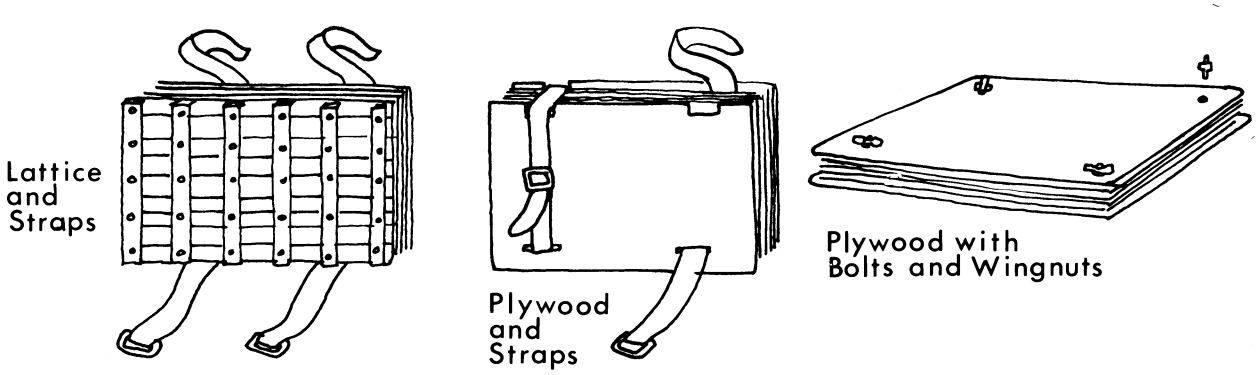
10 Make-and-take field equipment

"… to be a naturalist you do not need a lot of expensive equipment.… you can still study successfully and discover amazing things with the simplest of tools."
— Gerald Durrell

Plant press

A plant press can be as simple as a stack of books or as complicated as a lumbermill's kiln. Common sizes run from a 5"×8" hiker's press made of quarter-inch plywood to 18"×24" models of three-quarter inch stock. Make whatever seems to suit your needs and materials. Some simple ones using wood slats or plywood are shown below.

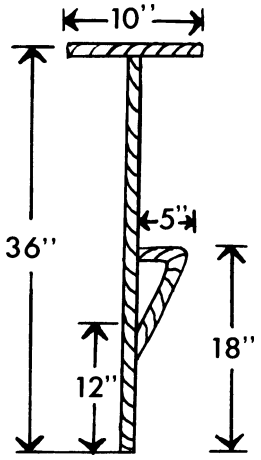


Vasculum

At times it may not be convenient to press plant specimens in the field. A large plastic sandwich box will keep specimens from drying out or from being crushed for short periods of time. Damp paper towels can be added to keep the plants fresh for longer periods.

Planting tool

A simple tool for planting willow or other unrooted cuttings can be made from a piece of rebar (concrete reinforcing rod) cut and welded to the shape shown at right.

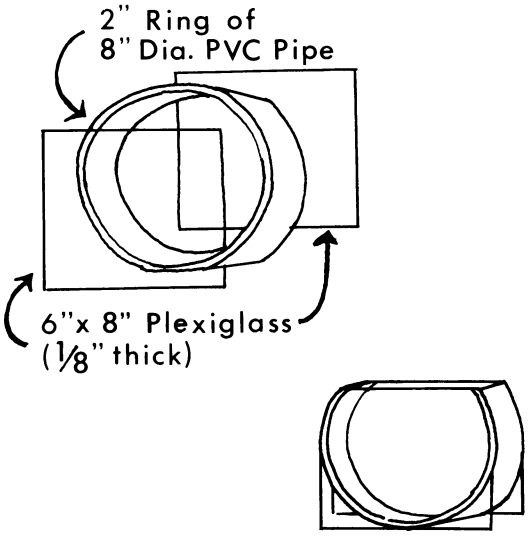


Small aquariums

For individual or small-group observations or experiments with aquatic organisms, small containers are essential. While an assortment of jam jars will work, a set of miniature aquariums will add pizazz and consistency to your classroom. Two possibilities are shown below. Feel free to adapt or invent to meet your needs and available materials.

