SCOUT product demonstration prop building instructions

NOTE for 2023!!!

Many product demonstration items have flotation added, either inside the PVC pipe or externally. Flotation added to a mission prop is intended to make those items easier to carry, keep them upright on the bottom if they are dropped while moving, and/or keep them attached to an object (Velcro to Velcro stick) when released by the ROV.

Regional competitions may build product demonstration props out of materials other than PVC pipe. Your regional coordinator will inform you of any changes to materials for your regional competition. NOTE: Look for a regional information document posted on your regional website. This document will list any changes to the product demonstration props.

Companies should be aware that tolerances in lengths of cut pipe and length of pipe inserted into joints can change the overall dimensions of product demonstration tasks. Except where noted, companies should expect tolerances in all product demonstration props and should build their ROVs and tools accordingly. In no case should the dimensions given in this document for a product demonstration prop be used to calibrate a measuring device.

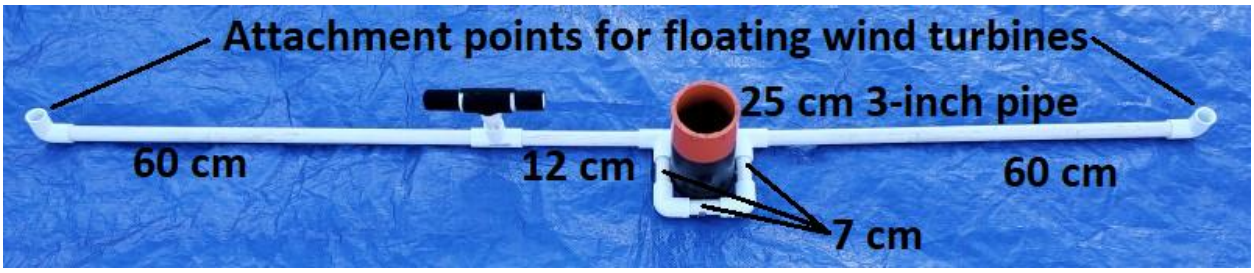
Online links and Home Depot part numbers are given for certain construction items. However, some Home Depot stores may not carry the listed items or Home Depot may not be available in your area. MATE recommends checking other local hardware stores or online sources, such as those listed below, for the required component.
https://www.pvcfittingsonline.com/
https://pvcpipesupplies.com/pvc-fittings/schedule-40-pvc-fittings/

SolidWorks files will be available soon for all product demonstration props. SolidWorks Student Edition is free for MATE competitors. The eDrawings Viewer is a free download that allows the Solidworks files to be viewed dynamically.

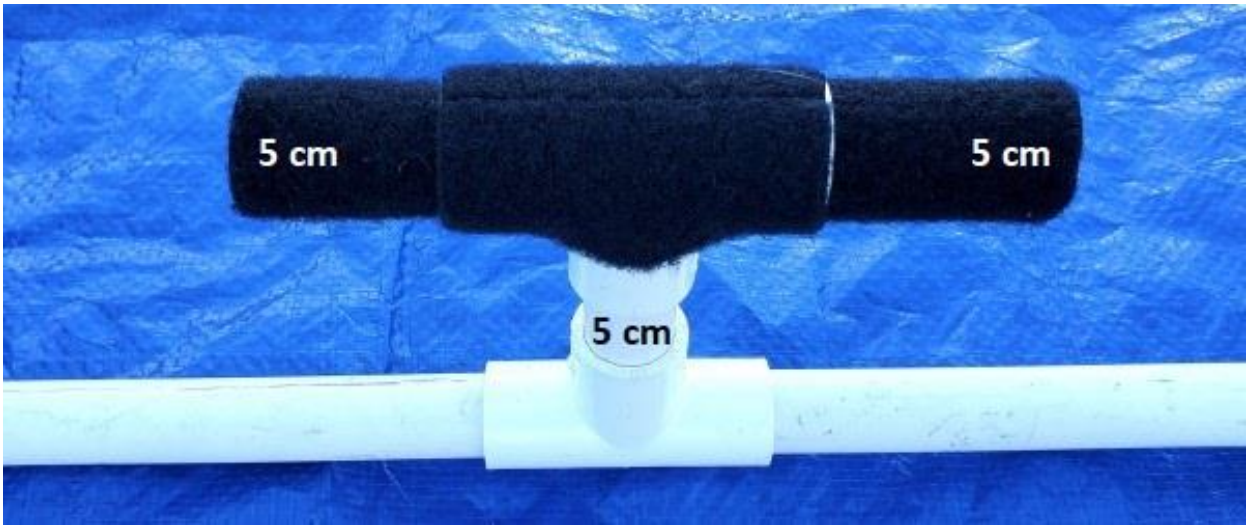
See last page for update notes (if any).

Task 1: Marine Renewable Energy

Task 1.1 Install a floating solar panel array

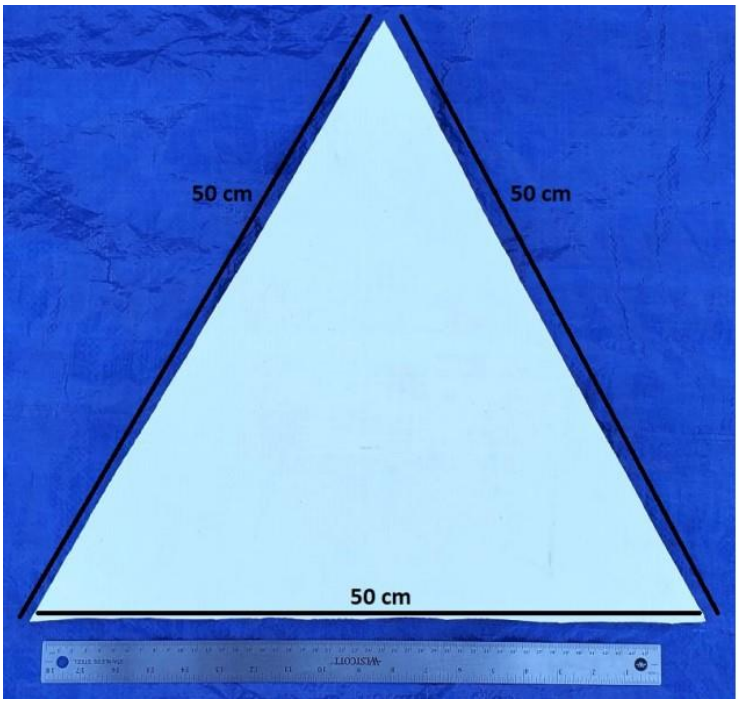


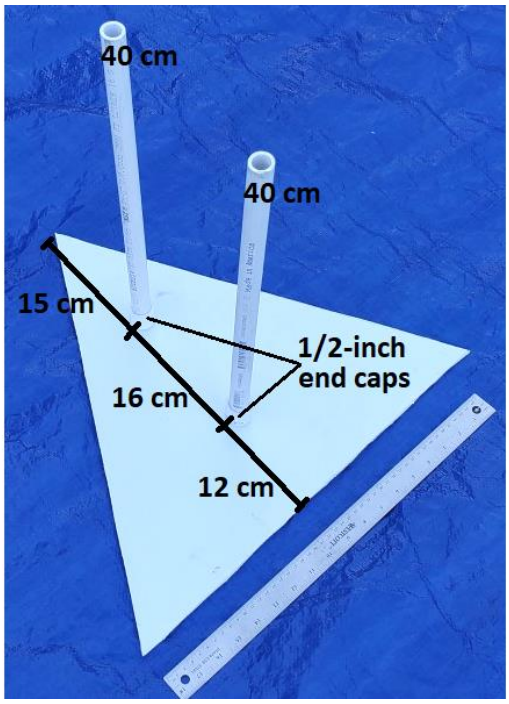
The base structure for the wind turbines and solar panel array. Wind turbines are connected to the indicated elbows by rope. The mooring connector attaches to the anchor point, a ½-inch PVC tee covered in Velcro loops. The power connector inserts into a 16 cm length of 3-inch pipe, which is secured by screws into the ½-inch PVC framework.



The mooring attachment point is constructed from ½-inch PVC and covered in Velcro loops.

A wind turbine. The blades are constructed from corrugated plastic sheeting. The rope will be long enough to reach from the floating turbine to the PVC framework on the bottom. Note the indicated water line. Flotation is used to hold the wind turbine upright in the water. Additional flotation may need to be added around the base to keep the turbine upright. NOTE: If the competition takes place in shallow water, rope will not be used. The 45 cm length of PVC will extend all the way to the framework on the pool bottom.

