Site Soils and Stormwater Management

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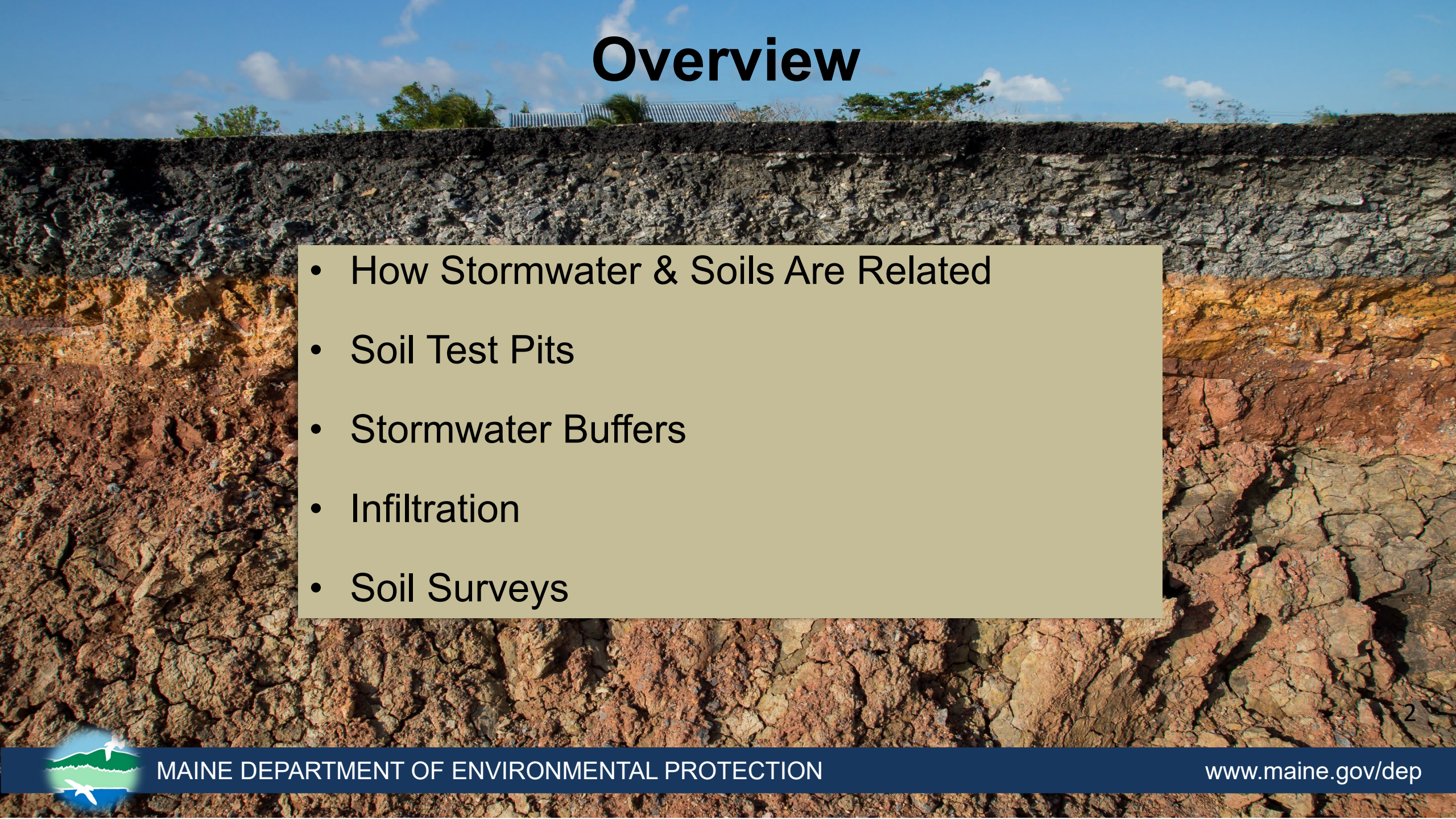
