Stormwater Infrastructure Maintenance 101

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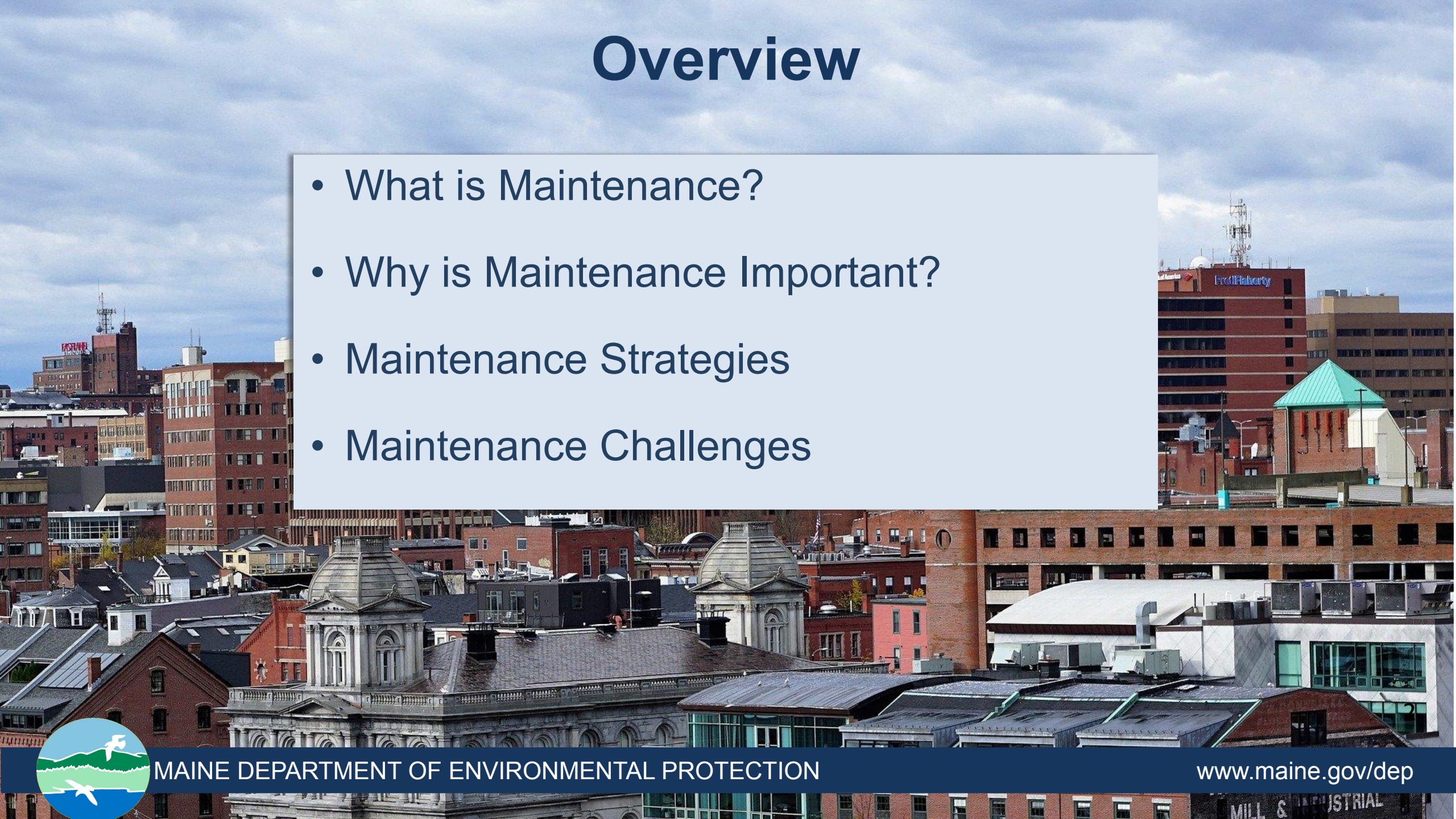
Overview

- What is Maintenance?
- Why is Maintenance Important?
- Maintenance Strategies
- Maintenance Challenges