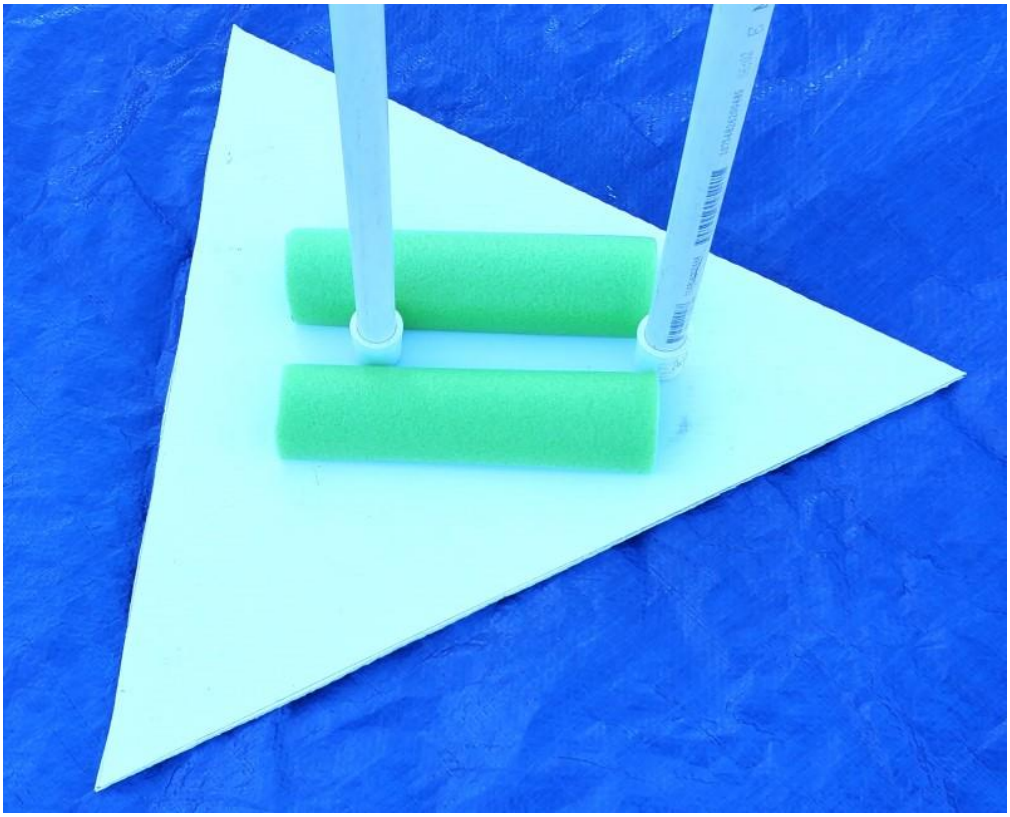




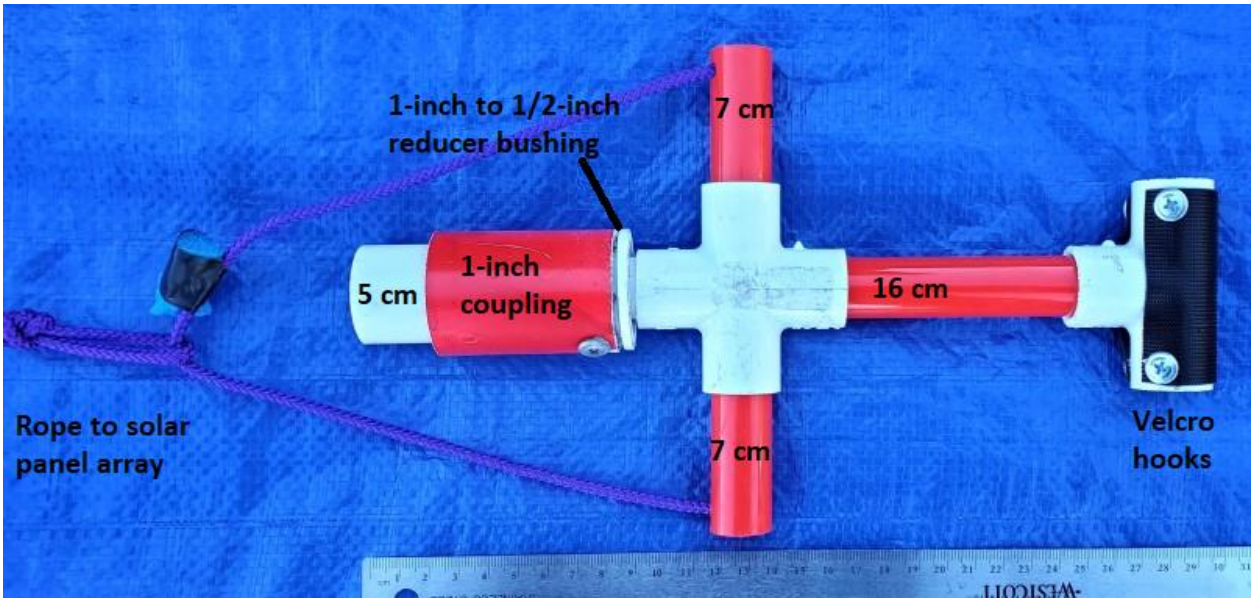
Left: The solar panel array is constructed from corrugated plastic sheeting. Right: Two ½-inch PVC pipes extend down from the corrugated plastic sheet.

Pipes below the solar panel array.

One of the two pipes extending down from the corrugated plastic sheet. Both lengths of PVC pipe have two layers black plastic (electrical) tape provide thickness. This thickness provides additional tension to hold the mooring connector and power connector onto the ½-inch pipe. Lengths of rope connect the pipes in the corner to the mooring connectors and the pipe in the center to the power connector.

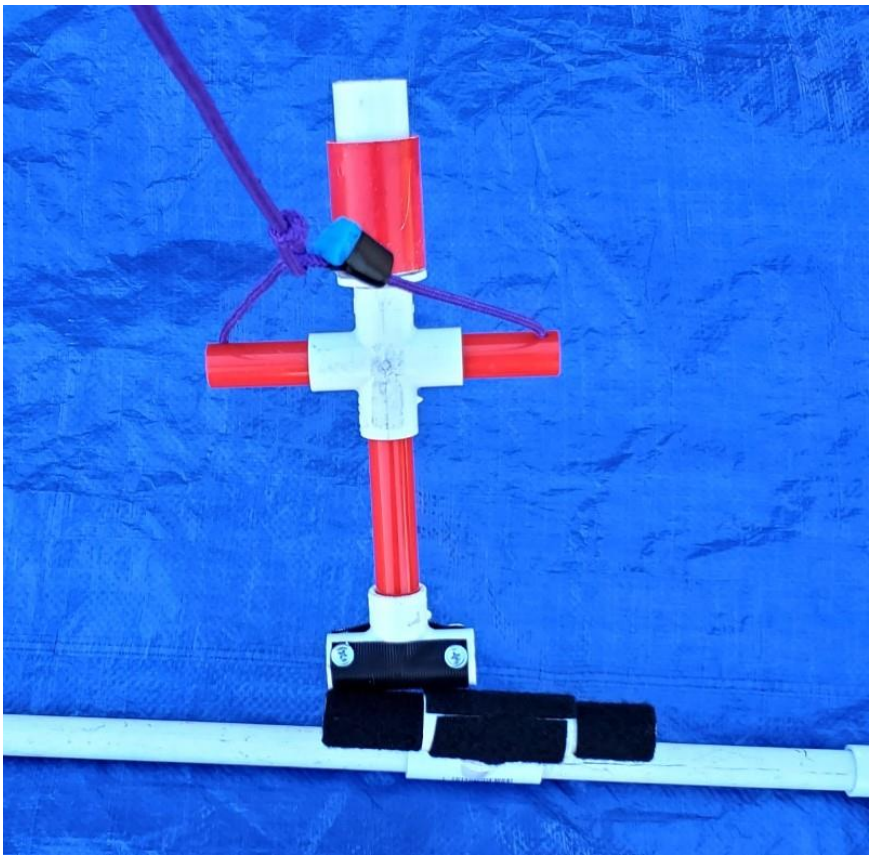


Flotation on the underside of the solar panel array.

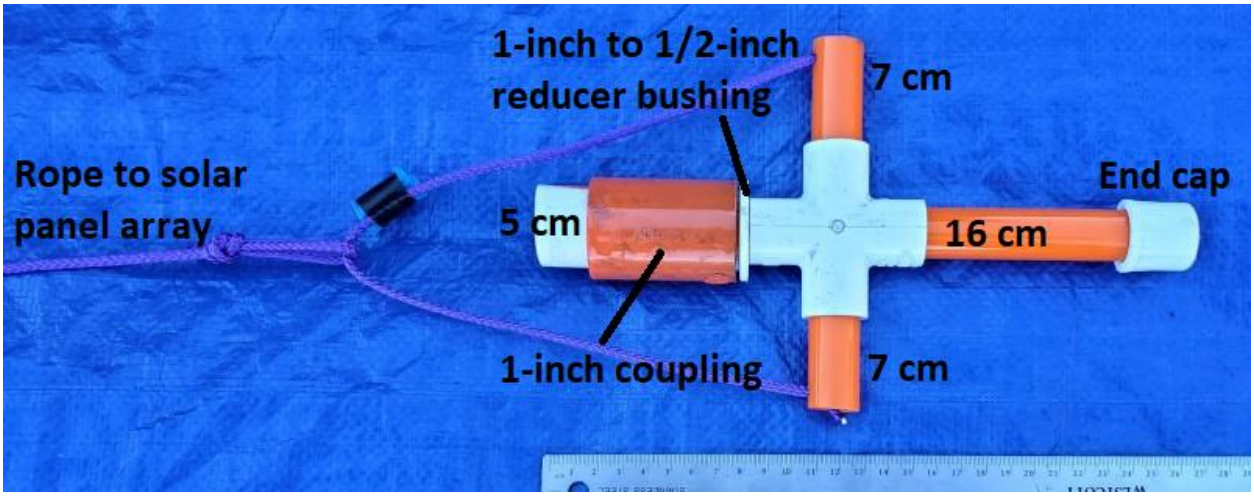


One will be attached to a length of PVC extending from the underside of the corrugated plastic sheet. The rope will be approximately 1.25 times the depth of the pool. Flotation is added inside the pipe and 1-inch coupling.

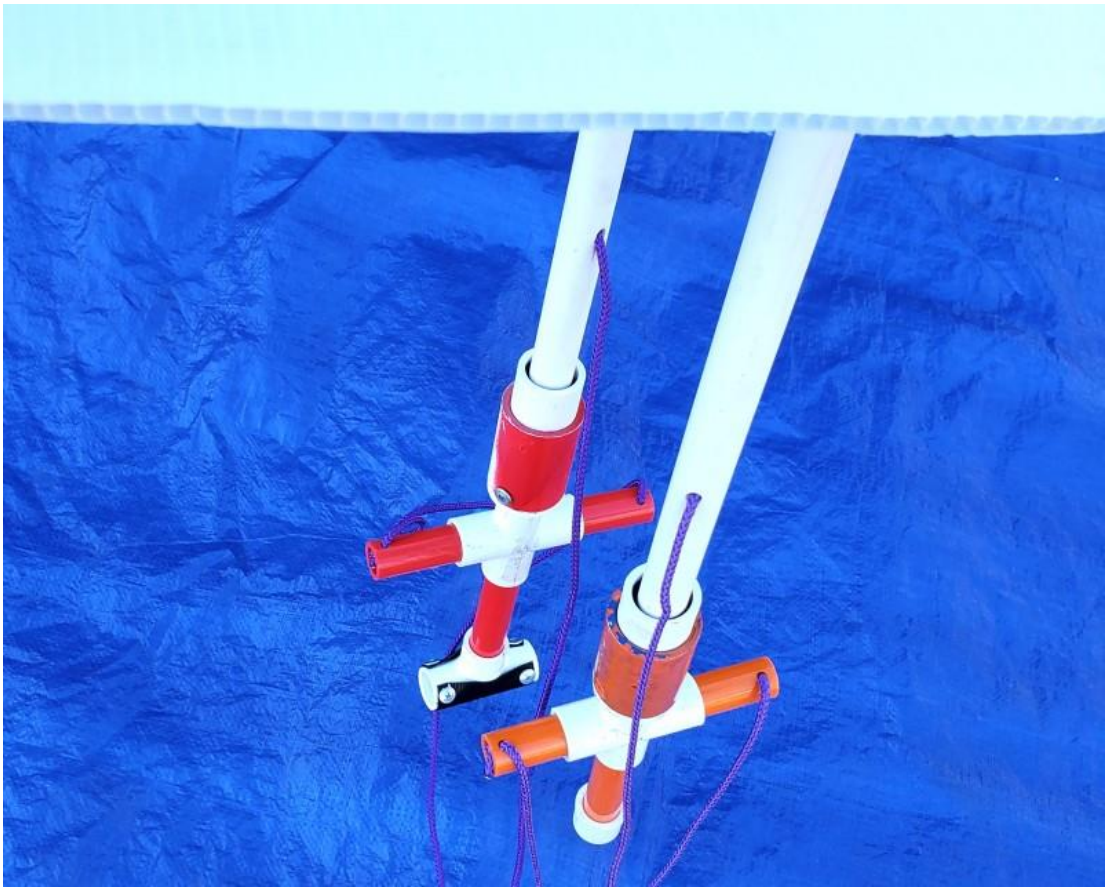
Velcro loops inside the 1-inch PVC coupling will loosely hold the mooring connector in the PVC pipe underneath the solar panel array.



