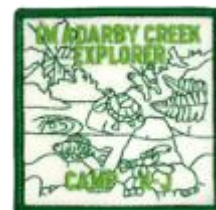
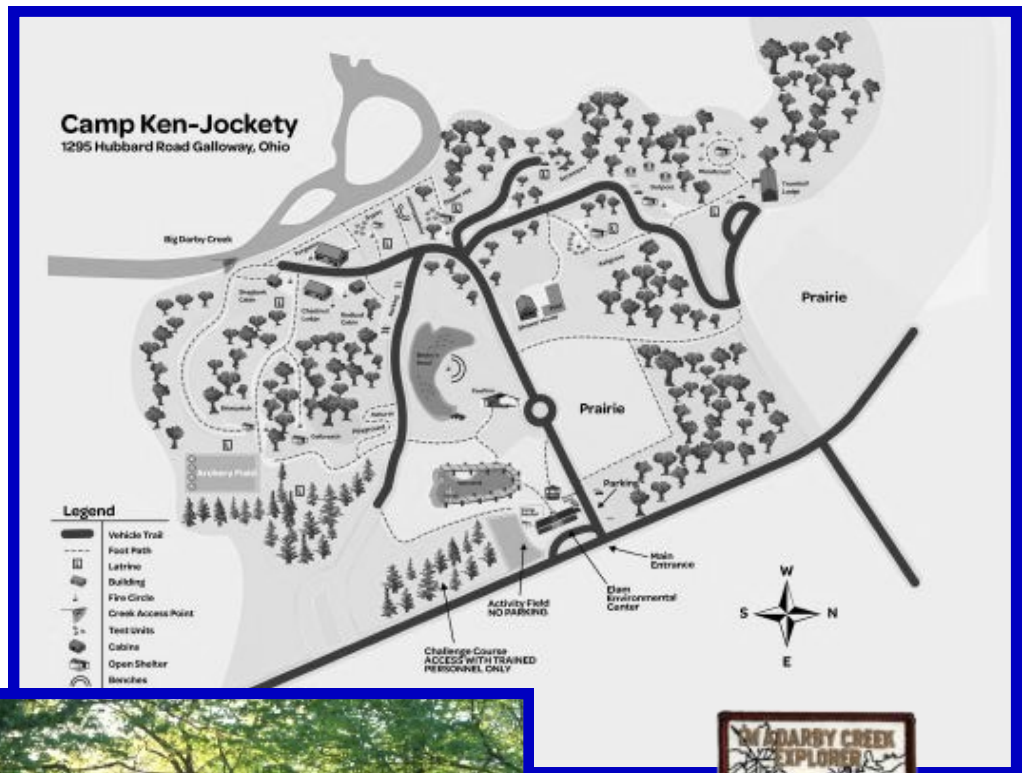


Darby Creek Explorer

PATCH PROGRAM



Introduction

Thank you for choosing Girl Scouts of Ohio's Heartland Council, Inc.'s *Darby Creek Explorer* patch program. Participation in these activities will help your girls explore a valuable natural resource and encourage conservation-minded habits.

About the *Darby Creek Explorer* Patch

A visit to Girl Scouts of Ohio's Heartland's Camp Ken-Jockey gives you the opportunity to explore The Big Darby Creek, a National and State Scenic River. The Big Darby Creek runs along the western edge of camp. Nearby portions of The Big Darby Creek are also accessible from Battelle-Darby Creek Metro Park and Prairie Oaks Metro Park, owned and operated by the Columbus and Franklin County Metropolitan Parks District.

This patch program was originally offered as part of the summer camp program at Camp Ken-Jockey in 1986 and was revised in 2014. The purpose of this patch program is to educate Girl Scouts about the ecological significance of The Big Darby Creek and to participate in activities that encourage the preservation and protection of the portion of the creek that is adjacent to Girl Scout property.

In completing activities to earn this patch, girls will:

- ◆ Realize that water is a valuable natural resource that is vital to all living things.
- ◆ Understand that water is an important habitat to the creatures and plants that live in/around it.
- ◆ Learn about the significance of The Big Darby Creek and its designation as a State and National Scenic River.
- ◆ Learn to recognize the major threats to the creek, explore ways to measure stream health, and be motivated to take action to protect this valuable resource.

