Welcome!

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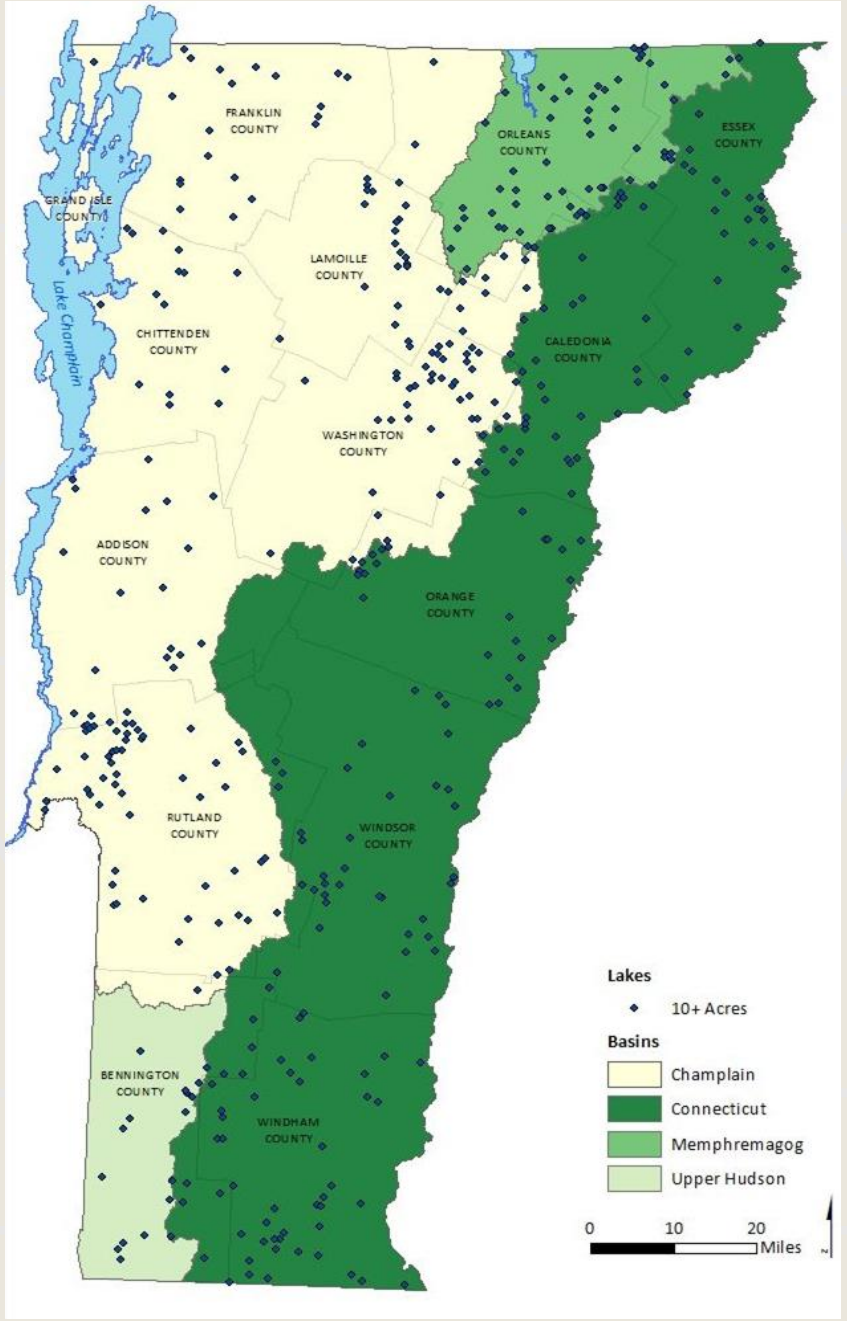
Natural Shoreland Erosion Control Certification 2025

What's the problem?