A mooring connector attached to the anchor point.

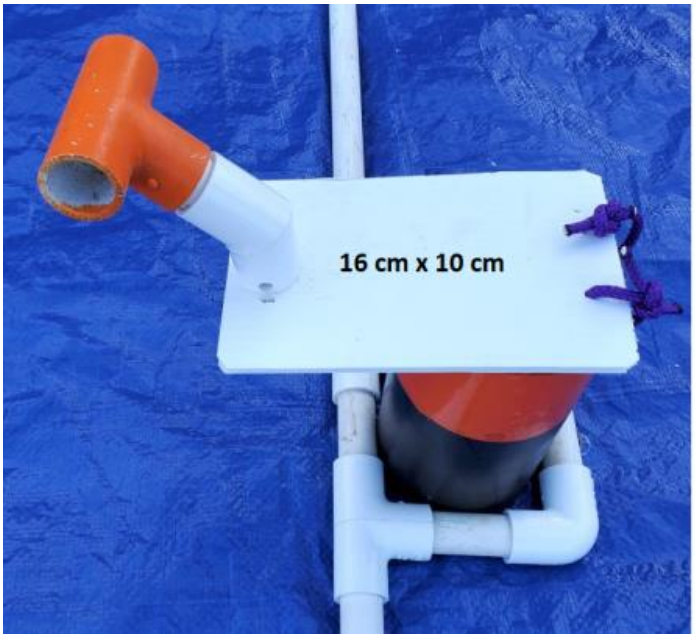


The power connector is constructed from ½-inch and 1-inch PVC pipe. Velcro loops are added inside the 5 cm length of 1-inch pipe to loosely hold it on the PVC pipes underneath the solar panel array. Flotation is added inside the pipe and 1-inch coupling.

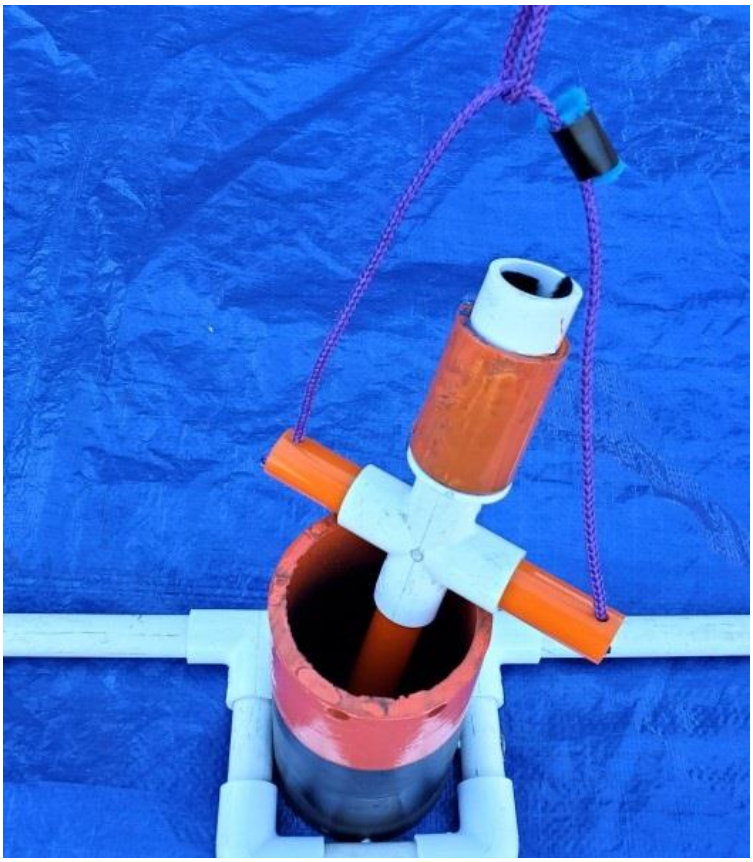


The mooring connector and power connector attached to the solar panel array.

The power port is located in the center of the base framework and is constructed from 3-inch PVC pipe.

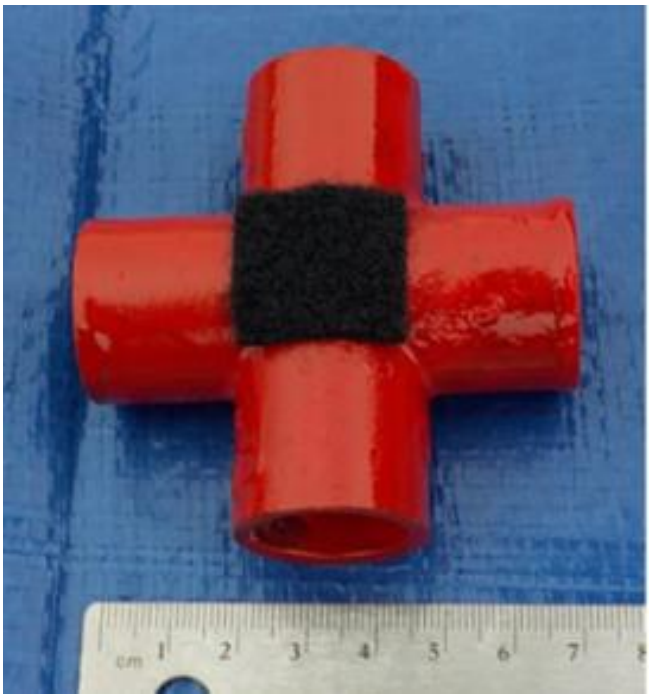


The power port cover is constructed from corrugated plastic sheeting with a ½-inch PVC handle constructed from a 45° elbow and a tee. Ropes are used to attach the lid through holes in the 3-inch pipe.

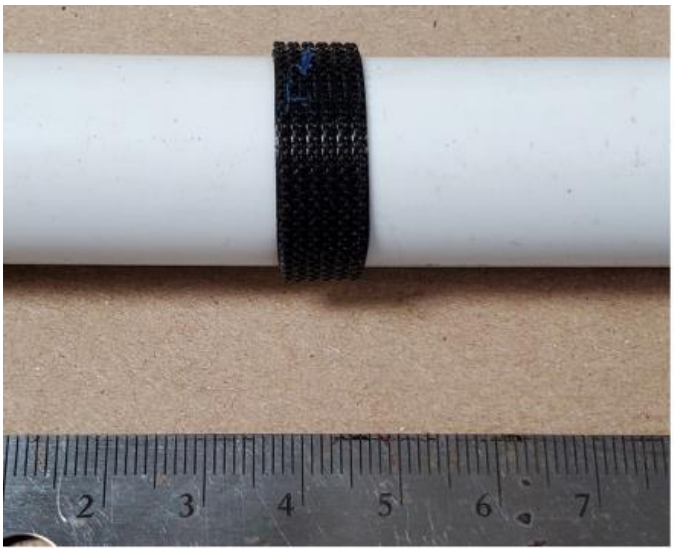


The power connector installed into the power port.

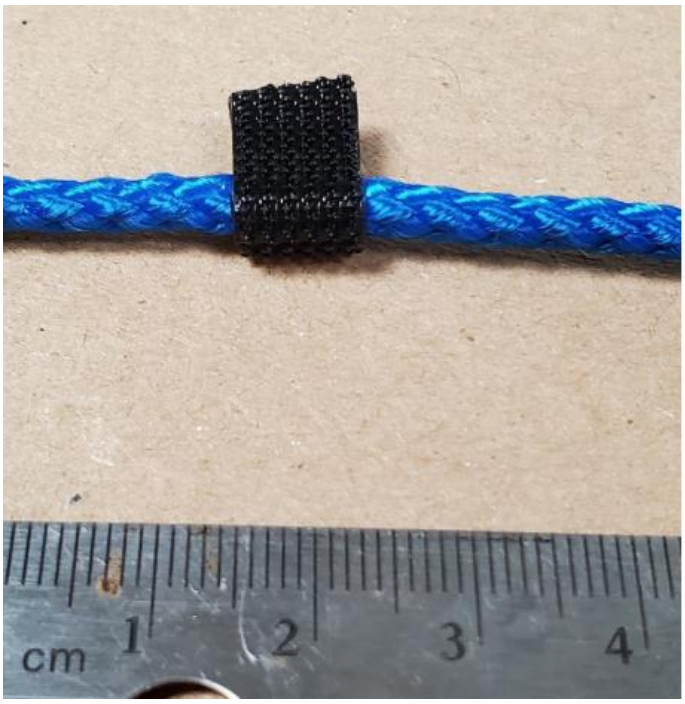
Task 1.2 Remove biofouling from the floating wind turbines