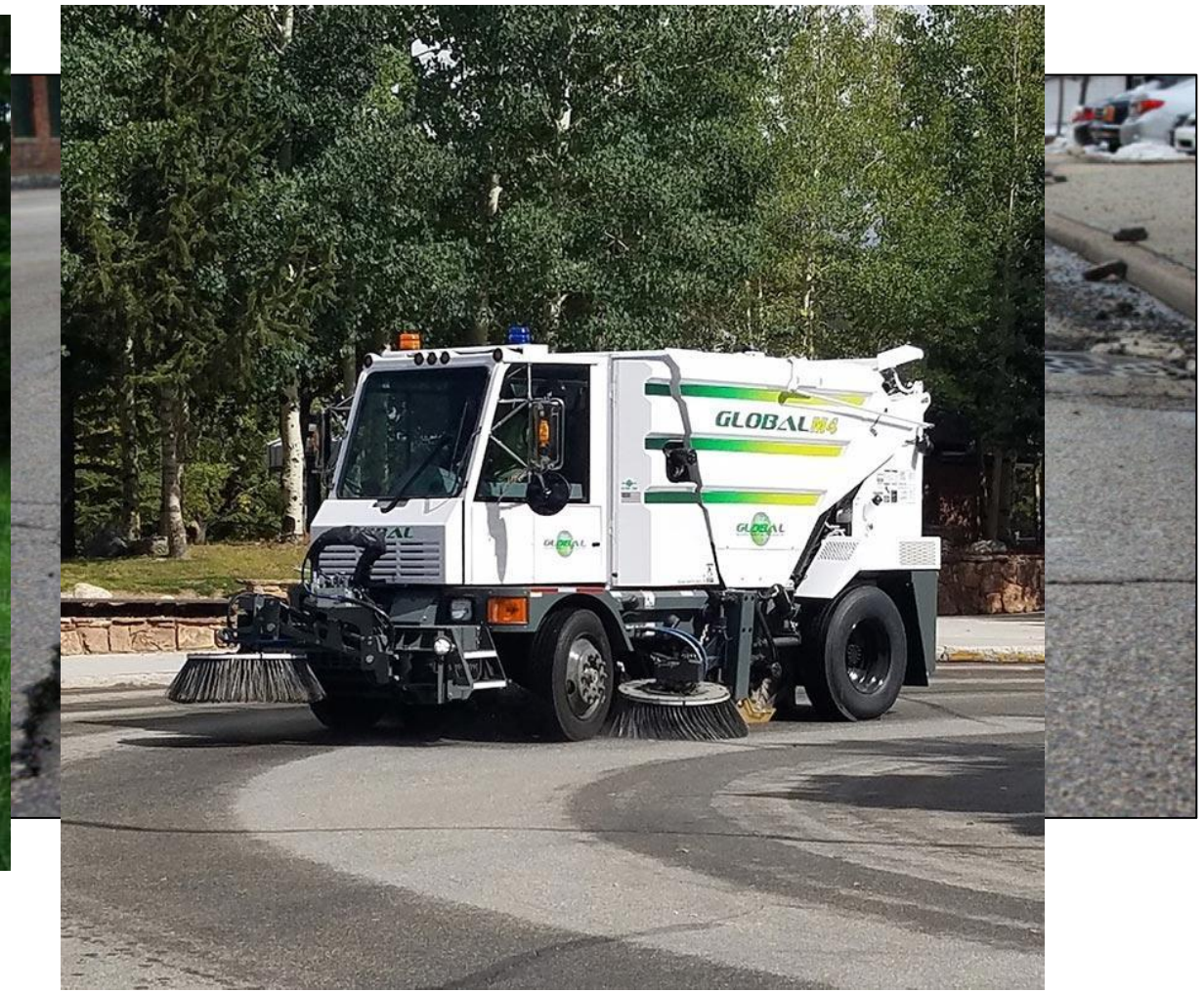
What is Maintenance?

- Regular upkeep and repair of stormwater infrastructure and management practices to ensure they continue to function properly

- Almost all infrastructure requires maintenance

- Two types: preventative and corrective

Familiar Examples of Maintenance



Why is it Important?

- Dysfunctional stormwater infrastructure can lead to flooding
- Nutrients/contaminants may be reintroduced
- Treatment mechanism effectiveness diminishes

