



Aquatic Organisms (Ages 12-14)

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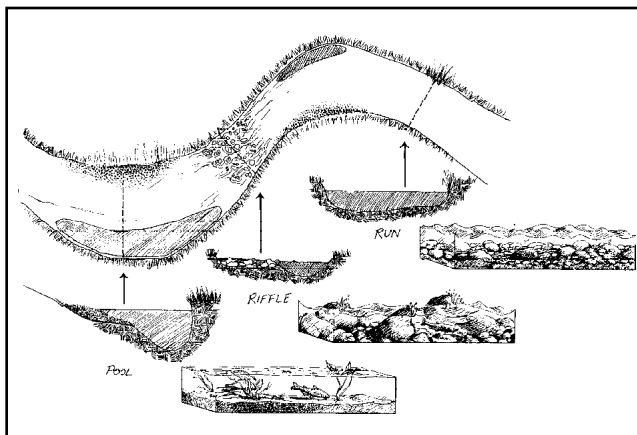
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Safety: Always go with an adult to your stream, pond, or lake. When going to the water body, do not attempt to do your investigation unless it is safe to do so. Do not sample in deep water. Wear the appropriate clothing for the site (old tennis shoes and pants). If the stream or lake is on private property, be sure to get permission before going to the site.

Streams, ponds, and lakes are home to many different kinds of animal and plant life. Aquatic organisms are plants or animals that live either part or all of their lives in water. By studying these organisms, much can be learned about the health and ecology of a particular water body.

Habitat

Streams, ponds, and lakes provide many different types of habitats for animals and plants. A habitat is a place that supplies the requirements an organism needs to live, such as food and shelter. Different organisms require different habitats. For example,

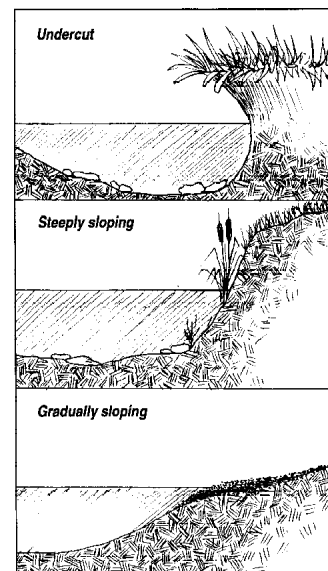


Stream habitats (Courtesy Tennessee Valley Authority).

some organisms burrow in the mud on the bottom, while others cling to rocks in fast-moving waters. You likely will find very different organisms in these two habitats.

Stream Habitats

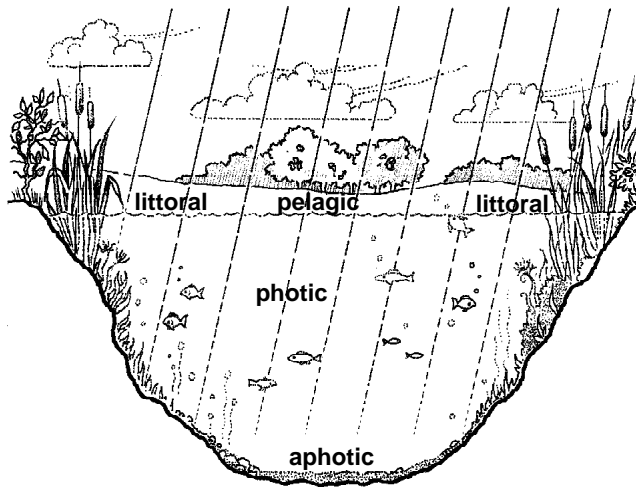
Some important habitats to look for when surveying a stream include pools, riffles, rocks, log piles, weed beds, undercut banks, and human-made objects. A **pool** is an area where the water deepens and slows down. A **riffle** is an area where the water flows quickly over rocks or other structures on the bottom, making noise as it goes. A **run** is another area where water flows quickly, but the water's surface is unbroken and does not make noise like a riffle. An **undercut bank** is an area where the lower part of the bank has been eroded away, leaving the upper part hanging over the water. This type of bank is a great hiding place for fish. A human-made object is anything that would not naturally be found in the stream, such as cement slabs, car bodies, and tires.