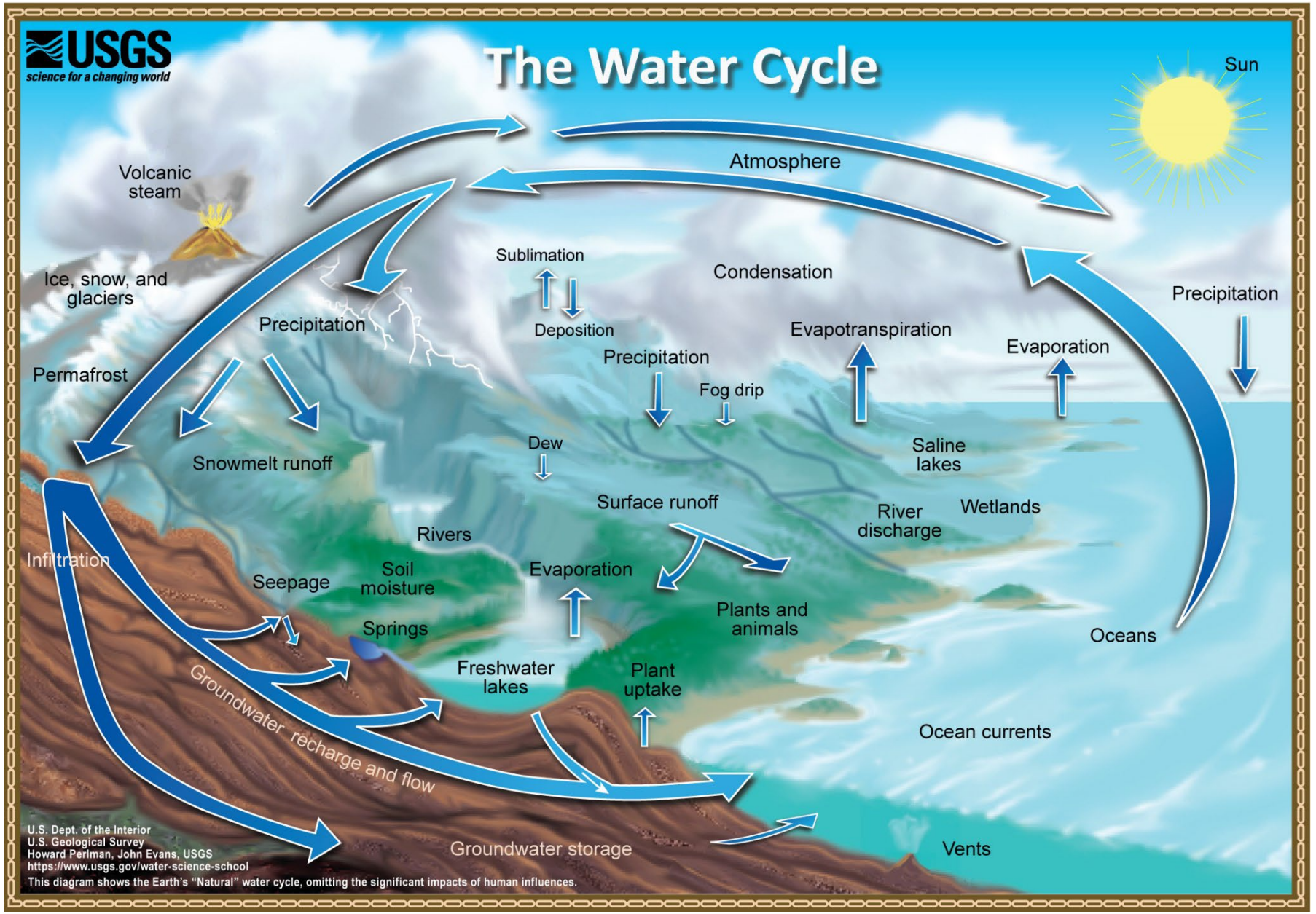
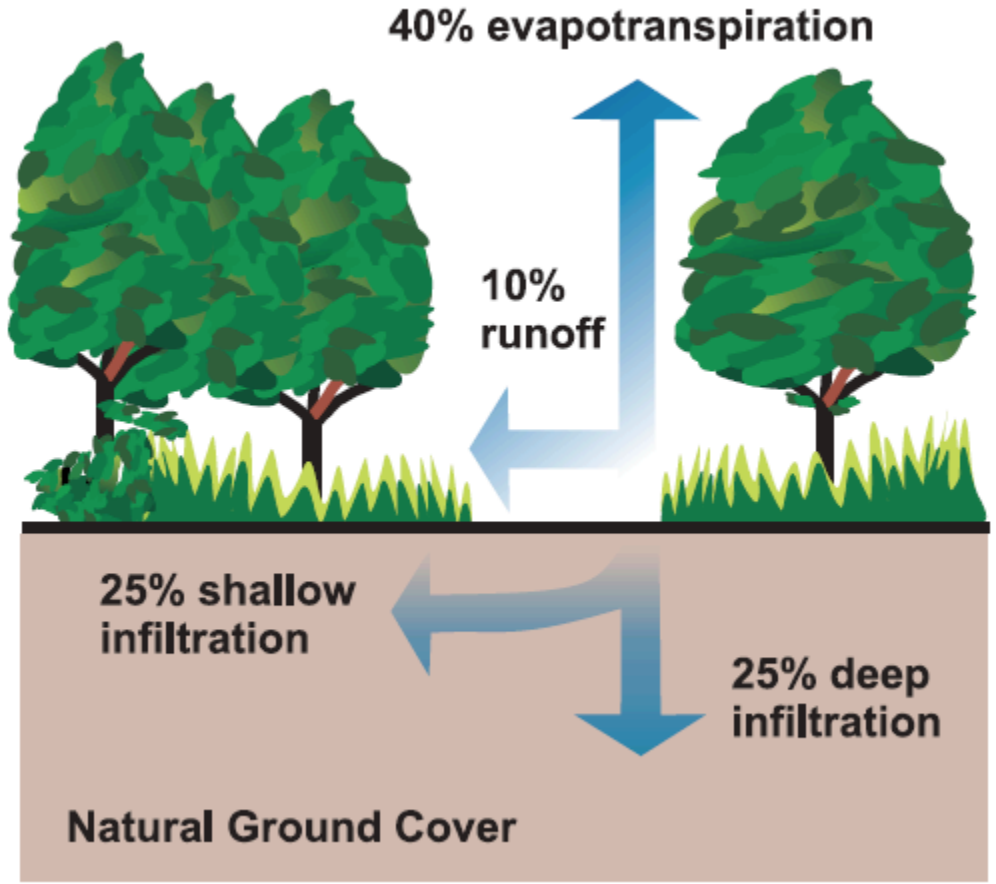
Overview

