decide if they want to look at their watershed as it moves forward in time (Current Issues) or its past (Local History).

B’s & J’s

**Map your watershed.** Find a simple topographic map of your community and discuss how the lines show elevation and which areas are higher or lower than others. Use highlighters or light colored markers to mark the boundaries of your watershed, and where the water exits your area. Try to also mark the location of your home or school on the map; is there anywhere else you visit often that you can find?

Discuss with others who lives upstream or downstream of various locations, does everyone live in the same watershed? Learn about the different types of land use in your watershed. What land uses are the most common? What types of pollution might come from those land uses?

C’s, S’s & A’s

**Map your watershed.** Map your watershed using a simple topographic map of your community. Discuss how the lines show elevation and which areas are higher or lower than others. Use highlighters or light colored markers to mark the boundaries of your watershed, and where the water exits your area. Also note on the map places you frequent, like your home, school, grocery store, etc. As well as areas of similar land use within your watershed and if areas are densely developed or the area is larger undeveloped. Does everyone in your group live in the same watershed? Discuss your findings.

Using larger maps, try to follow the path water takes out of your watershed and its journey downstream. Follow a drop of water all the way to the ocean, does their watershed lead to the Atlantic Ocean or into the Gulf of Mexico. Learn about the Hydrologic Units system used to group watersheds by size. Find out what your watershed's size is and make a table showing all the larger watersheds it is a part of on the path to the ocean.

Learn about the different types of land use in your watershed. What land uses are the most common? What types of pollution might come from those land uses?

B's & J's

**Current Issues.** Attend a local meeting, lecture or educational program about a local waterway, or keep track of any newspaper articles or stories they hear on the news, that are related to water quality, storm water, or water infrastructure in your area for a month.

**Local History.** Discuss how your watershed has changed in the last 10 years, 50 years, 100 years, etc. How did the waterways near you affect the beginnings of your community? How has the stormwater been affected by the changes in your community?

Interview community members or older family members who might have seen some of these changes.

You should start the interview by teaching their interviewee about the idea of a watershed and what you know of the storm water system in your area.



C's, S's & A's

**Current Issues.** Attend a local meeting, lecture or educational program about a local waterway, or keep track of any newspaper articles or stories you hear on the news, that are related to water quality, storm water, or water infrastructure in your area for a month. **Additionally, choose one of the following:**

Cadettes, Seniors and Ambassadors who choose to look at the Current Issues of their watershed, have this extra step because it is likely that they will have school courses that relate to the interstate relations and role of government in the tri-state water wars and or how local governments plan and engineer infrastructure additions.

Contact local professionals or officials to find out about your watershed's relation to the tri-state water wars. Is it involved, what does it mean for the future of the watershed, etc.?

Contact local professionals or officials to find out if there are any major infrastructure changes planned for the water, waste water or storm water systems in your community.

**Local History.** Discuss how your watershed has changed in the last 10 years, 50 years, 100 years, etc. How did the waterways near you affect the beginnings of your community? How has the stormwater been affected by the changes in your community?

Interview community members or older family members who might have seen some of these changes.

You should start the interview by teaching their interviewee about the idea of a watershed and what you know of the storm water system in your area.

### 3. There's more than one type of pollution?



Everyone knows pollution is bad, but not everyone realizes we have multiple types of pollution. Some pollution is very visible like litter, some is invisible like bacteria, some is easy to spot the source (Point Source) and some seems to come from everywhere (Non Point Source).

Point Source Pollution is what we typically think of when we think of pollution in our rivers, a pipe coming out of factory. It is easy to identify the single source, because we can simply “point to it”. Non Point Source Pollution however is the biggest threat to our waterways, because it comes from all over and doesn't have one clear source.

Brownies and Juniors can learn about Non Point Source Pollution by completing the Fred the Fish activity found in the reference materials for this patch, (or one of the other suggested activities for Non Point Source Pollution). Cadettes, Seniors and Ambassadors should help a group of younger girls complete a Non Point Source Pollution Activity.

After they've learned about Non Point Source Pollution, girls should pick one of the three follow up activities to explore a specific type of Non Point Source Pollution.

#### B's & J's

**Erosion and Sedimentation.** Define erosion and sedimentation, and compare and contrast pervious surfaces with impervious surfaces. Which were there more of in your community 50 years ago? Which are there more of now? How does the amount of pervious and impervious surfaces affect erosion in your watershed? How might erosion affect the storm water system in your community?

Try to find examples of impervious surfaces, pervious surfaces and erosion in your community. What was causing the erosion, is there a way to stop the erosion? Remember that erosion is a natural part of the weathering process and not always a bad thing!

**Hazardous Wastes.** Contact your local hazardous waste recycling center and ask if you can visit for a guided tour. Keep in mind different facilities will accept different types of hazardous wastes. Before you visit, create a list of questions to ask at the facility, examples include:

- What are the hazards caused by hazardous wastes entering our waterways?
- Is there a charge to drop off hazardous wastes?
- How much is it?
- List five common hazardous wastes around your house and yard.
- What do you do with them?
- How is a hazardous waste landfill different from a regular landfill?



**Be a Pooper Scooper.** Pet owners who walk their dogs are responsible for any droppings their pet leaves behind. When pet waste is not picked up, it can be washed into the sewer system by rainfall or melting snow, and travel through the stormwater system into a stream. The pet waste becomes run-off and the bacteria pollute our waterways. In some cities and counties, it is illegal for dogs to run loose without a leash. If no one is walking with a dog, who will pick up after the dog?