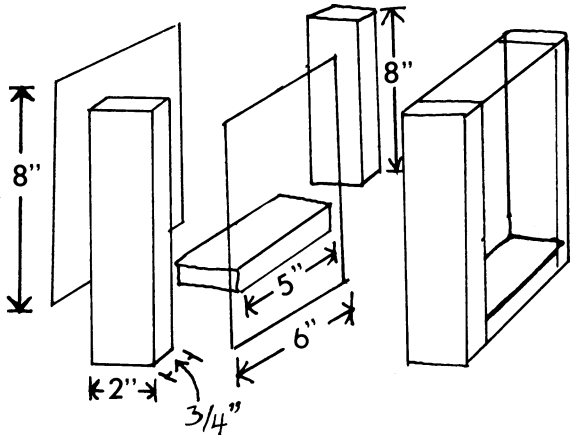
PVC Pipe

Cut a 2" ring of PVC pipe. With silicone seal, glue a piece of plexiglass to each side of the pipe, aligning the plexiglass edges with one outside PVC edge. Using the dimensions shown, the plexiglass will not cover the pipe. Do not worry about it. Clamp securely. After the silicone has completely cured, and with the clamps still in place, use a sabre saw, bandsaw or hacksaw to cut off the exposed top of the PVC pipe and the upper corners of the plexiglass.



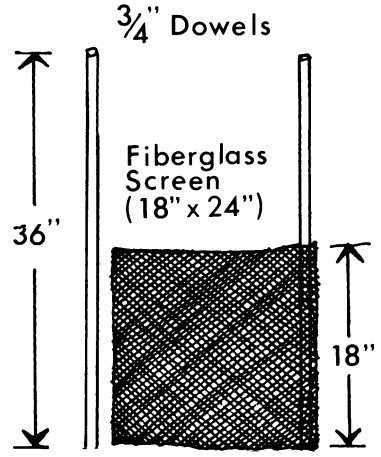
Wood

Before assembly, finish all edges of the 1"×2" cut pieces (see diagram for cutting dimensions) with a good sealer such as an epoxy paint or a finish with polyester resin. Nail the three pieces of wood together as shown using silicone seal as caulking at the joints. Glue the plexiglass sides to the wood frame with silicone seal. Clamp, and let the silicone cure completely.



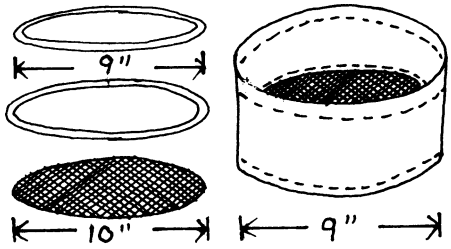
Hand screen

Stapling or tying fiberglass screen to two dowels makes a collecting screen. Disturb the upstream streambed and let the current carry insects down into the screen.



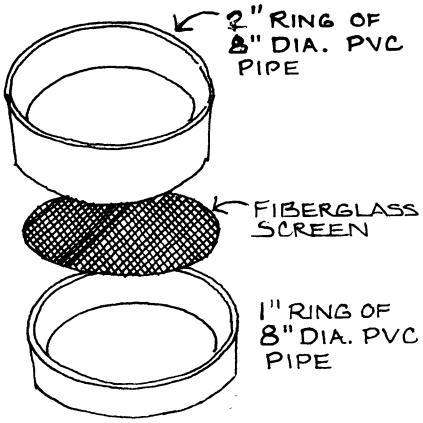
Sieves

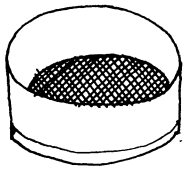
Many things can be used as a sieve to sort aquatic insects. Kitchen sieves and tea strainers are two commonly available items that will do as a start. Coffee cans with both ends cut out and screen attached to one end with solder, wire, or duct tape is an inexpensive alternative. Fiberglass screen from a hardware store, stretched over a plastic embroidery hoop, is another good starting point.



For a collapsible sieve that is easily stored, sew fiberglass screen to a cloth sleeve and attach it to two macrame rings.