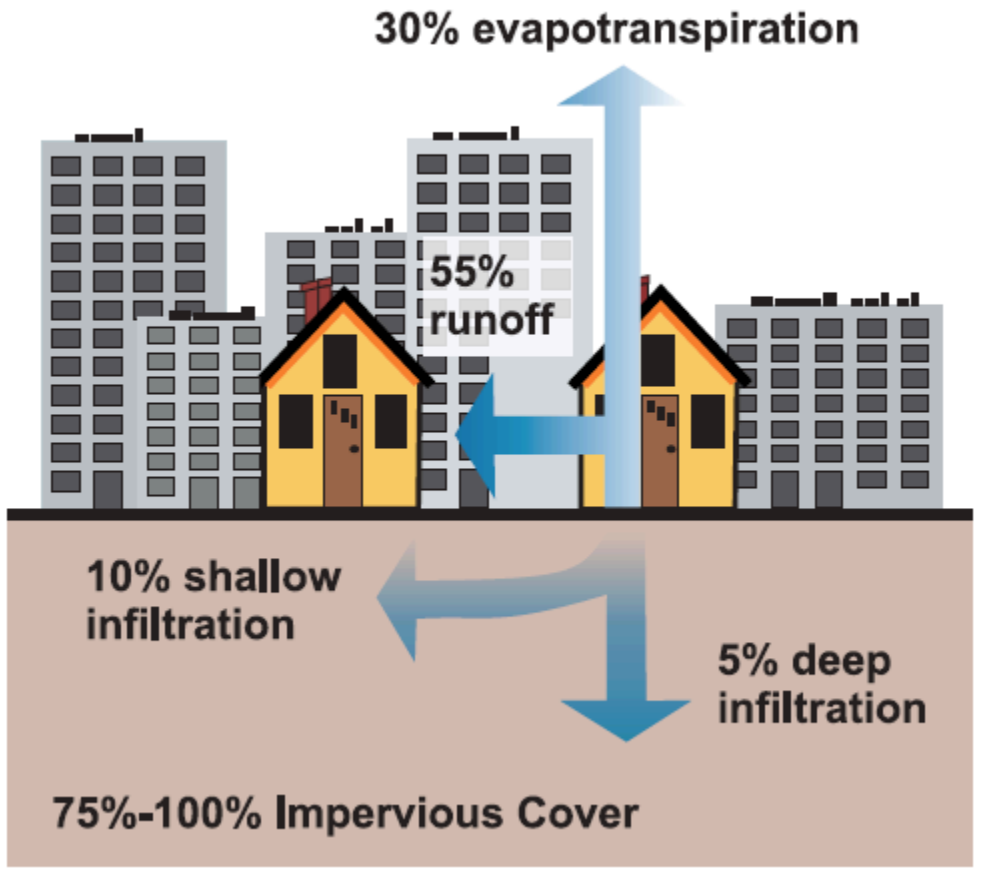


- How Stormwater & Soils Are Related
- Soil Test Pits
- Stormwater Buffers
- Infiltration
- Soil Surveys