Invent a pooper scooper a pet owner could carry along while walking their dog. Be sure it includes a place to hold the pet waste until the owner arrives home or passes by a trashcan. Draw a picture or make a model of your design and label the parts. What is the pooper scooper made of, where would you buy it, and how much would it cost? Where could you advertise your pooper scooper?

**Erosion and Sedimentation.** Define erosion, and compare and contrast pervious surfaces with impervious surfaces. Which were there more of in your community 50 years ago? Which are there more of now? How does the amount of pervious and impervious surfaces affect erosion in your watershed? How might erosion affect the storm water system in your community? Try to find examples of impervious surfaces, pervious surfaces and erosion in your community. What was causing the erosion, is there a way to stop the erosion? Can you find where the sediment goes after it is eroded?

Remember that erosion is a natural part of the weathering process and not always a bad thing! Can you find any examples of a major change in your watershed based on erosion and the buildup of sediment in a new place?

Try to find out if any BMP's related to pervious and impervious surfaces have been installed in your community. Are there pervious pavers, pervious pavement, etc. Are there any BMP's put in place to combat erosion? If yes, try to arrange a visit to the BMP with a professional who can explain how the BMP works and why it was chosen.

**Hazardous Wastes.** Contact your local hazardous waste recycling center and ask if you can visit for a guided tour. Keep in mind different facilities will accept different types of hazardous wastes. Before you visit, create a list of questions to ask at the facility, examples include:

- What are the hazards caused by hazardous wastes entering our waterways?
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In some cities and counties, it is illegal for dogs to run loose without a leash. If no one is walking with a dog, who will pick up after the dog?

Find out about the legal codes in your community. Develop a PSA to help your community remember to Scoop that Poop!

## 4. Girls Do Science!

Choose one of the following.

Arrange to “shadow” a water quality professional while they conduct a monitoring event in the field. Make sure you have some interview questions ready for them about what they are doing and why, as well as how they prepared for this job, and any special training they received in school.

Work with other Girl Scouts in your community to host a water quality monitoring event in conjunction with World Water Monitoring Day, (officially observed on September 18<sup>th</sup> each year).

**Leader Tip:** This step is the same for all girls!

The Storm Water Art activity is not required to complete the patch, though some girls might already participate in one of the local contests through their school.



If you're feeling Inspired, why not make some Stormwater Art?

Submit an entry to one of the following programs, some might have a fun prize.

Georgia River of Words Poetry and Art contest, or submit one entry as a group.

A local contest like DeKalb County Department of Watershed's Art Calendar Contest.

One of the three contests held annually by the Metropolitan North Georgia Water Planning District.



## 5. Sharing your Stormwater! Choose one of the following.

**Leader Tip:** This step in completing the patch should serve as a final wrap up for everything your girls have learned. There are 6 ideas provided, as well as a suggestion for girls to create their own way to share their new knowledge with their community.

Many of the provided project ideas build on an early step, allowing girls to carry themes and interests throughout the patch.

B's & J's

**Stream Clean-Up Event.** Participate in a stream clean-up day, a good place to find an event is through Rivers Alive. <http://www.riversalive.com/>

**Stream Monitoring.** Adopt a stream reach near you and conduct routine monitoring, share your findings in your community. Monitoring should be conducted 4-12 times a year, depending on the type of monitoring conducted.

**Leader Tip:** Check with the AAS coordinator or similar professional in your area about certification requirements, it is likely that an adult will be need to be certified and the girls can "assist" in the monitoring and recording of data.  
<http://www.georgiaadoptastream.com/>

**Leader Tip:** Many municipalities will be able to provide you with the supplies needed to participate in their storm drain marking campaigns.

**Storm Drain Marking.** Participate in a storm drain marking project, different communities use stencils, plaques or paint. Create door hangers or pamphlets to hand out to homes or businesses near your storm drain, sharing information you think is important about storm drains.

**Planting Projects.** After learning about erosion, find out if there are any stream bank restoration projects occurring in your area. Participate in an ongoing project, or find a community resource that can help you identify another space in your community that would benefit from the planting of native species.

B's & J's

**Green Cleaning Event.** Research "green cleaning" methods and or "green gardening" methods and create a "wheel of alternatives" to pass out in your community, to help people switch away from hazardous wastes. Be sure to include information about where to properly dispose of hazardous wastes and or how to properly store those you might have around your home. If you have a hazardous waste recycling center nearby, find out if they would be willing to let you host a drop off event for the community.

**Install a BMP.** Contact your local stormwater managing group; this might be the city, county, or a third party. Try to find out if they have any upcoming projects your girl scouts could assist with. For example, do they have any rain barrels that can be painted and or installed? Are they doing any rain garden planting soon?



**Create Your Own.** Based on something you've learned from a previous activity, develop your own community service and education project. Your project should help the community learn about storm water, watersheds, and or why knowing about water quality is just as important as knowing about water conservation.

C's, S's & A's

**Stream Clean-Up Event.** Work with others in your community to hold a stream clean-up day. You'll need to decide where you will host the event, and plan where the "trash and debris" will go after the event and how they will get there. A good place to start for resources is with <http://www.riversalive.com/>

**Leader Tip:** Check with the AAS coordinator or similar professional in your area about certification requirements.

<http://www.georgiaadoptastream.com/>

**Stream Monitoring.** Adopt a stream reach near you and conduct routine monitoring, share your findings in your community. Monitoring should be conducted 4-12 times a year, depending on the type of monitoring conducted.

