Sustainable Stormwater Management through Green Infrastructure

Jersey City Public School #5

Green Infrastructure Site Evaluation

Friday, October 25th, 2013

FORMAT:

(15 minutes) An Introduction to Stormwater Management
(60 minutes) Campus Stormwater Evaluation Field Exercise
(15 minutes) Group Discussion

GOALS:

1. Students will understand what a watershed is and how we all live in a watershed.
2. Students will understand how the land is connected to the sea.
3. Students will understand stormwater runoff and how it transports nonpoint source pollution to waterways.
4. Students will understand nonpoint source pollution and identify solutions to nonpoint source pollution.
5. Students will understand the difference between gray and green infrastructure.
6. Students will understand the variety of stormwater management green infrastructure strategies.
7. Students will identify the possible locations for consideration of green infrastructure (parking lots, downspouts, topography/slope).
8. Students will apply their knowledge by proposing green infrastructure practices for their school model.

SUSTAINABLE STORMWATER MANAGEMENT THROUGH GREEN INFASTRUCTURE

STORMWATER MANAGEMENT SOLUTIONS

October 25, 2013

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PASSAIC VALLEY SEWERAGE COMMISSION

WHO ARE WE?

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

Water Resources Program is one of many specialty programs under RCE. Our mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

Passaic Valley Sewerage Commission (PVSC) was established in 1902 and began operation of the Newark Bay Treatment Plant in 1924 as a means to alleviate pollution in the Passaic River and its tributaries. Major upgrades and renovations have made the PVSC one of the largest wastewater treatment plants in the US. PVSC moves forward identify alternative funding sources for necessary infrastructure maintenance, while providing innovative, environmentally sound and cost effective wastewater treatment.

WHAT IS STORMWATER?

Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.

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WHAT IS A WATERSHED?

- An area of land that water flows across, through, or under on its way to a stream, river, lake, ocean or other body of water.

- A watershed is like one big bathtub...

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

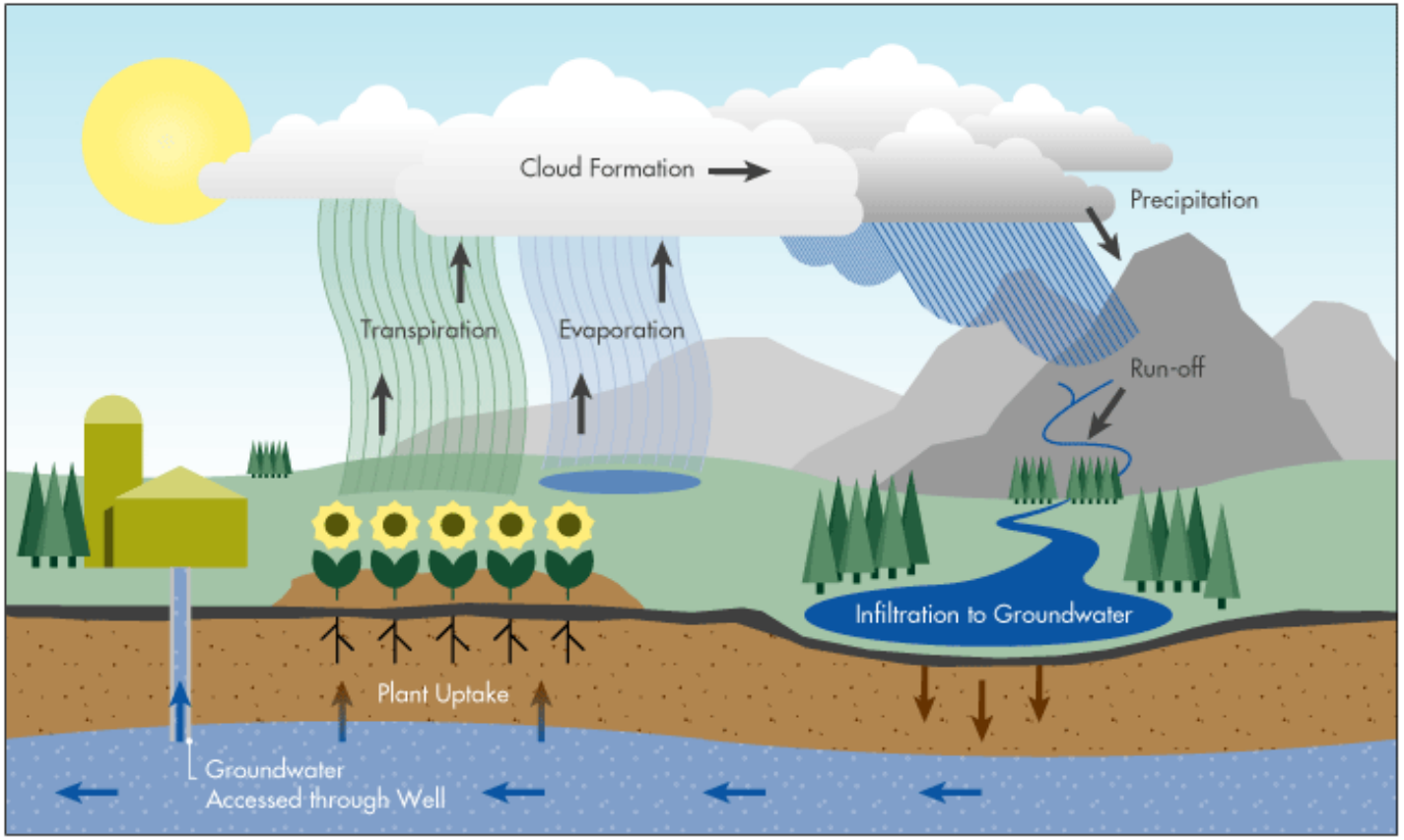
WHERE DOES PRECIPITATION GO?