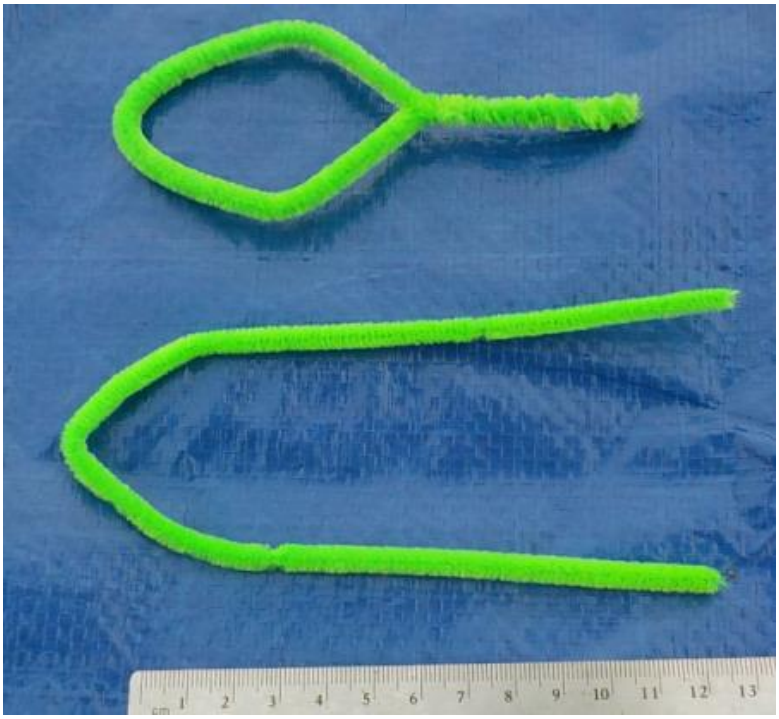
Encrusting marine growth.



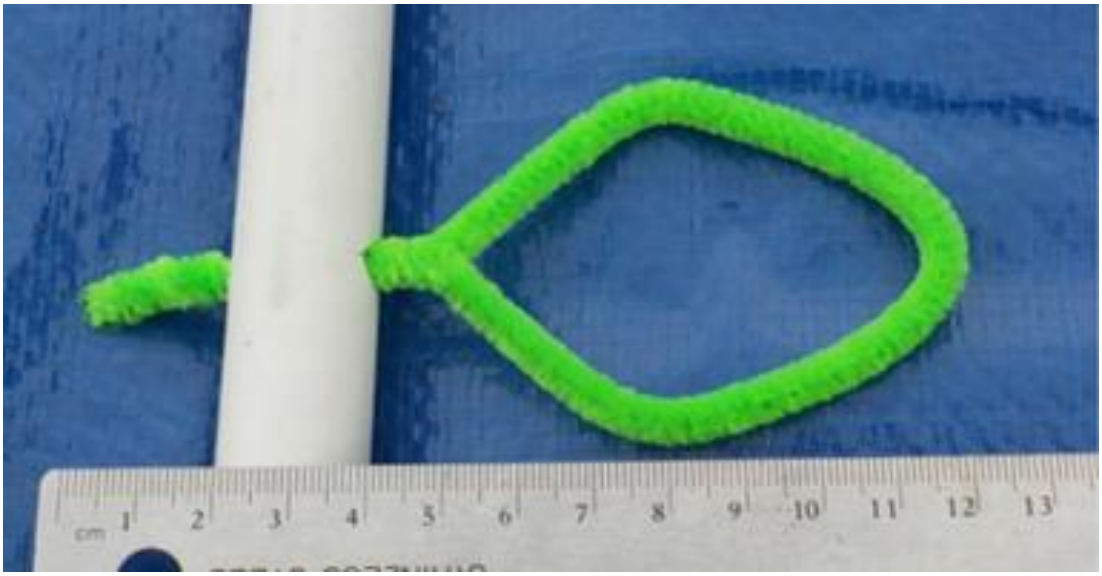
Left: Velcro hooks on ½-inch PVC pipe. A 0.8 cm wide length of Velcro hooks is wrapped around the ½-inch PVC pipe. Right: Encrusting marine growth attached to PVC pipe.



Left: A 2 cm x 0.8 cm length of Velcro hooks is wrapped around the rope. Right: Encrusting marine growth attached to a rope.



An algal marine growth. Four cm of the two ends of the chenille strip (pipe cleaner) are twisted together to create the algal marine growth.

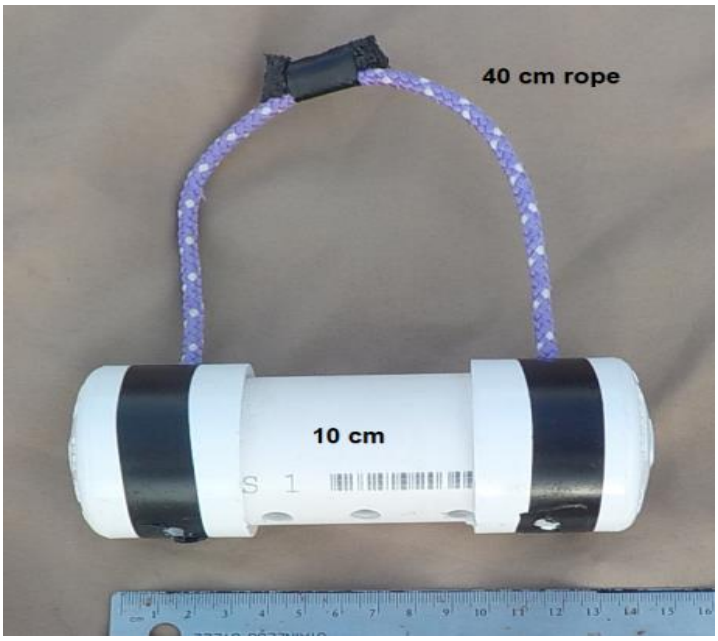


The algal marine growth inserted into a 3/16-inch hole.

The algal marine growth inserted into a 3/16-inch hole in a short (variable) length of PVC pipe attached to the rope of a floating wind turbine.

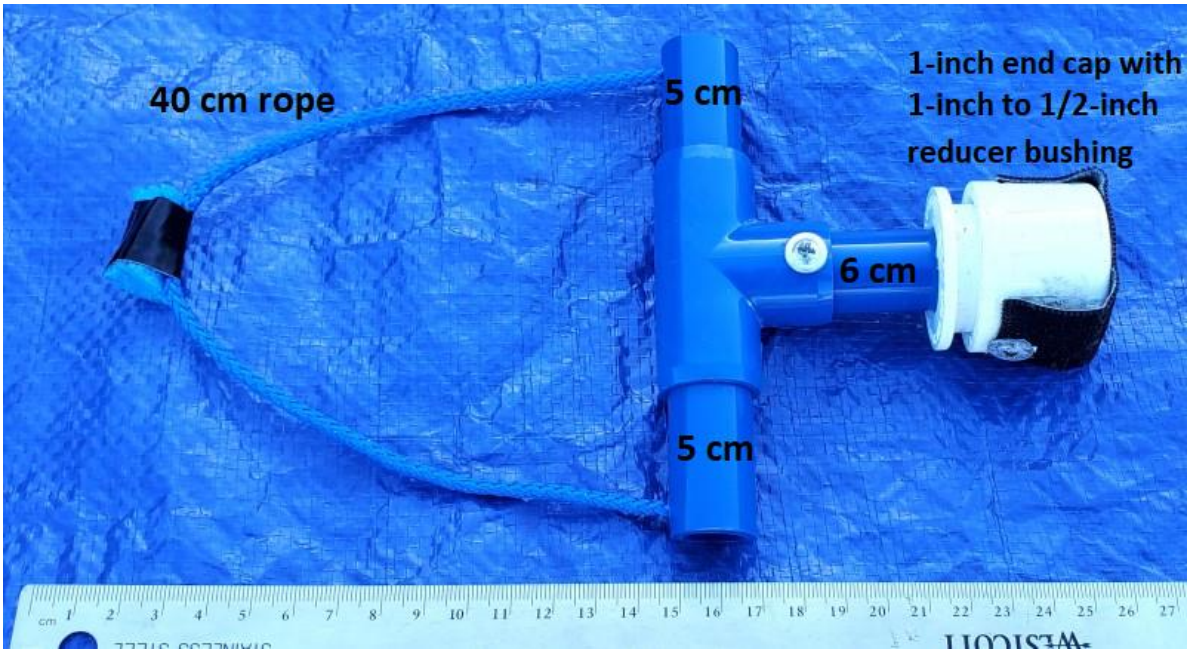
TASK 2: Healthy Environments from the Mountains to the Sea

Task 2.1 Identify reef organisms using eDNA

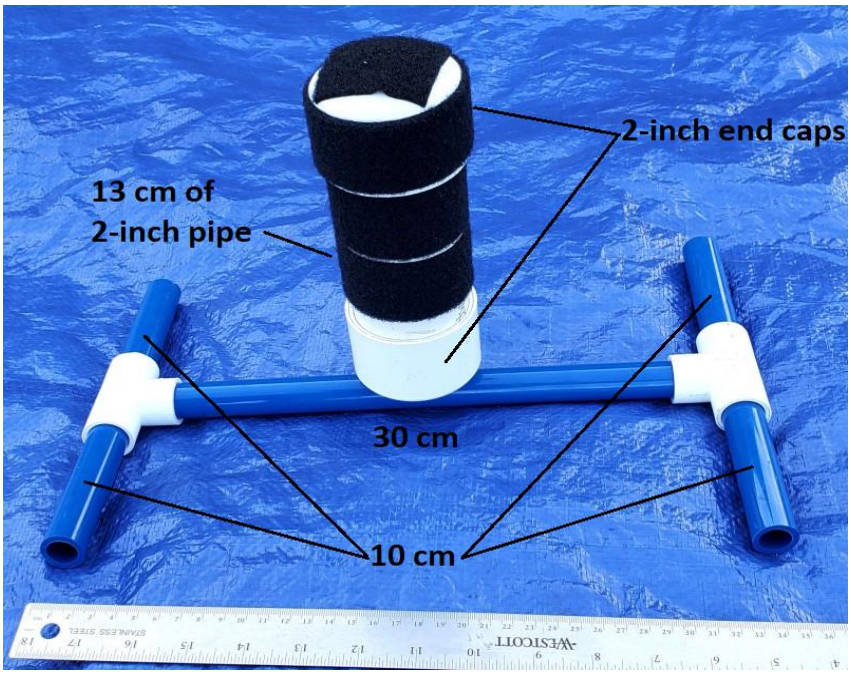


The water sample is constructed from 1 ½-inch PVC pipe. A 40 cm length of rope acts as a grab point.