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**Leader Tip:** Many municipalities will be able to provide you with the supplies needed to participate in their storm drain marking campaigns.

**Planting Projects.** After learning about erosion, find out if there are any stream bank restoration projects occurring in your area. Participate in an ongoing project, or find a community resource that can help you identify another space in your community that would benefit from the planting of native species.

**Install a BMP.** Research stormwater BMP's that are in use in your community, are there any you like the most, and are there any you think are missing? Work to find a community partner location that will help you install the BMP of your choice. It is important to think long-term about who will conduct any needed maintenance and who will be responsible for the cost. You can also contact your local stormwater managing group; this might be your city or county and ask if they have any BMP's they would allow you to assist with.

**Leader Tip:** It is important to think about any long-term commitments when selecting projects like installing a BMP. Who will conduct maintenance, who will be responsible for the costs associated with the maintenance. Installing their own BMP at a location significant to them is a wonderful opportunity for the girls, but they should be prepared to arrange for someone to take over after their gone.

An example is installing a rain barrel or rain garden at the troops meeting location, what happens when all of the Ambassadors go to college? Who makes sure the rain barrel is emptied in the winter? Who weeds the rain garden?

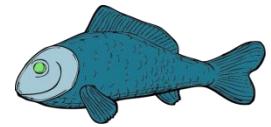
The girls might formulate a contract of sorts for another party to be involved with the project to alleviate any future worries.

**Green Cleaning Event.** Research "green cleaning" methods and or "green gardening" methods and create a "wheel of alternatives" to pass out in your community, to help people switch away from hazardous wastes. Be sure to include information about where to properly dispose of hazardous wastes and or how to properly store those you might have around your home. If you have a hazardous waste recycling center nearby, find out if they would be willing to let you host a drop off event for the community.



**Create Your Own.** Based on something you've learned from a previous activity, develop your own community service and education project. Your project should help the community learn about storm water, watersheds, and or why knowing about water quality is just as important as knowing about water conservation.

## Reference Materials



- Fred the Fish
  - Sum of the Parts (Additional Non-Point Source Pollution Activity Option)
  - After the Storm (Additional Non-Point Source Pollution Activity Option)
    - How to find your Watershed
    - Hazardous Waste Recycling
      - Local Contacts Guide
  - How to read a Topographic Map and Delineate a Watershed
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Fred the Fish is a very good teaching tool of Non-Point Source Pollution, but because it is thought highly of, your girls may have already meet Fred. If this is the case, or you feel it would better to focus your energy on other portions of the patch, we've included two other activities that offer chances for discussion and that don't require as many materials.

We also feel that most municipalities in the region would be willing to work with your group to offer additional Non-Point Source Pollution education materials or programs if you reached out to them.

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DeKalb County compiled the included listing of suggested county contacts for girls in the counties comprising the Girl Scouts of Greater Atlanta Council. This list is up to date as of early January 2016, but is not meant to be exhaustive.

Services offered within individual counties may change departments and change phone numbers at any time. Additionally, many (incorporated) cities offer their own services, like stormwater management, to their residents, either privately or through an agreement with their county.

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Additional resources may be found by reaching out to local environmental groups like riverkeepers, Friends of groups, etc.

You can find some of these groups by visiting,



<http://www.garivers.org/protect-your-river/discover-a-local-river-group.html>

You can search using a map based on major river basins, so it might be helpful to know which watershed you are located in.

# Fred the Fish Non-Point Source Water Pollution Activity.

## Materials and Equipment:

Script Pages (per girl)	A medium sized strainer	A Pencil
A pair of scissors	5 small cups or jars	Cold tap water*
9 large index cards	¼ cup soil*	Warm tap water*
A glue-stick or some tape	¼ cup brown sugar (fertilizer)*	Red food coloring (sewage)*
A light colored sponge	¼ cup pancake syrup or molasses (oil)*	Green food coloring (toxic waste)*
A yarn needle (or similar)	Salt	A paper and pencil per girl
A small weight or metal nut	Punched paper dots (litter)*	
Two 4-5 inch pieces of string or yarn*	A medium beaker or glass jar	*amounts can scale based on size of Fred's habitat
A large wide mouthed jar, beaker, pitcher, etc. (Habitat)	¼ cup detergent*	

## Focus:

Without water, life would be impossible. We use it in many ways- for drinking, bathing, recreation, farming and manufacturing. We depend upon a continuous supply of clean water, yet each time we use it, we change it- sometimes by polluting it.

## Challenge:

In what ways do we pollute water? How can we clean the water we pollute? How can we prevent water pollution?

Time: 45 Minutes-1 Hour (Steps 1-4 can be done in advance of presentation to girls)

## Procedure:

1. Copy and cut apart the nine roles from the script, and attach them to the large index cards with tape or glue.
2. Cut a fish shape out of the sponge. Use the yarn needle to thread a string through the bottom of the fish, attach a weight to the string so it hangs below the fish.
3. Fill the Habitat two-thirds full with cold tap water. Thread another string through the top of the fish and suspend it in the water by tying it to a pencil positioned at the top of the habitat. Adjust so that Fred the fish is midway in the water.
4. Number the paper cups or small jars 1 through 5, and then place soil in Cup 1, brown sugar (fertilizer) in Cup 2, pancake syrup (oil) in Cup 3, salt in Cup 4, and paper dots (litter) in Cup 5. Pour (and mix for suds), detergent and warm water into the medium sized jar and set out red and green food coloring (sewage and toxic wastes).
5. Introduce Fred the Fish to the group. Tell them he has grown up in a protected stream in a nature preserve, but he is about to leave the preserve and journey downstream. Fred has invited everyone on his trip. Have girls number their papers, 1 through 9, every time an event (script card) happens, girls will write a different descriptive adjective about, "How is Fred?".
6. Distribute the script cards, cups, food coloring, and warm water with detergent to volunteers. Read through the script.
7. After all the ingredients have been dumped in, lift Fred out of the jar and discuss the changes in his appearance and that of the water.
8. Ask the girls to compare their lists of adjectives and to draw a cartoon showing Fred's trip.

