

Dust Trap Protocol

(Adapted from existing U.S. Geological Survey protocol by Marith Reheis)

This manual was developed in response to a request from Northern Arizona University's Institute for Tribal Environmental Professionals (ITEP). ITEP has worked in the past with members of the United States Geological Survey (USGS) on climate change science curriculum for the Summer Scholars student groups. More recently, ITEP's Environmental Education Outreach Program has partnered with USGS staff scientists to investigate and stabilize mobilized sand dunes.

Dust traps are an ideal sampling instrument for the aforementioned research project given both the low price point for the building materials and the ease of construction. Additionally, these devices do not require electricity to operate which, unlike more complex instruments, makes them ideal for areas without access to power.

It may be wise to wipe down all trap components with ethyl alcohol prior to installing on the T-posts. This should minimize most foreign material that could influence the results of sample analysis

Construction of the Traps:

Below is a list of the materials that you will need to construct your own dust trap.

1. Teflon-coated single-piece angel food cake pan
2. Stainless steel wire
3. Small, clear glass marbles ~ ½" in diameter
4. Shears for cutting the wire and hardware cloth
5. Drill with metal-penetrable bits
6. ¼" Hardware cloth
7. Stainless steel wire strapping ½" wide

Dust Trap Materials



Step-by-Step Directions for Dust Trap Construction

Step 1

Prepare the cake pan by removing all stickers and adhesive by hand.

Step 2

Lightly sand the *outside* (do not sand the inside) of the cake pan with fine sand paper. This will ensure that the spray paint adheres properly to the outside of the pan. After sanding the outside of the pan, wipe down the pan with a clean, dry cloth to remove any dust generated while sanding.



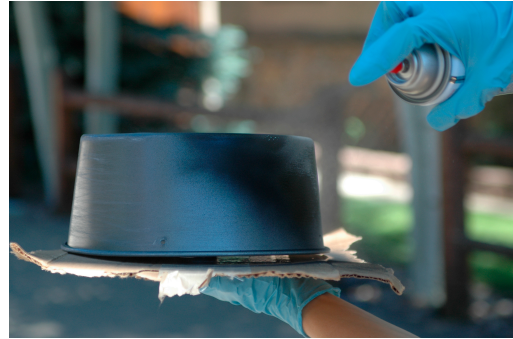
Step 3

Measure four equidistant points around the top of the pan, just under the rim. Next, drill four holes into the four marked points on the pan. Using light tape (ex: Scotch tape), cover the holes from the inside of the pan.



Step 4

Spray paint the entire *outside* of the pan being careful not to get paint inside of the pan. We found that placing the pan on top of a flattened cardboard surface made the painting process easier.



Step 5

Set the cake pan aside to dry (the paint can should specify the amount of time required to dry).

Step 6

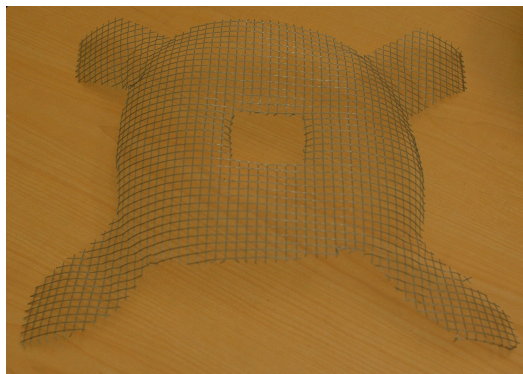
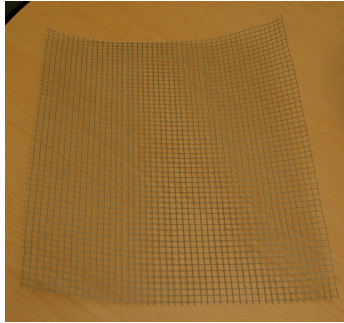
Open the hardware cloth package and remove the entire roll. It is important to note that one of the construction materials listed was a pair of tough, leather gloves. This is the point at which the gloves come into play. NOTE: Once hardware cloth is cut using the shears, the edges are *very* sharp. Therefore, you should always make sure to wear gloves when handling the hardware cloth.