It can be *absorbed* by plants and used for photosynthesis and other biological processes.

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

It can *infiltrate* through the soil surface and percolate downward to groundwater *aquifers.*



Hydrological Cycle - Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

It can *evaporate.*

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

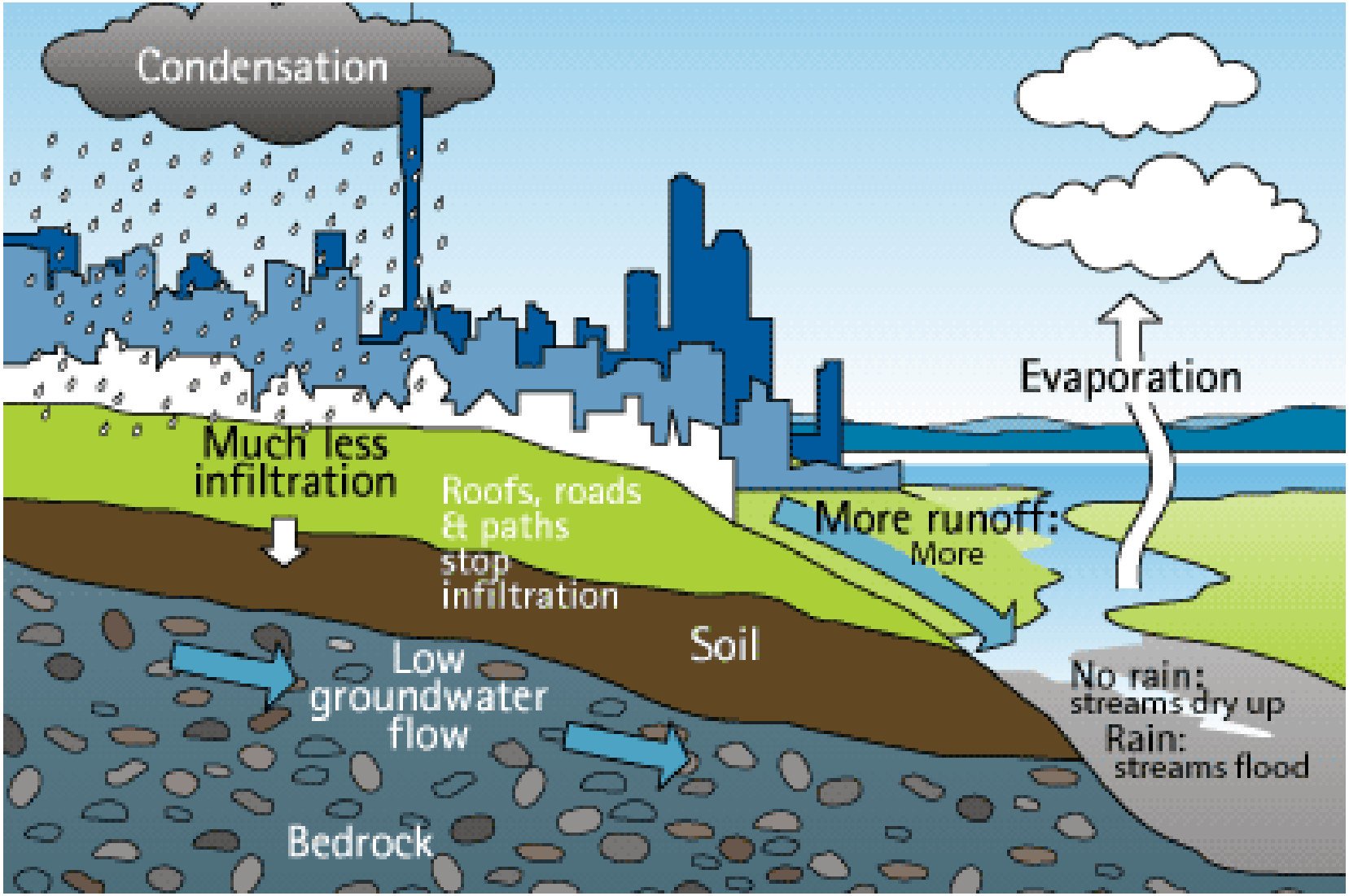
It can *run off.*

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

The Impact of Development on Stormwater Runoff

More development → *More impervious surfaces* → *More stormwater runoff*

The *Urban* Hydrologic Cycle



WHAT IS INFASTRUCTURE?

- Infrastructure includes the basic structures and organizations needed to operate our cities:
  - roads
  - water supply
  - sewers
  - electrical grids
  - telecommunications,

GRAY INFRASTRUCTURE

- Roads
- Curbs & Gutters
- Catch Basins
- Sewer Pipes
- Retention & Detention Ponds
- Treatment Plants

GRAY INFRASTRUCTURE
Combined Sewer Systems (CSOs)