USGS
science for a changing world
The Water Cycle
Sun
Atmosphere
Volcanic steam
Ice, snow, and glaciers
Permafrost
Precipitation
Snowmelt runoff
Sublimation
Deposition
Condensation
Precipitation
Fog drip
Dew
Evapotranspiration
Evaporation
Precipitation
Saline lakes
Surface runoff
River discharge
Wetlands
Rivers
Infiltration
Seepage
Soil moisture
Evaporation
Springs
Plants and animals
Oceans
Freshwater lakes
Plant uptake
Groundwater recharge and flow
Ocean currents
Groundwater storage
Vents
U.S. Dept. of the Interior
U.S. Geological Survey
Howard Perlman, John Evans, USGS
https://www.usgs.gov/water-science-school
This diagram shows the Earth's "Natural" water cycle, omitting the significant impacts of human influences.

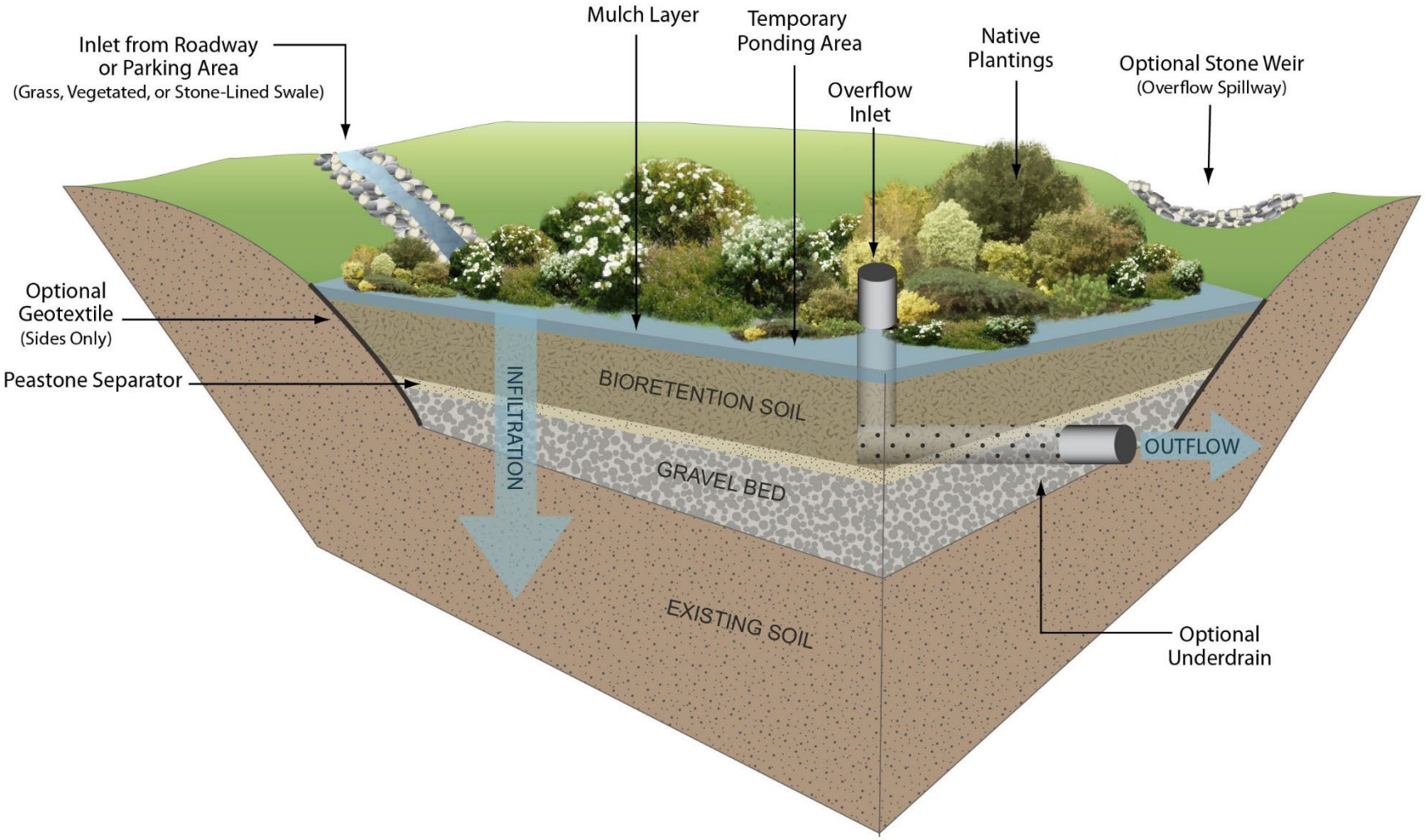
How Land Cover Impacts Stormwater Runoff





