Name _____

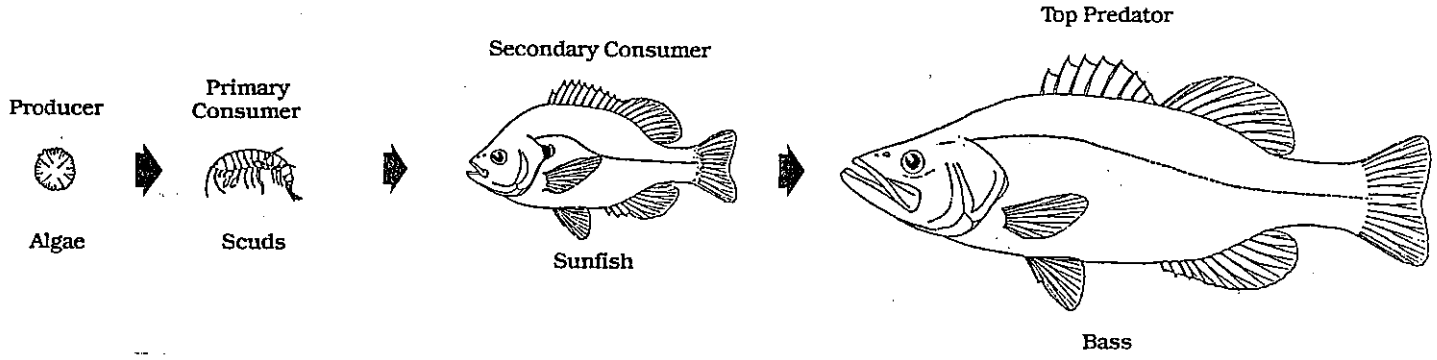
UNDERSTANDING FOOD WEBS

Vocabulary

producer	***omnivore***
primary consumer	***habitat***
secondary consumer	***ecosystem***
predator	***herbivore***

You Are Part of a Food Chain

In this simple food chain Algae get energy from the sun. The Algae are then eaten by the Scuds, who are eaten by Sunfish, who are eaten by Bass.



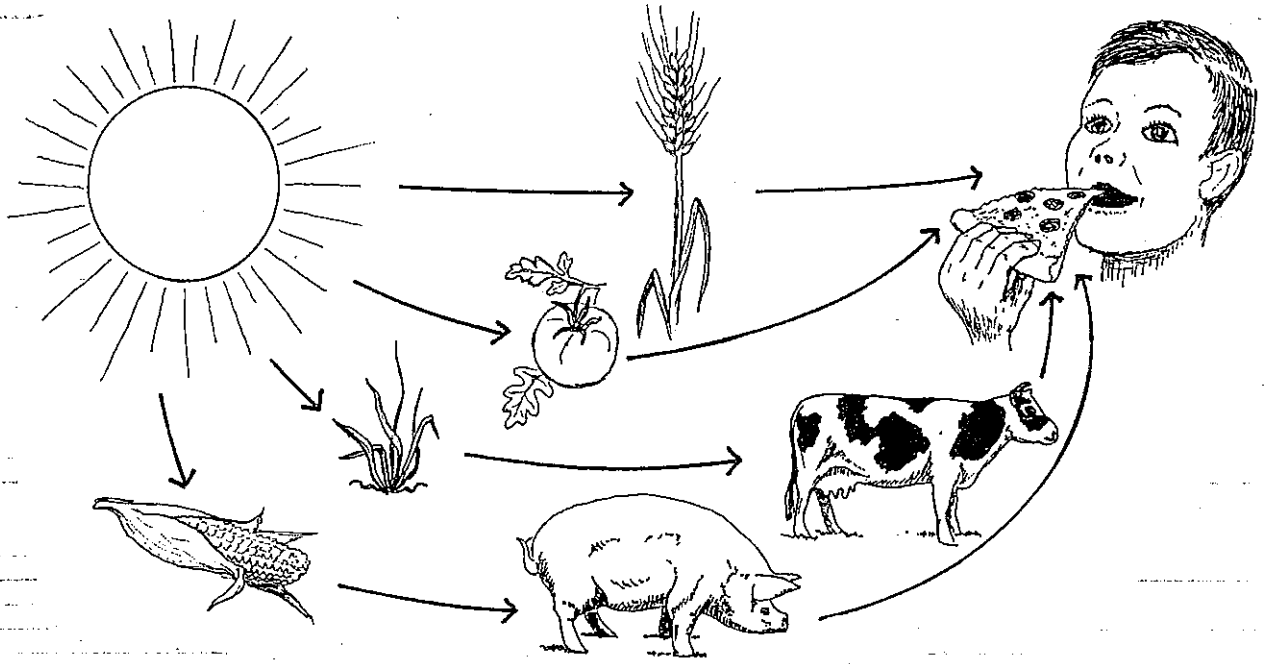
Algae are called "producers" because they make food from the sun's energy. Zooplankton like Scuds cannot produce energy for themselves. They are "primary consumers" because they eat plants like Algae to get the energy they need. Sunfish are "secondary consumers" because they eat the organisms that eat the producers. Bass are "top predators" because they prey on other organisms and, in this particular food chain, no one eats them.