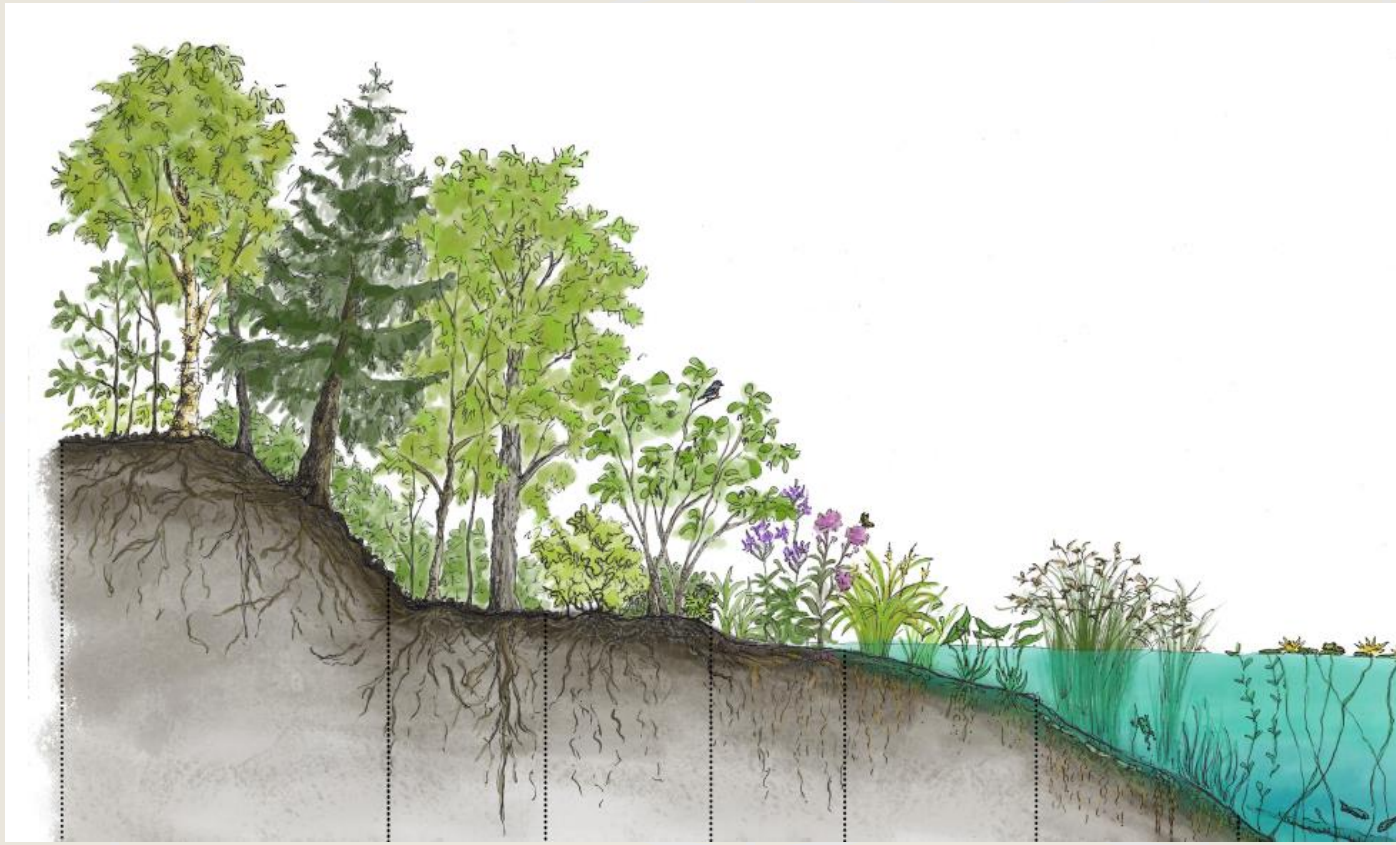
- 800 Lakes and Ponds in VT
- 220 over 20 acres
- Everything we do in these watersheds affects water quality
- What we do on the direct shoreland makes a big difference



