BUILD A MINI-CITY

Keep Omaha Beautiful

Description:

Students build a model city to see how permeable and impermeable surfaces affect the flow of water.

Objective:

- Students will create models to discover how permeable and impermeable surfaces impact stormwater runoff.
- Students will understand how Omaha's local watershed contributes to regional, national, and worldwide water bodies.
- Students will comprehend ways communities contribute to water pollution and actions individuals can take to reduce their impact.

Standards:

2nd Grade
- SS 2.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.

3rd Grade
- SS 2.3.3.b Describe how seasonal weather patterns, natural hazards, and natural resources affect human activities.
- SS 3.3.1.c Determine why things are located where they are in the community.
- SS 3.3.2.a Identify and differentiate between physical and human features of neighborhoods and communities.
- SS 3.3.3 Explain relationships between humans and the physical environment.

4th Grade
- SS 4.3.3 Explain how human and natural forces have modified different environments in Nebraska and how humans have adapted.
- SS 4.3.5 Use geographic skills to make connections to issues and events.

5th Grade
- SS 5.3.3 Explain how human and natural forces have modified different environments in the United States and how humans have adapted.

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Materials:

- Video
- Smaller trays for construction of mini-cities
- Larger trays
- Felt sheets
- Variety of sponges

- Scissors
- Plastic houses and buildings
- Spray bottles with water with filled to line
- Tape
- Funnel

Background Info:

From the EPAs website:

Section 502 of the Clean Water Act defines green infrastructure as "...the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters."

Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that provides many community benefits. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits. Stormwater runoff is a major cause of water pollution in urban areas. When rain falls on our roofs, streets, and parking lots in cities and their suburbs, the water cannot soak into the ground as it should. Stormwater drains through gutters, storm sewers, and other engineered collection systems and is discharged into nearby water bodies. The stormwater runoff carries trash, bacteria, heavy metals, and other pollutants from the urban landscape. Higher flows resulting from heavy rains also can cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure.

When rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants. Stormwater runoff is cleaner and less of a problem. Green infrastructure uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments. At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems that mimic nature soak up and store water.
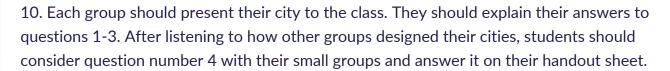
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Activity:

1. Divide students into 10 pairs or small groups.
2. Distribute the following materials to each group:
   a. Small tray
   b. Large tray
   c. Large piece of brown felt
   d. Several houses and buildings
   e. Several types of sponges
   f. Roll of tape
   g. Pair of scissors
3. Show students the video
4. Inform students that they will be building a mini-city. The idea is that they need to have a city that accommodates their needs – sports fields, parks, schools, grocery stores, houses, museums, etc. Their city also needs to have an infrastructure to function – roads, parking lots, sidewalks, etc.
5. Students should place the small tray on top of the large tray, leaning on the edge/corner. This should set their mini-city as if it is on a hill. The notch that is cut out of one corner of the small tray should be on the BOTTOM of the hill of the city. Students should then place the large piece of felt on their tray. This is the soil underneath their city. The notch cut out of the tray should match the notch cut out of the corner of the felt.
6. Students should work in their groups to create their cities. Tape should be used to make hard surfaces, such as roads, parking lots, etc. Different sponges can represent grassy areas, ball fields, gardens, etc. If needed, students can use their scissors to cut sponges to appropriately fit their city.
7. Distribute one spray bottle to each group. Spray bottles should be filled to the line with water. Instruct students to "rain" on their towns. As they spray the water, they will see where the water flows through their mini-city.
8. After they have sprayed their entire bottle of water, the teacher should help each group carefully lift the small tray off of the big tray. As you do this, tilt the tray a bit more to allow any excess water to flow out of the drain in the bottom corner. The excess water should now all be in the large tray which was underneath the smaller tray. The teacher should help the students, using the funnel provided, to pour the excess water from the big tray back into the spray bottle. This allows students to see how much of the water on their city became stormwater runoff by comparing the original level of the water (where the line is drawn) to the current level of water.
9. Students should work in their small groups to answer questions 1-3 on their student handout sheets.

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Activity cont:

10. Each group should present their city to the class. They should explain their answers to questions 1-3. After listening to how other groups designed their cities, students should consider question number 4 with their small groups and answer it on their handout sheet.

Note: Please allow materials to dry completely before packing them into the storage bin. Please return all materials EXCEPT the used tape. Even small, cut pieces of sponges can be used by the next group.

Assessment:

- Student mini-cities
- Group presentations
- Student handout pages