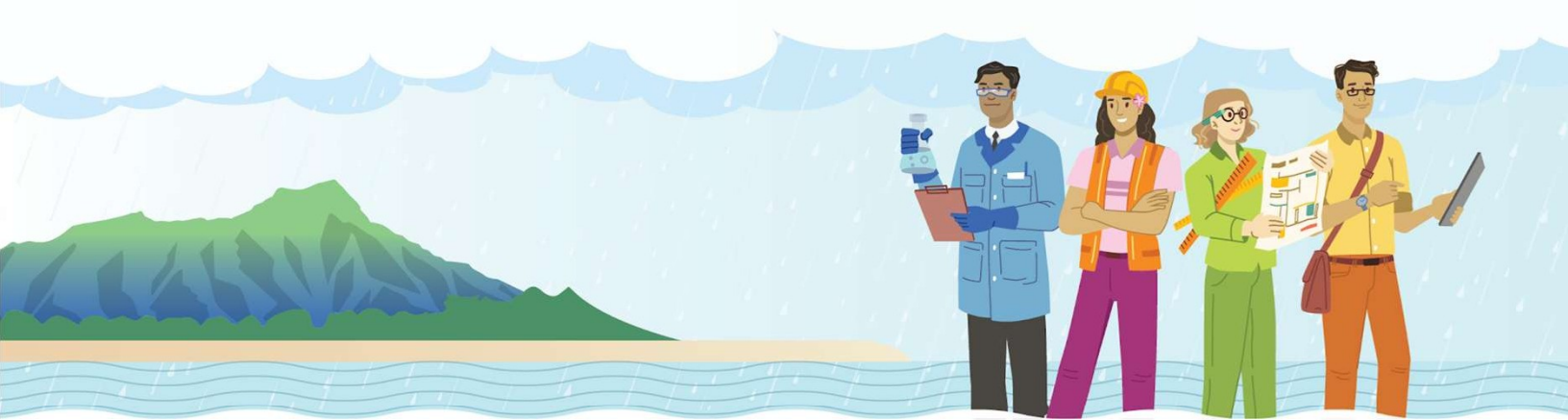




Storm Patrol Induction, Finding Your Why

Storm Water Career: All

All Careers Full- Course Lesson Plan #: 1 of 15

Next Lesson Plan Title (Full-Course): How Does the Rain Flow?

Select Career Short-Course Lesson Plan #: 1 of 6

Next Lesson Plan Title (Short-Course): How Does the Rain Flow?

SUMMARY

In this initial lesson, students will be introduced to the various water resource careers and learn about preventing pollution to the Maximum Extent Practicable. They will receive Storm Water Career Cards featuring different storm water careers and match them accordingly. They will also learn how water travels through a community.

FOCUS & GOALS

In learning how to become professionals in storm water management, students will:

- Gain understanding of different storm water management occupations
- Learn methods employed to reduce pollution
- Develop skills in observation and mapping

MATERIALS NEEDED

- Tray with large sponge with portion cut out down the length and strip of cardboard that will fit within the cut out (one per group)
- Duct tape
- Spray bottle, filled with colored water (use food coloring)
- Paper and pencils
- Storm Water Cycle Diagram
- Storm Water Career Cards

LEARNING OBJECTIVES

- Understand roles and responsibilities of professionals in storm water management
- Identify and evaluate pollution sources that affect surface waters
- Explore strategies for sustainable storm water management

VOCABULARY

Drainage Infrastructure - Network of man-made structures and systems designed to collect, convey, and manage storm water to prevent flooding.

Impervious/Impermeable - Often used interchangeably, both refer to surfaces or materials that prevent water from passing through or soaking into them.

Pervious/Permeable - Both mean allowing passage through or penetration, allows liquids to pass through.