First, cut the hardware cloth into a strip more than wide enough to cover the top of the cake pan. For instance, if the cake pan is 12 inches across, unroll and cut a 15 inch-wide section of hardware cloth. See diagram below.

Next, cut the strip into squares ~ 2 inches larger than the pan's diameter.

Once you've cut squares out of the original strip, lay the mesh over top of the pan and outline the pan's open top using a permanent pen.

Finally, cut the mesh so that it can fit just inside the pan leaving the four corners of the original square intact. Make sure to cut the center of the square out so that the central rod can pass through the mesh. Please note that the marbles will ultimately sit on top of the mesh so try to cut the mesh precisely and carefully so as to minimize the spaces where marbles can fall through.



Once you have finished cutting out the mesh portion of your dust trap, set it aside.

Note: If you are making multiple dust traps, it can be helpful to use the first mesh cut-out as a template for the remaining mesh cut-outs.

Step 7

Cut 2, 14" pieces of metal strapping and 4, 12" strips of wire.

Step 8

Retrieve the *dried* pan. Flip the pan upside-down and lay the mesh over the base of the pan. Mold the mesh over the sides of the pan, then remove the mesh and turn the pan right side up again. Lower the wire mesh ~3-4 cm into the pan and fold the four ear shaped projections over the rim of the pan.

Step 9

Once the mesh is resting in the pan, retrieve the metal straps and wire. Wire the metal straps onto the pan so that the two straps form a criss-cross, basket-like configuration over the top of the pan. Use the four drill holes to wire the straps to the pan. Firmly secure the two straps to the pan using wire but be sure to leave enough room in the drill holes for several more lengths of wire as the drill holes will later be used to secure the dust trap to the T-post.



Step 10

At this point the pan should be painted, the mesh should be situated in the pan and the two metal straps should be wired onto the pan. Once these steps have all been completed, pile marbles on top of the wire mesh until marbles are piled just past the rim of the pan.

Congratulations, you have completed construction of your dust trap!

Dust Trap Set-Up

Additional materials required

1. 8-foot tall steel T-post(s)
2. Fence post driver

Remember to bring your work gloves out into the field with you!



Important! It is critical to minimize contamination of the samples along each step of the construction and set-up process. Prior to transporting, and again prior to setting up the dust trap, carefully wipe down the inside of the cake pan with ethyl alcohol. If marbles or other components of the dust trap fall to the ground, do not place the items back in their original location without wiping said items thoroughly with ethyl alcohol.

Step 1

For the sake of safely transporting your dust trap, remove all of the marbles and place them in a clean, sealable plastic bag (ex: a gallon-sized Ziploc bag). Transport the dust trap in such a way that it will not get crushed or bent, this includes the mesh portion of the trap.

Step 2

Select your site(s).

Although this step may seem easy enough, it is critical to take time to select a site based on your research question.

Questions to consider include:

What do we want to learn from this research? or What is the research question?

What do we know about the prevalent wind directions in the area?

Has the dust flux been measured in this region previously?

Step 3

Drive the T-post into the ground past the two extensions at the base. Attempt to maintain the T-post as straight as possible (perpendicular to the ground). This will become important when the marbles are placed in the pan. If the dust trap is excessively lopsided, the marbles will fall out or be unevenly distributed.

Step 4

Once the T-post is securely grounded, mount the dust collector on top of the T-post as shown in the picture below. Remember that the dust trap is not yet wired down and is therefore susceptible to toppling over. It's best to have someone hold the trap in place until the wiring process is complete. Note: It can be very helpful to have an assistant during the next step.



Step 5

In order to ensure that the dust trap does not get blown or knocked over, the next step is to wire the cake pan portion of the collector to the top of the steel T-post. Again, it is incredibly helpful to have an assistant during this phase of the installation because as the tension on one side of the trap increases, the marbles may fall out or the trap may topple over. Trim away and dispose of excess wire.



Step 6

Once you have secured the dust trap to the T-post using wire, refill the mesh portion of the trap with marbles until full.



Let the sample collection begin!