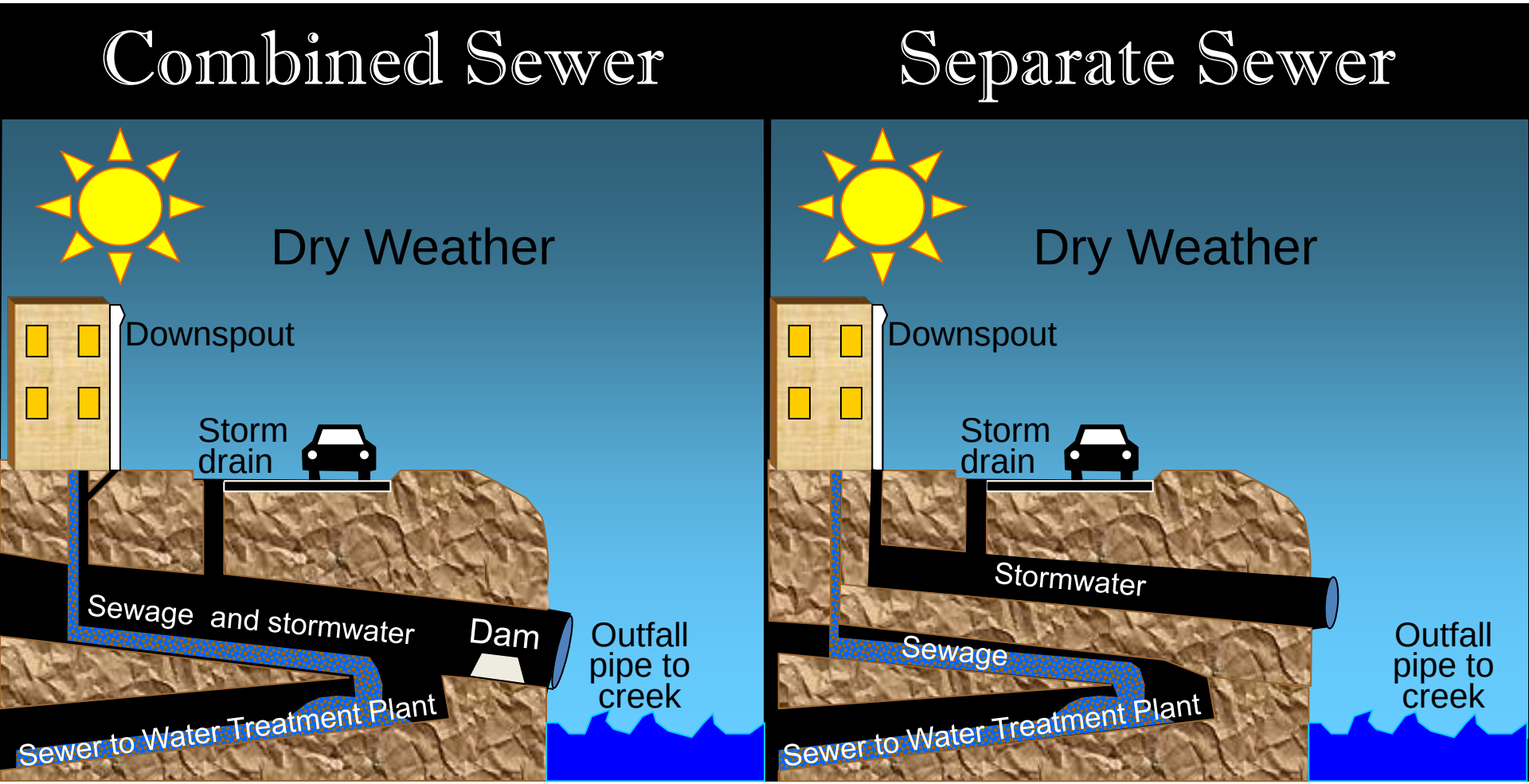
DURING DRY WEATHER

Normal sewage flow is contained within the system and flows to the Wastewater Treatment Plant.