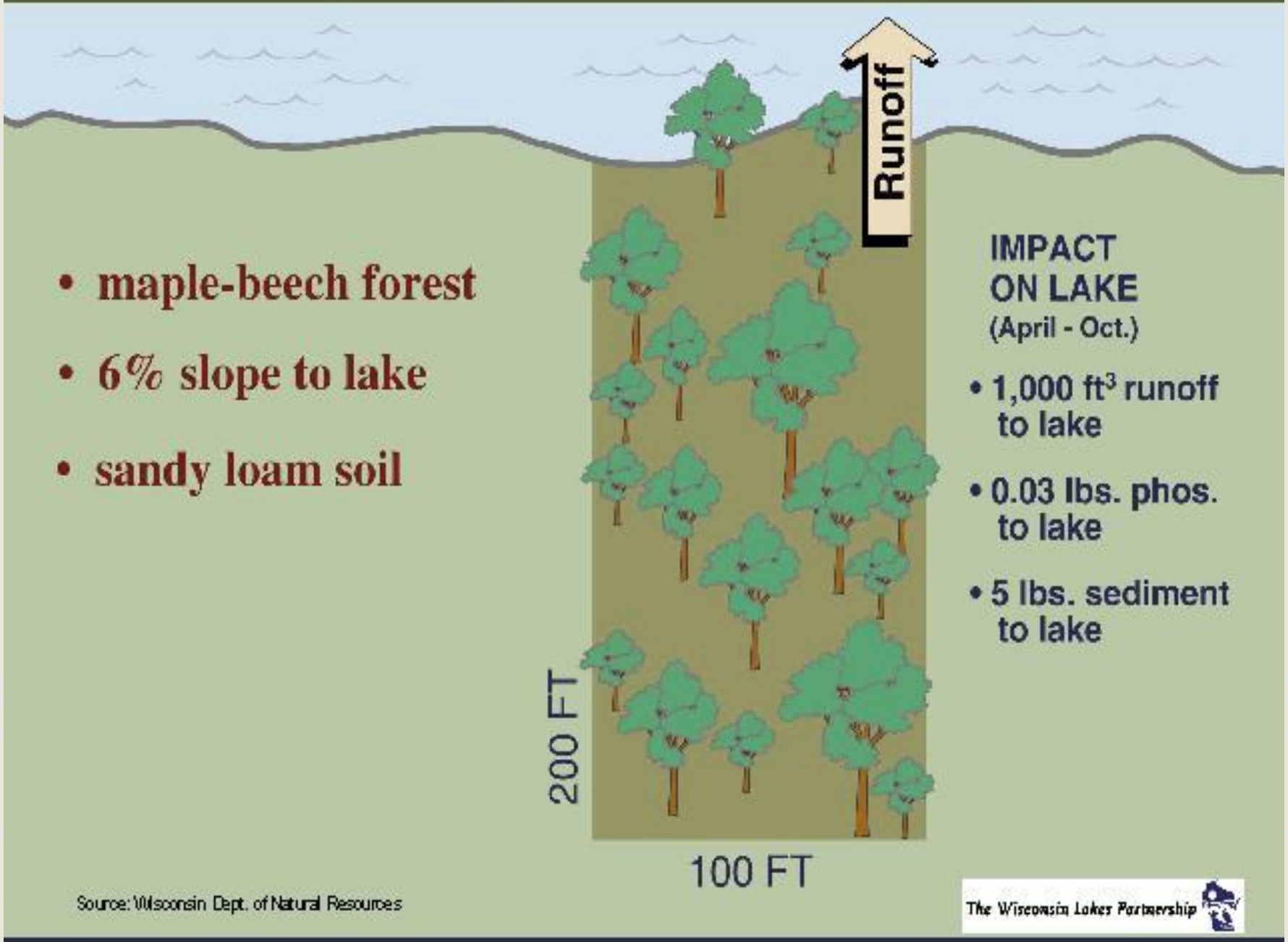
Vermont's lakeshores are threatened by developmental density and poor stormwater practices.