**\*\*Do not dump the contents of Fred's habitat down the drain. Strain out any paper dots and pour the watery mix over a large, grassy area where natural filtration can take place.\*\***

## Fred the Fish Script

1. Imagine a clean river as it meanders through a protected wilderness area. In this river lives Fred the Fish. **HOW IS FRED?** Fred has lived in this stretch of the river all his life, but now he is going on an adventure and traveling downstream.
2. Fred swims into farm country. He passes a freshly plowed riverbank. It begins to rain and some soil erodes into the river. *Add soil to habitat.* **HOW IS FRED?**
3. Fred nears the suburbs. Some fertilizer from the farms and the lawns washes into the river. The fertilizer makes the plants grow very fast and very thick, but the river can't give all the plants all the nutrients they need. The plants start to die and decay. As the plants decay, they use up some of Fred's oxygen. *Add fertilizer to habitat.* **HOW IS FRED?**
4. Fred swims under a highway bridge. Some cars traveling across the bridge are leaking oil. The rain washes the oil into the river below. *Add oil to habitat.* **HOW IS FRED?**
5. Winter is here and ice formed overnight on the roads. Trucks spread salt on the road to prevent accidents. As the ice melts, salty slush washes into the river. *Add salt to habitat.* **HOW IS FRED?**
6. Fred swims past the city park. Some picnickers didn't throw their trash in the garbage can and the wind blows it into the river. *Add litter to habitat.* **HOW IS FRED?**
7. Several factories are located downriver from the city. Even though there are rules about how much pollution the factories can add to the river, the factory owners don't always follow the rules. *Add sudsy water to habitat.* **HOW IS FRED?**
8. The city's wastewater treatment plant is located along this stretch of the river, but a section of the plant has broken down. Further down river home owners aren't taking care of their septic tanks and the tanks are leaking. *Add a few drops of red food coloring.* **HOW IS FRED?**
9. Finally Fred swims past an area where hazardous wastes have been illegally dumped located on the bank next to the river. Rusty barrels of toxic chemicals are leaking and the rain washes these poisons into the river. *Add a few drops green food coloring.* **HOW IS FRED?**

## Sum of the Parts.

This activity works better with larger groups. You may want to have an extra box of similar looking paperclips or small erasers to hand out to use to represent the pollution.

- Provide each student with a numbered piece of paper, there should be 2 of each number, tell the students that one end of the paper should be a waterfront, they have been given a piece of waterfront property to do whatever they please with, they should draw their plans on this paper.
  - You should designate if their waterfront will be a long or short side of the paper, so that when they are all lined up they are uniform in direction.
  - Try to randomly distribute the numbers.
- Once the drawings are complete, the papers should be taped to the front of the board or laid out on a table in order with corresponding numbers water-fronts meeting each other to form the lake, stream, river, etc. Students should then describe what they have drawn and hypothesis about any pollution that may come from their piece of land. They must find a small item near them to represent their pollution (anything will work, piece of paper, pencil, eraser, paperclip, etc.).
- Once everyone has described their land parcels, the class should line up in the same manner as their papers, holding their pollution item. Discuss how water would flow through this watershed, and begin passing down the items in this manner, if there is a lake in the water shed some items may settle there instead of being passed all the way down, eventually all or most of the items should reach the end of the waterway. As the items are passed, the type of pollution they are should be announced, towards the end students may need help remembering.
- Once all or most items have reached the end of the waterway, they should be gathered together to observe, any items that can be easily identified by their owner should be separated out, these represent the point source pollution, non-owner identifiable items represent nonpoint source pollution.

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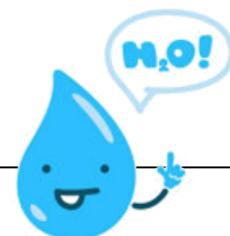
## After the Storm

Watch and discuss the EPA and Weather Channel (2006) produced "After the Storm", available for free online. (There are a few uploads on Youtube.) This video references "Polluted Runoff" which is typically non-point source pollution. The video is approximately 22 minutes long.

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## Finding your Watershed

- [http://water.usgs.gov/wsc/map\\_index.html](http://water.usgs.gov/wsc/map_index.html)
  - Starts at national level showing water resource regions, focuses in as you go.
- <https://cfpub.epa.gov/surf/locate/index.cfm>
  - Allows you to find your watershed by zooming in or by zip code
- <http://www.georgiawildlife.com/watersheds>
  - Shows HUC 10 level watersheds for the state of Georgia and will provide a list of any animals, plants, or ecosystems that are considered Rare within that watershed.
- <http://www.databasin.org>
  - Search for Georgia Watershed HUC 6



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## Hazardous Waste Recycling

To find hazardous waste recyclers in your area go to,

<http://www.dca.state.ga.us/development/EnvironmentalManagement/programs/recycling/default.asp>

# Local Contacts Guide

## General Contacts for Regional or State Wide Groups

AAS Local Contact Page

[http://www.georgiaadoptastream.com/db/local\\_coord.html](http://www.georgiaadoptastream.com/db/local_coord.html)

