

Pitfall Tube Trap Specifications & Construction

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This document provides a step-by-step procedure for constructing and deploying a pitfall trap unit that we hope can serve as a standard for ground-dwelling arthropod studies. It has been very successful for us in monitoring ground-dwelling arthropods in a variety of habitats in the southwestern USA. There are several key advantages of this design over the “Plastic Cup” design. The traps are easy to install and they can be left in place for up to three weeks. Because it has a protective cover and smaller tube diameter animals usually do not destroy traps or drink from the traps, which is important since even propylene glycol is poisonous. Traps do not dry out even in the hottest desert environments and do not become flooded unless rain surface flows form. The tubes are easy to replace to allow for continuous trapping year-round. They are relatively permanent and should last 10-20 years with only minor repairs. They sample the full spectrum of arthropod sizes including the largest species and yet vertebrate captures are minimized. The drawback in this design is that it is more expensive, costing \$1.85 per trap in materials and more effort is required in the initial construction of the traps. The pitfall trap consists of a collecting tube, pitfall sleeve, and a pitfall cover. Please contact Neil.Cobb@nau.edu for any questions or suggestions.

Description of Pitfall Trap Unit: A 32mm (ID) X 200 mm long borosilicate glass test tube serves as the pitfall <http://www.scienceenthusiast.com/>.



Figure 1A. Cut holes for side holes in pitfall covers.



Figure 1B. The stippled area shows the outline of one pitfall cover.

which is set flush into a hole created with a 2 inch diameter soil auger. The tube is filled with propylene glycol up to 100 mm, the propylene glycol is typically diluted 25 with water. The amount of preservative and dilution depends on expected amount of surface run off and evaporation. A PVC pitfall top is wired to the PVC sleeve to prevent dilution or overflow of pitfall by precipitation runoff.

I. Pitfall Construction

1. Pitfall Covers. First cut side holes in black or white SDR 35 PVC pipe with a 2 inch (Inner Diameter) to construct the pitfall cover (**Figure 1**). They also make transparent PVC if it will be important to not have either white or black cover tops (we use black covers for most environments because they blend in better with most ground cover types).

In two rows on directly opposing sides of the pipe, mark out increments every 3” (7.6 cm). Using a 1.5 inch diameter drill hole saw for doors (3.7 cm). drill holes on the marks directly opposing each other (**Figure 1**). These

holes will create side openings for the arthropods to enter the pitfall trap.

To complete the pitfall cover, use a table saw to cut the tube in two long halves thereby halving the 1.5" drill holes; then cut 3" pieces with either a table saw or miter saw (stippled area in Figure 1B),.

2. Pitfall sleeves. Cut a section 10" long from 1 1/4" PVC pipe (**Figure 2A**), The sleeve length will give you 2 inches beyond the length of the collecting tube to allow for soil that may fall into the pitfall sleeve during installation and when replacing pitfall tubes. This should ensure that tubes can stay in the same place for years without having to re-dig a hole that has filled with dirt.

A. Use a 1/4" bit, drill 2 holes in the pitfall sleeve directly opposite each other and 8" from the top of the pitfall sleeve. (**Figure 2B**).

B. Cut a 30 inch piece of baling wire and insert through two bottom holes, lie parallel with sleeve and secure at top with duct tape. Drill two holes in the top of the cover (**Figure 2D**) and insert the wire through the holes to complete the trap (**Figure 2E**). Use a 1/2" bit to drill 2 holes in the pitfall cover centered and directly opposite each other 3/4" from the zenith of the SDR 35 PVC arch (**Figure 2D**).