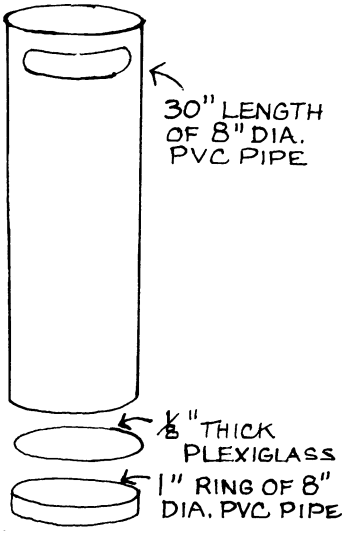
A nearly indestructible sieve can be made by sandwiching fiberglass screen and silicone seal between two rings of PVC pipe.

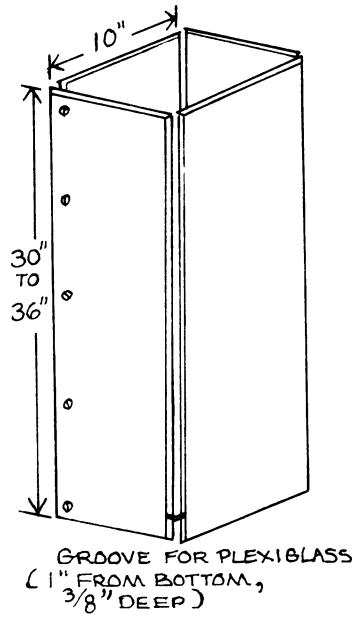




Aquascopes

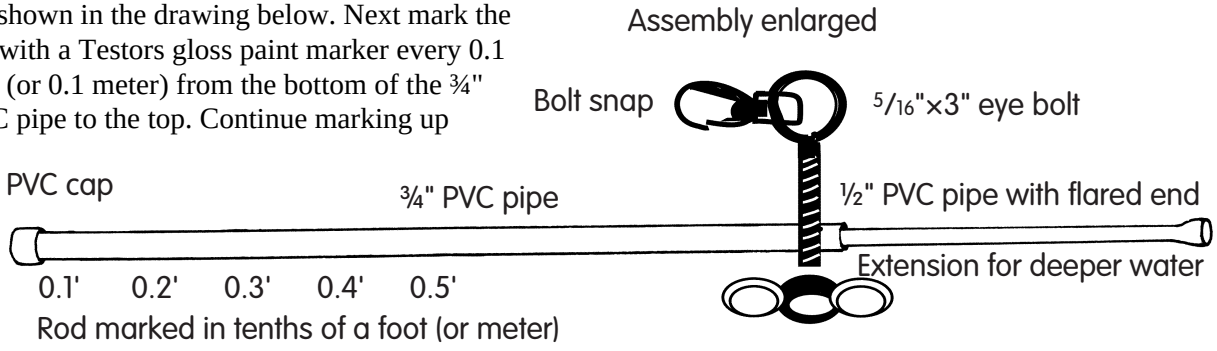
A tube that blocks reflected light and allows you to see below the surface of the water can be as simple as a bucket or ice chest with a hole cut in the bottom and a plexiglass window glued in. Below are two fancier versions, one made from cedar 1"×10"s finished with a good coat of wood sealer, and one from PVC pipe. Both use plexiglass windows glued in with silicone seal.