Which are you?

Draw a food chain of which you are a part. Label each part using your new vocabulary words.

Where Does Your Food Come From?

Think of food you like to eat, such as PIZZA. Pizza is made up of a number of different ingredients: cheese, flour, tomatoes and sausage. Cheese is a milk product which comes from cows, sausage comes from pigs, flour is ground wheat, and tomatoes are plants. So in one serving of pizza, you are eating food from several sources.



As in every other food chain, this one starts with the SUN.

When you eat fruit, grains or vegetables, you are a primary consumer because these foods got their energy directly from the SUN.

What ingredients of pizza make you a "primary consumer?"

If you eat meat or animal products like milk, you are a secondary consumer.

What ingredients of pizza make you a "secondary consumer?"

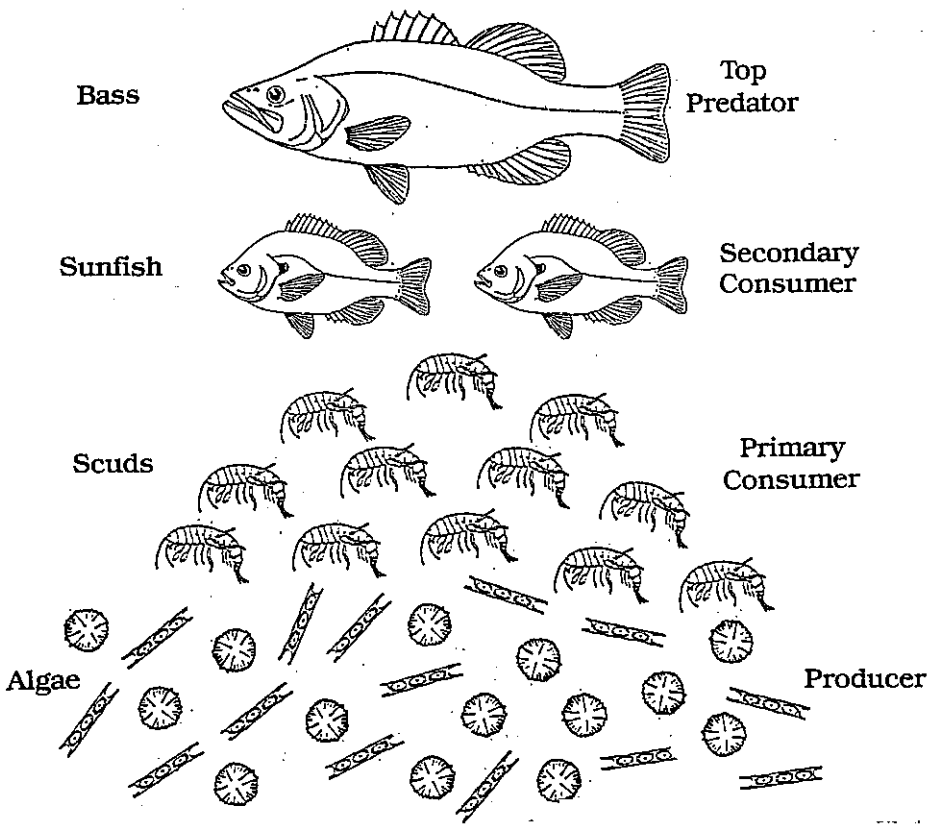
Humans are often "omnivores" because we eat both plants and animals.

Are you an "omnivore" when you eat pizza?

Think of another food you might eat and draw a picture tracing each ingredient from the SUN to YOU.

Pyramid of Numbers

To be more accurate, this food chain should really be drawn as a pyramid like this:



Which level is the largest in terms of number?

Which is the smallest in terms of number?

Is this pyramid accurate for every healthy food chain?

Are there more plants on the earth or more animals?

It Takes a Lot of Producers to Support One Predator

Let's say that a Bass eats 10 Sunfish a day, each Sunfish eats 10 Scuds and each Scud eats 10 Algae.

How many Scuds does it take to support a Bass?

How many Algae does it take to support a Sunfish?

How many Algae does it take to support a Bass?

