STORMWATER RUNOFF MAPPING

Purpose & Goals

Purpose: To understand how water runs off the landscape. To use this understanding to think like an engineer and make decisions in context with the water cycle.

Goals:

1) Be able to make decisions about water resources and land use on the school yard, using observation skills, watershed concepts, and calculations.
2) Compare and contrast needs of the water resource, wildlife, and human community.

Standards

STEM Science: 4.1.2.1.1., 4.1.2.2.1., 4.3.2.3.1., 4.3.4.1.1., 5.1.1.1.4., 5.3.1.2.2., 5.1.3.4.2., 6.1.2.1.1., 7.1.3.4.1., 7.1.3.4.2., 8.1.3.4.2., 8.3.2.3.1., 8.3.2.3.2., 8.3.4.1.2., 9.1.2.2.2.

Time: 1 hr

Grades: 4-8

Preparation & Materials

Provided by VLAWMO:

- Arial maps of the schoolyard
- 5-8 milk gallon jugs full of water
- Clipboards for each group
- Surface cover measurements and runoff coefficients table.
- Photos of stormwater best management practices (BMP's)

Provided by classroom:

- Markers, pencils
- Calculators
- Any preparations for outdoor field work.
- SmartBoard or projector screen

Terms

Best management practice (BMP): A strategy to collect, store, and treat stormwater.
Impermeable: A surface that doesn't allow water to soak into the ground.
Permeable: A surface that allows water to soak (permeate) into the ground.
Runoff: Water that runs off a surface during a rain event, into a stormdrain or water body.
Runoff Coefficient: A percentage of water that runs off a surface according to that surface type. For example, pavement has a high runoff coefficient because all of the water that falls on it either runs off or evaporates.
Surface Cover Measurement: Square foot measurements of various land surface covers on the school yard.
Water table: The level below the ground which is saturated with water The water table can move up and down depending on rainfall from year to year. A high water table means saturated soil is closer to the surface.

Procedure

1. Introduce the activity using a map of the schoolyard. Explain different surfaces in terms of stormwater runoff: water runs off pavement and even grass, picking up nutrients, salt, or other pollution such as motor oil or garbage.
2. Divide students into groups of 2-3, each equipped with a gallon of water, a marker, a map, and a clipboard.
3. Send students around the schoolyard to pour the water on a variety of surfaces. With clipboard, students draw arrows to depict the directions runoff drains. Students cover a variety of surface types (pavement, turf grass, sand/gravel, long grass or wooded areas) and note how much water is running off the surface and how much soaks into the ground.
4. Students return to the classroom. Use pre-calculated surface cover measurments and runoff coefficients from VLAWMO to have students calculate the ammount of runoff that's generated on the schoolyard during a 1" rain event. Refer to aerial map projected in front of the classroom. Groups may focus on individual surface covers, compiling them as a class.
5. Analyze completed field maps and discuss where to place BMP's on the school yard, and which BMP's to use. Describe and hand out BMP sample cards for reference. Students may present at the front of the class.
6. Students present their findings or combine their findings on a collective map to cover all areas of the schoolyard that were surveyed in step 3. Collective map includes arrows for drainage direction and taped-up BMP cards at the location. selected by the groups.

Vadnais Lake Area Water Management Organization
800 E County Rd E Vadnais Heights, MN 55127 (651) 204-6070

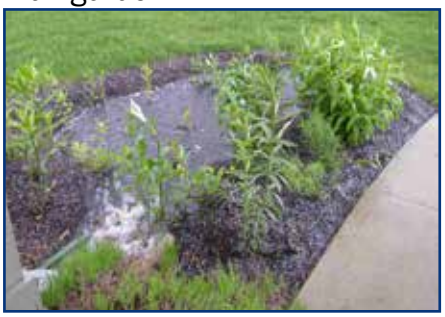
STORMWATER RUNOFF MAPPING

Best Management Practice (BMP) Examples

Detention basin/swale

Green roof

Raingarden



Permeable pavers

Underground retention basin

Stormpond

Surface Cover Measurements and Runoff Coefficients

Rooftop: 79,279 ft²
North parking lot: 30,448 ft²
South parking lot pavement: 11,761 ft² South parking lot gravel: 5,140 ft²
Baseball fields: 20,908 ft ²
Turf grass of schoolyard (behind school flat turf): 90,169 ft²
Tree cover: 22,8254 ft²
Raingarden: 1,524 ft²
Raingarden drainage area:
Turf grass: 25,134 ft² Gravel: 5,140 ft² Parking lot (turf sloped): 11,761 ft² Rooftop: 9,539 ft²

Total school grounds: 576,627 ft²
To be used hypothetically to demonstrate if the whole schoolyard was a single surface type.

Surface type	Surface area (sq ft)	Runoff Coefficient
Pavement/rooftop	0	0.98
Turfgrass - flat	0	0.2
Turfgrass - sloped	0	0.3
Raingarden	0	0
Open water	0	0
Gravel/baseball field	0	0.4
Playground	0	0.2
Tree cover	0	0.15
Open space	0	0.15

Reflection

1. Which surfaces shed water quickly? How far did it go from where it was poured?
2. What would the ast runoff surfaces look like during a rain event?
3. Which section of the schoolyard has the most runoff? Which area has the least?
4. Imagine you're the building planner at your school before it was built. What's your strategy for runoff - is there a certain direction you want water to go?
5. What are the positives and negatives of fast runoff drainage?
6. What's the nearest water body that would receive runoff from your school yard? How does this knowledge change your plan for the schoolyard?
7. Which surfaces would you create more of, which would you create less of?
8. What BMP's would you build on your schoolyard? Do any hold potential for other uses besides stormwater?
9. What stormwater BMP's are already on the school yard? Are they in the right place according to your findings?

Assessment

At the end of the activity, students will have assigned locations for each BMP and be able to cite a reason for their placement. They may hand in their map, their completed runoff calculations, or both.

Vadnais Lake Area Water Management Organization
800 E County Rd E Vadnais Heights, MN 55127 (651) 204-6070