Types of stream bank shapes (Courtesy Tennessee Valley Authority).

Pond and Lake Habitats

Ponds are smaller and usually shallower than lakes. Ponds may be shallow enough that plants can grow anywhere. The plants may not be visible if they



Lake characteristics (Illustration by Jon Dickey).

are completely underwater. Lakes, on the other hand, have a deep area where plants are unable to grow, known as the **pelagic** [pəl-aj-ik] (open-water) zone. The area in lakes where plants grow is the **littoral** [lit-er-əl] zone.

Some lakes are so deep that light cannot reach the bottom. The dark part of lake is called the aphotic zone. The area that light reaches is the photic zone. Plants cannot live in the aphotic zone.

The type of habitat can separate different types of animals. **Plankton** are floating or weakly swimming organisms that are carried by waves or currents in the a lake. These organisms are very small and can be seen with either a microscope or a high-powered magnifying glass. Stronger swimming animals, like fish, are known as **nekton** [nek-ton]. Organisms that live on the bottom of the lake are **benthic** [ben-thik] organisms. Organisms that burrow in the mud, such as worms, are called **infauna**.

Studying Organisms

Lakes and streams are home to many different species of aquatic plants and animals. To determine an organism's role in the ecosystem, scientists study both the appearance of the organism and its behavior.

Basic questions to answer about the organisms you find include: How big are they? What do they eat? How do they move? What are their habitats (where do they live)? What kind of mouth parts do they have? Use a magnifying lens to see if they have sharp teeth, "graspers," or other parts to capture and eat other animals.

Observe the behavior of the organisms closely and answer these questions: Are they fast moving, slow moving, or stationary? How do you think they avoid being eaten by predators?

Once you've had a close look at both the appearance and behavior of the organism, its role in the ecosystem can be determined by asking some questions: Is this organism a producer, primary consumer, predator, or decomposer/scavenger?

Producers make their own food. They are usually plants. **Primary consumers** can not make their own food, so for energy they must eat producers or something made by producers. For example, cows are primary consumers that eat a producer organism, grass. **Predators** are consumers that capture and eat other consumers, animals. **Decomposers** and scavengers get their energy from breaking down dead material. In the process, they recycle the nutrients back to the producers. Mushrooms growing on dead tree limbs are examples of decomposers.

Monitoring Water Quality

Aquatic organisms can be harmed by changes in the water, like low oxygen, high temperature, or turbidity. The most sensitive organisms may leave or die because of deteriorating water quality, but other kinds of organisms can adapt to poor conditions. Changes in communities of aquatic organisms are clues used by scientists studying the quality of our water resources.

As a rule, if water quality and habitats are good, many different types of organisms are able to live in the water body. This is known as high species **diversity**. If water quality and habitats are poor, very few types of organisms may be able to live in the water body, and there will be low species diversity. Areas of low species diversity may have many individuals of one or two species, but nothing else. Thus, species diversity can be used as an indicator of water and habitat quality. In general, high diversity of organisms indicates good water quality and habitat.

Sampling

Streams

There are many different ways that aquatic organisms can be collected for study. One way to sample organisms in streams is to use a kick net. See *Made at Home Sampling Equipment*, Lit #26, for instructions that explain how to build a kick net and other types of sampling equipment. Instructions for use of the kick net are given in the Stream Sampling section in this fact sheet. Turning over rocks and picking organisms off the bottom is also a good collecting technique. You also can drag a small dip net, like small ones used with pet fish, along emergent or submerged rooted vegetation in streams. The illustrations in *Common Aquatic Fauna of Oklahoma*, Lit #27, will help you identify the organisms you collect.