Keep Georgia Beautiful Local Affiliate Page

<http://www.keepgeorgiabeautiful.org/AffiliateDirectory.asp>

Soil and Water Conservation District Contact Page

<https://gaswcc.georgia.gov/find-my-swcd>

## Resource Conservation and Development Councils

<b>Council Name</b>	<b>City Based In</b>	<b>Email</b>	<b>Phone</b>	<b>Website</b>
Limestone Valley RC&D	Calhoun, Ga	dhuser.lvrcd@gmail.com	(423) 544-9076	www.limestonevalley.org
Rolling Hills RC&D	Cedar Town, Ga	None Available	(770) 749-0444	None Available
Two Rivers RC&D	LaGrange, Ga	tworiversrcd@hotmail.com	(706) 885-0101	www.tworiversrcd.org
Upper Ocmulgee RC&D	Lawrenceville, Ga	rcd.southeriver@gmail.com	(678) 376-9518	www.uorrcd.us/index.html

For each county within the Girl Scouts of Greater Atlanta Council, we have attempted to include the same base set of contact information. These contacts include a listed Main Public Contact, Water Department or Similar, Parks Department, the listed department or group for Storm Water Management. When available and applicable, we have also included other contact information for groups such as the county's Department of Public Works, Recycling Centers, Environmental Management, etc. The exact roles of each group will vary from county to county.

If you live in an incorporated city, we recommend that you reach out to that city to find out if they or the county provide the services in question.

# Local Contacts Guide

## **Bartow County- Rolling Hills RC&D**

**Main Public Contact:** (770) 387-5030

**Water Department:** (770) 387-5170

**Storm Water:** (770) 387-5067 (Stormwater Management Program)

**Parks Department:** (770) 387-5149

## **Butts County- Two Rivers RC&D**

**Main Public Contact:** (770) 775-8200

**Water Department:** (770) 775-0042 (Butts County, Cities of Flovilla, Jackson & Jenkinsburg, Water and Sewer Authority)

**Other:** (770) 775-8213 Department of Public Works

## **Carroll County- Rolling Hills RC&D**

**Main Public Contact:** (770) 830-5801

**Water Department:** (770) 832-1277 (Carroll County Water Authority)

**Parks Department:** (770) 830-2222

**Other:** (770) 830-5901 Department of Public Works, Roads & Solid Waste;  
(770) 830-5861 Community Development Department (Erosion)