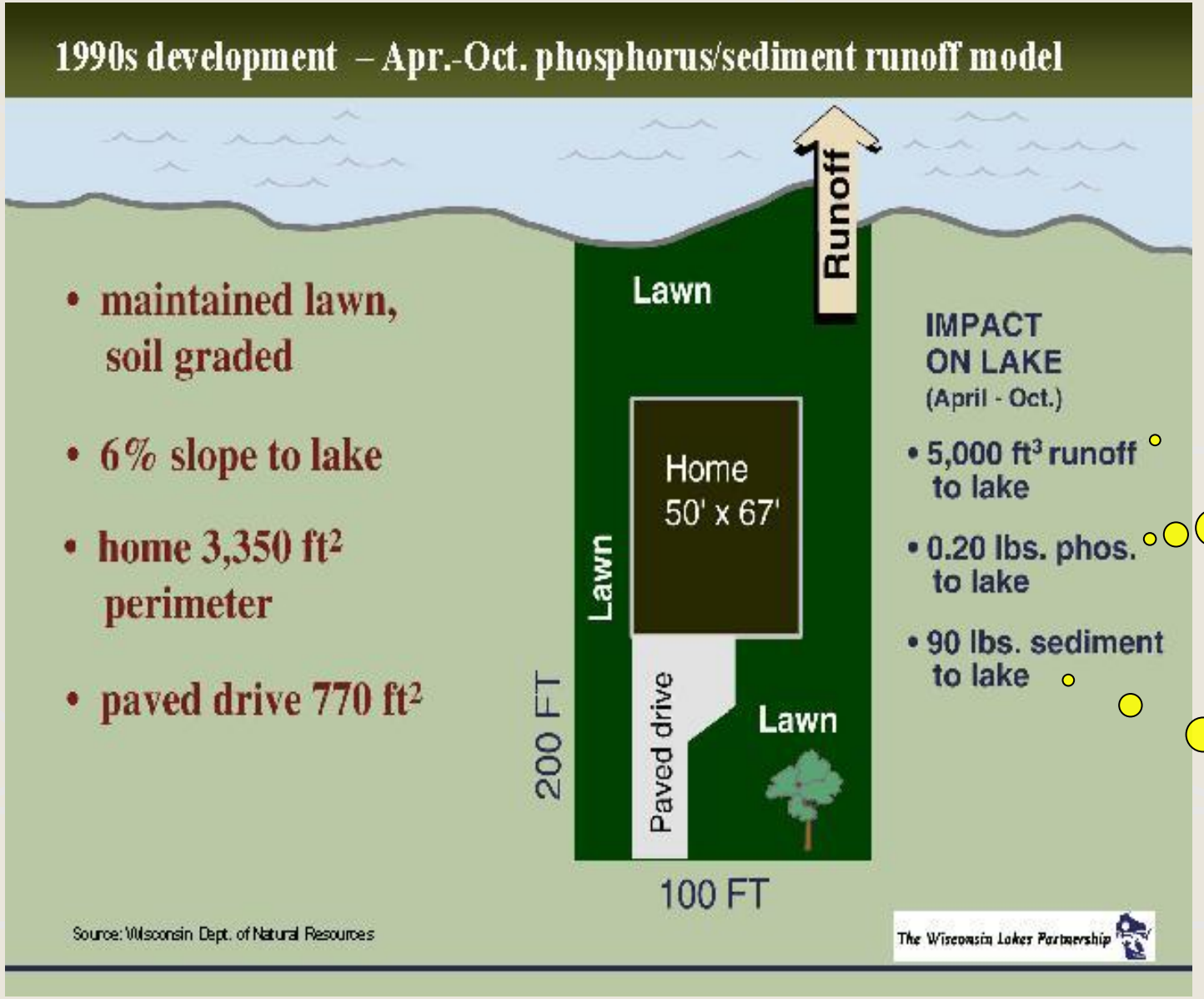
Living shorelines have many benefits

- Wildlife Habitat
- Stable Banks protect property
- Water Quality



Undeveloped – Apr.-Oct. phosphorus/sediment runoff model





5 Xs the runoff

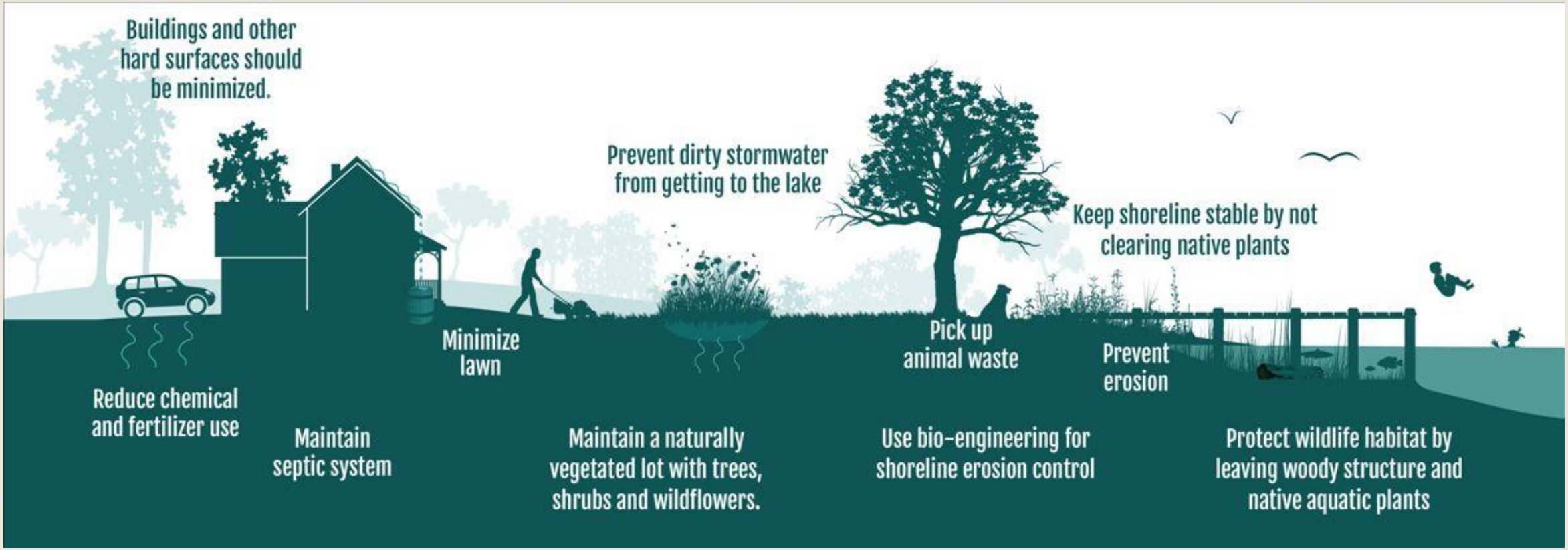
7 Xs the phosphorus

18 Xs the sediment

Why use Best Management Practices in shoreland areas?

