

Cleaning Water with Dirt

Demo for K-12 students or adults

Title: **“Cleaning water with dirt”**

Brief Description: I will pose the question to the group: how do we clean up our dirtiest water? There are a lot of possible answers. We will explore which ones have been tried, which ones have worked, and test out the latest cutting edge technology for cleaning water pollution: dirt.

Materials:

- **Mini Rain Garden:**

I have a small Rubbermaid tub with a small ¼” hole in one bottom corner, about 2/3 full with soils (the rain garden soil mix is best, but any soils that aren't too high in clay will work) with a couple plants in it. Mine has a sweet flag (Acorus gramineus 'Ogon') and an Oxalis in it, but really any plant that you can keep alive in a pot will do as long as it can handle getting drenched once in a while. I've also just taken a small potted plant from my house and used that for the same demonstration. Any potted plant that has a drain hole is essentially a mini rain garden... (If you are going to keep your mini rain garden inside your house between uses, the typical rain garden plants might struggle due to higher temps indoors and typical indoor plant pests that they aren't used to.)

- **A short length of pipe, gutter or downspout material, and/or a piece of regular asphalt.**

- **Sometimes I use a piece of permeable pavement as another “treatment” too.**

- **Polluted Runoff:**

Get some dirty, ugly water

- a. Optional: as student activity (or in advance if time is limited) take a wet rag to a parking lot and wipe up some oil or other nasty looking gunk, pick up some litter, add a drop of brake fluid, dirt, dust, whatever you can find that would wash down the drain. Put all these things into a **bucket or tub** and mix it up. This is your “polluted runoff”.
- b. Another option is to collect some real runoff from a storm drain (I have removed the grate and tied a container to a stick and taken samples from storm drains with some success, be very careful and make sure to replace the grating when you are done).

- **Two identical jars or clear sided cups** to look at the water in before and after “treatment”.

- **Water quality test strips:** I use the Sensafe water metals check strips:

<http://www.amazon.com/SenSafe-Water-Metals-Test-Kit/dp/B001768RHY> (available from other vendors too). There may be more effective tests out there, but this one is quick and metals are very important to this demonstration.

- **A spreadsheet or just some scrap paper** for student predictions and observations to be recorded.

Procedure:

1. Facts to mention and questions to pose:
 - a. This “Runoff pollution” is the largest source of pollution in Puget Sound:
 - i. 710,000 pounds of petroleum compounds per year
 - ii. 14 MILLION POUNDS of toxic chemicals enter Puget Sound waters annually
 - b. It comes from all around us, every road and roof
 - c. How long would it take a rain drop to travel from a cloud to Puget Sound if it lands in:
 - i. A forest? (so many places to stop, drip, evaporate, be absorbed by roots)
 - ii. A city? (like a waterslide park, each ride lasts a second or two)
 - d. If we don’t want to tear up every road and live in houses without roofs, what other ways can we address the problem at its source (or as close as possible)?
 - i. Prevention (stop leaks in cars, don’t litter, scoop the poop)
 - ii. Do what the forest did/biomimicry: slow the flow any way you can: trees, plants, soils, rain barrels & cisterns, permeable pavements...(you can introduce “Low Impact Development” of “Green Infrastructure” at this point)
2. Ask students to make predictions for:
 - a. How long will it take for our runoff pollution to move through the gutter/pipe/downspout vs. the mini-rain garden
 - b. How visibly cloudy/murky/dirty will the water be when it comes out?
 - c. Will heavy metals be at all changed?
3. Pour polluted runoff through each of the treatments and collect the data in your spreadsheet, holding up the cup, test strip etc. for students to chime in with their observational data.

Closing Questions: What treatment cleaned the water best? How can you take this tiny solution and make it big enough to make a real difference? Could you build a rain garden at your own home?

Then share rain garden brochures and handbook and throw out the “12000raingardens.org” website and the campaign as much as possible for more info and help on getting started.

Sample spreadsheet for observations:

Pathway/Treatment	Travel time (how long did it take to fill the collection jar 1"?)	Visible murkiness after collection (can you read a word through it? Tell what color something is on the other side of the jar...etc.)	Heavy Metals before vs. after: Higher, lower, the same.
Gutter/pipe/downspout	Predicted: Actual:	Predicted: Actual:	Predicted: Actual:
Pavement sample	Predicted: Actual:	Predicted: Actual:	Predicted: Actual:
Permeable Pavement sample	Predicted: Actual:	Predicted: Actual:	Predicted: Actual:
Mini Rain Garden	Predicted: Actual:	Predicted: Actual:	Predicted: Actual:



My teaching kit:
Big tub to hold everything and also to mix up runoff in; mini rain garden with “Don’t drip and drive” sticker and a tray to keep drips off the table/floor since it will keep dripping even hours after you finish; downspout section, permeable pavement, clear cup and water test strips.

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12,000 
RAIN GARDENS
in Puget Sound