Task 2.2 Administer Rx to diseased corals

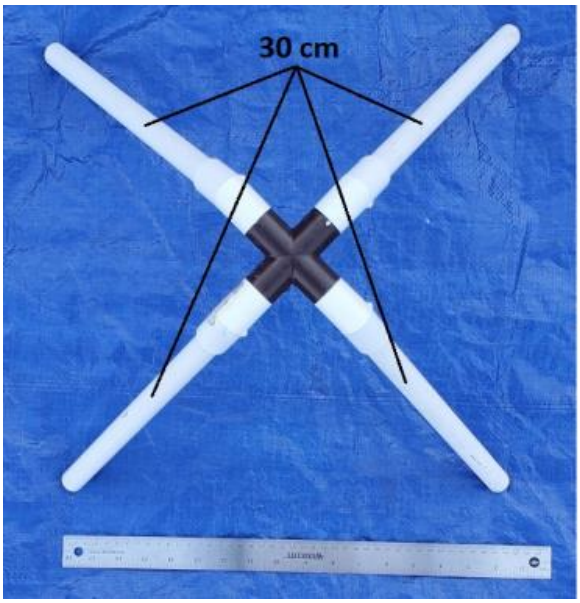


The UV light source is constructed from ½-inch PVC and a 1-inch end cap covered in Velcro hooks. To help the light source remain attached to the coral head after releasing it, flotation is added inside the PVC pipes.

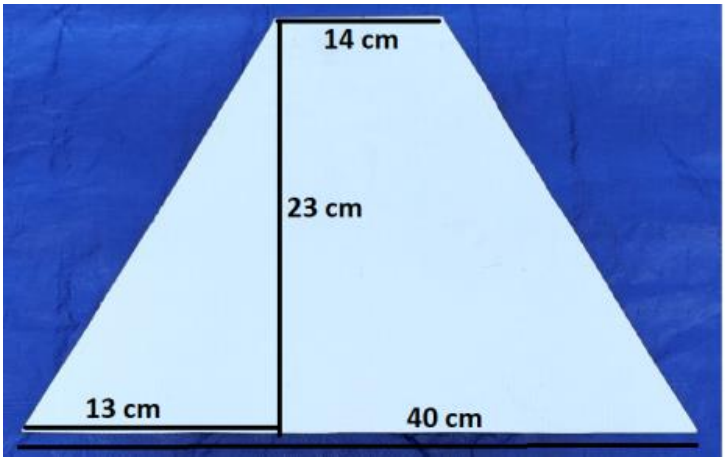


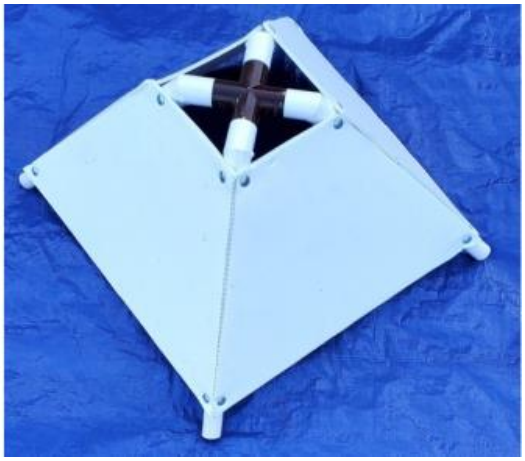
The coral head for irradiation by simulated UV light. The top 2-inch end cap and 2-inch pipe are covered in Velcro loops. A hole is drilled in the top 2-inch end cap to release the air from inside the 2-inch pipe.


The coral head for probiotics is constructed from a plastic bowl. Weight inside the lid will make the coral head negatively buoyant. Design note: Open the lid when the bowl is underwater so that it fills with water.

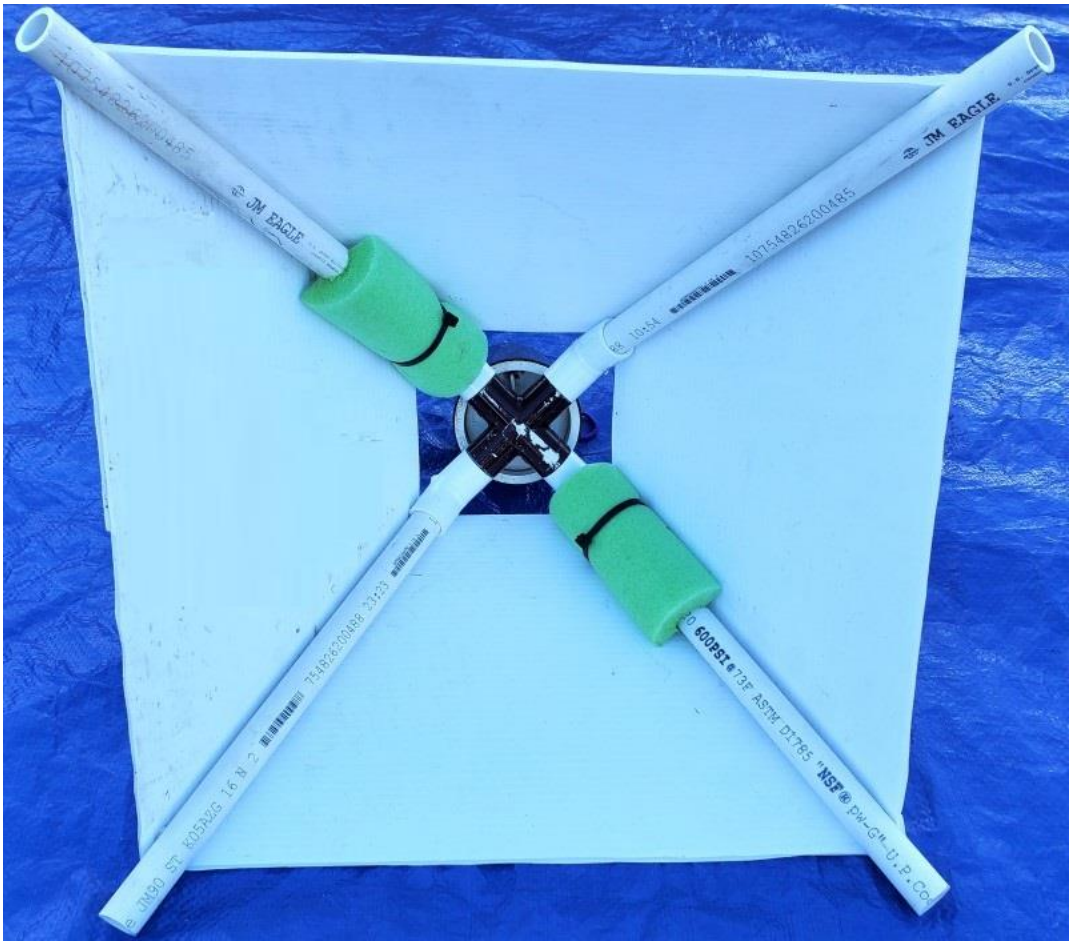


The tent is constructed from ½-inch PVC pipe. Left: Top view. Right: Isometric view. Flotation is added inside the PVC pipes.



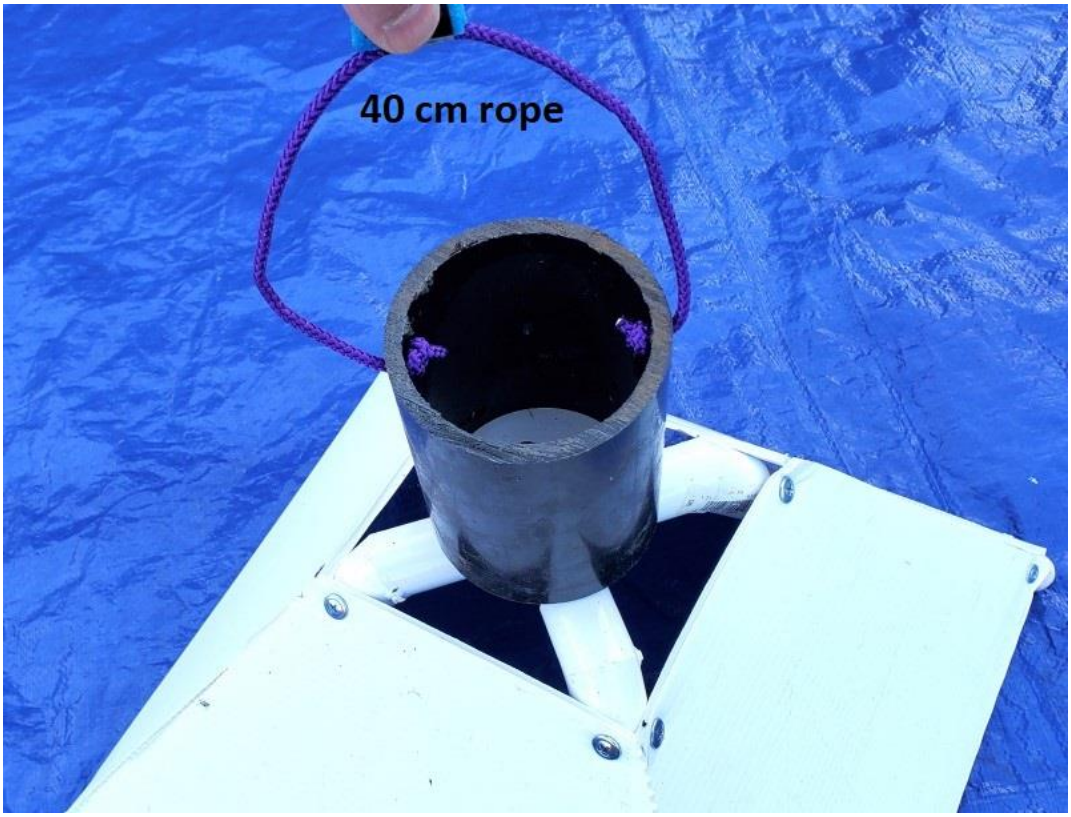


Left: The tent framework is covered in corrugated plastic sheeting. Right: The corrugated plastic sheeting attached to the ½-inch PVC framework. The corrugated plastic sheeting may need to be trimmed once attached to the PVC framework.