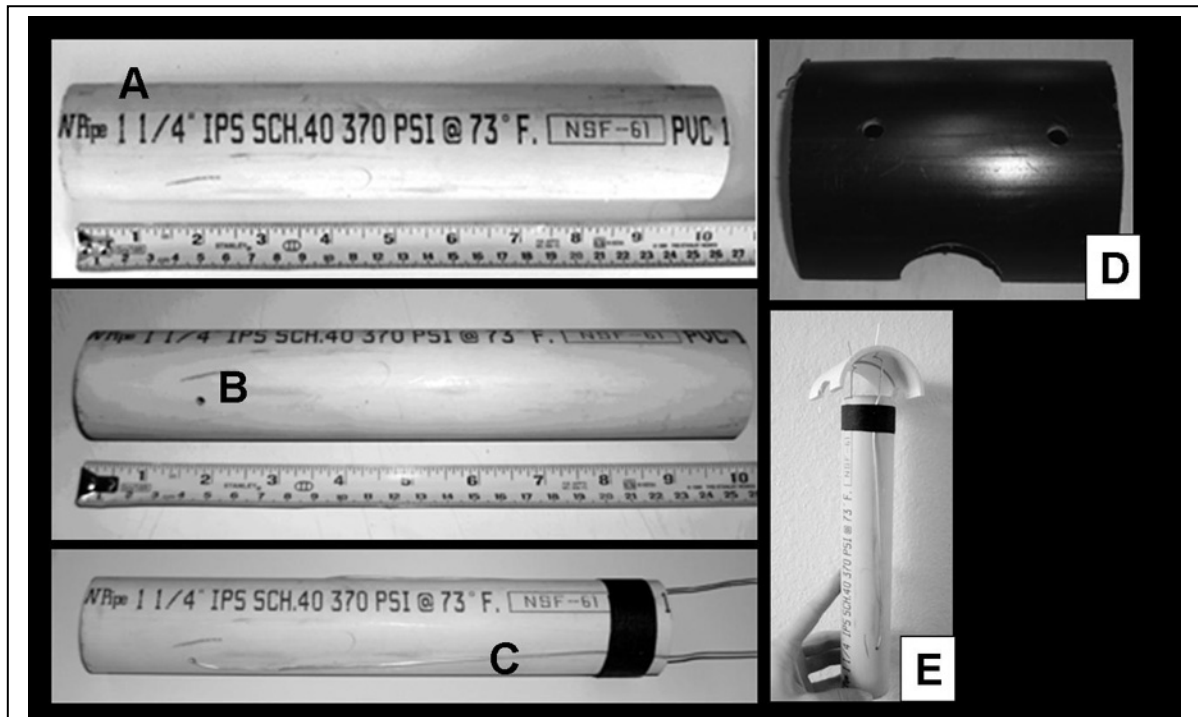
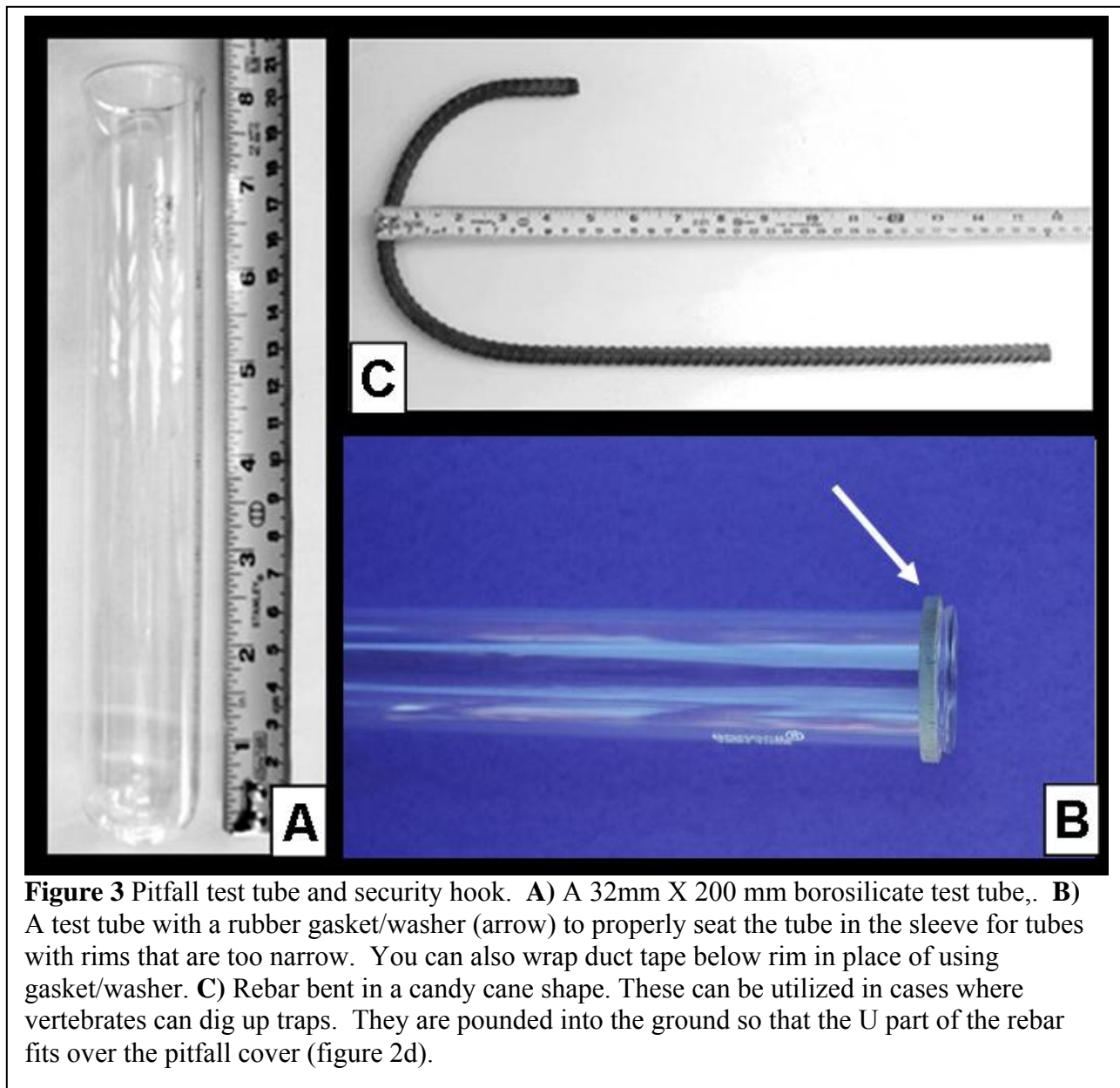