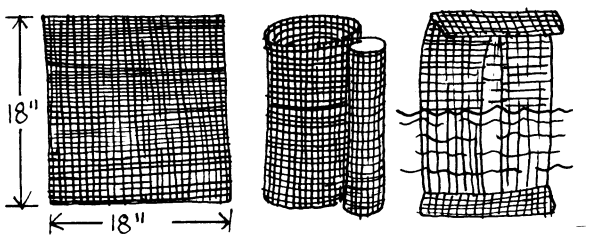
Telescoping depth stick/surveyor's rod

Two 6-foot lengths of PVC plumbing pipe that nest together (one piece half-inch diameter, and one piece three-quarter inch diameter) make a versatile tool. The flared end of the ½" pipe keeps it from dropping all the way into the larger ¾" PVC pipe. To construct the telescope, drill a hole near the top end of the ¾" PVC pipe all the way through the pipe and the ½" PVC pipe in its un-extended position. Next extend the telescoping ½" PVC pipe until it is about one foot from the end of the ¾" PVC pipe. Re-drill through the previous hole while the interior PVC pipe is in place. This hole will receive the eye bolt assembly shown in the drawing below. Next mark the rod with a Testors gloss paint marker every 0.1 foot (or 0.1 meter) from the bottom of the ¾" PVC pipe to the top. Continue marking up the side of the ½" PVC pipe while it is in its extended position. Use orange or red paint. Using yellow-colored plastic tape, mark every foot by wrapping the tape around the rod. Push the ½" PVC pipe back into the ¾" PVC pipe. Insert the eye bolt assembly into the rods, securing it with a wingnut. If the water gets deeper than 6 feet, you can pull out the eye bolt assembly, extend the ½" PVC pipe and insert the eye bolt assembly into the second hole of the telescoping rod. This gives you an 11-foot surveyor's rod. The measuring tape easily attaches to the bolt snap.



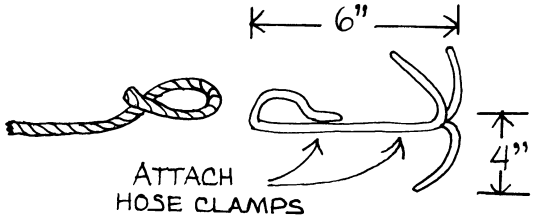
Insect rearing cages

Hatching aquatic insect larvae in a body of water is made easier by constructing a simple pillow cage from metal window screening. Join two opposite sides of an 18"×18" piece with a "drug store" fold. Flatten the cage, roll one end, add insects, roll the other end, and place the cage about halfway into the stream or aquarium. The water provides oxygen and food until the insect hatches. After hatching it can crawl above the surface to dry its wings.



Drag hook

A drag hook (grapnel, grappling hook) is useful for sampling mats of vegetation that are too far from shore to reach. A simple hook can be made from a 3-foot length of ⅜" rod. Cut two 10" and one 16" lengths. Bend the ends of all three sections to a hook. Sharpening the hooks is not necessary, is less safe, and makes them more likely to permanently snag. Bend one end of the longer section into an eye. Bind the sections together at roughly 60° angles with small hose clamps, then add a small amount of solder between the clamp and rod to help prevent the rods from turning. Attach rope to the eye, and it is ready to drag.



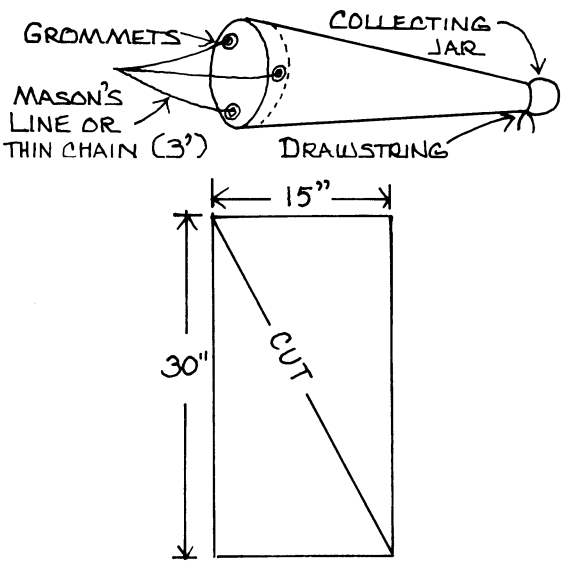
Nets

There are probably nearly as many types of nets as there are things to net. While some basic types are shown here, net designs are easily modified to suit specific purposes. For some jobs the nets illustrated may be too large, too small, too weak, or have mesh too coarse or too fine. Again, adapt to meet your needs and materials.