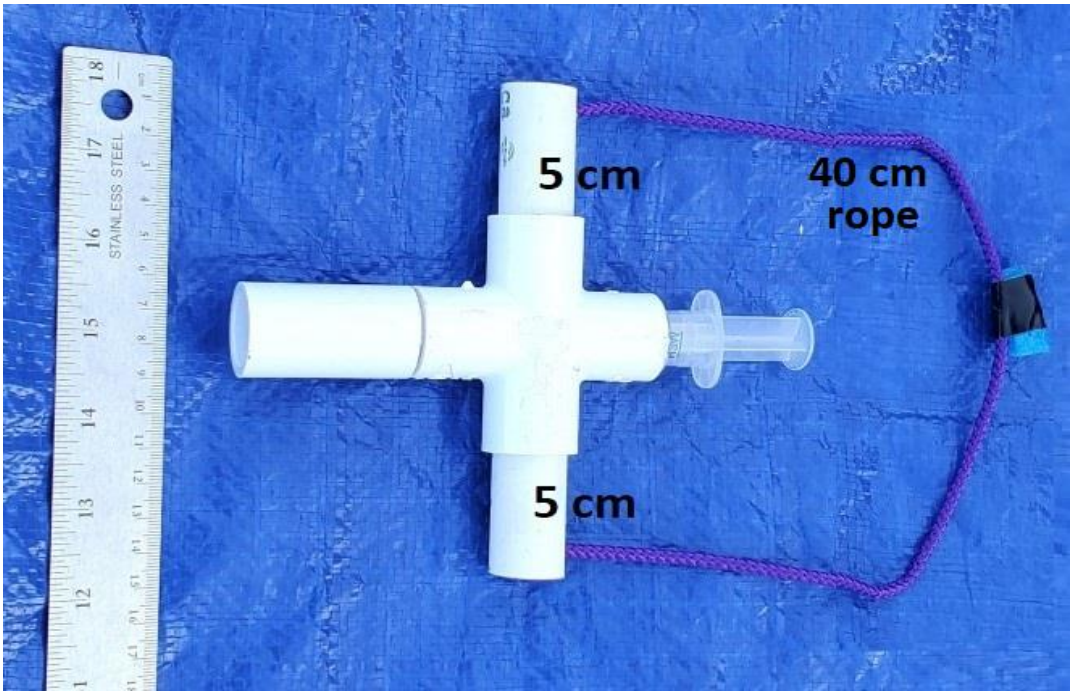


Additional flotation can be added to the inside of the tent if needed. The tent should be negatively buoyant in water.

Left: A 3-inch knockout cap screwed onto the top of the tent. Right: A 12 cm length of 3-inch pipe attached to the knockout cap.

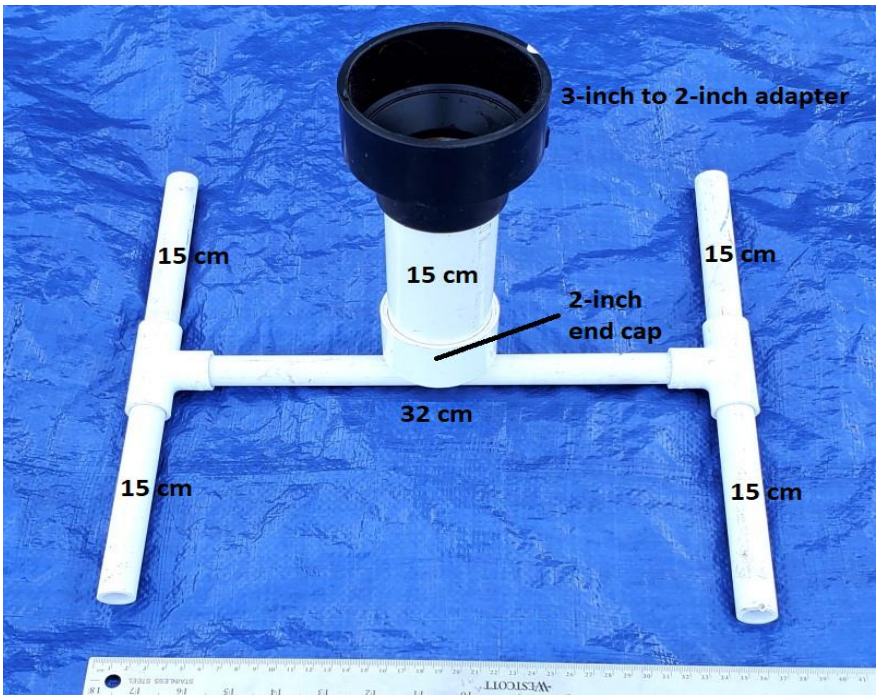


A 40 cm length of rope acts as a grab point for the tent.

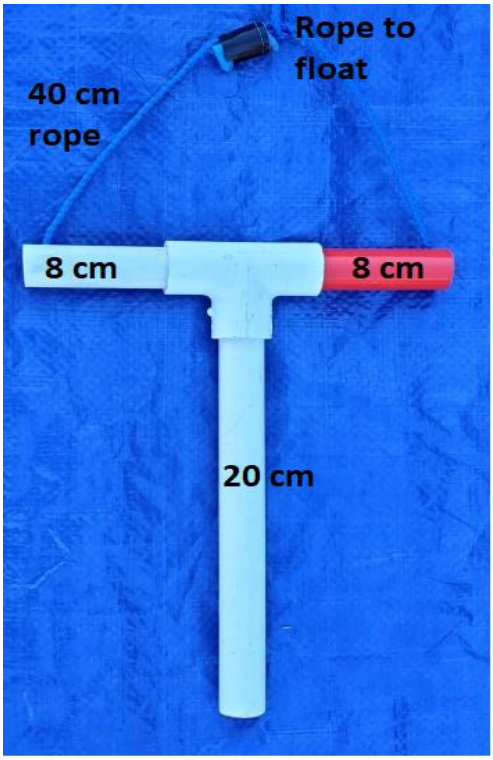


Hot glue is used to secure the syringe inside a ½-inch PVC cross and coupling. A 40 cm length of rope acts as a grab point for the syringe.

Task 2.3 Monitor and protect seagrass habitat



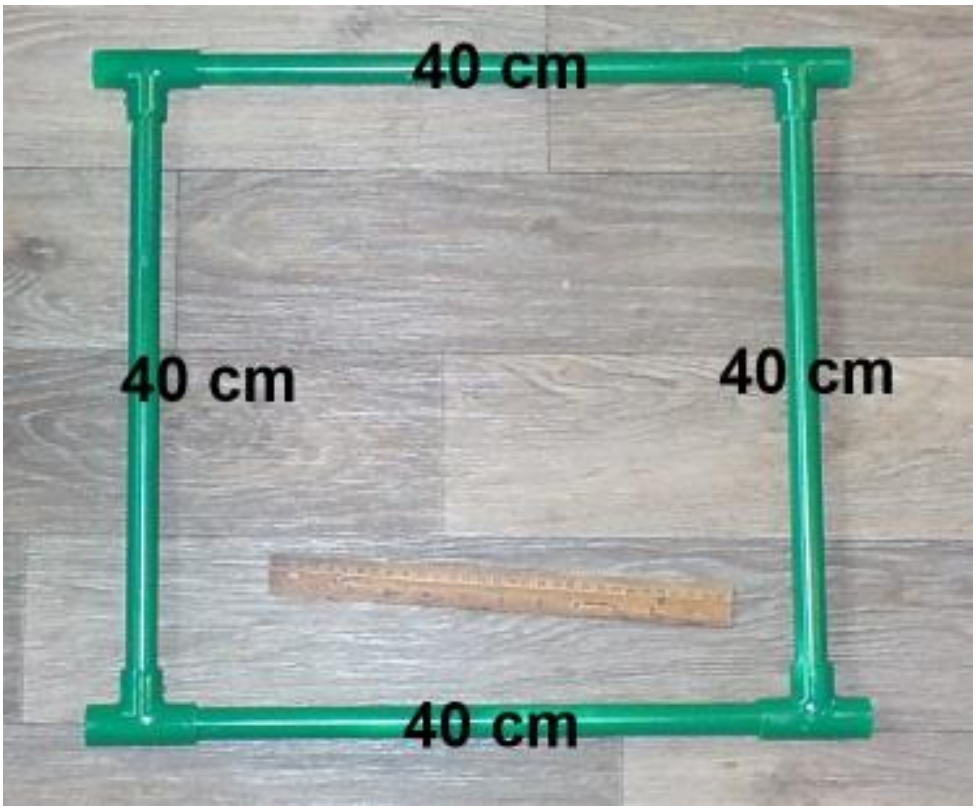
The Eco-Mooring base framework is constructed from ½-inch PVC.




Left: The Eco-Mooring is constructed from ½-inch PVC pipe. Right: The float of the Eco-Mooring. The rope should be long enough so the float is on the surface when the Eco-Mooring is deployed into the base.