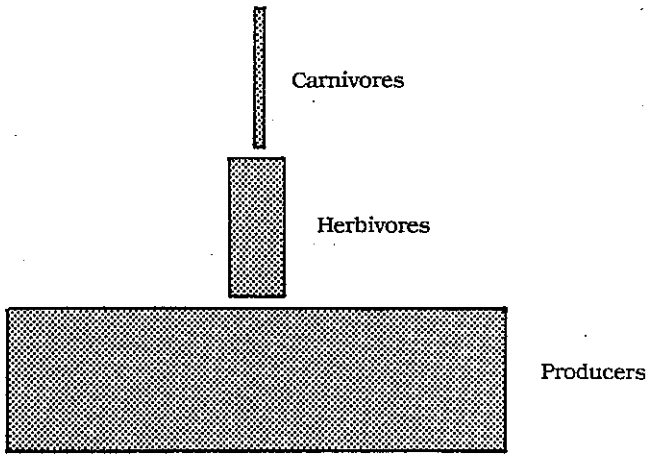
What would happen if there were more consumers than producers?

Pyramid of Energy

It takes a lot of organisms at each level of the food chain to support the next level. This is partly because energy is lost as it travels up the food chain. Most of the energy a Scud gets from eating Algae is used up in life processes like swimming and breathing. Only a small amount of the original energy from the Algae is available for the Sunfish when it eats the Scud.

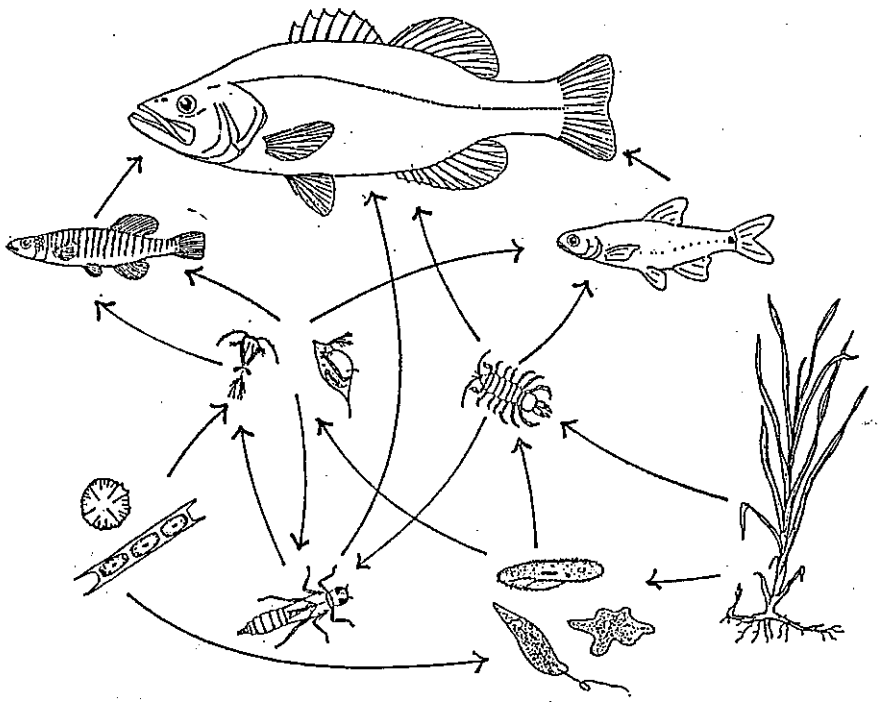
Similarly, when the Bass eats a Sunfish, the Bass gets even less of the original energy because the Sunfish has used up a lot in its life processes. At each level of the food chain, organisms have less and less energy to pass on to the next level.

Energy is also lost because animals can't digest all parts of the organisms they eat.
If you ate the Bass, would you eat every part of it?



Food Webs

In real life, food chains are not as simple as the one just described. Most animals eat many different organisms to stay alive. A Bass will eat many species of fish, insect larvae or anything else it finds. It is more accurate to use the word "web" to describe this interdependence of animals eating other plants and animals in order to obtain energy.