Why is it Important? - Flooding

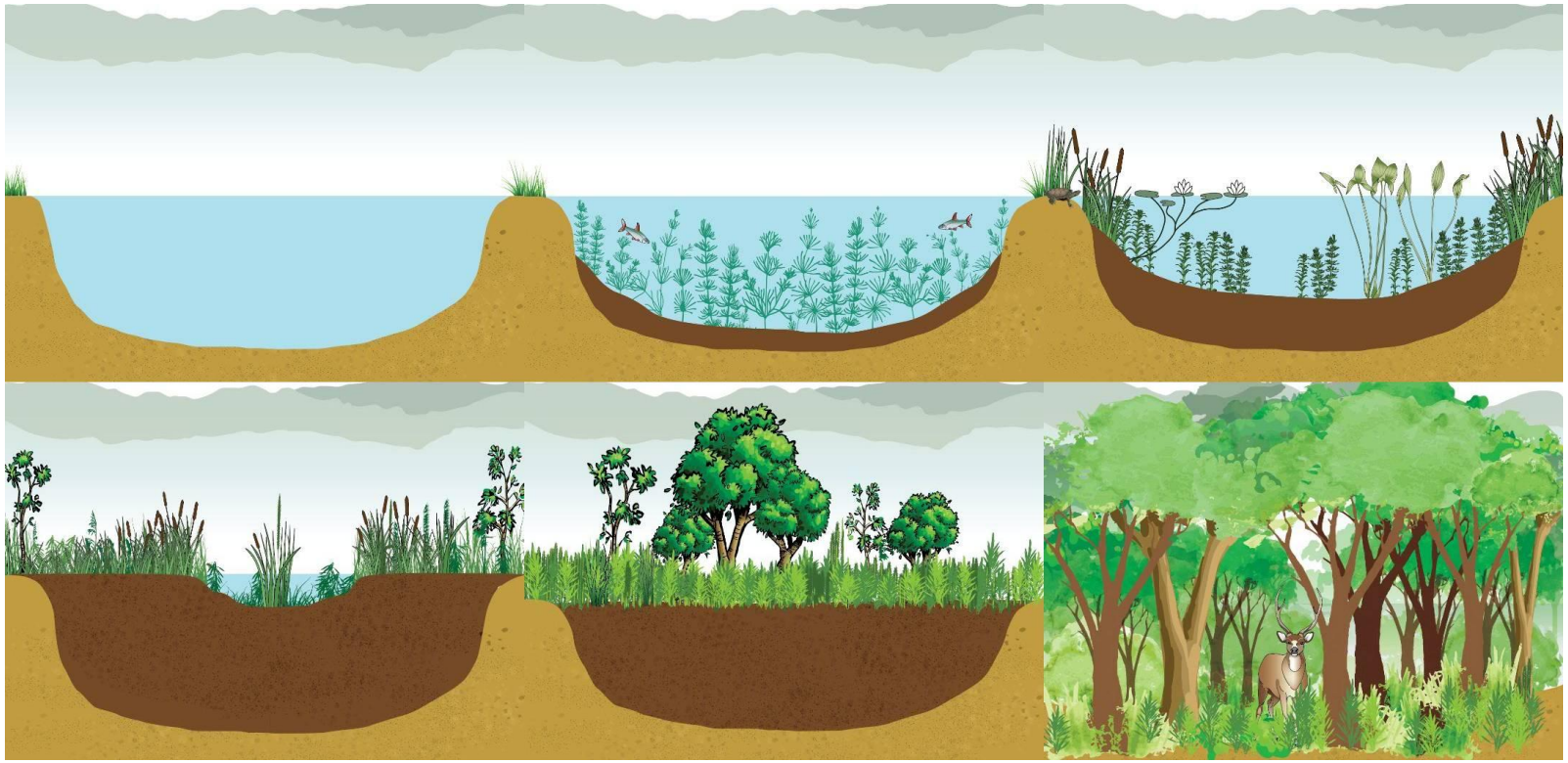
- Maintenance protects public health and safety

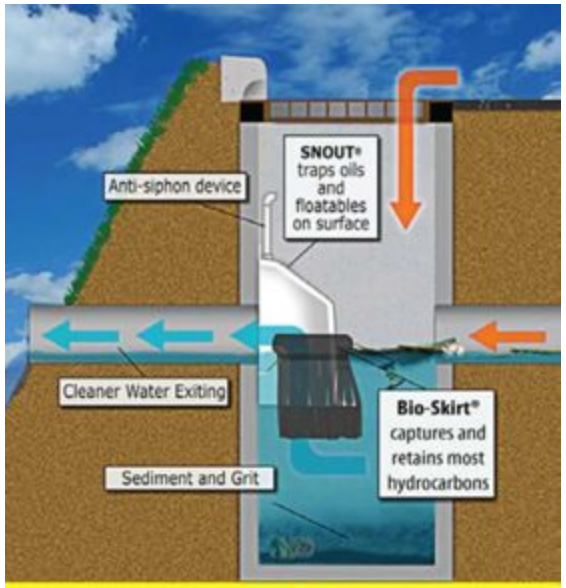
Why is it Important? - Flooding

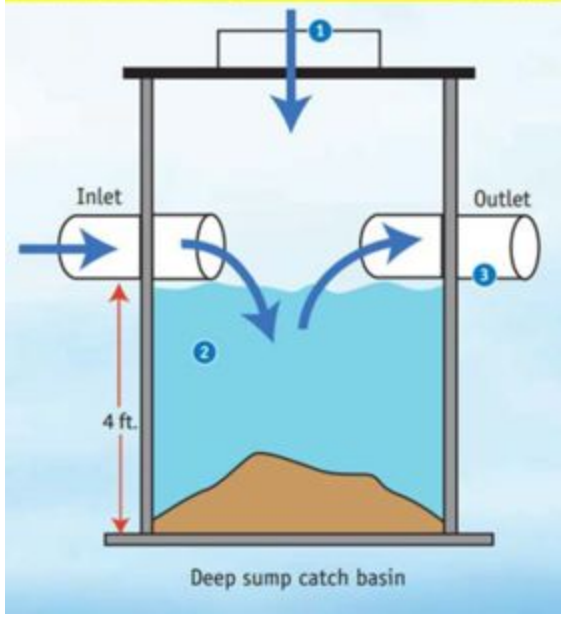
- Excess sediment accumulation can reduce capacity

- Ecological Succession

(natural process)







Why is it Important? – Reintroduction of Pollutants

- Without removal, sediments and carried pollutants stay in place.
- Excess accumulation may force sediments and pollutants into the system.