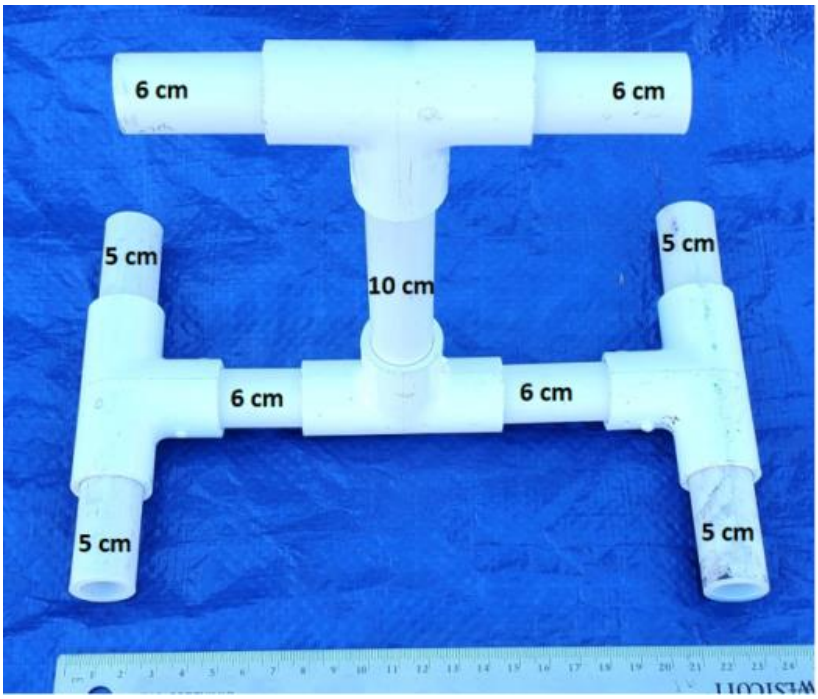
Task 2.4 Reintroduce endangered native Northern Redbelly Dace fry

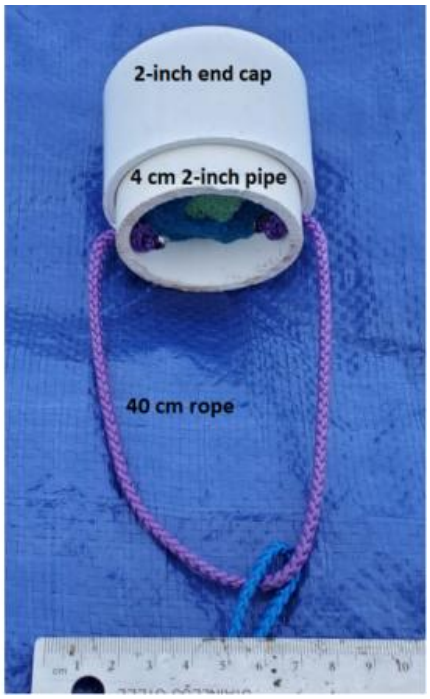
Northern Redbelly Dace fry. All hooks are removed.



A release site framework constructed from ½-inch PVC pipe.

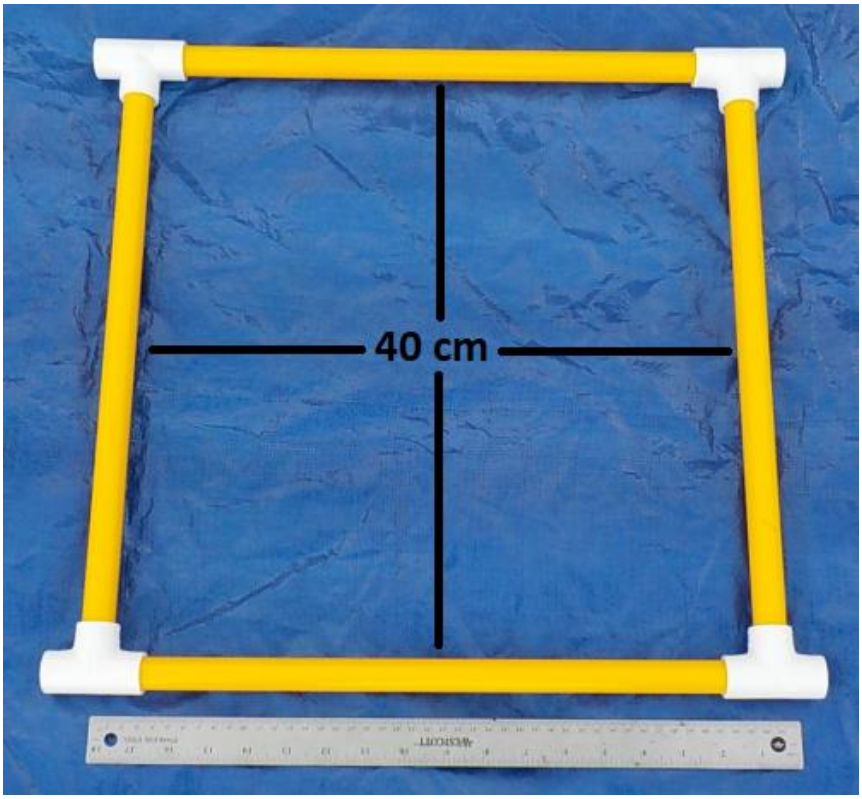
Task 2.5 Ensure the health and safety of Dillon Reservoir



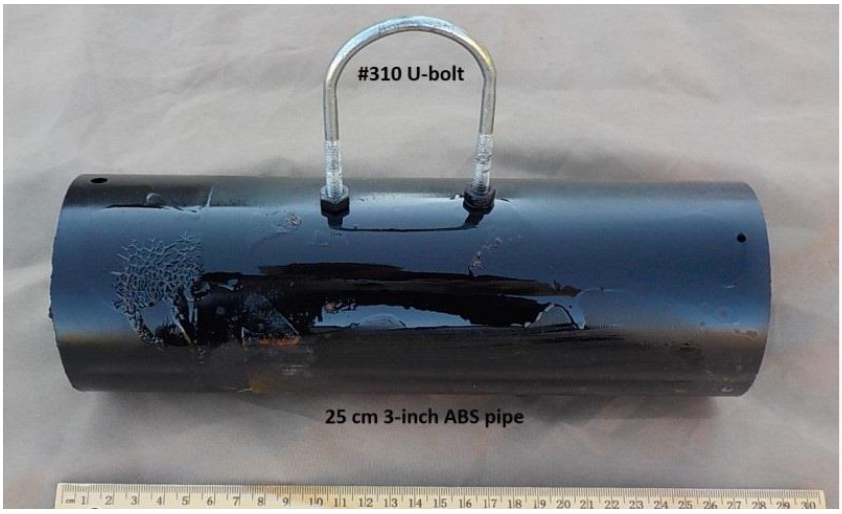


Left: The buoy rope base is constructed from ½-inch PVC. Right: The flotation for the buoy rope.

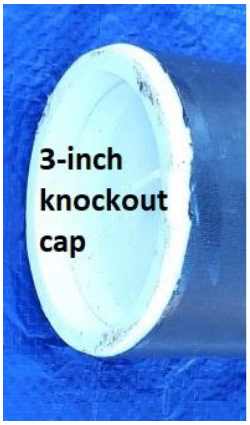
The buoy rope. Both the old rope and the new rope will be identical.



A designated area for placing the buoy rope. Each designated area is 41 cm square.



Heavy container (2-lb lead weight inside) constructed from 3-inch pipe.

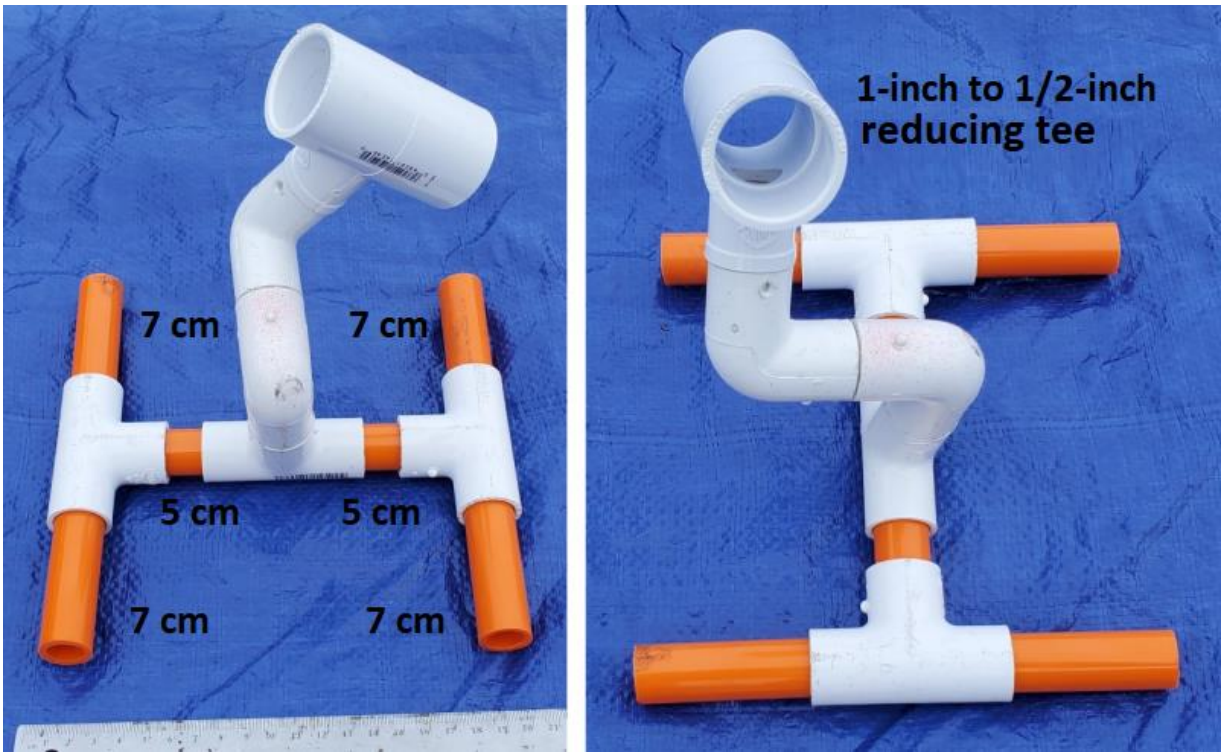


The lift bag is constructed from 3-inch pipe with a 3-inch knockout cap. Glue or epoxy is used to secure the knockout cap to the top of the lift bag to ensure no air leaks out.

A bicycle pump with 3/16-inch airline tubing. A barb fitting is used to connect the pump to the tubing. Tape is used to attach an 8 cm length of ½-inch PVC to the end of the airline tubing. The tape is loose enough so airflow is not restricted.

