Overview:

Youth team up to create race courses where the winning team’s water moves the slowest through a designed layout.

**Sculpting a landscape through passive rainwater harvesting holds water that would otherwise run off.**

Materials:

- Water
- 2 large cookie sheets (of the same size)
- 2 large spray bottles
- 2 identical, plastic tubs wide enough to fit the short end of a cookie sheet (15 quart storage containers available at variety stores work well)
- 1 package of 12 ounce, classic modeling clay (available at variety stores); each team will use ½ of the package
- Roll(s) of paper towels for drying cookie sheets
- Location for disposing collected water
- Table or other level surface large enough for the two plastic tubs, located in an area where participants can gather to watch the race(s)

Activity Duration:

30 minutes

Preparation:

- Consider the number of participants and how to divide them into two groups (2 to 4 in a group is optimal; if there are more than 8 participants, consider doubling the materials and having concurrent races).
- Gather and prepare materials.

Activity Steps:

1. Explain that participants are going to work together to devise a system where water moves over a sloped landscape in the slowest way possible.
2. Hold up a cookie sheet with its back side facing up and tilted at a steep angle. Spray water onto the top part of the cookie sheet so that participants can see the water running unencumbered down the sheet.
3. Participants watch the way the water moves and make comments.
4. Next, lean the cookie sheet backward against the side of the tub (the slope will be less severe). Spray water onto the top part again.
5. Participants watch the way the water moves and compare the speed of the flow with the previous demonstration.
6. Explain that what participants are witnessing is “sheet runoff” (just think of cookie sheets). The speed of the runoff depends on the slope of the landscape. Sheet runoff can be very fast and damaging to the landscape by causing erosion. When there is sheet runoff, the water also
leaves the area very quickly without having time to soak into the ground to benefit plants in the area.

7. Dry the cookie sheet.

8. Explain that the goal is for participants in teams to use clay to devise a course on a cookie sheet that will slow the water the most. The race course will be the length of the back side of the cookie sheet. The cookie sheets of competing teams will be placed in separate plastic tubs so that they lean against the side (in order for the angle to be the same for both teams).

9. Explain that Arizona surface water laws do not allow people to dam water so participants cannot place clay in strips that go all the way across their cookie sheets. However, people can use clay in many creative ways to channel and slow the flow of water. Participants will have a set time to devise their course, using some or all of their clay. Give participants 5 to 10 minutes, depending on their progress. They should choose one member to be the sprayer and another to be a spokesperson. At least two participants can hold the sides of each tub so that the weight of the cookie sheet does not cause it to tip over.

10. Divide the group into teams and give each group a cookie sheet and ½ of the clay from the 12-ounce package.

11. Teams move to different places in the room to devise their courses.

12. Allow participants to devise their own courses but encourage them to pay attention to the edges of their cookie sheets, especially in the upper region, and use clay to keep water from running off the edges and immediately going to the bottom of the tub.

13. When the activity time is up, the teams bring their cookie sheets to a table or level surface and place the tubs side by side, facing the same direction. Two to three tubs work best. If there are more teams, have different rounds.

14. The spokesperson for each team explains the reasons for developing the course in the way their team did and describes how their course will effectively slow the water. Participants at this point may hypothesize about which course will slow the water most effectively.

15. Participants place their cookie sheets in their tubs while the teams gather around. At least one participant on each team will hold the side of the team’s tub to keep it from tipping over backward (if they hold their cookie sheet it can jiggle and affect the water flow).

16. Participants designated to spray the water will stand facing their cookie sheets so they can spray the tops of their sheets effectively. Consider having participants spray their competitor’s cookie sheet to promote fairness.

17. Give each team a spray bottle.

18. Participants should give their spray bottles several “test” sprays in a different direction than the cookie sheets to assure a good flow of water. A wide-angle flow best resembles rain.

19. When the leader calls out to start, the participants, at the same time, spray five sprays at the tops of their cookie sheets.

20. Participants stop to watch the direction(s) the water has run and where it has collected.

21. Instruct participants to keep spraying in sets of five sprays until one team’s water reaches the bottom of the sheet.

22. Everyone watches the water to determine the moment that one team’s water runs off the base of the sheet. The team whose water takes the longest to reach the bottom of the cookie sheet has the more effective design because the “landscape” was able to hold the water for the longest time.
23. Lead a discussion on the participants’ designs, the direction(s) the water moved, and which designs were most effective.
   • Possible questions to ask:
     o What was your design strategy?
     o How did you decide on your design?
     o How many sprays did it take for the water to reach the base of the sheet?
     o What direction(s) did the water actually move down the sheet?
     o Did the direction(s) the water moved surprise you? Explain why or why not.
     o If you did the Zig Zag Race again, how would you change your design?

24. Show participants a muffin tin, held upside down. Explain that many people plant on mounds (called “berms”). Ask why planting this way might be a problem. Get responses. Spray water onto the upside down tin so participants can watch the water run between the “berms.”

25. Turn the muffin tin over and explain that passive rainwater harvesting encourages planting in depressions in the soil (called “swales”) that can collect water. Spray water over the tin so participants can see that the water moves into the cups.

26. Ask participants what techniques could be used in actual landscapes to hold water there longer.

27. Youth may opt to redesign their “landscapes” to try to make them more effective at holding water.

Extension:

Distribute grape stems as “trees” and ask youth to use the clay to “plant” the “trees” in the best locations in their bermed landscapes. This added activity gives participants the opportunity to explore “best practices” such as planting a tree in a raised area in the middle of a swale (called “doughnut planting”) to keep water from collecting around a tree’s base or planting a tree on the uphill side of a berm to allow water to soak in where the roots can best take up water.

Example of a “doughnut planting”

Source:

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