## **Cherokee County- Limestone Valley RC&D**

**Main Public Contact:** (678) 493-6000

**Water Department:** (770) 479-1813 (Cherokee County Water & Sewerage Authority)

**Storm Water:** (678) 493-6077 Stormwater Management Division

**Parks Department:** (770) 924-7768

## **Clayton County**

**Main Public Contact:** (770) 477-3208

**Water Department:** (770) 960-5200 (Clayton County Water Authority)

**Storm Water:** (770) 960-5200 (Clayton County Water Authority)

**Parks Department:** (770) 477-3766

**Other:** (770) 477-3674 Public Works, (770) 473-5470 Recycling Center, (770) 477-3681 Land Development

# Local Contacts Guide

## **Cobb County**

**Main Public Contact:** (770) 528-1000

**Water Department:** (770) 423-1000 (Cobb County Water System)

**Storm Water:** (770) 419-6446

**Parks Department:** (770) 528-8800

## **Coweta County- Rolling Hills RC&D**

**Main Public Contact:** (770) 254-2601

**Water Department:** (770) 254-3710 (Coweta County Water and Sewerage Authority)

**Storm Water:** (770) 254-3775 (Transportation & Engineering Department, Land Development)

## **DeKalb County**

**Main Public Contact:** (404) 371-2000

**Water Department:** (770) 724-1456

**Storm Water:** (404) 297-3840

**Parks Department:** (404) 371-2711

## **Douglas County- Rolling Hills RC&D**

**Main Public Contact:** (770) 920-7266

**Water Department:** (770) 949-7617 (Douglasville-Douglas County Water and Sewer Authority)

**Storm Water:** (770) 949-7617 (Douglasville-Douglas County Water and Sewer Authority)

**Parks Department:** (770) 489-3918

**Other:** (770) 920-3133 (Recycling Department)

## **Fannin County- Limestone Valley RC&D**

**Main Public Contact:** (706) 632-2203

**Water Department:** (706) 258-5160 (Fannin County Water Authority)

**Parks Department:** (706) 632-7696

**Other:** (706) 632-8361 (Department of Land Development)

# Local Contacts Guide

## **Fayette County- Two Rivers RC&D**

**Main Public Contact:** (770) 460-5730 x.5101

**Water Department:** (770) 461-1146 (Fayette County Water System)

**Storm Water:** (770) 357-2500 (Stormwater Utility)

**Parks Department:** (770) 716-4320

**Other:** (770) 305-5410 (Department of Environmental Management)

## **Floyd County- Rolling Hills RC&D**

**Main Public Contact:** (706) 291-5110

**Water Department:** (706) 291-5130 (Floyd County Water)

**Storm Water:** (706) 236-2495 (Floyd County Public Works Department)

**Parks Department:** (706) 291-0766

**Other:** (706) 291-5266 (Rome/Floyd County Recycling), (706) 236-4456  
(Rome/Floyd County Environmental Planning)

## **Forsyth County**

**Main Public Contact:** (770) 781-2101

**Water Department:** (770) 781-2160 Forsyth County Water & Sewer

**Storm Water:** (770) 781-2165 Department of Engineering, Stormwater  
Division

**Parks Department:** (770) 781-2215

**Other:** (770) 205-4573 Environmental Programs

## **Fulton County**

**Main Public Contact:** (404)-612-4000

**Water Department:** (404) 612-8006

**Storm Water:** (404) 612-8006

## **Gilmer County- Limestone Valley RC&D**

**Main Public Contact:** (706) 635-4361

**Water Department:** (706) 276-2202 (Ellijay Gilmer County Water Sewer  
Authority)

**Parks Department:** (706) 635-7700

**Other:** (706) 635-4589 (Road Department)

# Local Contacts Guide

## **Gordon County- Limestone Valley RC&D**

**Main Public Contact:** (706) 629-3795

**Water Department:** (706) 602-5678 (City of Calhoun Water Department)

**Parks Department:** (706) 602-4435

**Other:** (706) 629-2785 (Public Works Department)

## **Gwinnett County- Upper Ocmulgee RC&D**

**Main Public Contact:** (770) 822-8000

**Water Department:** (678) 376-6722

**Storm Water:** (678) 376-6914

**Parks Department:** (770) 822-8840

**Other:** (770) 822-7141 (Gwinnett County Recycling Center)

## **Haralson County- Rolling Hills RC&D**

**Main Public Contact:** (770) 646-2002

**Water Department:** (770) 646-6633 Haralson County Water Authority

**Parks Department:** (770) 646-2029

**Other:** (770) 646-3278 (Department of Public Works)

## **Heard County- Rolling Hills RC&D**

**Main Public Contact:** (706) 675-3821

**Water Department:** (706) 675-3358 Heard County Water Authority

**Parks Department:** (706) 675-3778

**Other:** (706) 675-3523 (Department of Public Works)

## **Henry County- Two Rivers RC&D**

**Main Public Contact:** (770) 288-6000

**Water Department:** (770)957-6659 Henry County Water Authority

**Storm Water:**(770) 288-7246

**Parks Department:** (770) 288-7300

**Other:** (770) 288-6410 County Recycling Center

# Local Contacts Guide

## **Lamar County- Two Rivers RC&D**

**Main Public Contact:** (770) 358-5146

**Water Department:** (770) 358-5112 (Lamar County Water & Sewer Authority)

**Other:**(770) 358-5364 (Building & Zoning Department); (770) 358-5150 (Public Works Department)

## **Meriwether County- Two Rivers RC&D**

**Main Public Contact:** (706) 672-1314

**Other:** (706) 672-1367 (Public Works Department); (706) 672-1283 (Building & Zoning)

## **Murray County- Limestone Valley RC&D**

**Main Public Contact:** (706) 695-2413

**Water Department:** (706) 695-3132 (Chatsworth Water Works Commission)

**Parks Department:** (706) 695-7359

**Other:** (706) 695-3231 (Public Works Department); (706) 517-1400 ext. 1231 (Land Use and Development Department)

## **Newton County- Upper Ocmulgee RC&D**

**Main Public Contact:** (770) 784-2000

**Water Department:** (770) 784-2125

**Storm Water:** (678) 625-1200

**Parks Department:** (770) 786-4373

**Other:** (770) 786-5808 (Newton County Landfill and Recycling)

## **Paulding County- Rolling Hills RC&D**

**Main Public Contact:** (770) 443-7550 ext. 202

**Water Department:** (770) 222-6868 (Paulding County Water System)

**Storm Water:** (770) 445-4759 (Department of Transportation)

**Parks Department:** (770) 445-8065

**Other:** (770) 443-0119 (Recycling Department)

# Local Contacts Guide

## **Pickens County- Limestone Valley RC&D**

**Main Public Contact:** (706) 253-8809

**Water Department:** (706) 253-8718 (Pickens County Water Authority)

**Other:** (706) 253-8871 (County Recycling Center); (706) 253-8873, (706) 253-8874 (Road Department)

## **Pike County- Two Rivers RC&D**

**Main Public Contact:** (770) 567-3406

**Water Department:** (770) 567-7287 (Pike County Water & Sewerage Authority)

**Parks Department:** (770) 567-2027

**Other:** (770) 567-2005 (Public Works Department)

## **Polk County (Ga)- Rolling Hills RC&D**

**Main Public Contact:** (770) 749-2100

**Water Department:** (770) 748-6001 (Polk County Water, Sewage & Solid Waste Authority)

**Other:** (770) 749-2132 (Public Works Department)

## **Rockdale County- Upper Ocmulgee RC&D**

**Main Public Contact:** (770) 278-7000

**Water Department:** (770) 278-7450 (Rockdale Water Resources)

**Storm Water:** (770) 278-7155 (Stormwater Utility)

**Parks Department:** (770) 278-7529

**Other:** (770) 785-6883 (County Recycling Center)

## **Spalding County- Two Rivers RC&D**

**Main Public Contact:** (770) 467-4233

**Water Department:** (770) 467-4208 Spalding County Water Authority  
Community Development

**Parks Department:** (770) 467-4750

**Other:** (770) 467-4254 (Department of Community Development, Environmental Resources); (770) 467-4774 (Public Works Department)