Ponds

You can collect bottom-dwelling organisms using a bottom dredge sampler. See *Made at Home Sampling Equipment*, Lit #26, for instructions that explain how to build a bottom dredge sampler. Instructions on how to use a bottom dredge sampler are given in the Pond and Lake Bottom Sampling Method section in this fact sheet. In shallow water, you can turn over rocks and pick organisms off the bottom also. You may also take a plankton sample from your pond or lake with a plankton net. See Pond and Lake Plankton Sampling in this fact sheet for instructions. The illustrations in *Common Aquatic Fauna of Oklahoma*, Lit #27, will help you identify the organisms you collect.

Stream Sampling Method

Use the following method to sample organisms in streams that have riffles and gravel/cobble substrates.

1. Sketch the area around your site, showing features such as bridges, roads, and houses located near the stream. Identify your sample site on the map.

2. Always start downstream and approach your sampling locations from the downstream end. This will keep you from biasing your collections with dislodged sediment or macroinvertebrates.

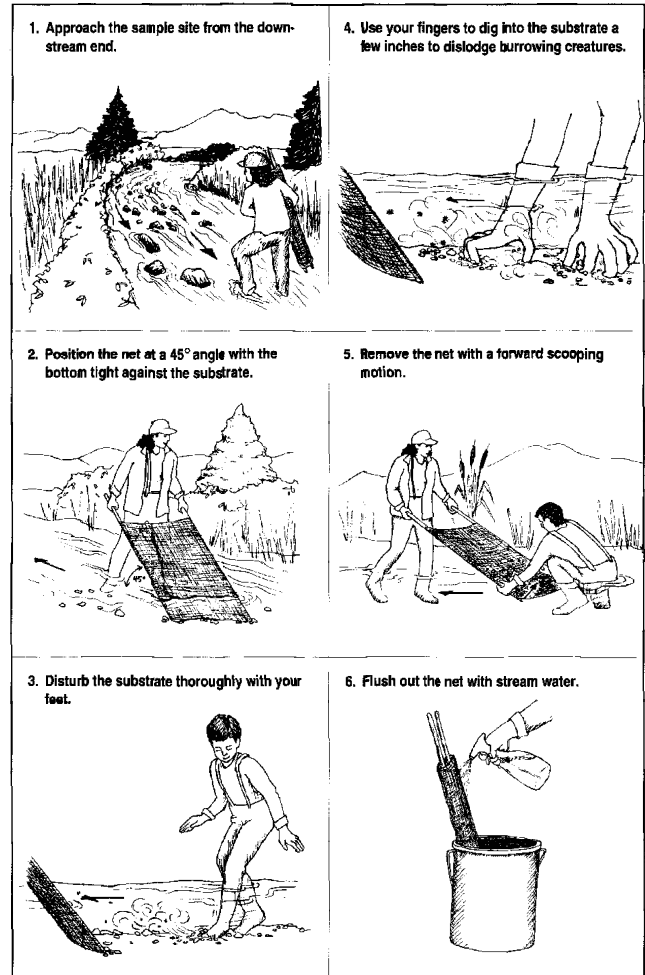
3. One member of the team, the net holder, should position the net at the downstream end of this sampling area. Hold the net handles at an angle to the water's surface. Be sure that the bottom of the net fits tightly against the streambed so no macroinvertebrates escape under the net. You may use rocks from the sampling area to anchor the net against the stream bottom. Don't allow any water to flow over the top of the net.

4. A second member of the team, the kicker, should now stand upstream from the net. Thoroughly stir up the sampling area with feet or gloved hands, so that dislodged organisms will be carried by the stream flow into the net. Be sure to disturb the first few inches of stream sediment to dislodge burrowing organisms. Stir the sampling area and rub rock surfaces for about three minutes, or until the area is thoroughly worked over.

5. Next, remove the net without allowing any of the organisms it contains to wash away. While the net holder grabs the top of the net, the kicker grabs the bottom. Remove the net from the stream with a forward scooping motion.