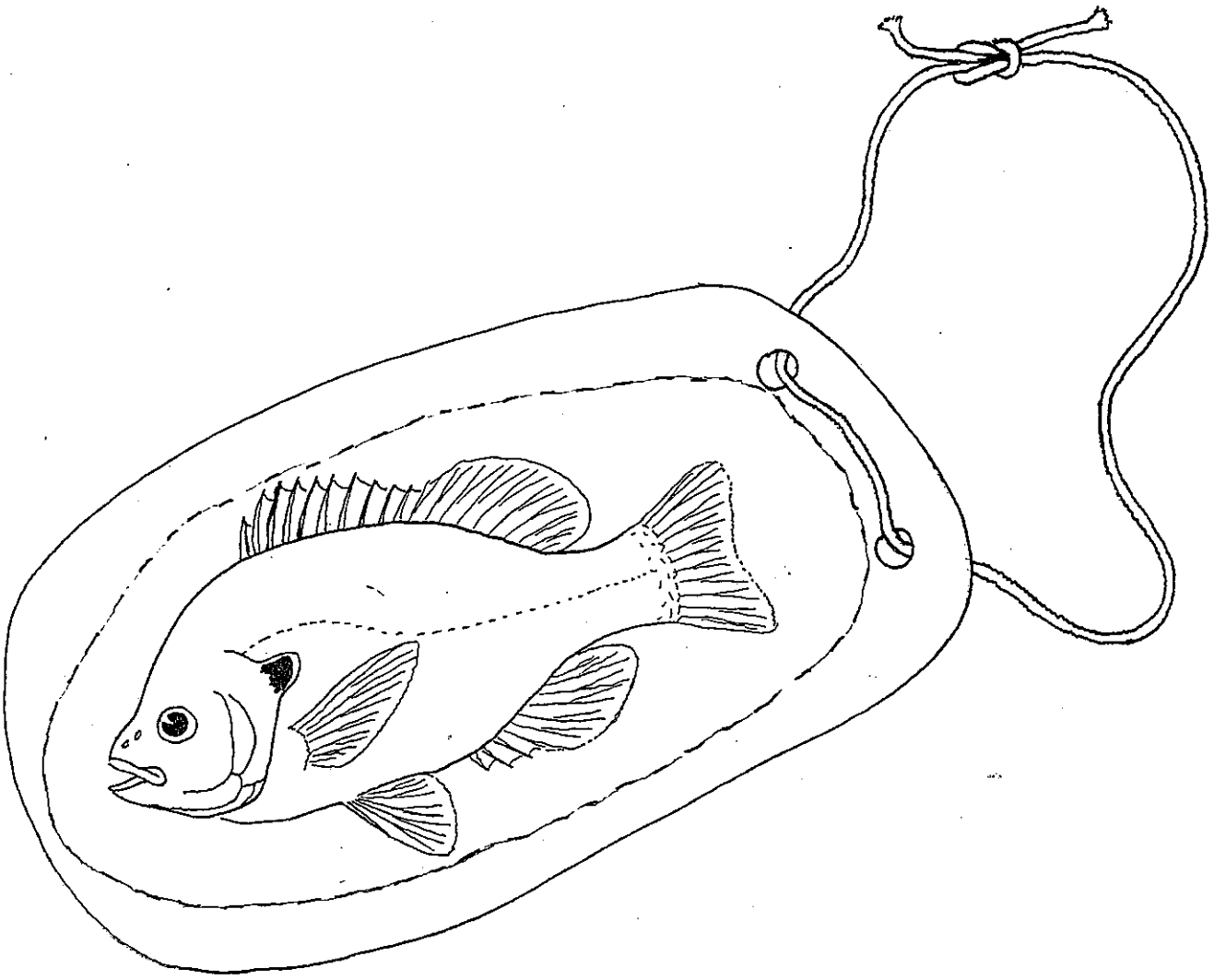
On a separate piece of paper, draw a food web showing how you get energy from five food sources.

FOOD CHAIN GAME

Before you play the Food Chain Game, you need to make tags which will identify you. Color the pictures of Algae, Scud, Sunfish and Bass. (You can copy them if you would rather, but make sure they are the same size.)

Next, cut the figures out along the dotted lines and paste them to a piece of posterboard, roughly the same size. The color of the posterboard should be the same for each type of animal. For instance, all Algae could have green posterboard.

Punch two holes at one end of the posterboard. Tie a two foot piece of string so that it looks like this:

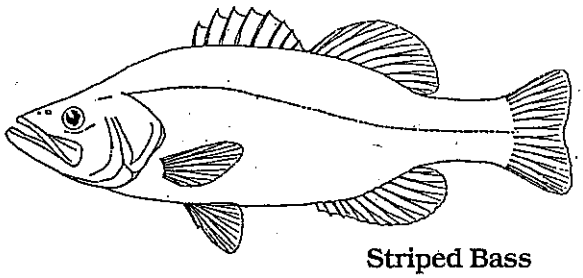


Name _____

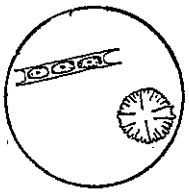
Sun

PATHWAYS OF ENERGY

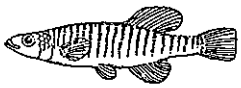
Draw arrows to discover how energy travels from the Sun to the Bass.