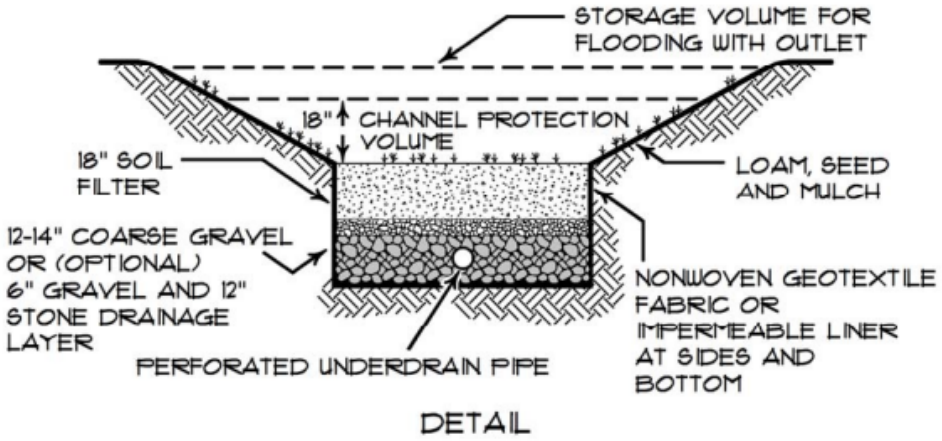
Soils & Stormwater Treatment

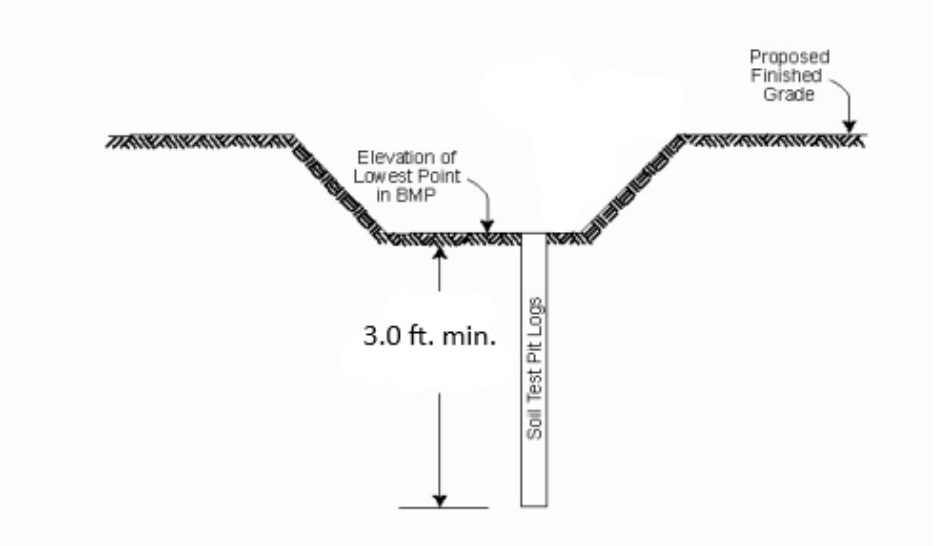
- Groundwater recharge via infiltration
- Pollutant removal via physical filtering, microbial activity, vegetation uptake, etc.
- Reduce peak flow via temporary ponding, forcing slow filtering through media, controlling outlet size



Soil Test Pits

- Detailed log or boring in area of each proposed BMP
- Extend to a depth of at least three feet below the lowest component of proposed structure





Soil Test Pits

Must include:

- Description & overburden stratification
- Composition & Texture
- Other relevant characteristics
- Elevation of seasonal high water table (SHWT)
- Depth to bedrock / presence of ledge

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SOIL PROFILE / CLASSIFICATION INFORMATION | **DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES**