This patch program is broken into 3 key parts:

1) **Water, everywhere?** Girls will explore basic properties of water, and the water cycle, imagine how much freshwater is available on Earth for humans to use, and brainstorm ways in which they use water, everyday.

2) **The Darby Creek Habitat.** Girls will learn about the history and significance of the Big Darby Creek, learn what animals live there, understand some of the threats to the creek, and go on an aquatic investigation. Older Girl Scouts will do a more in-depth stream study to better understand how biological organisms can be indicators of stream health.

3) **Stream Patrol.** Girls will use the knowledge they have learned to take action to protect the creek by making a pledge, educating others, and/or participating in a service project.

W a t e r , E v e r y w h e r e ?

Read & Discuss: What is water?

D, B, J Water is a clear, colorless, odorless, tasteless liquid. All things we call *wet* have water in them.

C, S, A Water is a colorless, transparent, odorless, tasteless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms. Water is a chemical compound with the chemical formula H₂O. A water molecule contains one oxygen and two hydrogen atoms that are connected by covalent bonds (Source: Wikipedia)



Discussion Point:

Q: What are some examples of things that contain water?

A: Just about everything! Lakes, milk, juice, fruit, leaves...even your own body is about 65% water.

Read & Discuss: What good is water?

Water is a basic need of life. All living things – people, plants, animals, birds, fish, and insects – rely on water to survive. Without it, they would die. That makes water very special. Water is also very special because of all the things we use it for everyday.

Discussion Point:

Q: What are some ways that you use water?

A: Drinking, bathing, swimming, canoeing, watering the garden, etc.

Activity: Where is water?

Instructions: Ask participants to stand in a circle. Hold up the Earth globe and ask them how much of the Earth they think is covered by water. Explain that they are going to do an experiment to see if they are correct. Ask each girl to hold up her right hand and stick out her thumb. Explain that they are going to toss the ball 10 times. Each time the ball is caught, the catcher should look at her right thumb and shout out if her thumb landed on water or land. The facilitator keeps track.

On average, 7 out of 10 girls should have their thumbs land over water, because the Earth is covered with approximately 70% water. You may play the game multiple times to collect more data, and/or to include all participants.

If an inflatable Earth globe is not available, use a regular globe or printed images of Earth to help the girls visualize how much of the planet is covered by water.

Materials:

Inflated Earth globe



W a t e r , E v e r y w h e r e ?

Read & Discuss: Water Cycle

The amount of water on Earth is always the same, but it is constantly moving from the oceans to the air to the land and back again, through a process we call the **water cycle**.

Water comes down from the sky as rain or snow. The sun heats the water on the ground, which causes the water to change to its gas form – water vapor (steam) – which then rises back into the air. We call this **evaporation**. When the cloud is cooled off enough, the water will become liquid again. We call this **condensation**. The liquid then falls back to Earth as rain (or – if it's cold enough – snow, ice, or sleet).

Optional Extension Activity: Water Cycle Experiment

Instructions:

- 1) Carefully pour your hot water into your large glass container.
- 2) Place the small bowl or cup in the center of the container (it must be heavy enough that it will not float on the surface of the water).
- 3) Tightly cover the large container with a piece of plastic wrap.
- 4) Place 1 or more ice cubes on the center of the plastic wrap, directly over the smaller cup/bowl.

Soon, small droplets of water will appear on the inside of the plastic wrap cover. Did you see the steam coming off of the hot water? That was water vapor. When the water vapor (which **evaporates**, due to heat) hits the plastic wrap, which is cooled by the ice cubes, it **condenses** into droplets. Eventually, the droplets will get heavy enough that they will drop into your smaller cup, as **precipitation**.

This experiment can also be performed outdoors, on a sunny day. You do not need to begin with hot water; simply place your covered bowl in a sunny location. Ice cubes will speed up the process, but are not necessary; you can have the same effect by weighting the center of the saran wrap with a small stone or coin. This will act as a drip point toward the cup below.