1. Provide bank stability
2. Protect water quality
3. Provide wildlife habitat
4. Restore and protect living shorelands

What Are Lake-Friendly Practices?

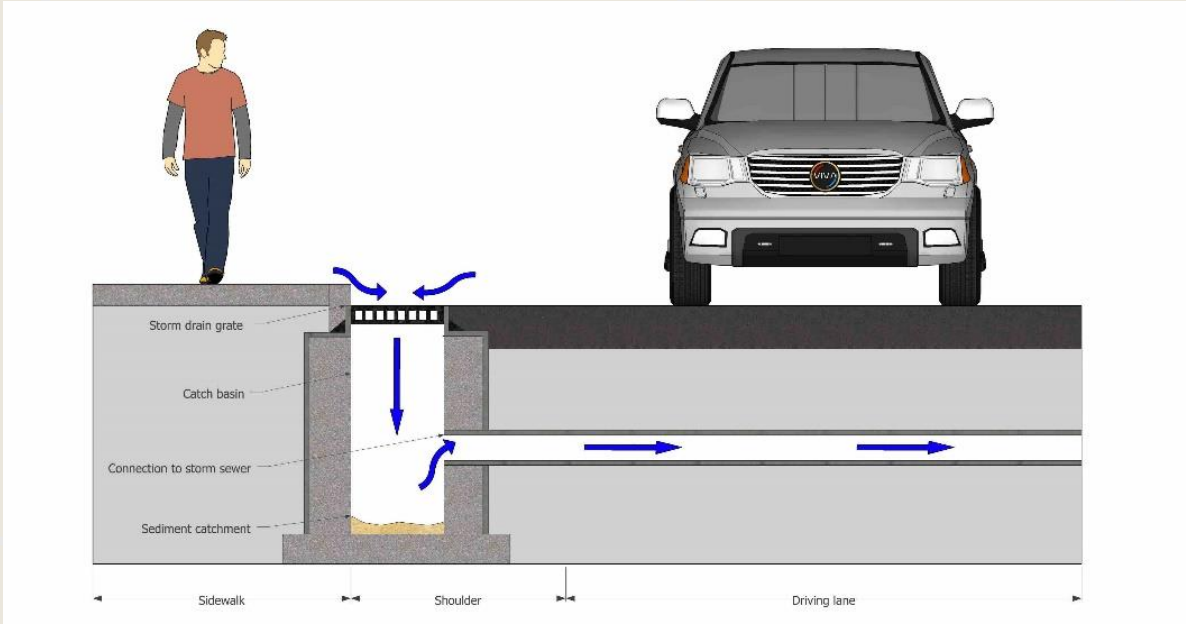


Conventional or “Grey” Stormwater Infrastructure

Convey Stormwater Away Without Treatment

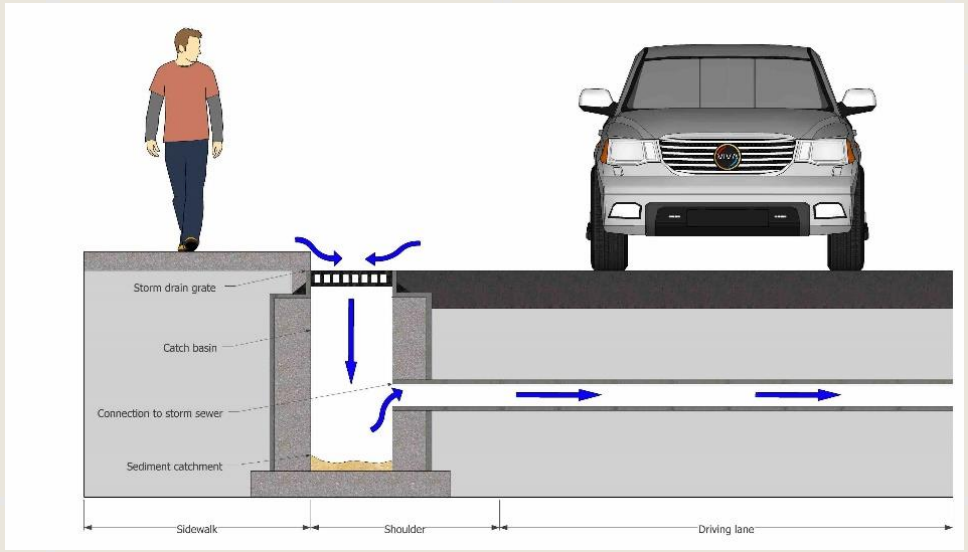
(Farrelly & Brown, 2011; Rowe et al., 2016)