Plankton Net

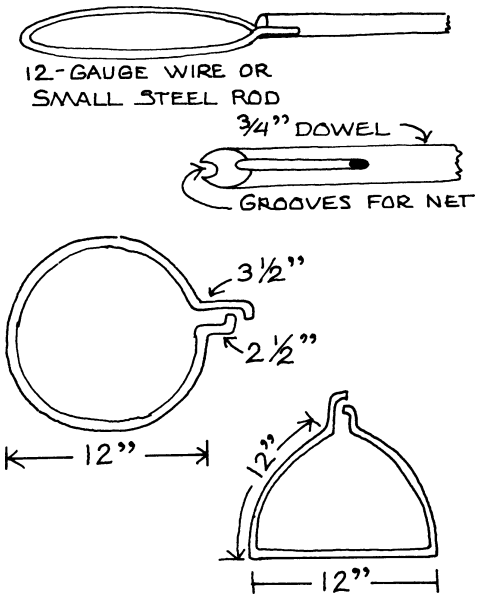
A plankton net is generally made of tightly woven material that will let water flow through but trap small solid particles. In this version, the large end is held open by a metal macramé ring, and a drawstring at the narrow end secures a glass or plastic jar to collect the concentrated solids.

Uncoated nylon fabric or silkscreen cloth are two possible choices of tightly woven fabric. Cut the fabric as shown in the diagram, sew the two pieces together into a cone, and then cut off about 4 inches at the narrow end. Hem a drawstring into the narrow end. Sew a 9-inch macramé ring into the larger end, and install three grommets as evenly spaced as possible around the larger end. Attach three pieces of strong line (such as mason's line or thin brass chain), each 3 feet long, to the grommets. These can then be attached to a rope if the net is to be towed from a boat or a wooden pole if the net is to be towed from shore.

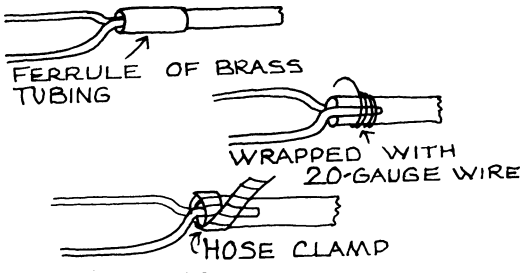


Nets with handles

Most nets with handles can be made from the same basic idea, modifying the size to fit specific needs. Make a hoop of 12-gauge wire (or steel rod if a stouter design, like a D-net, is needed) and attach to a ¾" dowel. Handle length will vary from about 3 feet for an aerial insect net to 6 feet or more for collecting from a pond or stream with steep banks.The rim is attached to the handle by two hooked prongs that fit into grooves gouged in the sides of the handle near the end. The diagrams give some starting dimensions.

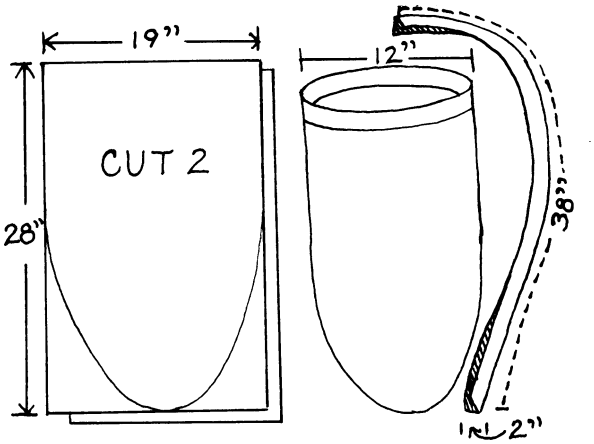


To secure the rim to the handle, wrap the handle with 20-gauge wire, use hose clamps, or find a piece of brass tubing with an interior slightly larger than the dowel to use as a ferrule. Nets can be attached by sewing them onto the rim, sliding them onto the rim (you need ferrules for this), or attaching with grommets and hog rings.



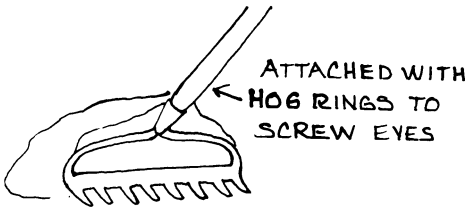
Aerial nets

Nets used to capture flying insects should be made from a coarse cloth (such as lightweight muslin) through which air can easily pass. The pattern shown is sewn around the edges. The long 4-inch strip of cloth is heavier material and is used to band the top. It should be attached so the rim can be threaded through this heavier cloth. Because these nets are sometimes torn on vegetation, a rim attached with a ferrule is recommended.