Materials:
Appendix A

Additional Teaching Aids:
D, B

Water Cycle – Animation lesson for Kids

<http://www.youtube.com/watch?v=gY9HG8zUgOE>

J, C, S, A

Bill Nye the Science Guy®: Water

http://www.youtube.com/watch?v=hehXEYkDq_Y

Materials:

- ◆ Container such as a large glass bowl or small aquarium
- ◆ Small clear cup or bowl
- ◆ Plastic wrap
- ◆ Hot water
- ◆ Ice cubes

Additional Teaching Aids:

Water Cycle Experiment by Cathy Davenport

http://www.youtube.com/watch?v=2rwFK5_Viqo

Kay's Water Cycle Experiment by Ed Evans

<http://www.youtube.com/watch?v=FmTh0ECGPCY>

W a t e r , E v e r y w h e r e ?

Activity: All the Water in the World

This simple illustration will help girls to understand where on Earth they might find water and just how much water is really available for us to use. They will imagine that all the water in the whole world is equal to one gallon and divide that one gallon into 5 categories. If you have food coloring available, it is helpful to put several drops into the water to make it easier to see.

Using the following list of measurements, separate your water:

Lakes, Rivers, Streams (sources of freshwater)	9 drops
Groundwater (water that is underground)	1 Tablespoon + 2 Teaspoons
Icecaps and Glaciers (sources of frozen water)	5 Tablespoons + ½ Teaspoons
Oceans (sources of salt water)	15 ½ cups + 1 Tablespoon
Water Vapor (water that is in the air)	1 drop

**Hint: If you remove the amount you need for the 4 smaller containers, the correct amount needed to represent oceans will be left in the gallon.*

Materials:

- ◆ 1 gallon jug of water
- ◆ Blue food coloring (optional)
- ◆ Liquid measuring cups and spoons
- ◆ Eyedropper or straw
- ◆ 4 small cups or other containers that will hold liquid (preferably clear; food storage containers work well).

Discussion Questions:

Q: Where is most of the water on Earth? What type of water is it?
A: In the oceans; salt water (97%)

Q: Would you want to drink salt water? Bathe in it?
A: No, salt water is not especially useful to us.

Q: What about the next greatest amount of water, where is it?
A: Icecaps and glaciers (2%)

Q: Is this water that we can use?
A: Maybe, but not very easily, because it is frozen.

Q: Where is the third greatest amount of water?
A: It is groundwater.

Q: Is that water that we can use?
A: Sometimes, but not very easily. We must pump it out of the ground using wells, which uses energy. Often must be purified.

Q: Where is the water that we can easily use?
A: Freshwater that is on the surface of the Earth – in lakes, ponds, streams, rivers – is the water that we most often use. Look how small that amount seems to all the water in the world!

The combined total of groundwater and surface freshwater equals about 1% of all of the water that is available for the everyday use of all the people in the world.



Water, Everywhere?

Discuss: An Endless Supply?

Now that the girls have a basic understanding of how much water is on Earth and how the water cycle works, help them understand that our water supply is not endless. Discuss some steps that they might take to conserve water every day.

Examples might include:

- ◆ Take a shorter shower
- ◆ Turn off the water when you are brushing your teeth
- ◆ Use a rain barrel to collect water to water your garden
- ◆ Water your garden early in the morning or late in the day, when the sun is not so hot. This will allow your plants to soak up more water and less will be evaporated by the sun.
- ◆ Check your sinks and toilets for leaks. Repair any that you find.
- ◆ Use your dishwasher and clothes washer only for full loads.