Project [redacted] | Owner Name: | Project Location (municipality): Clifton

Exploration Symbol: 1 ☒ Test Pit ☐ Boring

8 " Organic horizon thickness Ground surface elev. _____

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	loam	very friable	7.5YR 2.5/3	none
12		friable	7.5YR 3/3	
18			7.5YR 4/4	
24			10YR 5/4	
30		Limit of Observation = 22"		
36				
42				
48				

soil data by S.E.: Soil Profile / Classification Condition; Slope Percent; Limiting Factor > 22" Depth; ☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

soil data by S.S.: Soil series/phase name: Peru; ☐ Hydric ☒ Non-hydric; Hydrologic C/D Soil Group

Exploration Symbol: 2 ☒ Test Pit ☐ Boring

2 " Organic horizon thickness Ground surface elev. _____

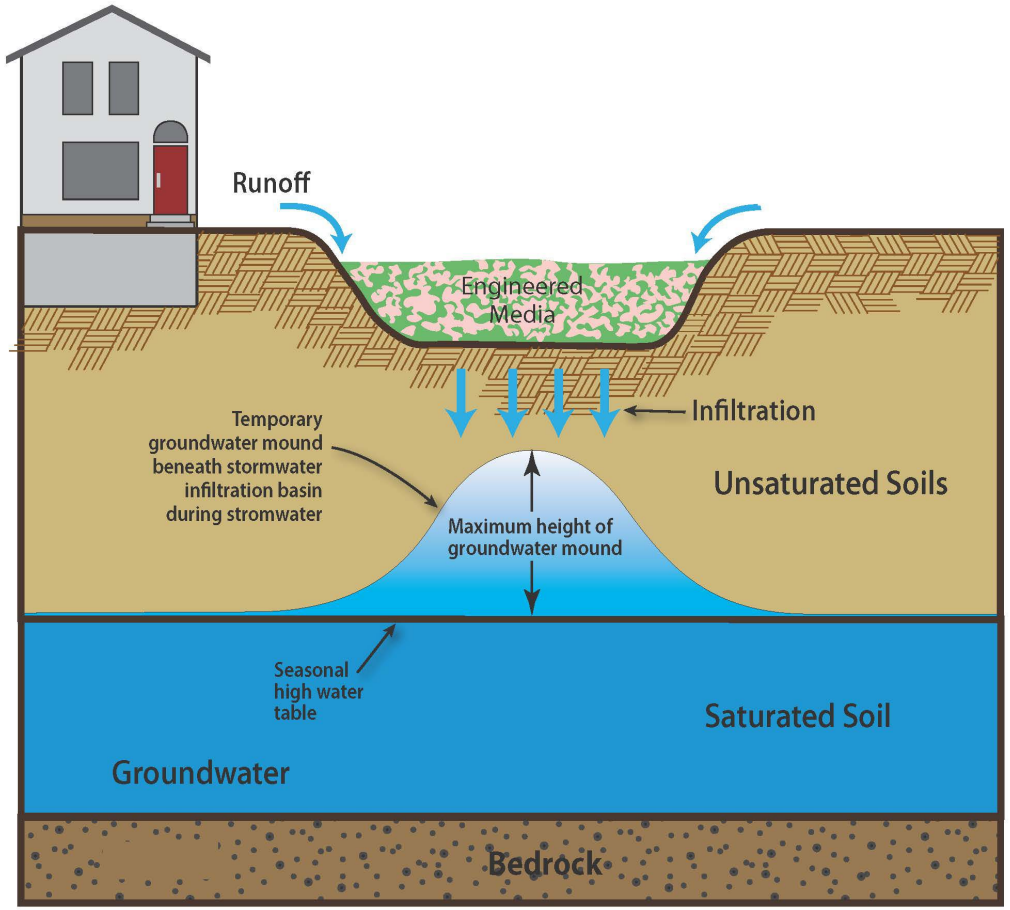
Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0				
6	gravelly silt loam	friable	7.5YR 4/4	none
12			10YR 4/6	
18				
24	cobbly silo	firm	2.5Y 5/6	10YR 4/6
30		Limit = 27"		
36				
42				
48				

soil data by S.E.: Soil Profile / Classification Condition; Slope Percent; Limiting Factor 20" Depth; ☐ Groundwater ☒ Restrictive Layer ☐ Bedrock

soil data by S.S.: Soil series/phase name: Peru; ☐ Hydric ☒ Non-hydric; Hydrologic C/D Soil Group

Why They're Necessary

- Ensure no groundwater intrusion
- Provide room for groundwater mounding
- Check for ledge
- Check for hydric soils
- Verify hydrologic soil group
  - buffer design & infiltration ability