Striped Bass



Algae



Killifish

Golden Shiner

Zooplankton

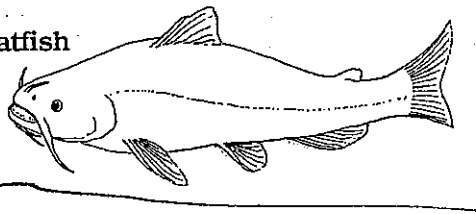
Insect Larvae

Scuds

Plants

One-Celled Animals

Catfish



Sun gives energy to Algae and Plants.
Algae gives energy to Zooplankton, One-Celled Animals and Scuds.
Plants give energy to Zooplankton, One-Celled Animals, Scuds and Catfish.
One-Celled Animals give energy to Scuds and Zooplankton.
Zooplankton gives energy to Insect Larvae, Shiners and Killifish.
Scuds give energy to Catfish, Insect Larvae, Shiners and Killifish.
Insect Larvae give energy to Catfish, Killifish, Shiners and Bass.
Killifish give energy to Bass.
Shiners give energy to Bass.

Name _____

PATHWAYS OF ENERGY Worksheet

1. **Complete this food chain:**
   SUN - ALGAE - _____ - _____ - _____ - BASS

2. **Complete this food chain:**
   SUN - _____ - _____ - INSECT LARVAE - _____ - _____

3. **What different organisms does the Bass eat?**

   What different organisms does the Killifish eat?

4. **What group should be the largest in number if this food chain is to be successful?**

5. **What group should be the smallest?**

6. **What would happen if all the Plants and Algae were killed off?**

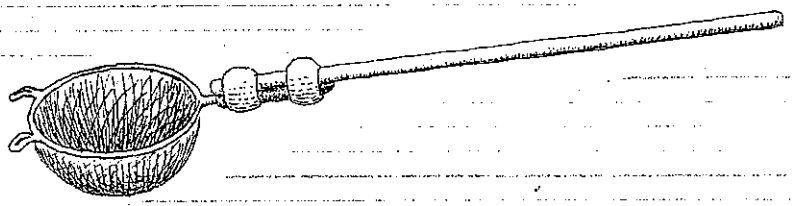
7. **What would happen if all the Insect Larvae were killed off?**

8. **With that in mind, can you explain why a food "web" is more successful than a food "chain"?**

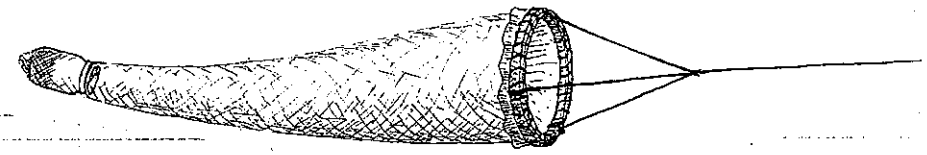
COLLECTING INVERTEBRATES

Introduction

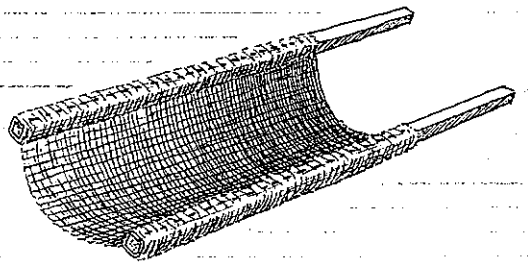
There are four types of collecting devices described below. Each one is used for a different environment, in which different organisms can be found:



Dip Nets are useful for collecting insect larvae and other organisms which live among weeds. It will also catch insects which skim across the surface of the water.



A Plankton Tow can be used to collect free-floating organisms in open water, such as fish larvae and zooplankton.



Hand Screens will catch invertebrates, like insect larvae, which live in quick-flowing streams.

A **Sifting Screen** is useful in collecting animals such as worms, which live in the bottom sediment.