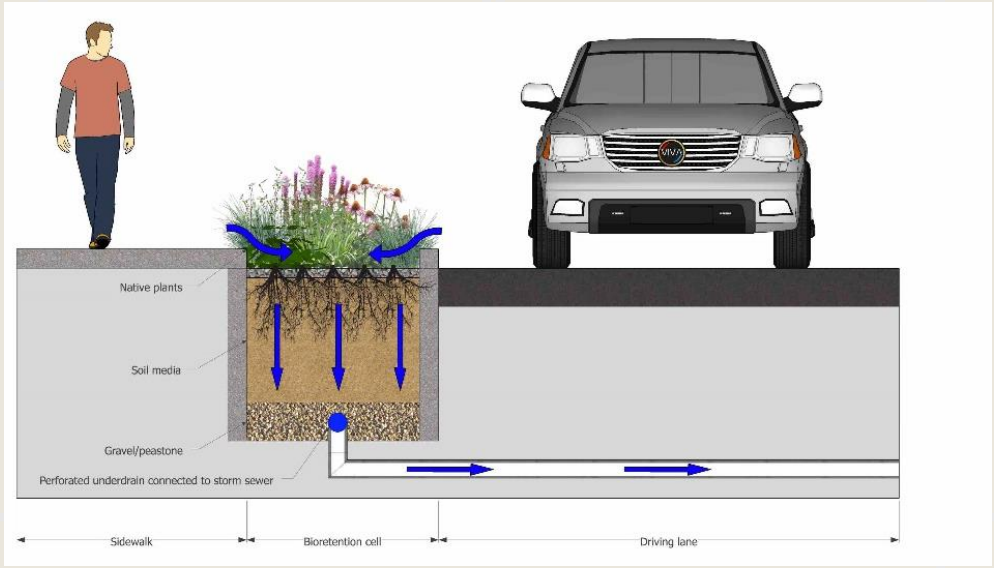
- Drains, Catch Basins, Pipes, Storm Sewers
- Ditches, Culverts



Green Stormwater Infrastructure

Ecosystem Services:
Flood Control, Water Purification, Carbon Storage, Temperature Control, Clean Air, Habitat



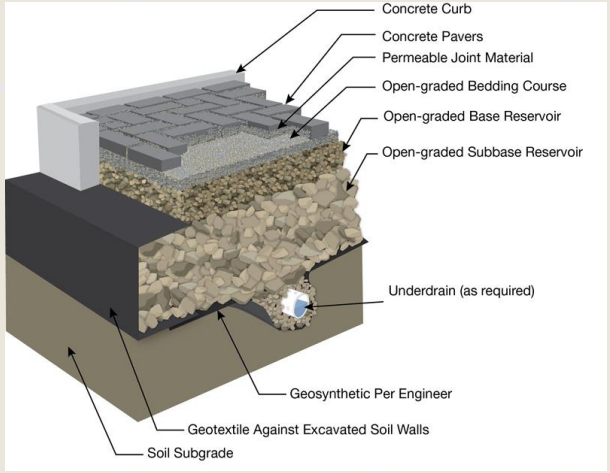


Green Stormwater Infrastructure

Ecosystem Services:
Flood Control, Water Purification, Carbon Storage, Temperature Control, Clean Air, Habitat

Stormwater Tree Pits

Green Roofs



Pervious Pavers & Pavement

Green Stormwater Infrastructure

Low Impact Solutions

What is Lake Wise?

- Free stormwater management and erosion assessment that offers technical assistance and can pair landowners with funding resources.

- **Goal:** Establish a culture of lakeshore living that is proven to protect the lake through stormwater management best practices.

- Lake Wise aims to inform, teach, and encourage change in current lakeshore development practices to ones that are more lake friendly.

- Lake Wise is an initiative of the Agency of Natural Resources that awards shoreline properties that have these lake friendly practices.

- Properties eligible for participation in the program include state parks, town beaches, private homes, and businesses.