Why is it Important? – Reducing Effectiveness

- Prevent movement through the system
- Reduce permeability of filter media
- Forcing bypass of treatment

Why is it Important? – Reducing Effectiveness

- Invasives may overtake native vegetation
- Monoculture
- Impacts aesthetic value

Recap: Why is Maintenance Important?

- Dysfunctional stormwater infrastructure can lead to flooding
- Nutrients/contaminants may be reintroduced
- Treatment mechanism effectiveness diminishes

Maintenance Strategies

Maintenance Plan

- I&M Plan - inspection and maintenance plan
- O&M Plan – operations and maintenance plan
- “Maintenance Manual”
- Details frequency and corrective action for each BMP.

INSPECTION AND MAINTENANCE PLAN FOR STORMWATER MANAGEMENT STRUCTURES (BMPS)

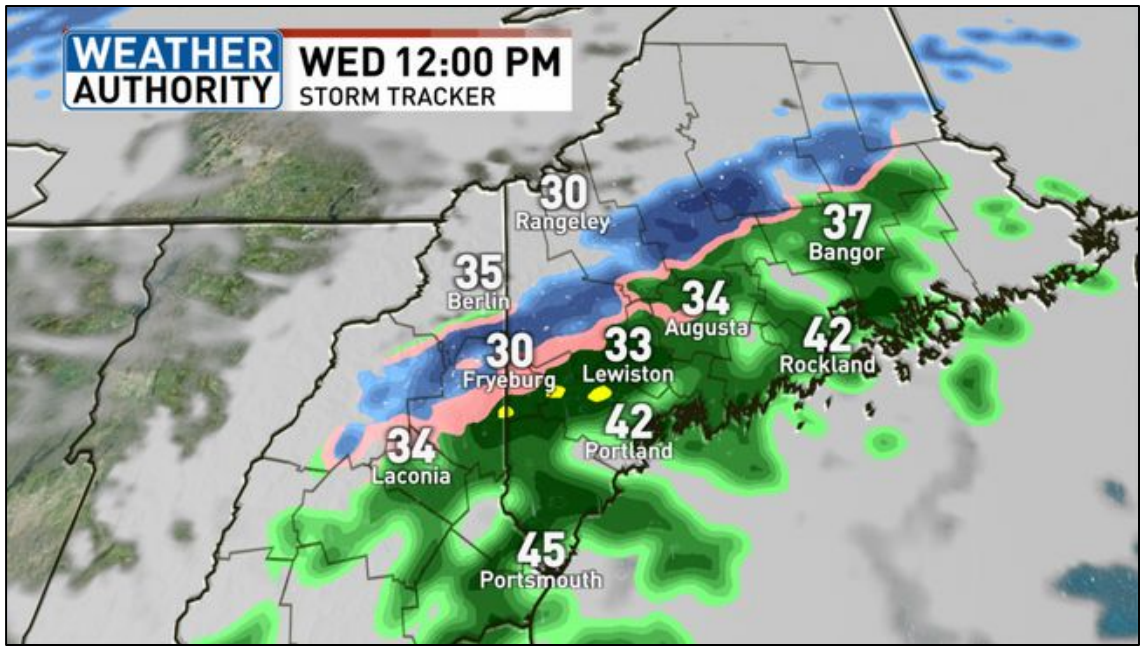
	INSPECTION SCHEDULE	CORRECTIVE ACTIONS
VEGETATED AREAS	Annually early spring and after heavy rains	Inspect all slopes and embankments and replant areas of bare soil or with sparse growth
		Armor rill erosion areas with riprap or divert the runoff to a stable area
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Mow vegetation as specified for the area
DITCHES, SWALES AND OPEN STORMWATER CHANNELS	Annually spring and late fall and after heavy rains	Remove obstructions, sediments or debris from ditches, swales and other open channels
		Repair any erosion of the ditch lining
		Mow vegetated ditches
		Remove woody vegetation growing through riprap
		Repair any slumping side slopes
		Repair riprap where underlying filter fabric or gravel is showing or if stones have dislodge
CULVERTS	Spring and late fall and after heavy rains	Remove accumulated sediments and debris at the inlet, outlet, or within the conduit
		Remove any obstruction to flow
		Repair any erosion damage at the culverts inlet and outlet
CATCH BASINS	Annually in the spring	Remove sediments and debris from the bottom of the basin and inlet grates
		Remove floating debris and oils (using oil absorptive pads) from any trap
ROADWAYS AND PARKING AREAS	Annually in the spring or as needed	Clear and remove accumulated winter sand in parking lots and along roadways
		Sweep pavement to remove sediment
		Grade road shoulders and remove accumulated winter sand
		Grade gravel roads and grave shoulders
		Clean out the sediment within water bars or open-top culverts
		Ensure that stormwater runoff is not impeded by false ditches of sediment in the shoulder
RESOURCE AND TREATMENT BUFFERS	Annually in the spring	Inspect buffers for evidence of erosion, concentrated flow, or encroachment by development
		Manage the buffer's vegetation with the requirements in any deed restrictions
		Repair any sign of erosion within a buffer
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Install more level spreaders, or ditch turn-outs if needed for a better distribution of flow
		Clean out any accumulation of sediment within the spreader bays or turnout pools
		Mow non-wooded buffers no shorter than six inches and less than three times per year
WETPONDS AND DETENTION BASINS	Annually in fall and after heavy rains	Inspect the embankments for settlement, slope erosion, piping, and slumping
		Mow the embankment to control woody vegetation
		Inspect the outlet structure for broken seals, obstructed orifices, and plugged trash racks
		Remove and dispose of sediments and debris within the control structure
		Repair any damage to trash racks or debris guards
		Replace any dislodged stone in riprap spillways
		Remove and dispose of accumulated sediments within the impoundment and forebay
FILTRATION AND INFILTRATION BASINS	Annually in the spring and late fall	Clean the basin of debris, sediment and hydrocarbons
		Provide for the removal and disposal of accumulated sediments within the basin
		Renew the basin media if it fails to drain within 72 hours after a one inch rainfall event
		Till, seed and mulch the basin if vegetation is sparse
		Repair riprap where underlying filter fabric or gravel is showing or where stones have dislodged
PROPRIETARY DEVICES	As specified by manufacturer	Contract with a third-party for inspection and maintenance
		Follow the manufacturer's plan for cleaning of devices
OTHER PRACTICES	As specified for devices	Contact the department for appropriate inspection and maintenance requirements for other drainage control and runoff treatment measures.