6. Roll the kick net into a cylinder shape and place it vertically in the partially filled bucket. Pour or spray water down the net to flush its contents into the bucket. If necessary, pick debris and organisms from the net by hand. Count and then release any fish, amphibians, or reptiles caught in the net.

7. Pick up any large rocks and look for organisms that are attached to them. Sort these organisms with the organisms caught with the kick net.



Stream sampling procedures (Courtesy Tennessee Valley Authority).

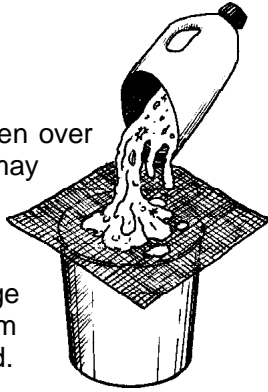
Try to collect more than 50 organisms, but do not sample more than three times in the same part of the stream. Pick out most of the pebbles, leaves and trash from the sample and pour off some of the water through a dipnet or screen. Pour the sample, with all its organisms into a large white tray. White plastic lids from ice chests work well for this. If you collected more than 100 organisms, put a stick or pencil or some other barrier across the middle to divide the sample in half. Now pick out only the organisms on one side of the barrier, and put them in a bucket or tray of fresh creek water. Remember to look for even

the tiny ones. Keep lots of fresh, cold stream water handy while doing this. The natural habitat for these organisms is cool stream water. In order to keep the organisms alive while picking through the sample, you may need to add stream water to the trays. For instructions on sorting organisms see *Sorting Your Insect Sample* in this fact sheet.

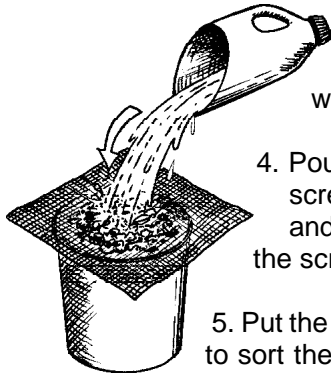
Pond and Lake Bottom Sampling Method*

1. Place some window screen over the top of a bucket. You may need to tie the screen to the bucket.

2. Use the plastic bottle dredge to scoop up some mud from the bottom of the lake or pond.

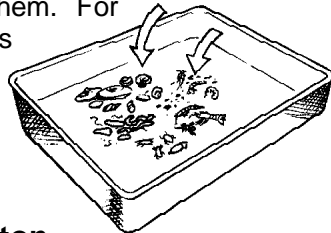


3. Pour the contents of the dredge through the window screen.



4. Pour water over the window screen to wash away the mud and leave the organisms on the screen.

5. Put the organisms in a white pan to sort them. For instructions

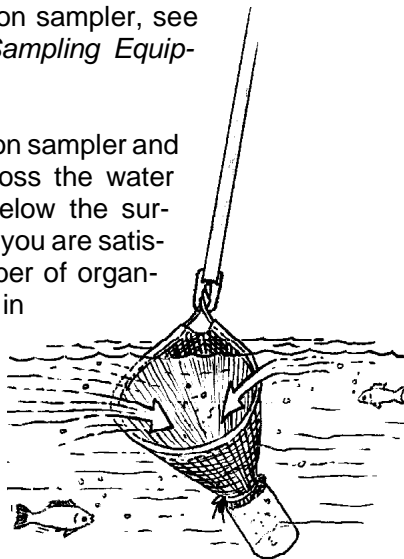


on sorting organisms see *Sorting Your Insect Sample* in this fact sheet.

Pond or Lake Plankton Sampling Method*

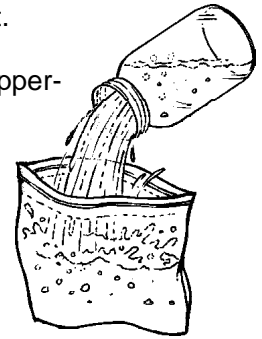
To make a plankton sampler, see *Made at Home Sampling Equipment*, Lit # 26.