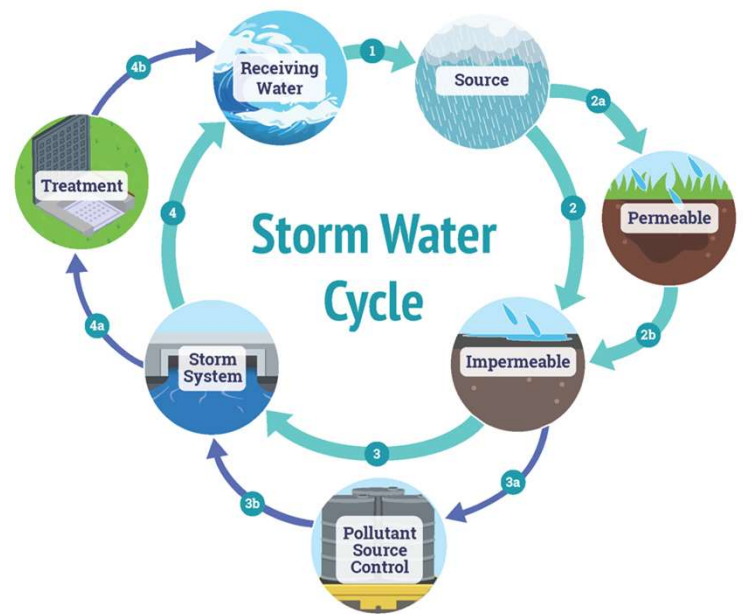
Background

Storm water management is an essential area of study that addresses the complex interactions between precipitation, urban infrastructure, and the environmental impact of urbanization. Understanding storm water is crucial for maintaining healthy ecosystems, ensuring public safety, and promoting sustainable urban development. This lesson plan aims to introduce students to the fundamental concepts of storm water, its movement through urban environments, and the diverse range of professionals involved in its management. Storm water refers to the water that originates from precipitation events such as rain or snowmelt, which then flows over surfaces and into the drainage system. Unlike natural landscapes where water can infiltrate into the ground, urban areas are characterized by impervious surfaces such as roads, parking lots, and buildings. These surfaces prevent water from soaking into the soil, leading to increased runoff. As a result, storm water can accumulate and create problems such as flooding, erosion, and water pollution.

In urban settings, storm water follows a specific flow path. When it rains, water flows over impervious surfaces, collecting pollutants like oil, heavy metals, and debris. This runoff is channeled through storm drains, which lead to storm water management systems designed to mitigate its impacts. These systems can include retention basins, detention ponds, and green infrastructure solutions such as rain gardens and permeable pavements. Understanding this flow and its implications is crucial for students interested in urban planning, environmental science, or public policy. The speed and volume of storm water runoff can significantly increase the risk of urban flooding, which poses threats to public safety, infrastructure, and local waterways. Consequently, effective storm water management practices are vital for reducing these risks and protecting community resources.

Storm water management is a multidisciplinary field that requires collaboration among various professionals. Civil engineers design storm water systems that can handle runoff efficiently, while environmental scientists assess the ecological impacts of storm water on local waterways. Urban planners incorporate green infrastructure principles into community layouts to promote sustainable land use practices. Additionally, public health officials monitor water quality to ensure the safety of drinking water and recreational areas. Moreover, landscape architects and ecologists work together to develop solutions that enhance natural drainage and improve the aesthetic value of urban spaces. Educators and community outreach specialists also play a crucial role in raising awareness about storm water issues and promoting best practices among residents.

As urban areas continue to grow, the need for effective storm water management becomes increasingly important. Engaging students in this topic equips them with the knowledge to become informed citizens and potential professionals who can contribute to sustainable solutions in their communities. Through this lesson plan, students will not only learn about the mechanics of storm water but also appreciate the breadth of expertise required to manage this critical resource effectively.



I. Storm Water Cycle Activity

1. Present students with the following situation: One day they go to their favorite beach but there's signs that warn it's not safe and it's very murky. How would you find out what happened? What if all the beaches on the island were like this?
2. Introduce students to the Storm Water Cycle diagram, discuss each of the following parts as listed in the storm water cycle steps on the back page of the diagram.
3. First, discuss the source of rain. How is rain formed? Where does it come from? What affects how much and when?
4. Next, discuss how rainwater flows. When it flows into a permeable/pervious area. Some of it will soak in. Why? How much? What happens to the extra that can't soak in?
5. Discuss runoff. When it flows into an impermeable/impervious area. What happens to the rate of flow? Can it accumulate pollutants? What kind, where do they come from?