Inspections

- Early identification of problems
- Create opportunities for preventative maintenance rather than corrective maintenance
- Ensure proper function

Inspection Schedule

- Annually, semi-annually, quarterly, seasonally
- After significant rainfall
- 5-year recertification (Maine)



LONG-TERM MAINTENANCE (please comment on the following):
All areas of the development have been inspected for erosion, and appropriate steps have been taken to permanently stabilize these areas.
All stormwater control structures have been inspected for damage, wear, malfunction, and appropriate steps have been taken to repair or replace the failing systems.
The erosion control and stormwater maintenance plan for the site is being implemented as written, and a maintenance log has been created and is being maintained.

https://www.maine.gov/dep/land/stormwater/stormwaterbmps/five-year-recertification.html

Maintenance Strategies

Maintenance Strategies – Vegetated Areas

INSPECTION AND MAINTENANCE PLAN FOR STORMWATER MANAGEMENT STRUCTURES (BMPS)		
	INSPECTION SCHEDULE	**CORRECTIVE ACTIONS**
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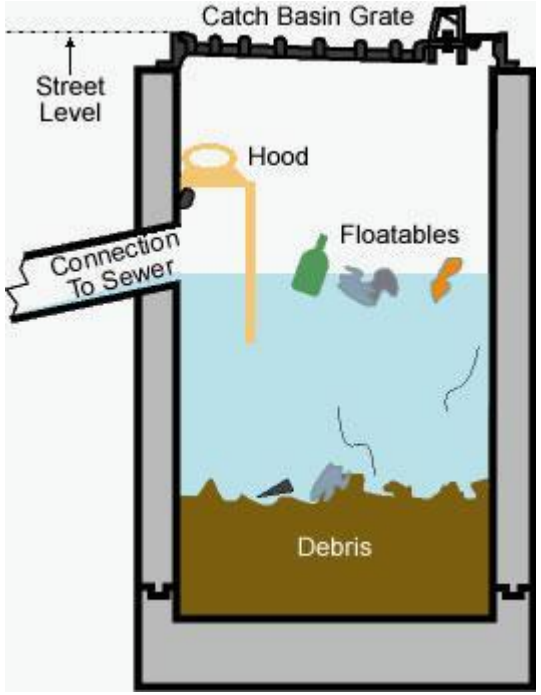
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Mow vegetation as specified for the area

Maintenance Strategies – Ditches/Swales/Channels

DITCHES, SWALES AND OPEN STORMWATER CHANNELS	Annually spring and late fall and after heavy rains	Remove obstructions, sediments or debris from ditches, swales and other open channels
		Repair any erosion of the ditch lining
		Mow vegetated ditches
		Remove woody vegetation growing through riprap
		Repair any slumping side slopes
		Repair riprap where underlying filter fabric or gravel is showing or if stones have dislodge