Figure 2 The pitfall sleeve and cover **A)** Pitfall sleeve made from a 10" (28cm) PVC pipe. **B)** Drill a 1/4" hole through the sleeve 2" from the bottom. **C)** Insert a 30" section of wire and secure with tape. **D)** Pitfall cover made from PVC pipe with holes for the wire. **E)** Assembled pitfall sleeve with cover.

3, Prepare tubes and security rebar (optional). The pitfall tube (**Figure 3A**) is a large lipped glass test tube, we feel it is critical to use glass tubes to prevent arthropods from being able to hold onto the walls of the tube.



A. The tubes are made in India and over 95% of them fit directly in the PVC sleeve but for those tubes that are not wide enough to fit into the PVC sleeve we use 1" in general purpose gaskets or rubber washers that can be purchased at most hardware stores or you can wrap the tube with duct tape one or two revolutions to prevent the tube from slipping down the sleeve. (**Figure 3B**). The washer/gaskets can be expensive and crack over the winter if left outside, duct tape lasts for several years.

B. Place the wrapped test tube (or with a gasket) in the pitfall sleeve. The test tube should rest lightly on the wire.

- C. Insert the ends of the wire into the ¼” drill holes in the SDR 35 PVC pitfall lid. The finished pitfall trap assemblage should look like **Figure 3D** and the top of **Figure 3E**:
- D. It is rare that pitfalls require protective rebar but if the plots are important they may need protective rebar. This is an optional device that can be used for greatly reduce the likelihood that wildlife or humans do not disturb pitfalls.. Cut a 23” long piece from ¾” steel rebar,. Bend the rebar into a “candy cane” shape (**Figure 3C**). The radius of the arch should be ~4”.

II. Installation of Pitfall Assembly

Figure 4 illustrates the components needed for installing a pitfall. First, is a soil Augur (**Figure 4**