More on Buffers

- Some buffer lengths depend on hydrologic soil group

<u>The ideal buffer:</u>

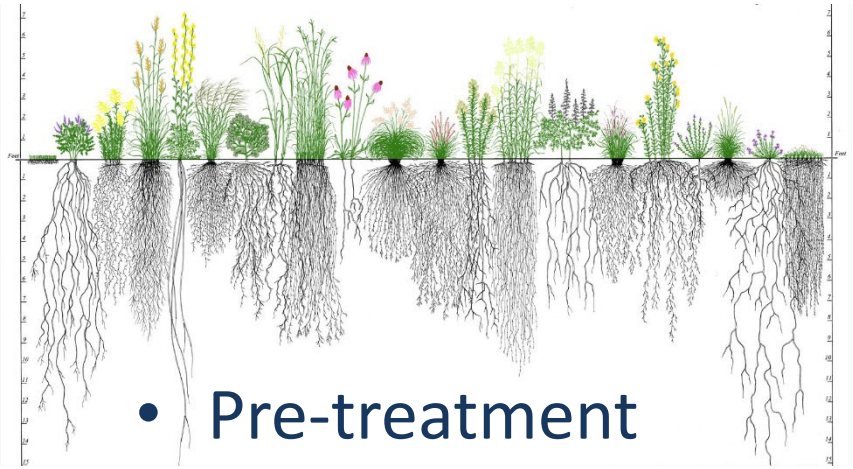
  - Thick, organic duff layer
  - 12” min. to restrictive layer
  - Granular structure / well draining
  - Low bulk density
  - Pit-mound topography

High quality buffers may be allowed a reduced flow path length (case-by-case basis).

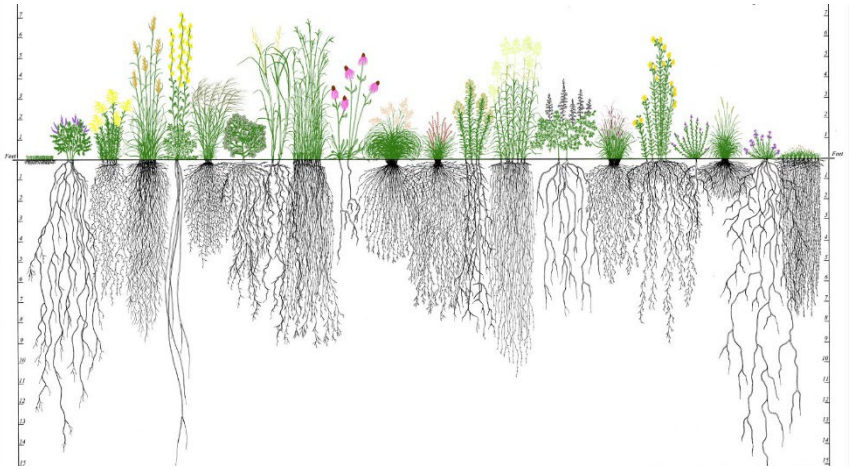
Table 5.7
Buffer Flow Path Length per Length of Road or Ditch (feet)

		0-8% Slope		9-15% Slope	
Hydrologic Soil Group	Length of Road or Ditch (feet)	Forested Buffer	Meadow Buffer	Forested Buffer	Meadow Buffer
A	200	50	70	60	84
	300	50	85	60	102
	400	60	100	72	120
B	200	50	70	60	84
	300	50	85	60	102
	400	60	100	72	120
C Loamy Sand or Sandy Loam	200	60	100	72	120
	300	75	120	90	144
	400	100	N/A	120	N/A
C Silty Loam, Clay Loam or Silty Clay Loam	200	75	120	90	144
	300	100	N/A	120	N/A
D Non-Wetland	200	100	150	120	180