1. Take the plankton sampler and slowly drag it across the water surface, or just below the surface. Repeat until you are satisfied with the number of organisms that collect in the jar at the end of the plankton sampler. Downwind areas usually have more plankton than upwind areas.

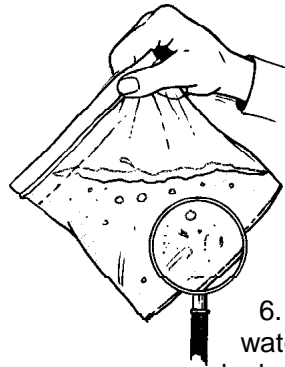


2. Remove the jar from the net.

3. Pour the water into a zipper-sealed bag.



4. Hold the bag by one of the corners, so that one corner is at the bottom. After a few minutes, the plankton will begin to settle into the corner of the bag.



5. Hold the bag up to the light and examine it with a magnifying glass. A 20X magnifying glass should work; however, if you have a higher magnifying glass you will be able to see more detail.

6. You also can place a drop of water on a microscope slide and look at the plankton through a microscope. You can also use discovery scopes to view the organisms.

Sorting Your Insect Sample

Pour your sample into a large, shallow, white pan. Add some stream or lake water to the pan, and fill an ice cube tray with stream water. Using tweezers, an eye dropper, or a spoon, pick through the leaf litter and organic debris, looking for anything that swims, crawls, or seems to be hiding in a shell, like a snail. Look carefully; many of these creatures are quite small and fast-swimming. Place similar organisms into the same chamber of the ice cube tray. Identification is easier if you sort the organisms into groups based on physical similarities and placing them together in sections of an ice cube tray as you pick them from the pan or net.

Some monitoring programs find it easier to collect organisms from the net by hand-picking them rather than washing the sample into a pan and then trying to pick through the floating debris. The advantage to placing the organisms in a pan is that they are more likely to survive in the pan; their characteristic movements will help you identify different organisms.

If you prefer to sort organisms directly off the net, a white background, such as a white plastic trash bag under the net, will help you see the bugs more clearly. In addition, periodically wetting the net with a water bottle will help keep the bugs alive and moving.

* Illustrations by Jon Dickey

Preserving Organisms

Choose an appropriately sized clear jar to preserve your organisms. Include only a small number of organisms (1-5) of each type. If there are individuals within a type that look a bit different, try to see that representatives are included in your preserved sample. For large organisms, one individual of a type may be sufficient for your sample. A baby food jar or half-pint jar should be large enough for most samples. Label your jar with your name, county, the stream or lake name (if it doesn't have a name, write the location instead), the date, and the habitat type (riffle, run, pool, vegetation, lake bottom, photic or aphotic, or other type of habitat). Put enough alcohol in the jar to completely cover all the organisms. Use 70% isopropyl alcohol (rubbing alcohol) to preserve your sample for a few months. If you want to maintain your specimens for a longer period, contact an Extension entomologist or a biologist for assistance. You should be able to see the organisms easily. If there is not enough alcohol in the jar, the sample will be too cluttered and you will not be able to see the organisms easily when you shake the jar gently. Only include invertebrates in the sample! Do not include fish, frogs, tadpoles or other larger organisms. After placing the organisms in the jar, screw the lid on tightly and be sure the jar is labeled with your name, the location of the stream or lake, the name of the stream or lake, and date the sample was taken.

History

Streams, lakes, and ponds can change dramatically over time but they usually do so very slowly, making it hard to notice gradual year-to-year changes. For example, a stream may have once been deep with a stable channel, but today it may be much shallower with a channel that changes with every high flow. A pond may have once been deep with many fish in it, but today has few fish and is overgrown with plants.