Task 2.6 Monitor endangered Lake Titicaca giant frogs

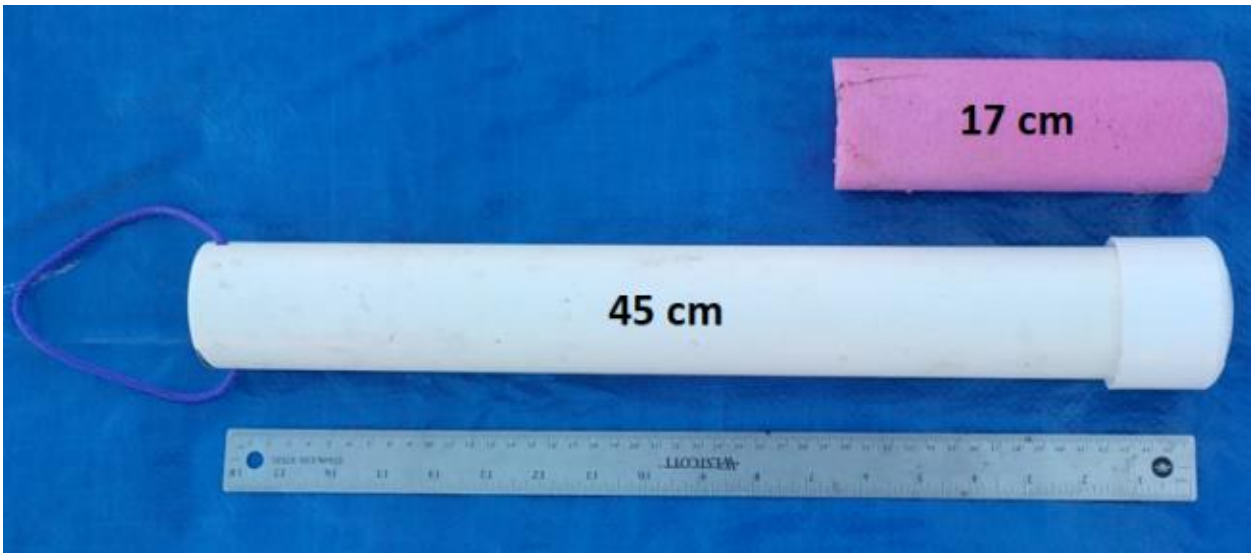
Designated area for camera.



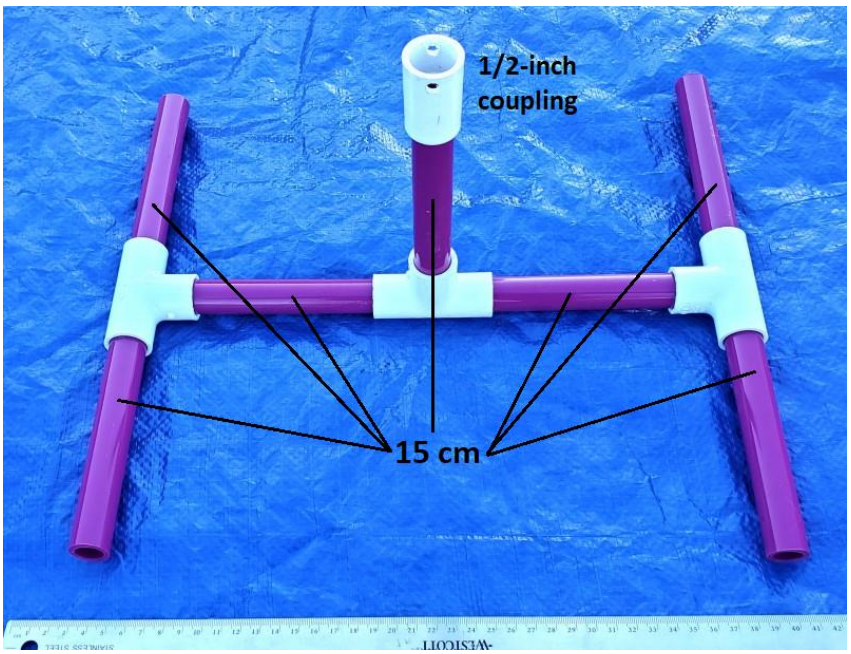
Left: Camera front view constructed from ½-inch PVC pipe. Right: Camera side view.

Task 3: *MATE Floats!*

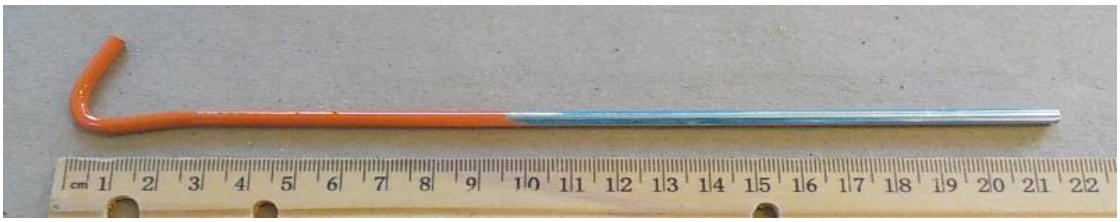
Task 3.1 Recover the float



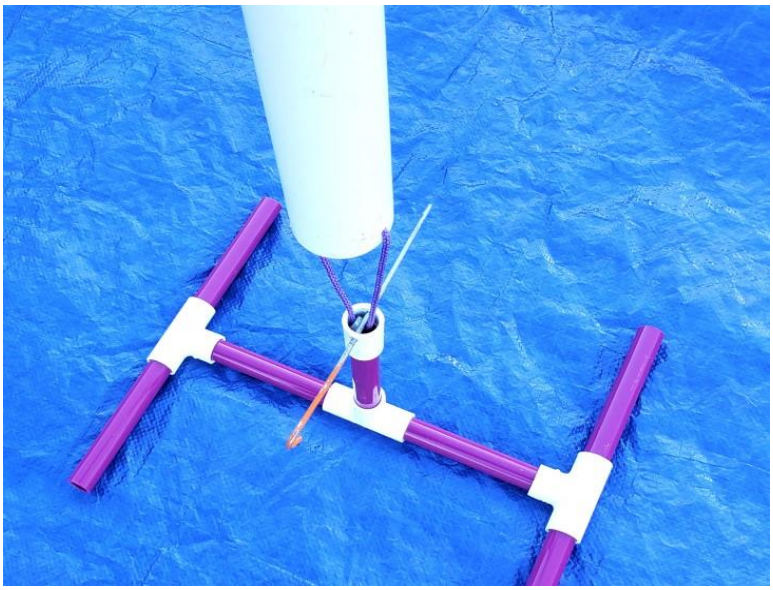
The float is constructed from 1 ½-inch PVC pipe.



The base that the holds the float is constructed from ½-inch PVC pipe. A hole is drilled through the top of the ½-inch coupling.

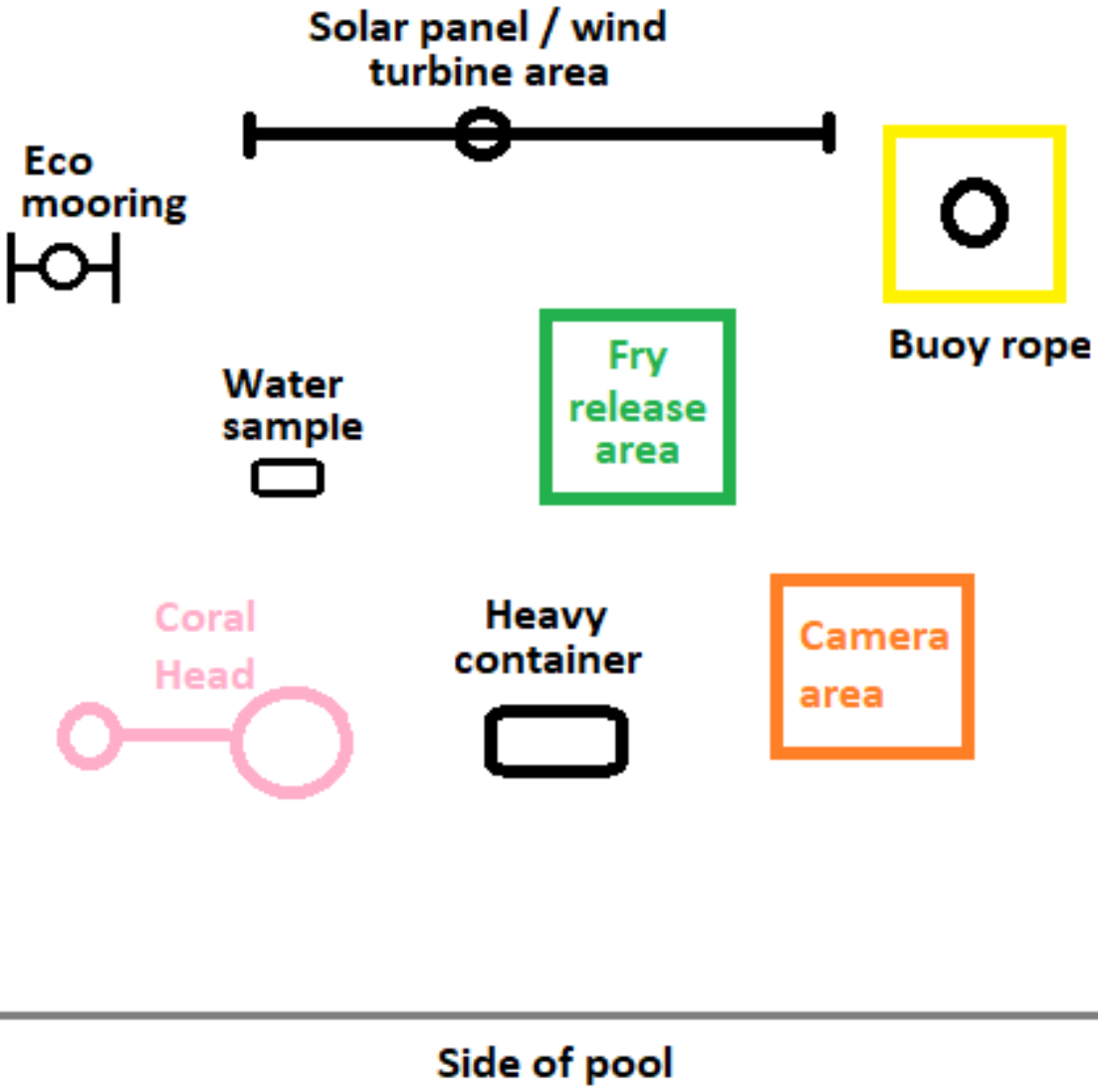


The pin.


The pin holding the float into the base.

SCOUT class product demonstration set up:

The following is a possible underwater set up for the SCOUT class product demonstration. The set up at regional events may vary.



Update Notes:

Updates are highlighted in yellow.

SCOUT prop building instructions.
2-1-2023. Pg 2. Dimensions and labels added to photo.

2-1-2023. Pg. 23. Camera side view photo: The tee is a 1-inch to ½-inch reducing tee, not a reducer bushing.