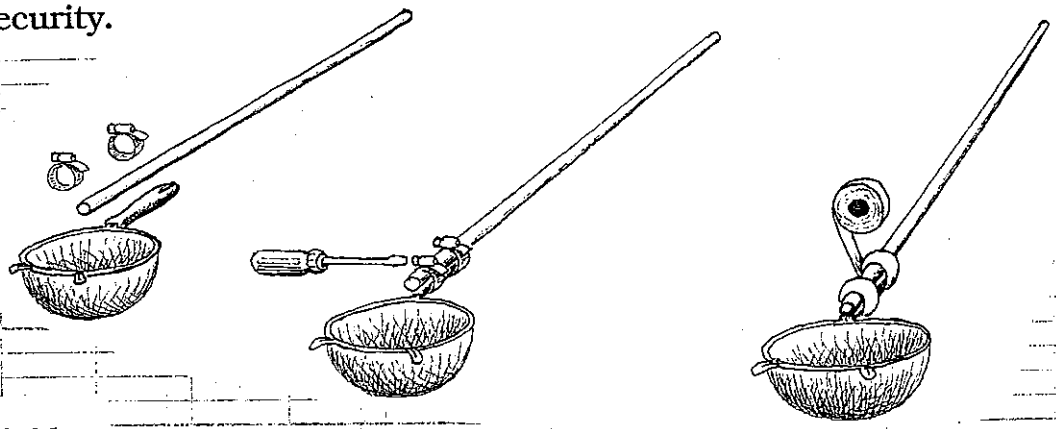
HOW TO MAKE A DIP NET

Materials

- ☐ Kitchen strainer
- ☐ Handle (broom handles or 1" dowels work well)
- ☐ Hose clamps
- ☐ Screwdriver
- ☐ Strong waterproof tape

Building the dip net

A simple dip net can be made by taking a kitchen strainer and attaching a broomstick or dowel to the handle with one or two hose clamps. Be sure to tighten the clamp well with the screwdriver, then tape over the clamps for added security.

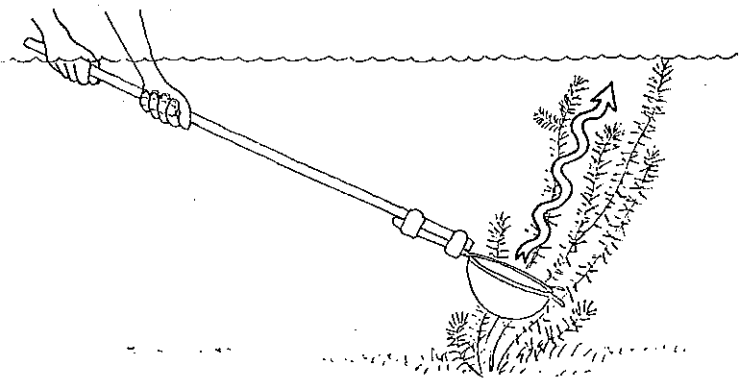


In the Field

You'll need: Dip net, boots or waders (if you plan to wade), collecting container, tweezers (optional).

Go to a pond or shallow stretch of the river where there are lots of weeds. Start from near the roots of the plant and sweep the net up g-e-n-t-l-y along the stem towards the surface. You may be able to stand on shore and do this but, if you have to wade, be sure that you have proper foot covering: waders, rubber boots or old sneakers.

After each sweep with the net, check to see if there is anything crawling around in your strainer. If so, rinse it out in a bucket of water or gently remove with tweezers and place in a collecting jar with a little water.



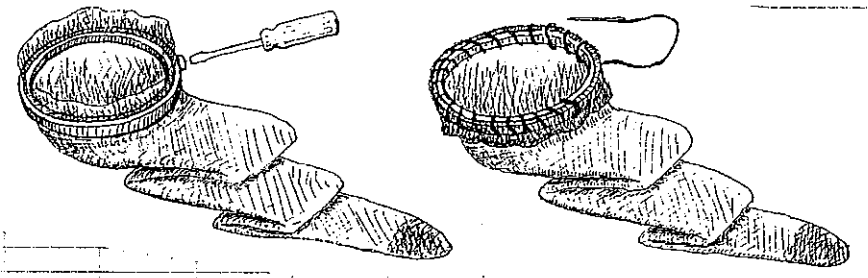
HOW TO MAKE A PLANKTON TOW

Materials

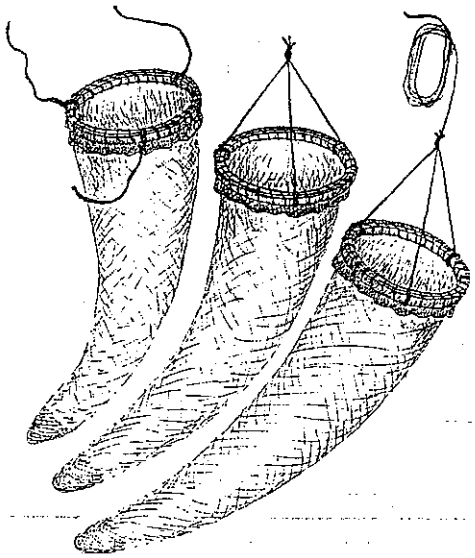
- ☐ Wooden Embroidery Hoop - at least 8" in diameter.
- ☐ Stocking or panty hose, cut off at the thigh
- ☐ Needle
- ☐ Strong thread
- ☐ Thick string or twine
- ☐ Small Jar (less than 3" diameter mouth)
- ☐ Rubber band