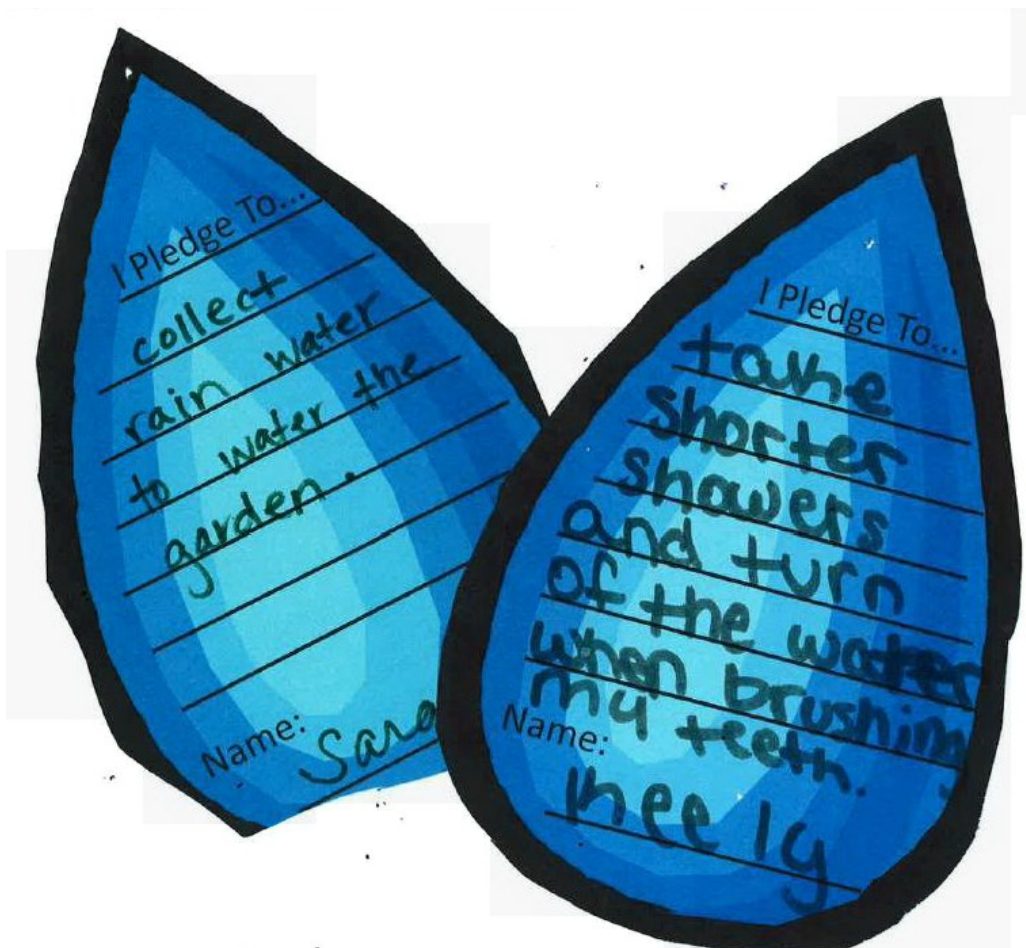
Additional Teaching Aids:

B

“Water Wisdom” trivia is located throughout the *WOW! Wonders of Water* Brownie Girl Scout Journey (girl book). Ask the girls some of these questions to help them brainstorm ways to conserve water.

DBJCSA

Appendix B (Water drop pledge). Print a copy for each girl and ask her to write her pledge to conserve water; keep them in a binder and review them at your troop meetings, or have each girl take hers home and post it as a reminder.



The Darby Creek

The following activities should all take place in or around the Big Darby Creek, when possible. For details on how to schedule a visit to Camp Ken-Jockety, email camp@gsch.org or visit us online at www.gsch.org. You may wish to schedule a Pick-a-Program, a troop program scheduled through the Council and led by a knowledgeable facilitator, to complete many of these activities.

Read and Discuss: The Darby River Facts

Review the list of Darby River facts that highlight the river's features, biodiversity, preservation efforts, and threats. Whenever possible, engage girls in the discussion. For example, when addressing threats to the river, ask girls if there are any things they can think of that people do that might hurt the creek or the animals that live there. Generally, they are quick to address things like "pollution" or "trash" – you might expand on these ideas to get a little more specific to what kinds of pollution, or where it might come from.

Materials:
Appendix __: Darby River Facts

Activity and Discussion: What's a Watershed?

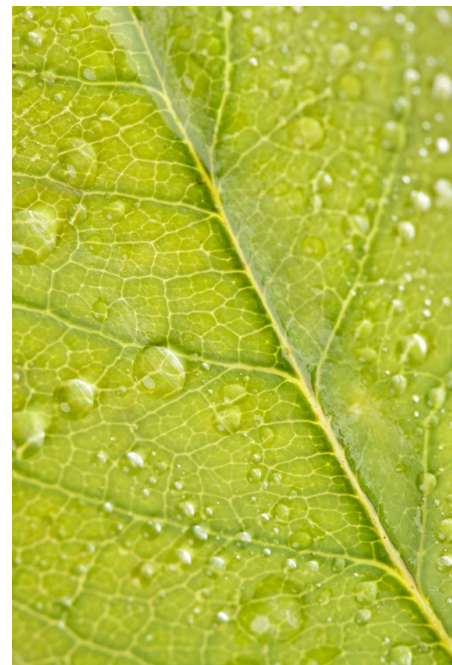
A **watershed** is defined as an area of land where all of the water that is under it or drains off of it goes into the same place.