Maintenance Strategies – Culverts & Catch Basins



CULVERTS	Spring and late fall and after heavy rains	Remove accumulated sediments and debris at the inlet, outlet, or within the conduit
		Remove any obstruction to flow
		Repair any erosion damage at the culvert's inlet and outlet
CATCH BASINS	Annually in the spring	Remove sediments and debris from the bottom of the basin and inlet grates
		Remove floating debris and oils (using oil absorptive pads) from any trap

Maintenance Strategies – Roadways & Parking

ROADWAYS AND PARKING AREAS	Annually in the spring or as needed	Clear and remove accumulated winter sand in parking lots and along roadways
		Sweep pavement to remove sediment
		Grade road shoulders and remove accumulated winter sand
		Grade gravel roads and gravel shoulders
		Clean out the sediment within water bars or open-top culverts
		Ensure that stormwater runoff is not impeded by false ditches of sediment in the shoulder

Maintenance Strategies – Buffers

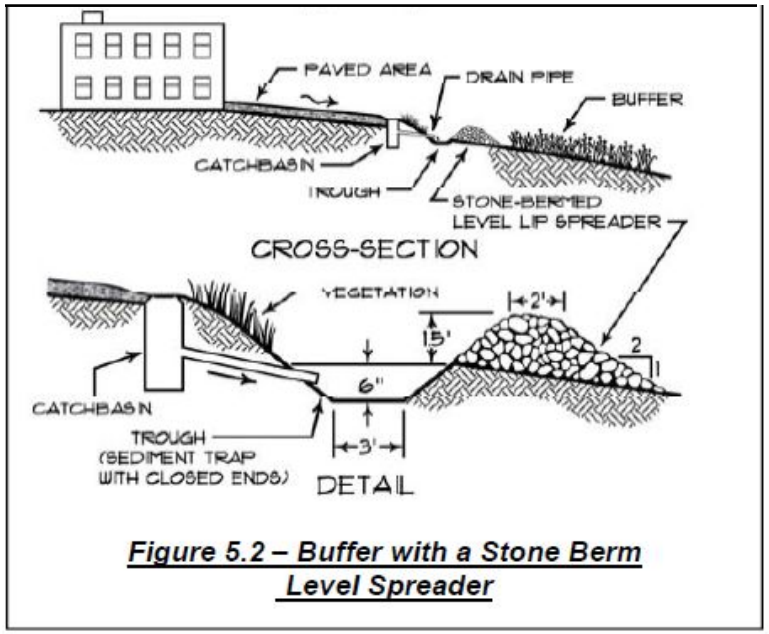
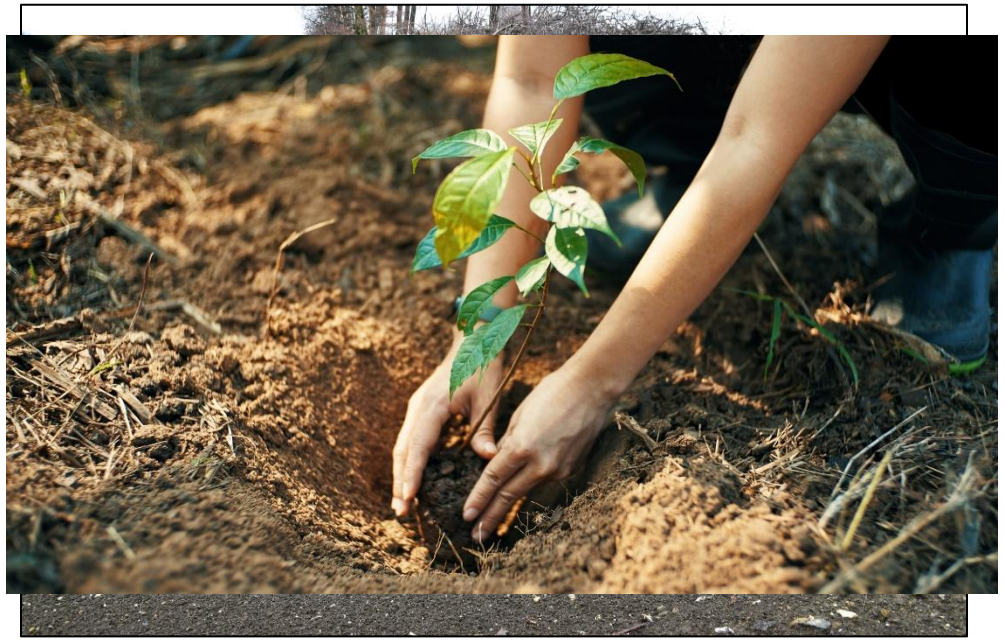