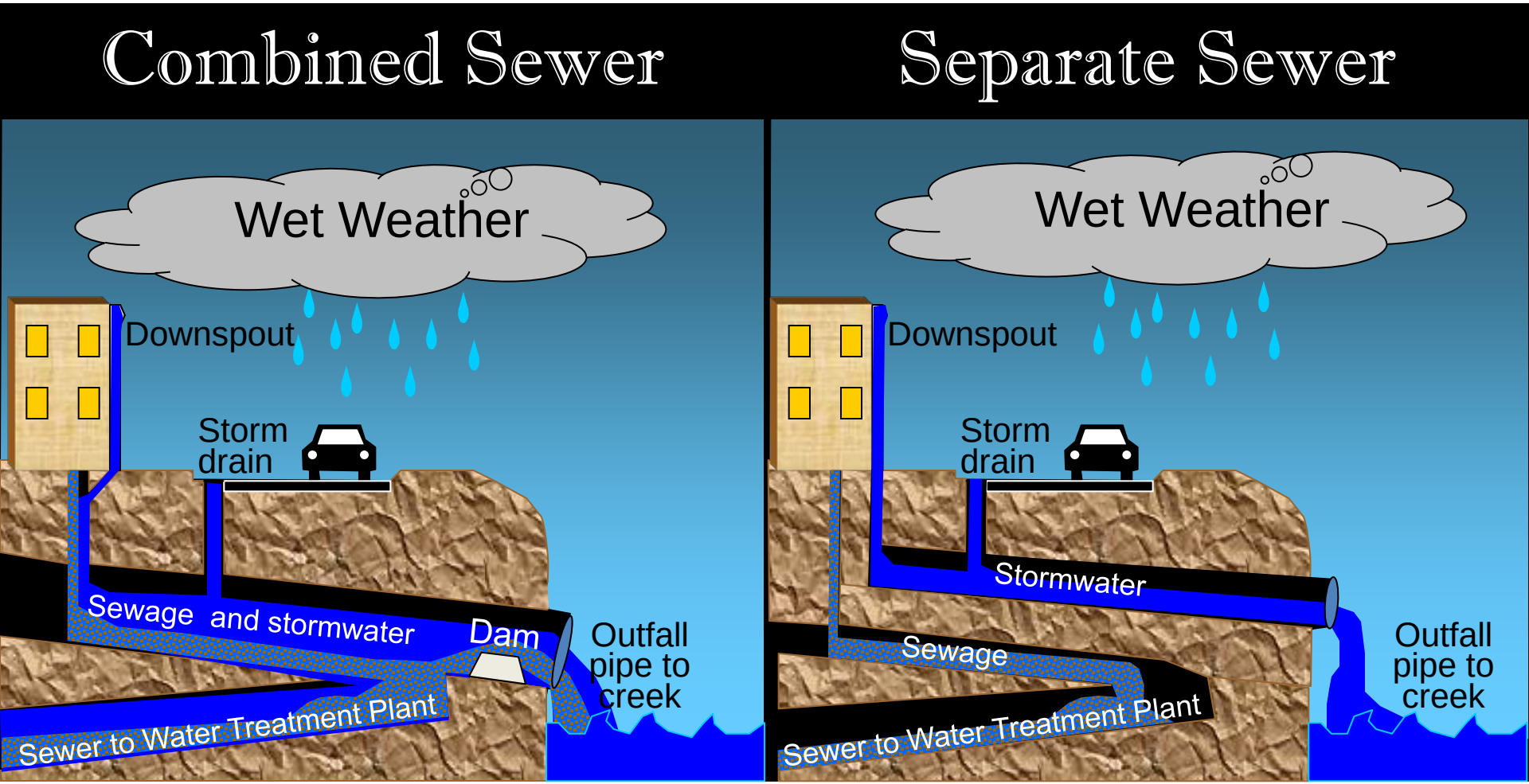
DURING STORMY WEATHER

The combination of stormwater and sewage can exceed normal capacity and overflows into area waterways.