The Big Darby watershed includes 560 square miles of land and is drained by the Big Darby Creek, the Little Darby Creek, and about 1 dozen smaller tributaries, smaller streams that drain into the Darbys. That's equivalent to 348,400 acres or 271,104 football fields. In comparison, all of Camp K-J is less than 250 acres.

Materials:
Appendix __: Watersheds

The Big Darby is part of the Scioto River watershed. The Scioto is part of the Ohio River watershed. The Ohio River drains into the Mississippi River and empties into the Gulf of Mexico. So, the Big Darby Creek is, ultimately, part of the Mississippi watershed, which is the largest drainage system in North America and the 4th largest in the world, covering more than 1.24 million square miles.

An easy way to visualize what a watershed might look like is to find a leaf from a nearby tree. The small veins in the leaf represent smaller streams flowing into a larger stream (the main stem). The entire leaf represents the larger stream's watershed.



The Darby Creek

Read and Discuss: Who Lives Here?

DB Gather in an area near the creek (the picnic tables at the bottom of the hill beyond Shagbark Cabin are a good spot).

JCSA Take a hike along the creek trail, which runs along The Big Darby Creek between the Dipper Hill tent unit and the creeking area (see Appendix D: Camp Map).

Younger girls can also take a hike along the creek, depending on their interest and activity level. Depending on your speed and pauses for observation, the hike will take between 10-20 minutes.

As you sit or walk with the girls, encourage them to pause for a few moments to listen, watch, and think about what animals might call the creek – and the area around it – “home.” Encourage them to think of not only those animals that live in the water, but those that live in the forest and meadows around it.

Here are some examples:

- ◆ Amphibians & Reptiles (turtles, frogs, salamanders, snakes)
- ◆ Birds (geese, ducks, herons, songbirds, woodpeckers)
- ◆ Crustaceans (crayfish/crawdads)
- ◆ Insects (dragonflies, damselflies, beetles, mayflies, and many others)
- ◆ Mammals (deer, raccoons, opossums, rabbits, otters, mink)
- ◆ Mollusks (mussels, clams, snails)

Creature Feature: The Scioto Madtom

A madtom is a tiny catfish, typically less than 2 inches long. The Scioto Madtom is thought to be **endemic** to the Darby, meaning that it has never been found to live anywhere else. It is listed by the U.S. Fish and Wildlife Service on the Endangered Species List.

The Scioto Madtom was first discovered by a man named Milton Trautman, an **ichthyologist**, in 1943. Several more were seen over the next 2 years, and then no more were seen for 12 years, despite efforts to find them. In 1957, 14 were found in the original location.

Some people suspect that the fish gradually became extinct due to declining water quality in Ohio streams. Others hold out hope that the fish is nearly missing. Alternatively, it's possible that the Scioto Madtom was simply a variation of another more common species. It's possible that we will never know!

Materials:
Appendix __: Darby River Facts

ich thy-ol o-gist *n.*
A scientist who studies fishes.



Photo source:
www.darbycreeks.org

The Darby Creek

Read and Discuss: What Can They Tell Us?

BJCSA (Daisies may skip this step)

The animals that we find in the Big Darby Creek can tell us a lot about how healthy the stream is. Animals that live in the stream have different levels of sensitivity to environmental factors such as pollution, the amount of dissolved oxygen in the water, and how clear or turbid (cloudy) the water is.

A lot of animals rely on the stream, but none more than those who live in the water for most of their lives. You may not realize it, but there are dozens of types of insects (and other **macroinvertebrates** – small creatures without a backbone) that spend most or all of their lives in the water.

Many species of insects, including the commonly known dragonflies and mayflies, lay their eggs in the water. When the eggs hatch, a **larva** or a **nymph** emerges, depending on the species. The insect will live the majority of its life in the creek in this immature stage. Many live only for a few hours or days after emerging as adults.

A **larva** is the “baby” form of an insect that undergoes **complete metamorphosis**. The most familiar example of this type of metamorphosis is a caterpillar turning into a butterfly.

A **nymph** is the “baby” form of an insect that undergoes **simple or incomplete metamorphosis**. Generally, the adult looks similar to the immature insect, without adult features, such as wings.