Figure 5.2 – Buffer with a Stone Berm Level Spreader

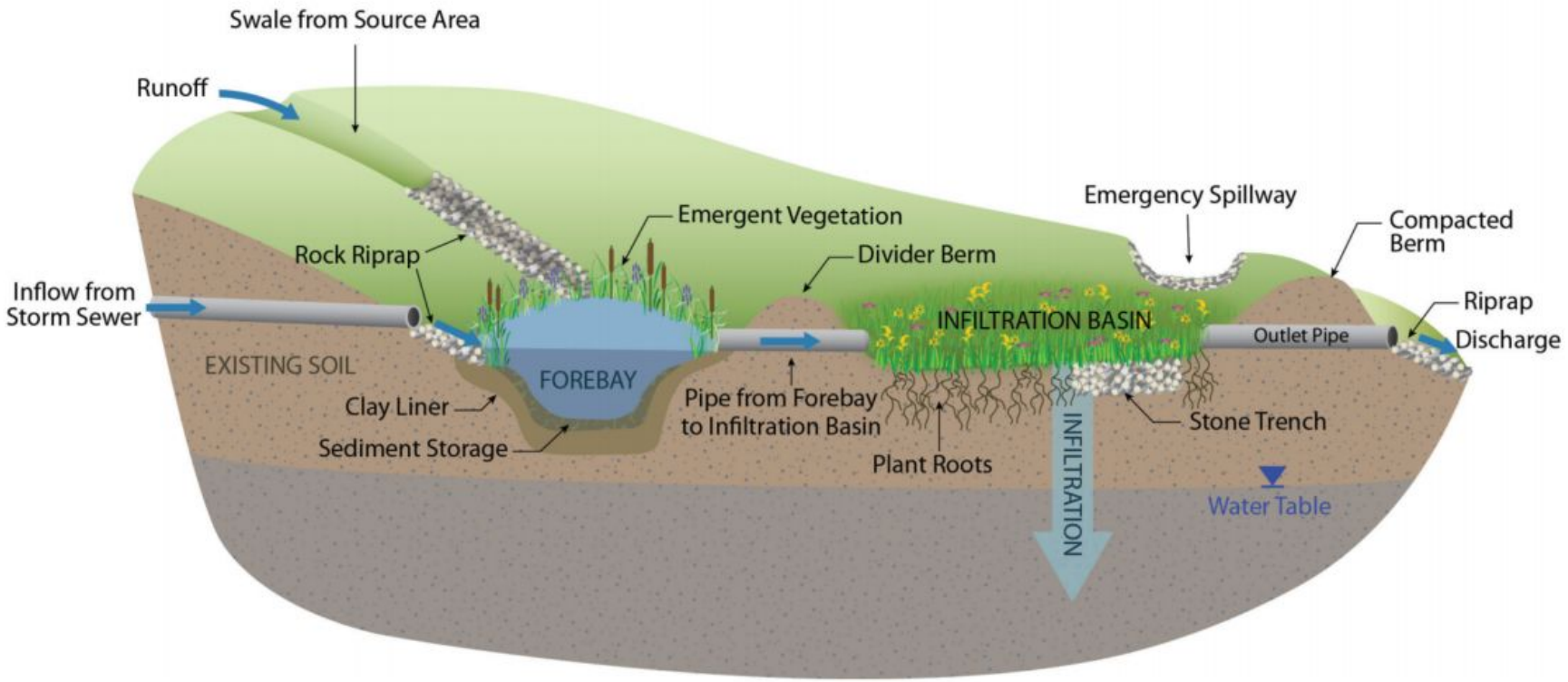


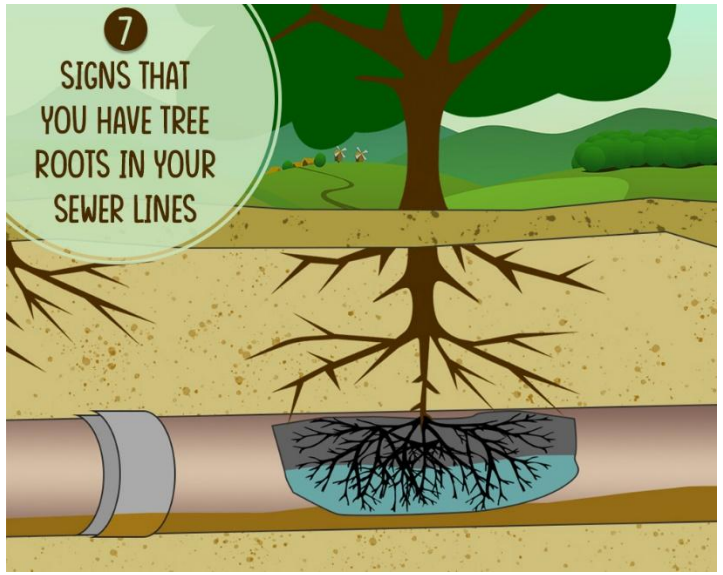
RESOURCE AND TREATMENT BUFFERS	Annually in the spring	Inspect buffers for evidence of erosion, concentrated flow, or encroachment by development
		Manage the buffer's vegetation with the requirements in any deed restrictions
		Repair any sign of erosion within a buffer
		Inspect and repair down-slope of all spreaders and turn-outs for erosion
		Install more level spreaders, or ditch turn-outs if needed for a better distribution of flow
		Clean out any accumulation of sediment within the spreader bays or turnout pools
		Mow non-wooded buffers no shorter than six inches and less than three times per year

