Activity: Make a Quadrat

A **quadrat** is a framed area often divided with string to create a set number of squares. Quadrats are often used for sampling for biological diversity.

The quadrat that you will make using these directions will be 12” x 12” square and strung to make 25 points and 36 squares within the quadrat (Fig. 1). However, these directions are applicable to smaller and larger quadrats with less or more points as well.

This activity uses U.S. standard or customary units, inches, rather than metric units, e.g. meters or centimeters, because PVC is categorized based on its diameter in inches and is often sold by the foot.

Figure 1. Completed quadrat

Materials (per quadrat):

- Four feet of 1/2” diameter, Schedule 40, PVC pipe
- Four 1/2” PVC 90 degree angle elbow connectors
- Approx. 20’ string or fishing leader line. If using fishing leader line, use a heavy gauge. If using string, use nylon or polyester (that can get wet, like mason line, not cotton). Use a color that is easy to see in the environment you are sampling.

Tools:

- Saw or PVC cutters
- Drill with drill bit (~ 1/8”)
- Ruler or tape measure
- Needle with large eyehole–if using string or fishing line that is very flexible (can also use tape to make end “stiff”.
- Permanent marker or pencil

Optional (Gluing will help transect withstand scientist and environmental wear and tear)

- PVC cement that can withstand wet conditions (depending on brand and type, may also need to use PVC primer)
- Newspaper
- Gloves

**Work outside or in a well-ventilated area when using PVC cement.

Procedure

1. Mark PVC pipe into 12” sections using a ruler and permanent marker or pencil.

2. Cut PVC with saw or PVC cutters at 12” marks.

3. Using a ruler and marker (or pencil), mark the 12” pieces of PVC pipe where the holes will be drilled. Holes should be marked and drilled at 2”, 4”, 6”, and 10”, resulting in five holes, equally spaced, 2” apart.

4. Once marked, drill the holes straight through both walls of the 12” lengths of PVC pipe.

5. Without gluing, assemble the four 12” PVC lengths together with their elbows.
   a. Face the drilled holes of the PVC sections into the center of the quadrat.
   b. The elbows should be securely joined to the 12” PVC pipe sections, but the elbows do *not* have to be jammed as far down into the PVC pipe as possible.
   c. After assembling, make sure that the completed quadrat is square and will lay flat.
      i. Adjust the square by pushing or pulling PVC sections more securely into or out of the corners.
      ii. Twist the quadrat corners until the square lies flat.

6. When all sides are aligned properly, mark the 12” PVC pipes and their corresponding elbows with a maker at the point where they meet. Make your lines similar to lines “A” and “B” in Fig. 2.
   a. The “A” lines in the figure trace where the elbow joins the pipe. These lines are so you know where to put the glue, and where to stop pressing the elbow and pipe together during final assembly.
   b. The “B” lines in the figure are drawn as straight as possible from the elbow onto the PVC pipe sections.

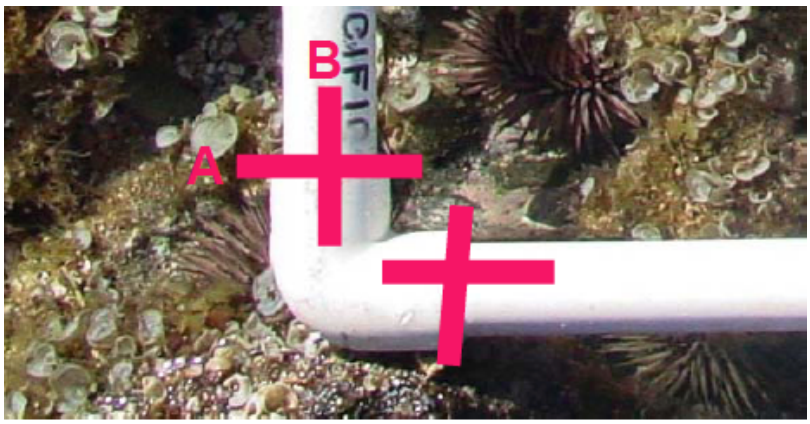

Figure 2. Mark PVC lengths and elbows with permanent marker before gluing

7. Prepare to glue PVC by laying out newspaper and putting on gloves.

8. Work carefully and quickly–PVC cement dries very fast! During final assembly, you will make sure PVC elbows and pipe meet up so the elbow angles are correct and your quadrat lies flat. In order to ensure you build a flat quadrat, we recommend cementing the quadrat pieces in the following order:
    a. Put a thin layer of PVC cement on one end of one of the PVC pies and one elbow until the "A" line.
    b. Press down on the elbow until you reach the "A" line and make sure the "B" lines on both pieces align.
    c. Quickly make necessary adjustments and let dry.
    d. Repeat steps a-c to assemble the quadrat in the following order:
        i. Cement the two PVC pieces of opposite corners together, for example corner 1 and corner 3 in Fig. 3.
        ii. Cement corners 2 and 4 at the same time (Fig. 3). By gluing the two final corners together at the same time to complete the quadrat you will be able to twist the frame slightly to ensure it lies flat.

Figure 3. Cement opposite PVC corners together first

9. Once the quadrat is assembled, cut two ~10 foot long pieces of fishing line or string per quadrat.

10. Leaving a few inches of line free, wind the line a few times around the PVC pipe near one of the holes closest to an elbow. Securely attach the line by tying the few inches of free line to the long end of line that you will be using to string the quadrat.