During your creek exploration, you are likely to find both examples of larva (such as crane flies) and nymphs (such as dragonflies). You may also see adult examples of these insects flying around near the creek.

Why worry about macroinvertebrates? Certain types of macroinvertebrates are more or less sensitive to environmental factors such as pollution than others. By collecting and comparing the types of critters that live in the stream bed, you can get a pretty good idea of how healthy or polluted the stream is. You will learn more about this in the creek exploration activities.

Materials:
Appendix __: Darby River Facts

ich thy-ol o-gist n.
A scientist who studies fishes.



The Darby Creek

Activity: Macroinvertebrate Match

BJCSA (Daisies may skip this step)

Photocopy the pages in the appendix. You may choose to make this a small group activity, or have the girls work individually, or in pairs.

Ask the girls to look at the cards with photographs/drawings of macroinvertebrate nymphs, larvae, and adults and do their best to match the immature insect with the adult insect. Use the answer key to check their answers and make any necessary corrections.

Activity: Creek Exploration

Option A: Water Snooper (DB)

Option B: Kick Seining Activity (JCSA)

**A group of Brownies who are older, especially interested/focused, or who have enough adult assistance to provide at least a 1:4 adult to girl ratio can choose to do option B.*

Option A: Water Snooper

Instructions: First, be sure that there are no sharp edges on your can. Cover any sharp edges with duct tape. Tear off a piece of plastic wrap that is large enough to cover one end of the can, leaving about one inch extra around the edge. Put a rubber band around the plastic wrap to hold it in place (be sure to keep the wrap tight). Cut off any excess wrap and wrap tape around the rubber band and plastic wrap. Take your critter scope for a test run in the sink, if you wish. When you are ready, take your critter scope to the creek. Look through the open end while you push the closed end under the surface of the water. You might see fish, crayfish, or other critters!



Modification: In lieu of making critter scopes, younger girls may also simply use small hand nets to investigate the stream and (attempt!) to catch fish and crayfish.

Materials:

Appendix __: Macroinvertebrate cards

Materials:

- ◆ A large tin can (such as a coffee can) with both ends removed (one for each scope)
- ◆ Clear plastic wrap
- ◆ Large rubber bands (one for each scope)
- ◆ Duct tape
- ◆ Scissors

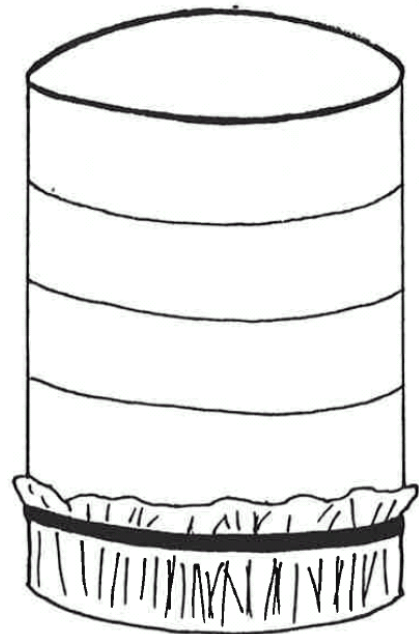


Image Source: *Darby Duck and the Aquatic Crusaders* published by Franklin County Soil & Water Conservation District.

The Darby Creek

Option B: Kick Seining Activity

Kick seining is an activity that uses a special net and technique to catch small critters from the streambed.

Instructions:

Start by explaining to the group that many of the animals that live in the creek must bury themselves in the streambed or cling onto rocks in order to prevent themselves from being swept away by the current of the water. In order to find them, they are going to use a special technique called “kick seining.”

A kick seine is a large, rectangular net that is attached on two sides to poles. These poles may be made of wood, metal, or plastic. Effective kick seines have weights along the bottom of the net to aid it in sitting along the bottom of the stream bed.

During kick seining, the net is placed perpendicular to the current of the stream so that the weight within the net is resting on the stream bed. Ideally, kick seining takes place within a “riffle,” a section of the stream where the water has a moderate to swift flow and higher turbulence than in the quietly moving portions of the stream. Because the water is churning in these locations, the level of dissolved oxygen is naturally higher, making it an ideal environment for sensitive organisms. The riffles are more pronounced when the stream is at a relatively low depth. Depending on the depth of the water and the participants’ ages, you may or may not be able to safely access the riffles within our creeking area. Generally, there are plenty of organisms to be found in all areas of the Darby.