I. Storm Water Cycle Activity Continued

6. Discuss dirty, polluted runoff flowing into drains then into pipes. Why can't we see the pipes? Where do they go? Have they seen these in their community?
7. Optional to introduce and discuss the concept of treatment systems. Filtration, screening, settling, retaining or detaining, bioremediation, etc.
8. Discuss where the flow in the pipes discharge and what are receiving waters: streams, lakes, ocean. How does pollution affect these systems? Does treatment clean it enough?
9. Discuss how this storm water cycle eventually connects through evaporation. Include discussion on how evapotranspiration from plants where the water soaked in contributes to this. Also, discuss how water that soaks in can also go to ground water and then be extracted for drinking water, eventually all recycled as rain water.

II. Exploring Permeability Activity

1. Divide into small groups. Have students simulate how storm water moves across a surface.
2. Distribute sponges in trays and explain the cutaway portion represents a stream.
3. Tell them to cover the bottom of the "stream" with a strip of cardboard to represent the stream bed. Have students cut out pieces of duct tape to represent buildings, parking lots, roads, and sidewalks.
4. Squirt colored water on the sponge to simulate rain. Have them note how and where the water flows and whether it soaks in, runs off, or flows into.
5. Invite students to share examples of permeable and impermeable surfaces in their community.



III. Storm Patrol Careers Activity

1. Tell students that a fictional town called U'awaikai has identified a list of professionals it needs to hire to keep storm water from flooding the city and mucking up the beaches. We need their help to develop a team by selecting professionals from a set of Storm Water Career Cards.
2. Provide at least one card to each student, ideally one of each career pathway (Planner, Engineer, Scientist, Architect).
3. Tell students that the first phase in managing U'awaikai's storm water is to "Assess the Flow: Identify how water moves through the community".
4. Have the students read through their cards and pick one that is the best fit for this phase. If they only have one card, have the students nominate their card as a good fit for this phase.
5. Ask the students to read the descriptions and as a class determine which one(s) should be "hired" by U'awaikai to work on tasks for this phase of storm water management.
6. Repeat steps 3 to 5 with these additional phases:
 - a. Check the Impact: Study how storm water affects our oceans and reefs.
 - b. Design the Solution: Create a plan (infrastructure + landscaping).
 - c. Build & Maintain: Bring the plan to life and keep it running.
 - d. Measure Success: Monitor the benefits to the community and nature.
7. Encourage each student to share at least one of the professional descriptions on their card(s).

III. Storm Patrol Careers Activity Continued

1. As they build the team, have them reflect and share on:
 - a. How professionals in each phase assist with other phases, how they rely on each other expertise, and can best work as a team.
2. Instruct them to select one or more careers they want to know more about. Have them research online and be prepared to share next time. Let them know they should select their professional role for their project's team. Encourage them to come up with their own job title.

Adaptations and Resources

Project Based Learning Track:

After conducting the Activities, guide students in team collaboration and complete Section 1 of their Storm Patrol Project Workbook to address the following:

- What is an issue with storm water in their chosen community?
- Research causes and solutions for this issue.
- Identify the types of professionals involved in developing and implementing these solutions.

If time permits, include a guided networking session to enhance team formation. See Lesson 11 Activity II.



Activity-Centric Learning Track:

Conduct Activities I, II, and III, skipping step 9 of Activity III.

Tips to Truncate Lesson:

- Present on the storm water cycle rather than lead an inquiry-based discussion.
- Pass out a Storm Water Career Card to each student (at least one from each career pathway) and have them share the description with the class. Follow with a short discussion on the variety of careers before asking students to research more at home.

Tips to Extend Lesson:

- Have them write an advertisement for a career and then a resume in response.
- Have students research recent storm water-related issues in their community or region.
- For one of the permeable surfaces identified in their community, have them research what it is and how it works.

Resources:

- U.S. Environmental Protection Agency (EPA), *Storm Water Program*, <https://www.epa.gov/npdes/npdes-stormwater-program>
- National Oceanic and Atmospheric Administration (NOAA), *Ocean & Coasts*, <https://www.noaa.gov/ocean-coasts>
- Center for Watershed Protection, <https://www.cwp.org/>
- Storm Water Resource Center, <https://stormwaterresourcecenter.org/>