Find out about the stream's, pond's, or lake's past by talking to adults who have lived by the water body. What it was like when they were young? Some questions you can ask include: Did you fish in the stream, pond, or lake in the past? Were there more or less fish in the stream, pond, or lake than there are now? Has the stream channel, depth, or width changed? Has the depth of the lake changed? Has it become more shallow? Is the stream sunnier or shadier? What intentional or unintentional changes have people made that may have helped or hurt the water body? You can come up with your own questions to ask also. These questions and your ques-

tions may lead to other memories the adult may have about the stream, pond, or lake. Encourage the adult to talk about whatever he or she feels is important about the water body. Remember to take good notes! You also can use a tape recorder, so you will be able to go over the interview later.

Supplies List

Stream Sampling Method

- kick net
- friend to help with sampling
- bucket
- spray bottle
- white plastic lid (like ones from ice chests)
- white pan (to look at organisms on)
- stick or pencil for a barrier (if you collect a large amount of organisms)
- ice cube tray (white is preferred)
- tweezers
- jar for preserving organisms
- label (masking tape and pen)
- 70% isopropyl alcohol or rubbing alcohol

Pond and Lake Bottom Sampling Method

- window screen
- bucket
- plastic bottle dredge
- ice cube tray (white is preferred)
- tweezers
- jar for preserving
- label (masking tape and pen)
- 70% isopropyl alcohol (rubbing alcohol)

Pond or Lake Plankton Sampling Method

- plankton sampler (with attached jar)
- zipper sealed bag(s)
- magnifying glass
- discovery scopes

References to Help You Identify Your Sample

Common Aquatic Fauna of Oklahoma, 4-H Lit #28.

Reid, George K. *Pond Life. A guide to common plants and animals of North American Ponds and Lakes.* Golden Press. New York. Western Publishing Company, Inc. Racine Wisconsin.

Parker, Steve. *Eyewitness Books Pond and River.* Alfred A. Knopf. New York.

Other reference books may be available at your local bookstore.

Are You a Water Whiz?

Write the word that best fits the description in the blank next to the number. Use each word once. You will not use all the words.

Word Bank:

1. habitat 2. pool 3. riffle 4. pelagic 5. littoral 6. photic 7. aphotic 8. plankton 9. nekton 10. benthic organisms 11. infauna
12. producer 13. primary consumer 14. predator 15. decomposer/scavenger

- _____ (1) open water zone; plants do not grow in this area
_____ (2) floating or weakly swimming organisms
_____ (3) an area where the water flows quickly over rocks or other structures on the bottom, making noise as it goes.
_____ (4) organisms that make their own food
_____ (5) area in lake where plants grow
_____ (6) part of stream where the water deepens and slows down
_____ (7) consumers that capture and eat other consumers
_____ (8) a place that supplies the requirements an organism needs to live
_____ (9) organisms that live on the bottom of the lake
_____ (10) dark part of the lake, where light can not reach

If you got 7-10 correct answers you are a Water Whiz!

If you got 4-6 correct answers you are Water Smart.

If you got 1-3 correct answers you are Water Weak. (Reread the fact sheet and try again!)

Answers: 1) pelagic 2) plankton 3) riffle 4) producer 5) littoral 6) pool 7) predator 8) habitat 9) benthic organisms 10) aphotic

Requirements for State Fair Exhibit for Aquatic Organisms Report for Streams (12-14)

Sample organisms from at least two habitats in (a) two or more streams, or (b) one stream at two different times of the year. Use Report Form (Lit #22). Your report tells numbers of different types of organisms and describes the environment(s) where samples were collected. The report must include labeled photos. A representative sample of properly preserved and labeled aquatic organisms collected from each of two habitats must be included. Members entering this project for the second or third year must compare changes over time in the same body of water and include photos of the same spots, taken in previous years.

Requirements for State Fair Exhibit for Aquatic Organisms Report for Ponds or Lakes (12-14)

Sample organisms from at least two habitats in (a) two or more ponds or lakes, or (b) one pond or lake at two different times of the year. Use Report Form (Lit #23). Your report tells numbers of different types of organisms and describes the environment(s) where samples were collected. The report must include labeled photos. Members entering this project for the second or third year must compare changes over time in the same body of water and include photos of the same spots taken in previous years.

Credits

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