Maintenance Strategies – Ponds & Basins

WETPONDS AND DETENTION BASINS	Annually in fall and after heavy rains	Inspect the embankments for settlement, slope erosion, piping, and slumping
		Mow the embankment to control woody vegetation
		Inspect the outlet structure for broken seals, obstructed orifices, and plugged trash racks
		Remove and dispose of sediments and debris within the control structure
		Repair any damage to trash racks or debris guards
		Replace any dislodged stone in riprap spillways
		Remove and dispose of accumulated sediments within the impoundment and forebay

Maintenance Strategies – Filters / Infiltration





FILTRATION AND INFILTRATION BASINS	Annually in the spring and late fall	Clean the basin of debris, sediment and hydrocarbons
		Provide for the removal and disposal of accumulated sediments within the basin
		Renew the basin media if it fails to drain within 72 hours after a one inch rainfall event
		Till, seed and mulch the basin if vegetation is sparse
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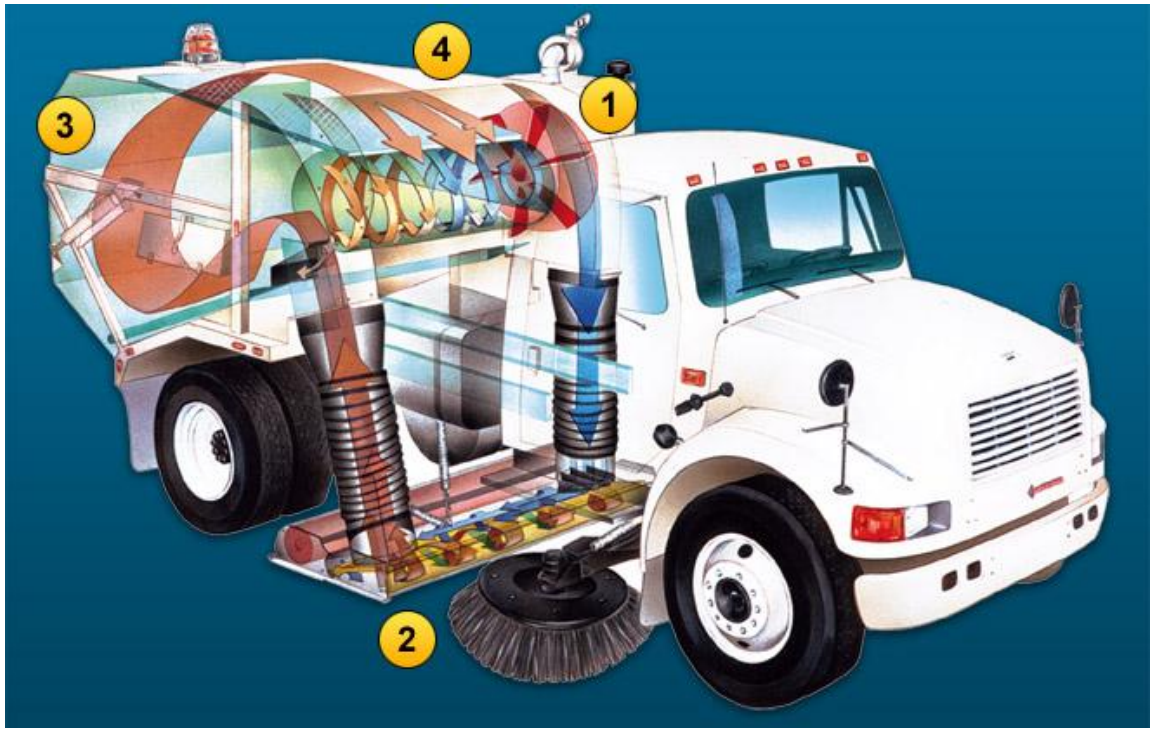
Maintenance Strategies – Porous Pavement



- Routine washing, vacuuming, and/or sweeping of the surface to remove sediment accumulation in voids

Maintenance Strategies – Proprietary Devices

- Some devices require media replacement or filter replacement
- Some require vacuuming of sediments
- Check the provided I&M manual
- Maine requires a maintenance contract

Maintenance Challenges

- Inadequate understanding of what facilities exist
- No designated responsible party
- Transfer of ownership
- Lack of planning & funding
- Difficulty in accessing/cleaning certain BMPs

Maintenance Challenges

https://www.360training.com/osha-campus/osha-training/confined-space-entry-training

Wrapping Up

- Effective maintenance of stormwater infrastructure is critical to the continued protection of our communities and environment from the negative impacts of stormwater runoff
- Implementing effective maintenance can save money, increase infrastructure longevity, and ensure treatment continues to be provided

Moving Forward

The Future of Stormwater Management in Maine

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www.maine.gov/dep