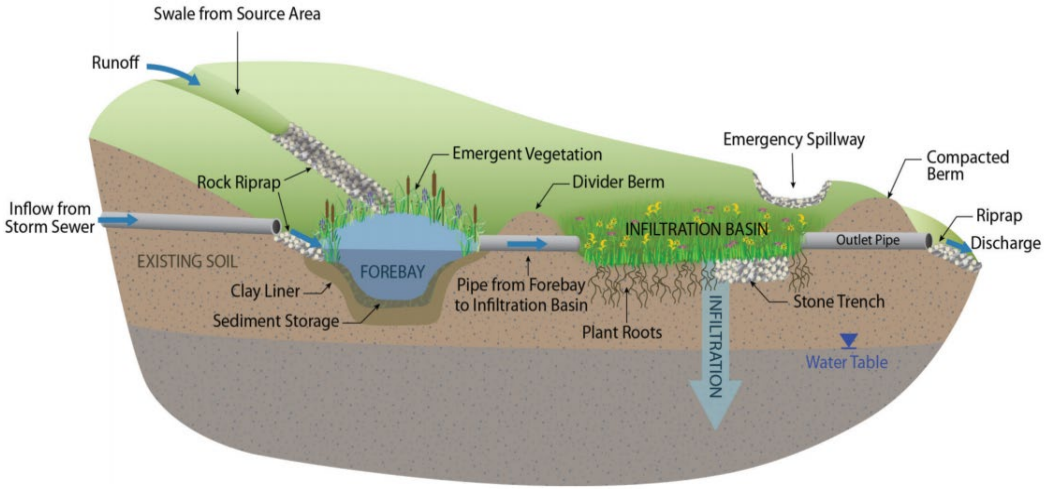
Soil variability across a buffer = take the weighted average



Infiltration

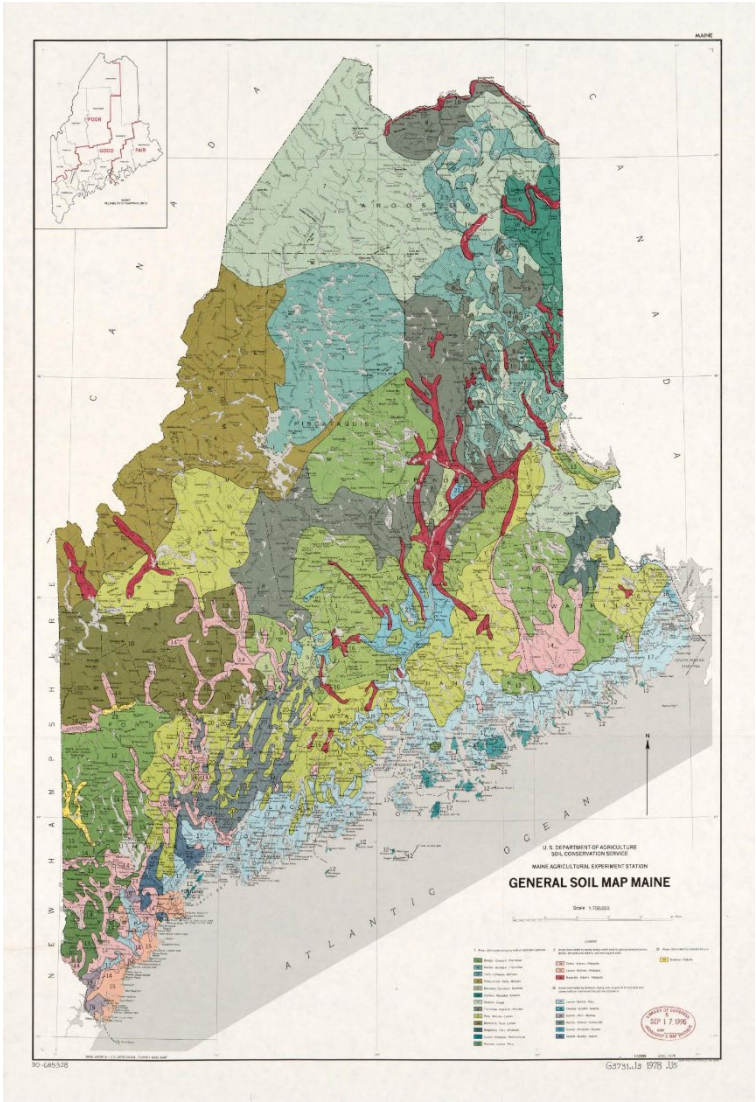


- Pre-treatment
- Setbacks from natural resources, wells, and septic systems
- 3 feet separation from SHWT
- Max permeability of 2.41 in/hr
- Systems serving >1 ac. impervious need more than 5 ft saturated overburden above bedrock surface (measured during seasonal low GW) – see exceptions Pg. 47 Ch. 500 *Appx D 3.(e)*



Soil Surveys

- Hydrologic Soil Group needed for developing runoff models
- Helpful for Low Impact Development
  - Avoiding development of well draining soils
  - Lowers overall runoff totals



Wrapping Up

- Soils play an important role in stormwater treatment and runoff volume control
- Chapter 500 has requirements for test pits at BMP locations
- Buffers and infiltration BMPs may require additional soil information
- Soil surveys can help with modeling and designing low impact development projects

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