Investigating the School Grounds

Post-visit lesson for "Watersheds and You"

Grade: 3rd – 12th Grade
Skills: Observation, analysis
Learning Objective: Students will: determine where rain water (stormwater) travels from the impervious surfaces on the school grounds; understand if there is no detention pond, the rain water is not being allowed to soak into the ground naturally; determine areas on the school grounds to which some runoff may be redirected for infiltration.
Summary: Students will walk around the school campus and investigate the paths taken by stormwater runoff from the hard surfaces, and look for opportunities to redirect runoff to planted areas instead of flowing to stormdrains.
Teaching Time: 45 minutes.
Vocabulary: impervious, topography, infiltrate, geography, rain gardens
Materials:

- proper clothing
- the maps of the school property the students created or labeled from Part I ("**Water Runs Downhill, Right**?").

Background Information:
With the knowledge the students gained from "Watersheds and You," they should understand that the topography of the local landscape determines watershed boundaries and where stormwater flows when it rains. This is important when creating solutions for flooding; and in times of droughts or as water resources become strained, it is important for allocating a finite quantity of clean freshwater for irrigation, domestic use (homes and businesses), fish and other wildlife. The people residing and/or working in each watershed should understand that all the water draining off the land or soaking into it within the boundaries of each watershed is the only water available to satisfy all these demands.

Until 1989, most development occurring in Pierce County that included impervious surfaces (i.e., hard surfaces like roads, parking lots and roofs which don't allow the rain to soak into the ground) directed stormwater draining from these surfaces to the stormdrain system (connected underground pipes). These stormdrains carry the stormwater directly to the nearest body of water, which could be a lake, stream, wetland, or Puget Sound.

This "freeway" for stormwater does a number of detrimental things. Even an average rain storm can increase the flow in streams several times over because a large volume of water reaches the stream at the same time from a wide area of land. This increased flow can increase erosion in the stream channel, adding sediment to the water downstream. It can also scour the bottom of the stream carrying away salmon eggs and spawning gravels. When the rain subsides, the stream returns to a more normal flow, but the impervious surfaces have reduced the amount of rainwater soaking into the ground. Therefore, come summer time, the stream flow may be low or even run dry because there is not enough water in the surrounding soil to replenish it. Our local urban streams now experience these dramatic changes in flow, from near flood conditions to very little water, and cause a great deal of stress to those animals who are adapted to a more consistent flow.

Development practices since 1989 have slowly improved the way stormwater is directed off impervious surfaces, but the old systems are still in place. Many of the initial detention ponds created to hold back (detain) stormwater were built too small, or

quickly became too small as local development expanded the areas of impervious surfaces draining stormwater to them. The ponds don't flood because they have an overflow pipe near the top to release flow to the nearest body of water. When they quickly fill up and release water, they are essentially no different from the direct discharge systems of old. It has been only recently that regulations have finally called for stormwater detention and retention ponds to be large enough to not impact our local water bodies.

Another solution to this problem of where to send stormwater from impervious surfaces is to look for opportunities to direct stormwater to vegetated areas for infiltration. This would help slow down the volume of stormwater reaching our streams, lakes and wetlands, as well as provide for aquifer recharge. This is one element of Low Impact Development, which, just like the name indicates, minimizes as much as possible, any impacts to the environment from a development project such as an apartment building, shopping mall, or road. Constructed vegetated areas for stormwater infiltration are called "rain gardens," and are designed to infiltrate stormwater from impervious surfaces. Grass-lined swales, sometimes called bioswales, are another way to allow water to soak into the ground as well as provide for the filtering of some pollutants.

Before you begin this lesson, make sure you know the general lay of the land surrounding the school grounds, in which direction water flows, and the name of the creek, stream, pond, lake, wetland, or whatever body of water to which the stormwater eventually drains. Investigate what kind of storm drain system(s) are in place at your school (i.e., storm drains leading to a detention pond, direct discharge storm drains, or stormwater infiltration). There could be a combination as well. Choose locations where the students could assemble for observation and discussion of the stormwater system.

Procedure:
If you and your class toured the school grounds for Part I, the pre-visit lesson "**Water Runs Downhill, Right?**" a quick review of what was talked about should be done.

1. If you are taking your class out for the first time, find an open area where most of the school grounds can be seen and have the students tell you which way would rain water flow if it fell onto the grass, gravel, or soil-covered portions of the school grounds. In other words, which way is the land sloped (remember to have them view all of the surrounding land and not just the school grounds).

2. Ask them to name the body of water that is located in that direction, whether a pond, lake, stream, river, wetland, or Puget Sound. "So rain water that soaks into the ground will still flow in that direction."

3. Ask them, "What about the rain water that falls onto the roof(s) of the school?" Determine if the water is able to soak into the ground (do the downspouts release the water onto the ground?) or if it is piped to the storm drain system (do the downspouts continue on into the ground?).

4. **If the stormwater becomes part of the storm drain system, is the water carried to a detention pond on site? This may be the case if the school was built after the early 1990s.**

5. Are all of the downspouts set up the same way, either releasing their water onto the ground or connected **to a storm drain system?**

6. **If there is a detention pond on site, how large is it? Where is it located on the school grounds? (*At the lowest point, or at least lower than the buildings and parking lots so that gravity can allow the stormwater to flow to the pond.*)**

7. **Make sure the students see the inlet pipe, which is the lower of the two, and the outlet pipe, most likely smaller in size. Have any of the students ever seen the pond full? Where does the water go from here? (*Water that stays in the detention pond may evaporate or soak into the ground. Water flowing out the outlet pipe will flow to* [the name of the nearest body of water.])**

8. **If the downspouts go into the ground and there is no detention pond on site, ask the students where the stormwater goes. (*The water coming off the buildings goes to an older storm drain system which takes the stormwater directly to the nearest body of water.*)**

9. Direct the students to a parking lot where there is a storm grate allowing the stormwater to flow into it. "Where is this storm drain in the parking lot?" (*At the low point.*) "Where does this stormwater go **when it rains?" (*To the detention pond* [if one is on campus] *or directly to* [the name of the nearest** body of water.]) "Directing the stormwater to [the name of the nearest body of water] does not allow the water to soak into the ground and help it get clean, or have it slowly replenish the water in the drier months, or help recharge our aquifers."

10. Some parking lots on school grounds have a grass swale or area where stormwater is directed to allow for infiltration. Point this out if you have one or more of these.

11. If your school does not, are there some planted areas, either native or ornamental, where some stormwater may be directed into them? Are there any near the parking lots, **especially on the down slope side, where this could be done? Have the students brainstorm locations as to where stormwater may be directed on the school grounds.**

12. If there are grass or gravel areas, could these be remade into planted areas where trees and shrubs could help hold the water and allow it to **soak into the ground? Explain the concept of rain gardens. Remind them that these areas need to be in places where any excess stormwater flowing over the land during heavy rains will not be a concern (ball**

fields, wooded areas on campus, away from the buildings, or at least, below the buildings). If your school has a detention pond or grass swales, or anything that helps stormwater infiltrate, let the students understand this is one way to have the water flowing through our watersheds behave more naturally, as if the school and other impervious surfaces were not there.

Extension:
After the students have brainstormed possible areas that could be used to allow stormwater to infiltrate into the ground, you may want to have them measure certain impervious surfaces on the school grounds so they can understand how much rain water is generated during the year. This activity is called "**It's Just a little Rain**."