Once the net is in place, the remaining participants will need to stand a few feet upstream, directly in front of the net. Their job is to be the shufflers. Most of the organisms in the creek burrow into the sediment on the bottom of the stream or cling on to rocks. By using their feet to shuffle the rocks around, participants will loosen the sediment and the animals within it, which will then float with the current and get caught in the seine net. As they shuffle, participants should slowly move closer to the net until they are next to it and can reach down to pick up the weight on the bottom. The net should be brought up into a horizontal position to see what animals can be found. This can be repeated, with the net being rinsed in between.

Materials:

- ◆ Kick seine(s)
- ◆ Small buckets for collecting samples (white dishpans work well)
- ◆ Microscopes/hand lenses (optional)
- ◆ Appendix ____: Stream quality checklist(s)
- ◆ Appendix ____: Seining overview

In order to complete this activity, you will need one or more kick-seine nets and buckets. These items can be borrowed from camp by contacting camp@gsoh.org. Or, many GSOH service units own their own creeking equipment. Check with your SU Manager.

The Darby Creek

Provide a white dish pan for collecting the organisms (fill about half way with water). Care should be taken to get organisms such as fish into the buckets first. Follow with larger animals, such as crayfish and then look for small insects and other invertebrates. Crayfish should be handled with care, as they can pinch, but most other organisms are completely harmless.

Identifying and Observing Organisms

As time allows, ask the sampling groups to spend some time identifying their finds. You might do this on the shore of the creek, or if you want to investigate even more, you can have participants bring their buckets up to the picnic tables. Laminated sheets and booklets will be provided that will help you decide what types of critters you found and which are more pollution tolerant than others. Try to encourage groups to pay attention to organisms other than just crayfish. You may want to pass out hand lenses or even select a few smaller animals to be viewed under a microscope.

After observations are complete and you are ready to wrap up, ask participants if they were able to get a sense of what the stream quality might be based on the animals you found*. Be sure to leave enough time for the groups to return to the creek and carefully release the animals back into the water (don't forget to rinse all of the animals out of the buckets!).

*CSA participants are encouraged to tally the number of each type of organism on their stream quality checklist and measure the quality of their sample, according to the total number of points in each category. Typically, the Big Darby Creek location at Camp Ken-Jockey scores a Good to Excellent stream quality rating.

The Darby Creek

Safety First!

Before beginning any “creeking” activity, it is important that the following safety items are considered:

- ◆ Use common sense! The creek must be at a safe water level. Do not enter the creek after a period of heavy rain or if the water appears to be moving swiftly or is unclear. There is a large rock in the center of the stream, approximately 20 feet upstream from the creeking spot. As a rough guide, you must be able to see at least a portion of the top of this rock for the water to be safe to enter. Be especially cautious when taking younger girls into the creek. Do not enter the creek when there is any threat of hazardous weather including – but not limited to – thunder, lightning, or flooding. When in doubt, ask camp staff.
- ◆ Ensure that all participants are wearing proper clothing and footwear. A complete change of clothes is recommended for all participants in creeking activities. The creek bed is full of sharp and potentially slippery rocks; it is also possible that there may be debris in the water. Appropriate footwear includes old tie-on sneakers or hard-soled water shoes. Rain boots are not recommended, as water can easily come up and over the top and flood the boot. No participant should be permitted to enter the creek while wearing flip-flops, Crocs, any other type of shoe that does not adequately protect the foot, or while barefoot.
- ◆ Be aware of trip hazards and holes. The stream bed is a natural, ever-changing environment. There are large rocks, which can be difficult to see, and areas where the water suddenly becomes deeper. No participant should enter any water that comes higher than her/his knees.
- ◆ Establish ground rules before entering the water. This may include: respecting boundaries (how far upstream or downstream participants may walk), no splashing/swimming/roughhousing, staying with an adult, being careful with nets and other equipment, etc. Participants may be invited to pick-up rocks in search of aquatic critters, but should respect the stream by placing rocks gently back where they found them; do not permit participants to throw rocks.
- ◆ Be respectful of the stream and gentle with the organisms that live there. Remember, you are a visitor in their home!