Shoreland BMP's

- Two main types:
- Vegetative:
  - Infiltrate
  - Filter
  - Benefit wildlife
- Structural:
  - Infiltrate
  - Filter

Driveways & Private Roads

- Standards:
  - Defined and minimized driveway
  - Reduce unnecessary compaction
  - No erosion
  - Runoff channeled away from the lake
- BMPs:
  - Crowned driveways, good gravel, and rock or grass lined drainage ditches
  - Open-top culverts and rock aprons
  - Infiltration trenches
  - Vegetated swales
  - Turn-outs
  - Water bars
  - Pervious pavement

Open-Top Culverts

Infiltration Areas
Defined Parking Areas

Properly Size and Maintain Culverts

Structures

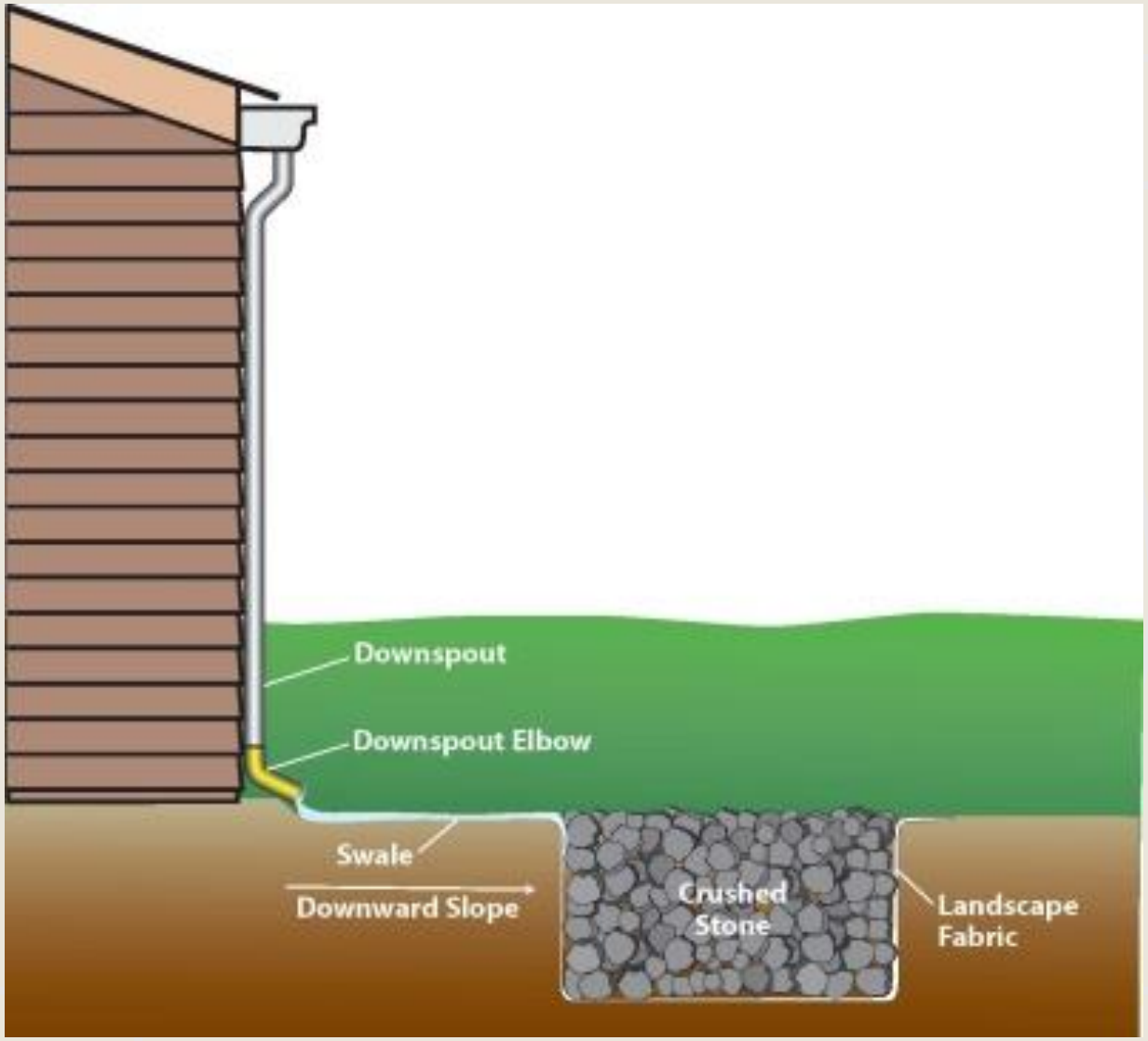
Standards:

- What % of the property contains impervious surfaces
- No erosion caused from impervious surface runoff

BMPs:

- Dripline trenches
- Infiltration trenches
- Rooftop downspout disconnection and drywells
- Rain gardens
- Rain barrels
- Vegetated swales

Dripline Trench



Drywells

- Most BMPs sized and designed for the 1” rainstorm
- 1,000 square feet of impervious surface generates 620 gallons of runoff

124 five-gallon buckets!