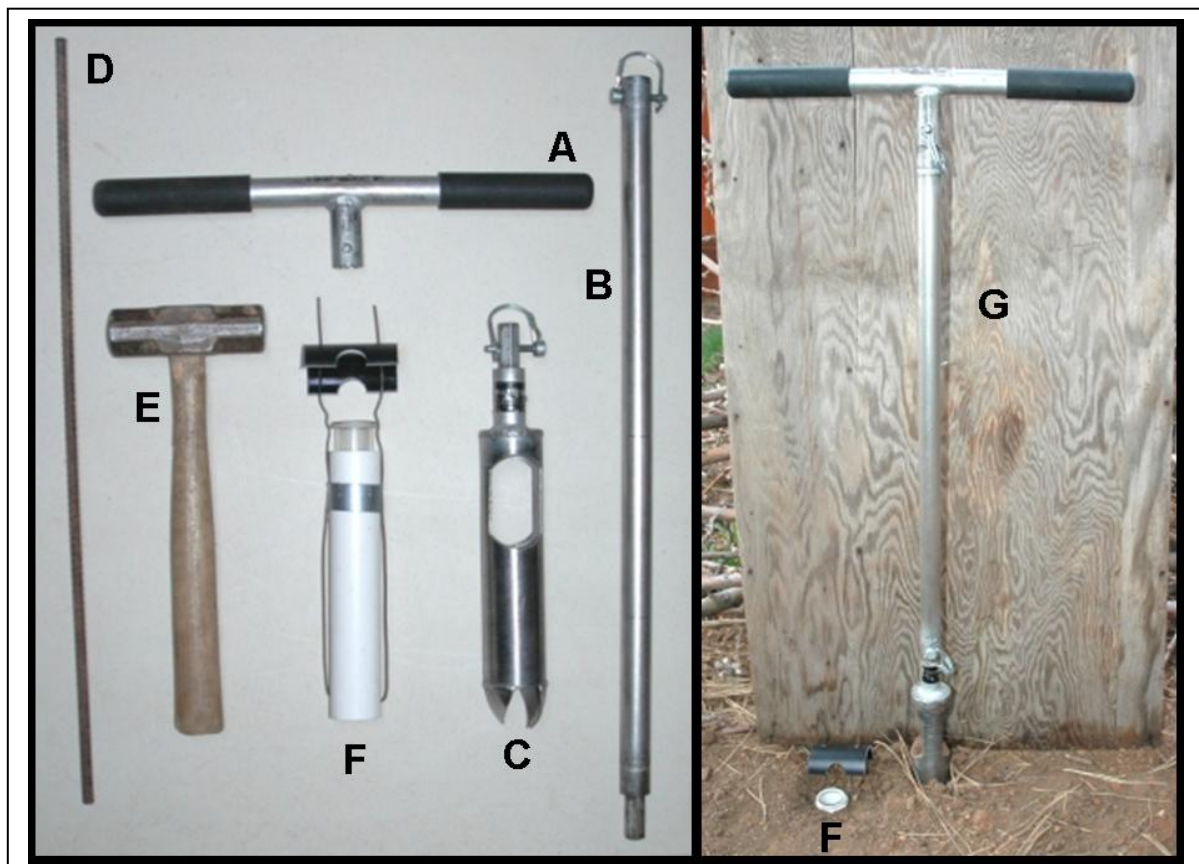


Figure 4 Equipment needed for placement of pitfall traps and assembled pitfall. **A)** top bar of soil auger, **B)** Middle post of soil auger. **C)** Soil auger (5 cm width). **D)** Rebar and **E)** hammer for testing that soil depth is adequate for pitfall placement. **F)** Assembled pitfall free (left pane) and placed in ground (right pane), and **G)** Assembled soil auger (board only used as picture backdron)

A-C and assembled **4G**) for digging the hole. Prior to digging we use a thin piece of rebar and a mallet (**Figure 4D-E**) to make sure we have clearance for digging a hole. The rebar creates minimal soil disturbance and is a quick way to make sure you are not going to dig into rock. For non-rocky

habitats this is not necessary. Dig a hole to the top of the auger blade (**Figure 4C**). Insert the pitfall sleeve (**Figure 4F** left pane) into the hole and make sure it is flush with the ground (**Figure 4F** right pane); use fingers or a blunt instrument to tap the soil around the edges of the pitfall sleeve and recheck every visit to make sure the trap is flush with the ground. We insert rubber stoppers into the top of the sleeve to make sure soil is kept out of the sleeve and slightly smaller stoppers that are placed into the test tubes if we install the entire unit together. Stoppers are pulled out after placement of the trap. Make sure a cork is placed in the pitfall glass tube while putting it into the sleeve to prevent dirt or debris from falling into the tube. Afterwards place the PVC top over the pitfall tube and pull the wires down to keep the lid in place. We only place U-shaped rebar (**Figure 3C**) over the PVC lids if we think they will be disturbed by vertebrates and even then some vertebrates will pull traps no matter what preventive measures you employ.