11. Weave the long end of the line through the holes on opposite sides of the quadrat to create a set of parallel lines (Fig. 4). If your string is very flexible, you many need to use a needle to push it through the PVC pipe holes. You can also tape up the end of the string to make it "stiff".

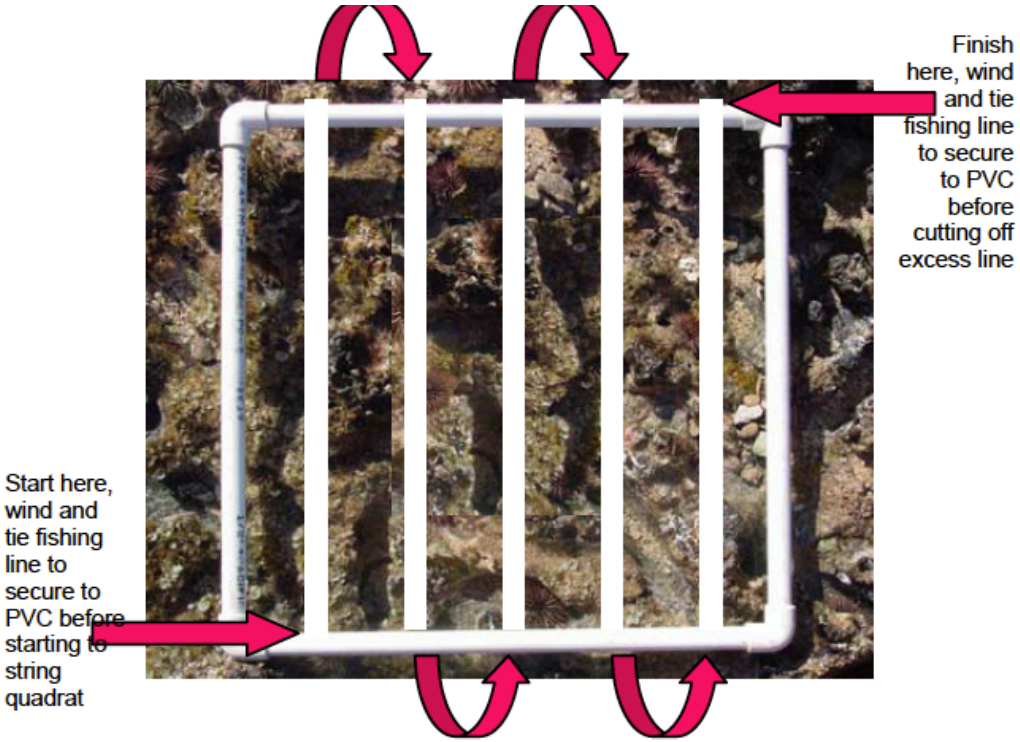

Figure 4. String quadrat to create set of parallel lines.

12. At the end, wind the end of the line around PVC near your last hole and tie as tightly as possible. The line for each of the sections should be taut, that is tight and not slack.

13. Repeat #12 on the remaining two sides of the quadrat, but this time alternately going over and under the first string in a weaving motion (Fig. 5).

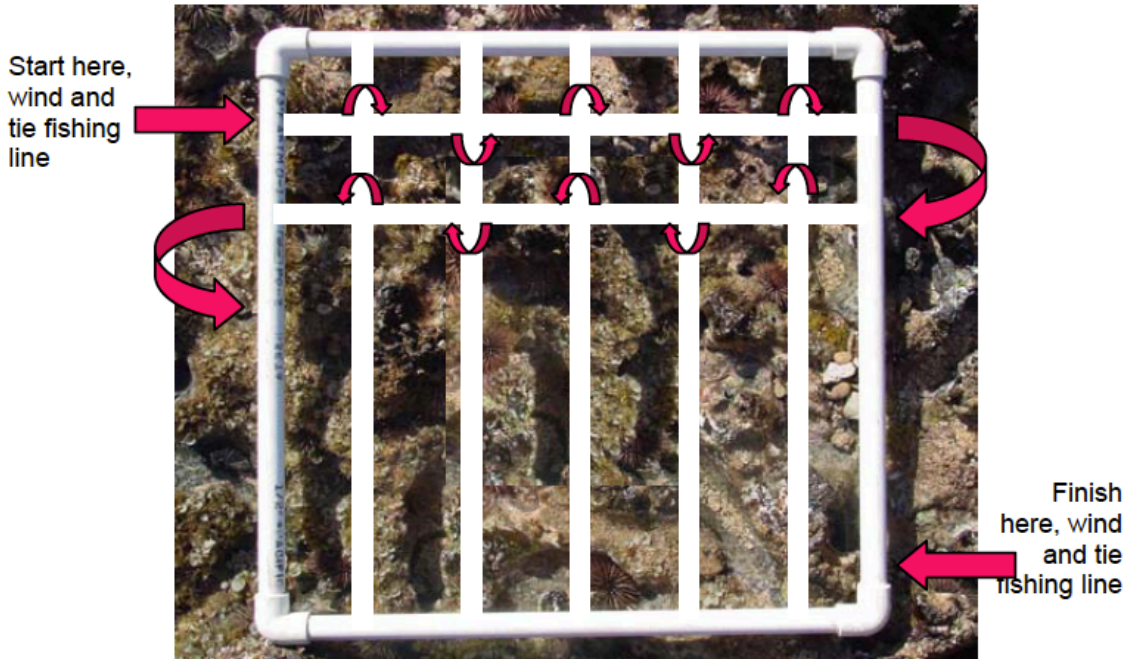

Figure 5. To create a stable grid, alternate going over and under previously laid string.