Combined versus Separate Sewers

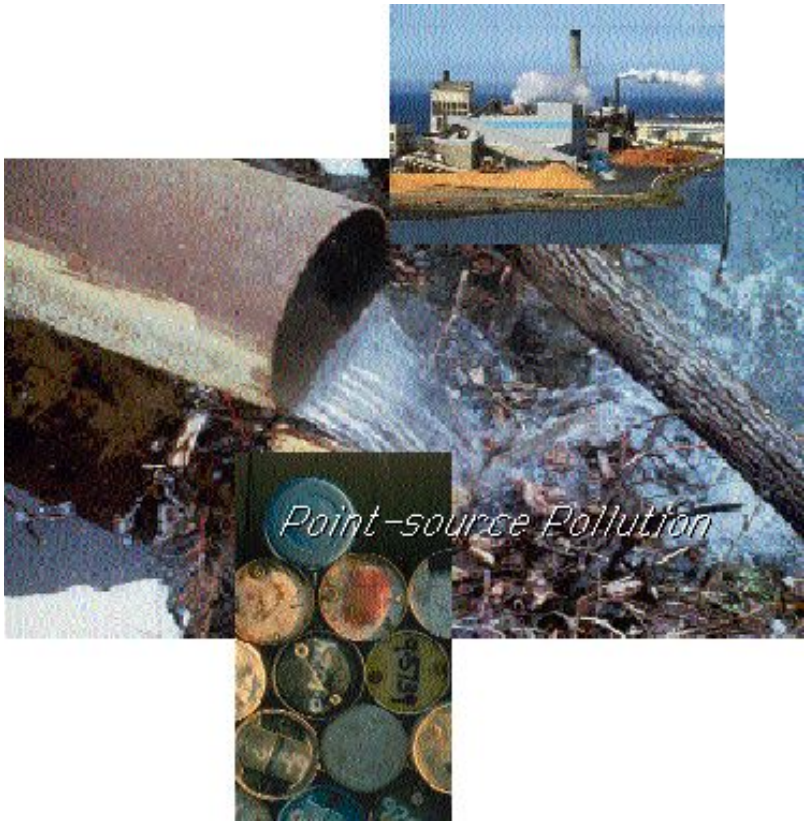


Combined versus Separate Sewers



WATER POLLUTION SOURCES

POINT SOURCE POLLUTION



NONPOINT SOURCE POLLUTION

Environmental Health Perspective, National Institute of Health

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POINT SOURCE POLLUTION

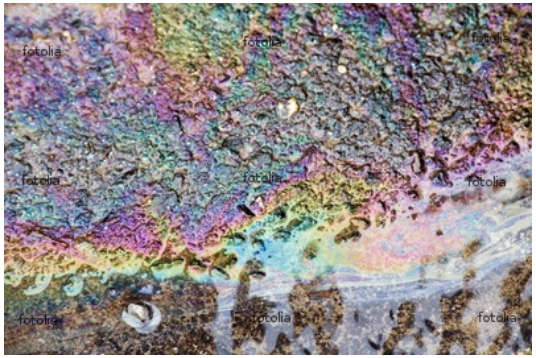
- Comes from a specific source, like a pipe
- Factories, industry, municipal treatment plants
- Can be monitored and controlled by a permit system (NPDES)

NONPOINT SOURCE POLLUTION

- Nonpoint Source (NPS) Pollution is pollution associated with stormwater or runoff
- NPS occurs when runoff collects pollutants on its way to a collection system or water body
- NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility

EXAMPLES OF NPS

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment



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IMPACT OF NPS

- Fish and wildlife
- Recreational water activities
- Commercial fishing
- Tourism
- Drinking water quality

WHAT IS GREEN INFASTRUCTURE?

Green infrastructure is an approach to wet weather management that is cost-effective, sustainable, and environmentally friendly. Green Infrastructure management approaches and technologies infiltrate, evapotranspire, capture and reuse stormwater to maintain or restore natural hydrologies.

USEPA. 2009. Green Infrastructure Manual.

Rain Garden in Holmdel, NJ

Native NJ Purple Coneflower

Pervious Pavers

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GREEN INFASTRUCTURE DESIGN APPROCAHES

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1 – GREEN ROOF

Unilever/Parker Urban Greenscapes. 2009. Green Infrastructure Manual.

Basic Info:

- high quality water proofing and root repellant system
- lightweight growing medium and plants

Benefits:

- Economic benefits (savings on energy heating and cooling costs)
- Improved air quality
- Carbon dioxide/oxygen exchange
- Amenity space and aesthetics
- Sound insulation

2 – RAINWATER HARVESTING: CISTERN

Basic Info:

- Capture, diversion, and storage of rainwater

Benefits:

- Eliminates need for complex and costly distribution systems
- Provides additional water source
- Landscape irrigation
- Reduces flow to stormwater drains
- Reduces non-point source pollution
- Delays expansion of existing water treatment plants
- Reduces consumers' utility bills

2 – RAINWATER HARVESTING: RAIN BARREL

Residential Rain Barrel

Basic Info:

- Capture, diversion, and storage of rainwater

Benefits:

- Saves drinking water
- Irrigates the landscape
- Reduces utility bills
- Prevents basement flooding
- Reduces pollution

artist: Tamara Petrosino

artist: Jon Horowitz

artist: Dorothy Cohen

artist: Helen Haniffy

3 – PERMEABLE PAVEMENT

Basic Info:

- Allows runoff to flow through the surface to an underlying storage layer

Benefits:

- Manage stormwater runoff
- Alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

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4 – VEGETATED SWALE

Basic Info:

- Broad, shallow channel with a dense stand of vegetation covering the side slopes and bottom
- Traps pollutants

Benefits:

- Reduced peak flows
- Removal of pollutants
- Promotion of runoff infiltration
- Lower capital costs.

5 – NATURAL STORMWATER BASIN

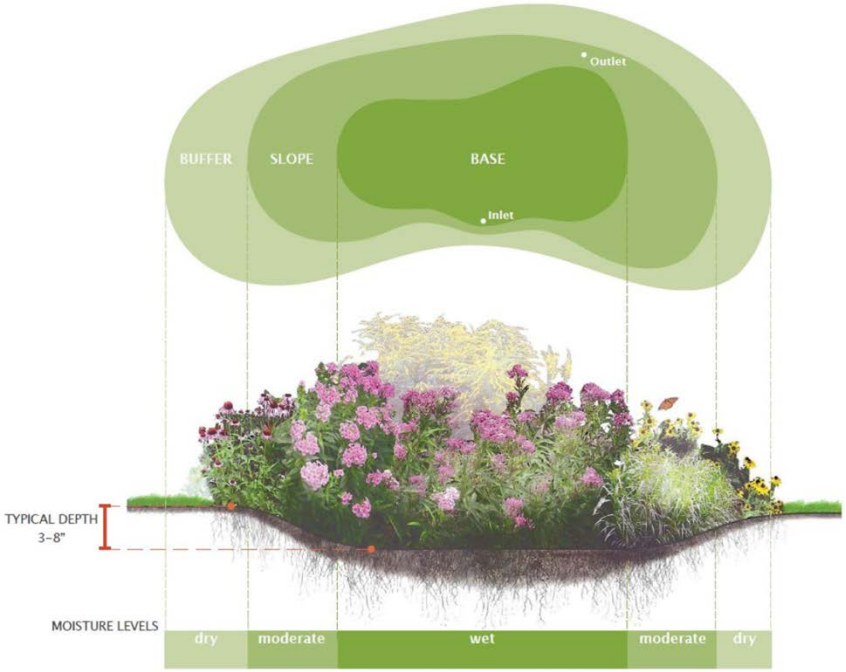
Basic Info:

- Broad, shallow channel with a dense stand of vegetation covering the side slopes and bottom
- Traps pollutants

Benefits:

- Reduced peak flows
- Removal of pollutants
- Promotion of runoff infiltration
- Lower capital costs.

6 – RAIN GARDEN



What is a rain garden?

A rain garden is a landscaped, shallow depression that captures, filters, and infiltrates stormwater runoff. The rain garden removes nonpoint source pollutants from stormwater runoff while recharging groundwater.

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What are ways we can better manage stormwater in our community?

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Sustainable Stormwater Management through Green Infrastructure

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Field Evaluation Worksheet

Name: _____ **Date:** _____

Directions: As you are observing your school's campus, think about the questions below. These questions are general questions to think about during a site evaluation to implement green infrastructure. Based on your observations, answer the following questions. Make sure to take notes during your site evaluation. To assist you further, think about the types of green infrastructure that may be applicable to each site.

Types of Green Infrastructure: Green Roof, Rainwater Harvesting (Cisterns or Rain Barrels), Permeable Pavement, Vegetated Swale, Natural Stormwater Basin, Rain Garden

1. Where is stormwater runoff coming from?

2. If it rained on this area, where would the stormwater runoff go?

3. Identify type(s) of nonpoint source pollution on this site.

4. Can you identify three to four locations of where you can implement green infrastructure? If yes, please identify the sites and the type of green infrastructure below.

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