We fill our tubes half-way with propylene glycol (green-colored) diluted 25 to 50% with water or not diluted if we use RV propylene glycol (pink-colored). The amount of dilution depends on expected temperature and precipitation is expected during the sampling and the length of the sampling. The longer the sampling period or with increased heat and/or precipitation expected that amount of dilution is reduced. We also add the equivalent of a few drops of liquid soap to each tube to break surface tension. We typically replace tubes every three weeks, we typically do not have a problem with evaporation after three weeks, we do have pholcid spiders discover the traps and create webs over them. Three weeks also allows us to understand seasonal changes without expending excess resources in replacing traps. If you are collecting specimens for DNA three weeks is probably the maximum time to let specimens stay in the tubes in the field. These are guidelines, temperature, humidity, likelihood of surface flow during rain events diluting glycol and other considerations should all be factored in when determining concentration and amount of propylene glycol and length of trapping period.

III. Supply Contact Information and Availability

Materials:

Pitfall Trap Construction Equipment

Number Required	Item Description
1	Shovel
1 pair /person	Tough work gloves to keep blisters at bay while digging
50/site	32 x 200mm lipped Borosilicate test tubes (Science Enthusiast)
as needed	1¼” SDR 35 PVC pipe for pitfall sleeve
as needed	2” SDR 35 PVC pipe for pitfall lid
as needed	baling wire
1	Pair of wire cutters
1	Drill for pitfall trap construction
1	¼” drill bit
1	1” drill bit
1	Power saw for sectioning PVC pipe
as needed	122 Rubber Splice Tape with Liner (Cat. No. 2002) for wrapping test tube rims

as needed	100 ASTM Friction Tape (Cat. No. 1002) for wrapping test tube rims
100/site	Hooks of 3/8" steel rebar to deter wildlife (e.g., Peccary disturbance)

Soil Auger (Forestry Suppliers)

Cat. #	Quantity	Descriptions
78450	2	EXTENSION, 2' ft Forestry Suppliers
78454	2	CROSS HANDLE Forestry Suppliers
78401	2	AUGER, REGULAR, 2 X 12 inches Forestry Suppliers

Supply Contact Information

1. **32 x 200 mm Borosilicate Test Tubes with Rim:** Order through www.ScienceEnthusiast.com or by calling 1(888)288-5450. Test tubes come in packs of 50 for \$69.95; refer to product #26118. We have done bulk orders for \$56 per case when ordering 20 cases. The president of Science Enthusiast, Jim Duffey, has sent his assurance that the test tubes will be available for at least the next five years, and likely many more. In the unlikely event that Science Enthusiast is no longer able to provide the test tubes, Mr. Duffey has promised to personally put us in contact with the manufacturers in India. He can be reached by e-mail at jimd@duffeygroup.com, or by phone at (630)305-9249. We did not find any other vendors that provided glass tubes with diameters greater than 30mm.
2. **1¼" and 2" SDR 35 PVC pipe:** Home Depot, Lowe's, Ace Hardware, or any other local hardware store should carry these. The actual measurement will differ slightly from the marked value. Be sure to buy pipe that is *marked* 1¼" and 2" rather than trying to buy pipe that physically measures these dimensions.
3. **Baling Wire, Wire Cutters, Drill, ¼" and 1" Drill Bits, Power Saw:** Home Depot, Lowe's, Ace Hardware, or any other local hardware store should carry these supplies.
4. **122 Rubber Splice Tape with Liner (Cat. No. 2002):** This can be purchased at Home Depot or most other hardware stores. Cost is approximately \$2.50 for 7 m.
5. **100 ASTM Friction Tape (Cat. No. 1002):** This can be purchased at Home Depot or most other hardware stores. Cost is approximately \$2.00 for 18 m.
6. **Steel Rebar:** Block-Lite Co., Inc., located at 3900 E. Industrial Dr., Flagstaff, AZ, 86004, is a masonry supplier for northern Arizona. Hardware stores also supply steel rebar, but at a higher cost than your local concrete or masonry supplier. Block-Lite Co., Inc. can be contacted at (928)526-1118. Only needed in areas where mammals disturb traps (e.g., elk, peccaries).