# Local Contacts Guide

## **Troup County- Two Rivers RC&D**

**Main Public Contact:** (706) 883-1610

**Water Department:** (706) 883-2030 (City of LaGrange Utilities)

**Parks Department:** (706) 883-1670

**Other:** (706) 883-1713 (Department of Roads, Engineering & Sanitation)

## **Upson County- Two Rivers RC&D**

**Main Public Contact:** (706) 647-7012

**Water Department:** (706) 647-3513

**Parks Department:** (706) 647-9691

**Other:** (706) 647-2824 (Road Department)

## **Whitfield County- Limestone Valley RC&D**

**Main Public Contact:** (706) 275-7500

**Water Department:** (706) 529-1105 (Dalton Utilities)

**Storm Water:** (706) 281-1768 (Department of Public Works, Stormwater and Erosion)

**Parks Department:** (706) 226-8341

## **Polk County Tennessee**

### **Southeast Tennessee RC&D Council:**

(423) 507-1252

director.setnrkd@gmail.com

### **Polk County SWCD:**

(423) 338-4555

polkscd@comcast.net

### **Polk County Litter Grant Program:**

(423) 338-4534

### **Polk County Road Department**

**West Polk Office:** (423) 338-4177

**East Polk Office:** (423) 496-2456

**Ocoee Utility District Polk County Water Services:** (423) 559-8505



# How to Read a Topographic Map and Delineate a Watershed

This fact sheet is an excerpt from Appendix E of the *Method for the Comparative Evaluation of Nontidal Wetlands in New Hampshire*, 1991. Alan Ammann, PhD and Amanda Lindley Stone. This document and method is commonly called "The New Hampshire Method."

## ***Interpreting Topographic Maps***

In order to successfully delineate a watershed boundary, the evaluator will need to visualize the landscape as represented by a topographic map. This is not difficult once the following basic concepts of the topographic maps are understood.

Each contour line on a topographic map represents a ground elevation or vertical distance above a reference point such as sea level. A contour line is level with respect to the earth's surface just like the top of a building foundation. All points along any one contour line are at the same elevation.

The difference in elevation between two adjacent contours is called the contour interval. This is typically given in the map legend. It represents the vertical distance you would need to climb or descend from one contour elevation to the next.

The horizontal distance between contours, on the other hand, is determined by the steepness of the landscape and can vary greatly on a given map. On relatively flat ground, two 20 foot contours can be far apart horizontally.

On a steep cliff face two 20 foot contours might be directly above and below each other. In each case the vertical distance between the contour lines would still be twenty feet.

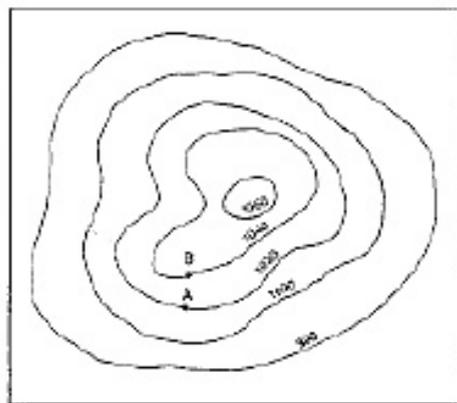


Figure E-1: Isolated Hill

One of the easiest landscapes to visualize on a topographic map is an isolated hill. If this hill is more or less circular the map will show it as a series of more or less concentric circles (Figure E-1). Imagine that a surveyor actually marks these contour lines onto the ground. If two people start walking in opposite directions on the same contour line, beginning at point A, they will eventually meet face to face.

If these same two people start out in opposite directions on different contours, beginning at points A and B respectively, they will pass each other somewhere on the hill and their vertical distance apart would remain 20 feet. Their horizontal distance apart could be great or small depending on the steepness of the hillside where they pass.

A rather more complicated situation is one where two hills are connected by a saddle (Figure E-2). Here each hill is circled by contours but at some point toward the base of the hills, contours begin to circle both hills.

How do contours relate to water flow? A general rule of thumb is that water flow is perpendicular to contour lines. In the case of the isolated hill, water flows down on all sides of the hill. Water flows from the top of the saddle or ridge, down each side in the same way water flows down each side of a garden wall (See arrow on Figure E-2).

As the water continues downhill it flows into progressively larger watercourses and ultimately into the ocean. Any point on a watercourse can be used to define a watershed. That is, the entire drainage area of a major river like the Merrimack can be considered a watershed, but the drainage areas of each of its tributaries are also watersheds.

Each tributary in turn has tributaries, and each one of these tributaries has a watershed. This process of subdivision can continue until very small, local watersheds are defined which might only drain a few acres, and might not contain a defined watercourse.

