

W.A.T.E.R WORKSHEETS

SPONGE CITY

A lesson for investigating stormwater infrastructure through infiltration testing

ACTIVITY DESCRIPTION

Stormwater parks use infrastructure designed to slow, capture, and absorb rainwater into the ground, reducing flooding and improving water quality. This hands-on activity will guide students in testing how quickly different surfaces absorb water, helping them understand the role of infiltration in stormwater management.

Students will work in teams to measure infiltration rates at different locations within the park, record data, and analyze the results to determine how well the site manages rainwater.

This lesson provides a hands-on way for students to explore stormwater infrastructure while building skills in data collection, analysis, and environmental problem-solving.

SUGGESTED CURRICULUM APPLICATIONS

Science: Hydrology, environmental science, soil permeability.

Math: Measuring volume, calculating rates, graphing results.

Engineering: Understanding how infrastructure influences water movement.

Geography: Land use, water cycle, urban planning

ACTIVITY OBJECTIVES

- Understand how stormwater infrastructure helps manage water.
- Conduct infiltration rate tests to compare how different surfaces absorb water.
- Analyze data to determine factors affecting infiltration.
- Connect infiltration rates to real-world applications in stormwater management.

ACTIVITY VITALS

- **Activity Time:** 45 minutes
- **Subject Areas:** Science, Math, Engineering, Geography
- **Grade Levels:** 7th–12th grade
- **Skills:** Measurement, observation, data collection, analysis, problem-solving
- **Key Vocabulary:** Infiltration, permeability, runoff, stormwater, hydrology, impervious surface
- **Jobs & Careers:** Civil Engineer, Environmental Scientist, Hydrologist, Urban Planner, Landscape Architecture

LET'S GET STARTED

THIS ACTIVITY CAN BE DONE USING A NON-INVASIVE APPROACH (NO DIGGING REQUIRED) OR AN INVASIVE APPROACH (DIGGING REQUIRED)

ACTIVITY MATERIALS

- Clipboards & pencils
- Data collection sheets (for recording infiltration rates)
- Small measuring cups or graduated cylinders
- Stopwatches or timers
- Watering cans or small buckets
- Non-invasive Option: Soil infiltration testing kits (DIY method using bottomless coffee cans or PVC rings)
- Invasive Option: Dig a hole 1' wide x 1 long x 1 foot deep in appropriate locations
- Tape, Permanent Marker (or flag if digging a physical hole) - for marking water elevations
- Rulers (for measuring water depth)

ACTIVITY PROCEDURE

Preparation (Before the Activity)

1. Select multiple test locations within the stormwater park (e.g., grassy area, bare soil, mulch, pavement).
2. Set up an Activity Station with materials and instructions.
3. Review key vocabulary and discuss how stormwater parks manage water.
4. Divide students into small teams (3–4 students per team).

Step 1: Observing the Site

Walk students through the stormwater park and point out different surfaces (permeable vs. impermeable).

Ask guiding questions:

Where does rainwater go in this park?
Why do some areas absorb water faster than others?

Step 2: Conducting Infiltration Tests

Setup:

- Each team selects a test location and places a bottomless coffee can or PVC ring into the ground.

- Press the can down slightly to create a seal.

Testing:

- Pour a measured amount of water (e.g., 500ml) into the ring.
- Start the stopwatch and time how long it takes for the water to fully absorb.
- Record the results on the data sheet.

Repeat:

- Conduct tests in at least two different areas and compare results.

Step 3: Data Analysis & Discussion

- Compare infiltration rates between locations.
- Discuss factors affecting infiltration (soil type, plant cover, compaction, land use).
- Relate findings to stormwater infrastructure design—why do cities need permeable surfaces?

Step 4: Reflection & Connection to Real-World Issues

- How does infiltration affect flooding and water quality?
- How do engineers design stormwater parks to improve infiltration?
- What would happen if this park were covered in concrete instead of plants and soil?

STUDENT WORK + DATA SHEETS

Infiltration Rate Recording Sheet
Observations & Analysis Questions
Reflection Questions

EXTENSIONS:

Math Connection: Convert infiltration times to rates (e.g., mm/sec). Graph class results.

Engineering Challenge: Design a model stormwater system using permeable and impermeable materials.

Long-Term Monitoring: Conduct seasonal infiltration tests to see how rates change with weather conditions.

Community Connection: Research local flooding issues and propose stormwater solutions for your neighborhood.