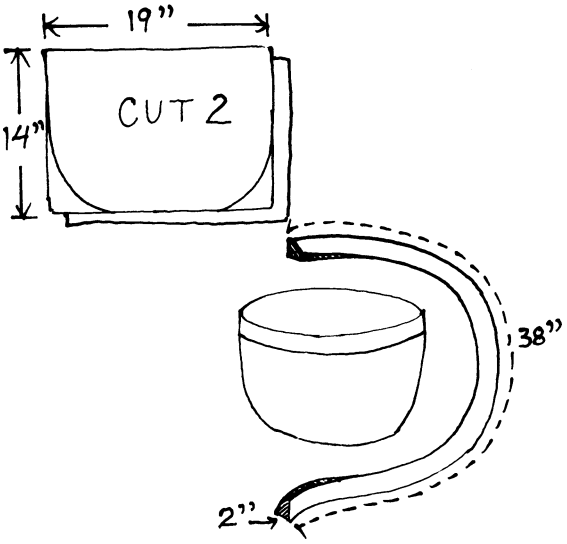
Drag rake

A garden rake fitted with a dip net bag is useful for collecting from stream or pond bottoms. The rake is used to loosen the bottom material with the net on the downstream side. Water flow will carry specimens into the net. Because unwanted silt or other material may also be carried into the net, it may be helpful to use a fabric that will let silt pass through but collect specimens of the proper size.

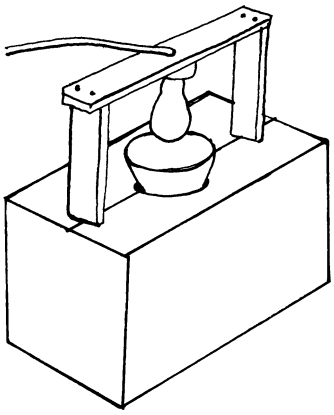


Dip nets

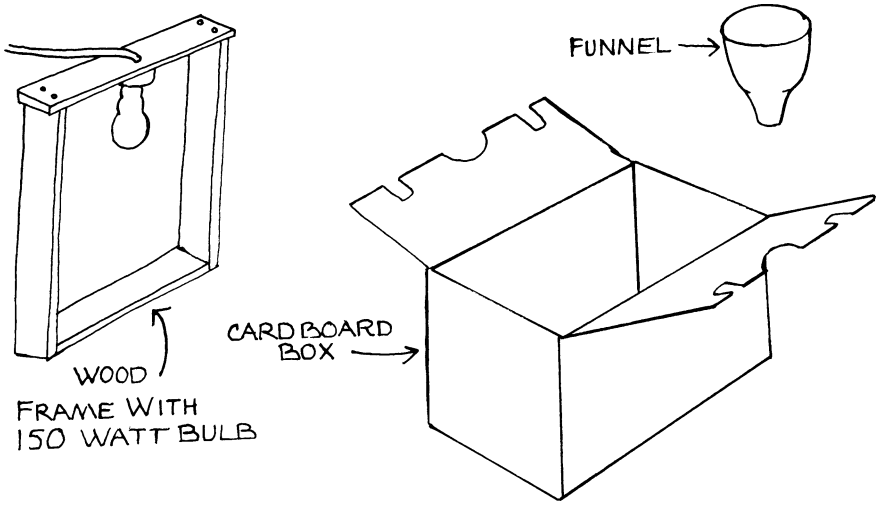
Dip nets can be made from the same lightweight muslin as aerial nets or a mesh such as mosquito or no-see-um netting. Generally, dip nets are shorter than aerial nets, with the depth slightly greater than the diameter of the rim. Again, a heavier piece of fabric is used to band the top. Possibilities for attaching the net to the rim are explained on the previous page.