Constructing the plankton tow

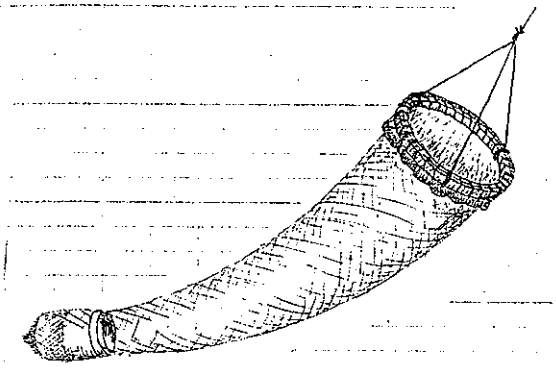
Embroidery hoops are made up of two circles, one slightly smaller than the other, which fit snugly together. Take the end of the stocking and place it around the smaller circle. Put the larger circle over it and tighten it by turning the screw attached to the hoop. There should be about an inch of stocking overlapping. Sew this overlapping piece to the rest of the stocking so that the hoop is securely attached to the stocking. Be sure to take small stitches so that your plankton tow will be strong.



Now take your string and cut 3 one-foot pieces from it. Make three evenly-spaced holes in the stocking around the circle. Put a piece of string through each hole and tie it to the circle securely. Tie the three strings together at the other end. Now attach another string at least 5 feet long to the other three strings. This is the line which allows you to pull the tow through the water or tie it to a dock.



Put the small jar inside the toe of the stocking and attach the outside with a rubber band. The water will escape through the holes in the stocking mesh and the plankton will get caught in the jar.



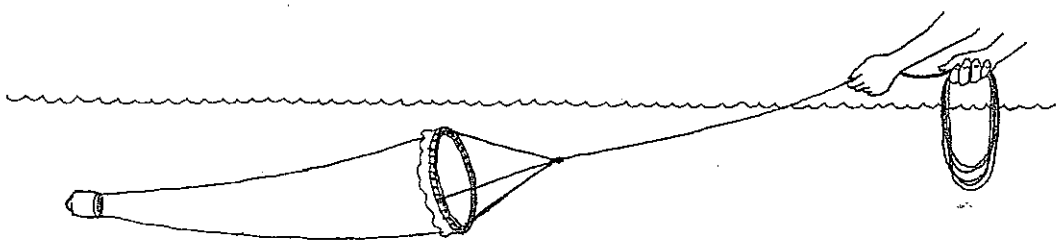
In the Field

You'll need: plankton tow, waders (optional), collecting container(s).

Plankton tows can either be tied to a dock or pulled through the water by someone with waders or boots. Be sure the jar in the toe of the stocking is filled with water or the tow will not sink. The tow should be completely submerged just under the surface. If you walk through the water with your tow behind you, keep the top of the circle just at the water's surface. Look for weeds to walk through. If you tie it to a dock, make sure there is a current, so that the tow streams out and doesn't hang limply. Leave it there for at least 20 minutes.

When you are ready to check your sample, pull the tow out of the water. Hold the jar in one hand and turn the stocking inside out until you can pour the contents of the jar into a collecting tray. These organisms tend to be very small: you may need a magnifying lens to see them.

Another method of catching organisms in a plankton tow is to take a bucket of water and pour it slowly through the tow. One person needs to hold the tow at arm's length while the other person pours. The plankton should all end up in the jar at the toe of the stocking.



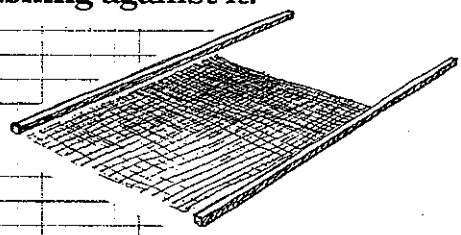
HOW TO MAKE A HAND SCREEN

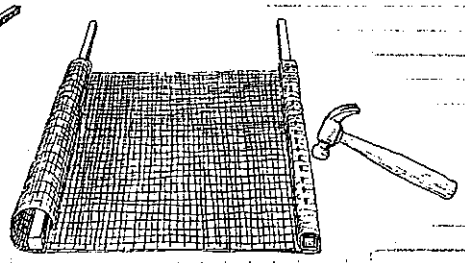
Materials

- ☐ Two wooden sticks - 2 1/2 feet in length and an inch thick
- ☐ Square of screen - 2 feet by 2 feet (The same kind you would find in a screen door)
- ☐ U-shaped tacks or carpet tacks
- ☐ Hammer

Building your hand screen

Place the screen flat on the ground and put the sticks on opposite sides of the square. Place the sticks so that the bottom of the screen is even with one end of each stick. There will be extra wood left at the other end of each stick that will serve as handles when you use the screen. Wrap the sticks with the edges of the screen and tack the screen to the sticks with carpet tacks or U-shaped nails. The screen will have to be strong enough to withstand the current of a stream rushing against it.