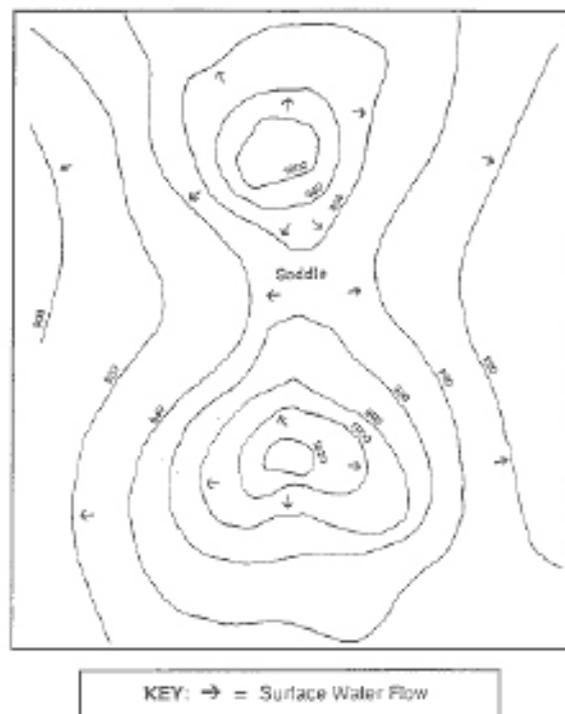


Figure E-2: Saddle

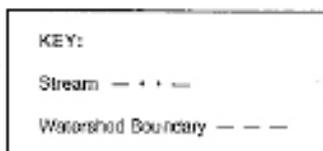
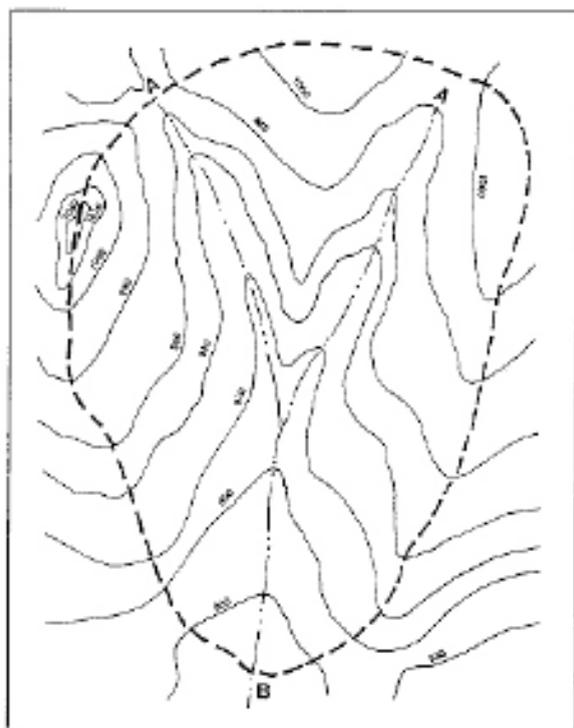


Figure E-3: Idealized Watershed Boundary

Figure E-3 shows an idealized watershed of a small stream. Water always flows downhill perpendicular to the contour lines. As one proceeds upstream, successively higher and higher contour lines first parallel then cross the stream. This is because the floor of a river valley rises as you go upstream. Likewise the valley slopes upward on each side of the stream. A general rule of thumb is that topographic lines always point upstream. With that in mind, it is not difficult to make out drainage patterns and the direction of flow on the landscape even when there is no stream depicted on the map. In Figure E-3, for example, the direction of streamflow is from point A to point B.

Ultimately, you must reach the highest point upstream. This is the head of the watershed, beyond which the land slopes away into another watershed. At each point on the stream the land slopes up on each side to some high point then down into another watershed. If you were to join all of these high points around the stream you would have the watershed boundary. (High points are generally hill tops, ridge lines, or saddles).

## Delineating a Watershed

The following procedure and example will help you locate and connect all of the high points around a watershed on a topographic map shown in Figure F-4 below. Visualizing the landscape represented by the topographic map will make the process much easier than simply trying to follow a method by rote.

1. Draw a circle at the outlet or downstream point of the wetland in question (the wetland is the hatched area shown in Figure E-4 to the right)
2. Put small "X"s at the high points along both sides of the watercourse, working your way upstream towards the headwaters of the watershed.
3. Starting at the circle that was made in step one, draw a line connecting the "X"s along one side of the watercourse (Figure E-5, below left). This line should always cross the contours at right angles (i.e. it should be perpendicular to each contour line it crosses).
4. Continue the line until it passes around the head of the watershed and down the opposite side of the watercourse. Eventually it will connect with the circle from which you started.



Figure E-4: Delineating a Watershed Boundary - Step 1

At this point you have delineated the watershed of the wetland being evaluated.



Figure E-5: Delineating a Watershed Boundary - Step 2

The delineation appears as a solid line around the watercourse. Generally, surface water runoff from rain falling anywhere in this area flows into and out of the wetland being evaluated. This means that the wetland has the potential to modify and attenuate sediment and nutrient loads from this watershed as well as to store runoff which might otherwise result in downstream flooding.

### Measuring Watershed Areas

There are two widely available methods for measuring the area of a watershed: a) Dot Grid Method, and b) Planimeter. These methods can also be used to measure the area of the wetland itself as required by The New Hampshire Method.

- a) The dot grid method is a simple technique which does not require any expensive equipment. In this method the user places a sheet of acetate or mylar, which has a series of dots about the size of the period at the end of this sentence printed on it, over the map area to be measured. The user counts the dots which fall within the area to be

measured and multiplies by a factor to determine the area. A hand held, mechanical counting device is available to speed up this procedure.

- b) The second of these methods involves using a planimeter, which is a small device having a hinged mechanical arm. One end of the arm is fixed to a weighted base while the other end has an attached magnifying lens with a cross hair or other pointer. The user spreads the map with the delineated area on a flat surface. After placing the base of the planimeter in a convenient location the user traces around the area to be measured with the pointer. A dial or other readout registers the area being measured.

Planimeters can be costly depending on the degree sophistication. For the purposes of The New Hampshire Method, a basic model would be sufficient. Dot counting grids are significantly more affordable. Both planimeters and dot grids are available from engineering and forestry supply companies. Users of either of these methods should refer to the instructions packaged with the equipment they purchase.

For more information on The New Hampshire Method, wetlands restoration programs, conservation planning, ecosystem restoration, and other technical references, visit [www.nh.nrcs.usda.gov](http://www.nh.nrcs.usda.gov) or call (603) 868-7581.

**When your girls have completed all 5 steps and are now Super Storm Water Smart Girl Scouts, have them go to their local Girl Scout Badge and Sash store to receive their Stormwater Badge!**