Terrestrial light trap

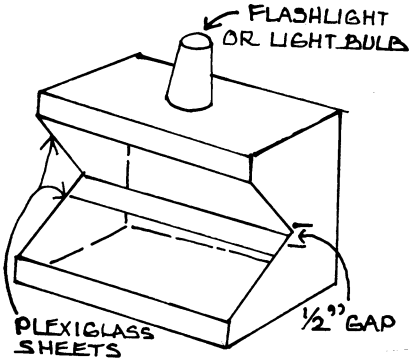


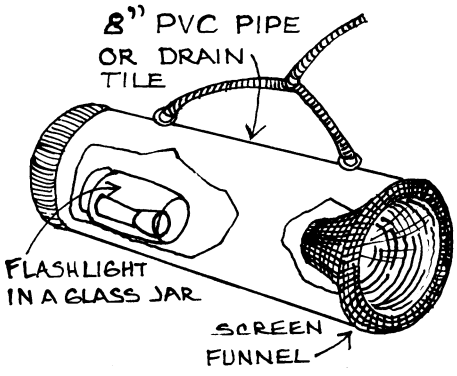
Moths and other insects attracted by light can be collected in simple light traps. A white sheet hung in front of a gas lantern is an effective trap. The insects can be collected from the sheet with a net or jar. Shown below is a type of simple trap that will collect the insects for you. Vary the dimensions according to the strength of the light source available, and vary the materials to what is readily and cheaply available. The trap at the top works best with at least a 150-watt bulb. The lower trap will be more effective if the inside is coated with white paint or aluminum foil to increase reflected light. Sections of egg carton placed in the bottom of either trap will give the captives a place to rest and hide and help prevent injury from fluttering around.



Aquatic light trap

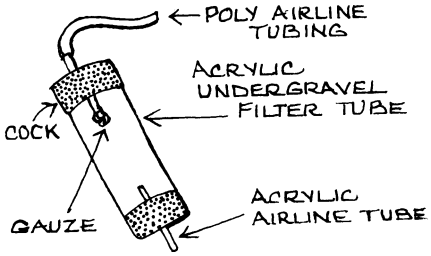
To use the same idea in water as on land, try a trap similar to the one illustrated below. This trap will be more effective if the light source is shielded so most of the illumination is directed toward the funnel end of the trap. The funnel end points downstream.

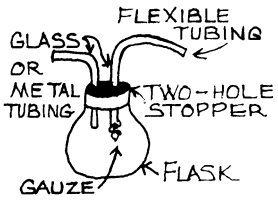




Insect aspirator

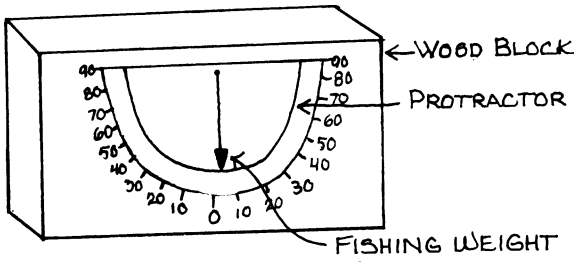
To capture small insects from foliage or nets, an aspirator (called a pooter in Britain) is handy. The one shown on the left is made from supplies found in most pet shops and the other from items available in most science classrooms. By inhaling through the flexible tube, the small insects are drawn into the large capture tube. The idea is easily adapted to many different materials.





Clinometer

To measure the slope of objects, a simple clinometer can be made from a block of wood and a protractor. Renumber the divisions with 0° at the bottom center and 90°at the end of each horizontal. A fishing weight whittled into the shape of a plumb bob and hung from thread or light fishing line makes a good pointer.



Bibliography

For more ideas on inexpensive equipment, watch for science activity books for younger students and check the background sections of various field guides. Below are listed some books that have been helpful.

Durrell, Gerald, *A Practical Guide for the Amateur Naturalist*.

Hillcourt, William, *Field Book of Nature Activities*.

Klots, Elsie, *The New Field Book of Freshwater Life*.

National Science Teachers Association, *Classroom Creature Culture*.

Stein, Sara, *The Evolution Book*.

Usborne Hobby Guides: *The Young Naturalist*, by Andrew Mitchell and *Understanding and Collecting Rocks and Fossils*, by Martyn Bramwell