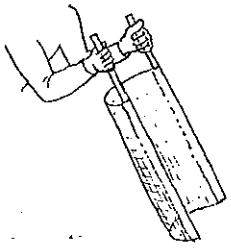


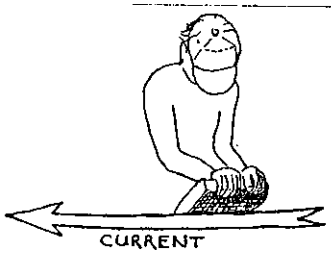
In the Field

You'll need: Hand screen; two pairs of waders, boots or old sneakers; collecting container, tweezers (optional).

Hand screens are designed to work best in fast-moving streams. Place your collecting jar on shore and wade into the stream with your screen. Hold it by the handles and place the other end in the water, so that it rests on the bottom of the stream. Hold the screen at an angle so that the top is leaning downstream, away from the current. Another person should go upstream about 3 feet from the screen and turn over rocks. Animals clinging to the rocks will be disturbed and swept into the screen.

Lift the screen even with the water's surface so that your specimens won't escape. Gently remove them from the screen with tweezers or your hands and put them in your collecting jar with a little water.





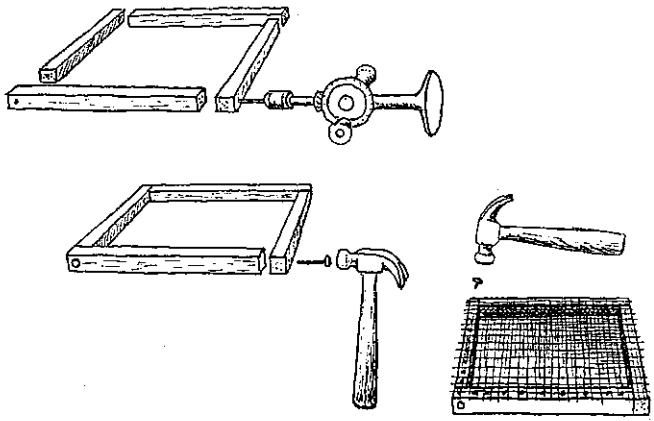
HOW TO MAKE A SIFTING SCREEN

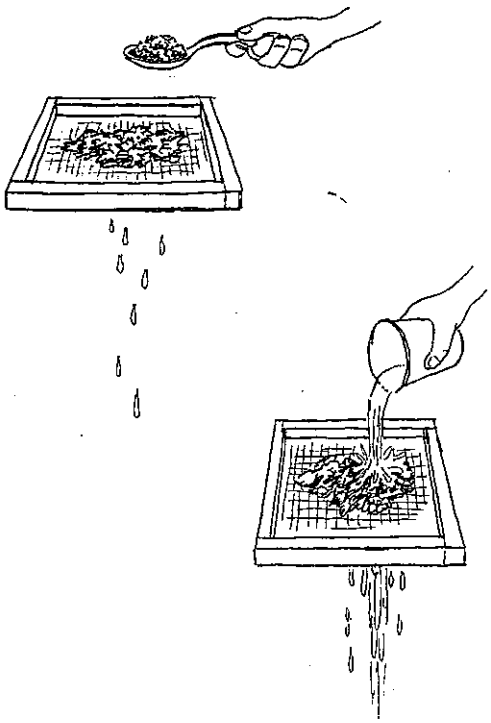
Materials

- ☐ Four pieces of wood - 1"x 2" pine - each 12" long
- ☐ Small nails
- ☐ Hammer
- ☐ Hand Drill (optional)
- ☐ Screen - (fine meshed)
- ☐ Carpet or U-shaped tacks

Building the screen

Make a square with your four pieces of wood. Hammer the ends carefully together with the nails, making sure the wood does not split (you can minimize splitting by pre-drilling each hole, making the holes smaller than the nail's diameter). Now take the screen and attach it to the square using carpet tacks.





In the Field

You'll need: Sifting screen, boots, waders or old sneakers, trowel or large spoon, two collecting containers.

Sifting screens are good for finding out what lives in the bottom sediment. Wade into the water and scoop some sediment up with your garden trowel or spoon. Put the sediment in the screen and gently pour water through it using one of your containers. The small animals who live in the mud will get caught in the mesh. Pick them up gently and put them in your other collecting jar with a little water.