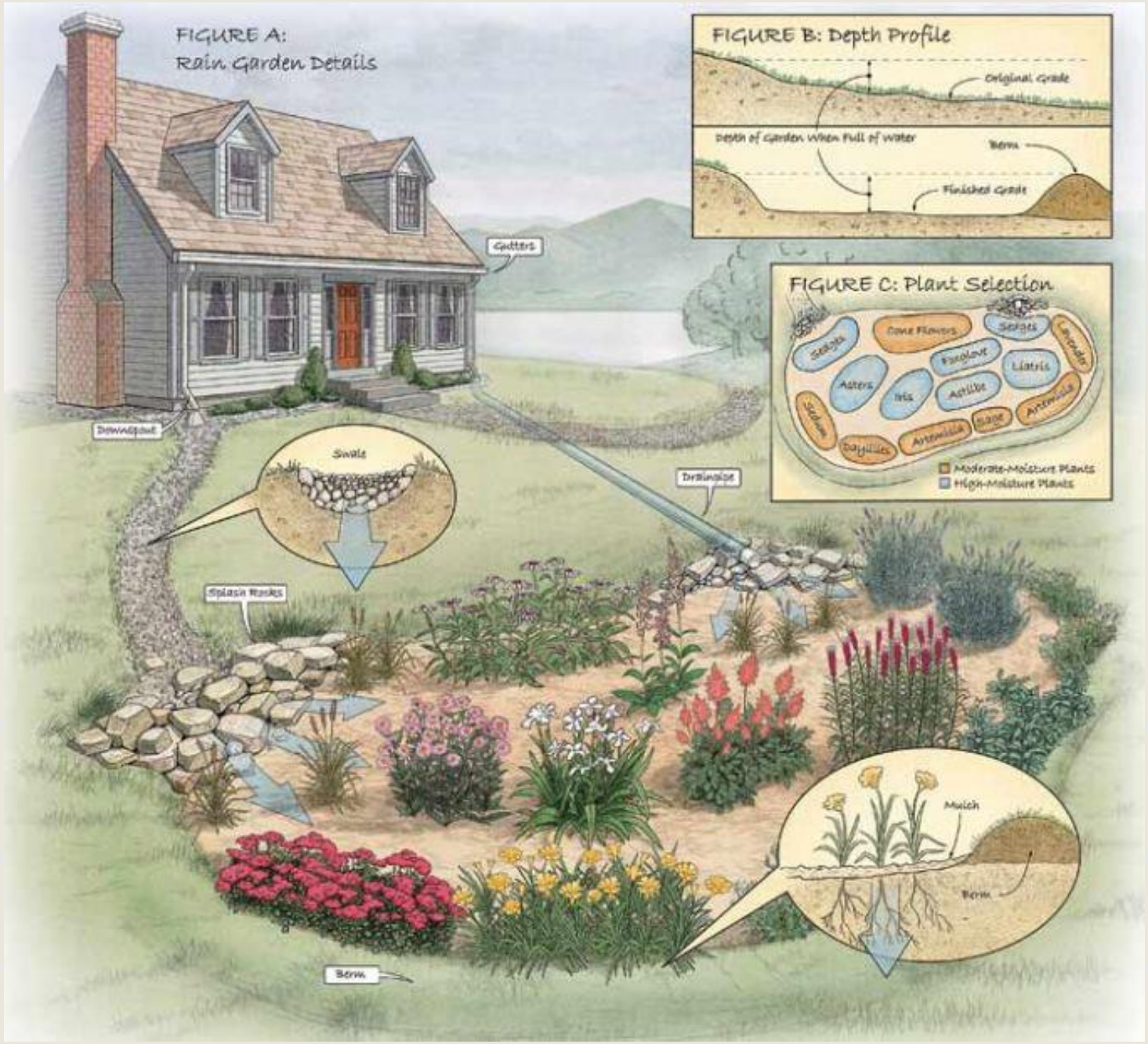


FIGURE A:
Rain Garden Details
Gutters
Downspout
Swale
Drainage
Splash Rocks
Berm
FIGURE B: Depth Profile
Original Grade
Depth of Garden When Full of Water
Berm
Finished Grade
FIGURE C: Plant Selection
Cone Flowers
Sedges
Asters
Iris
Liatris
Agilite
Daylilies
Moderate-Moisture Plants
High-Moisture Plants
Mulch
Berm

Rain Gardens

Sizing BMPS – Vermont Rain Garden Manual

1. Calculate area of impervious surface runoff

   1000sqft

2. Calculate Slope

   <4%, then 3-5” depth

3. Determine soil type

   SILT

4. Plug info into the Sizing Table

Courtesy of North Dakota State University

The ribbon formed here depicts a clay soil because it is greater than 1.5” in length.

SAND: Soil does not form a ribbon at all.
SILT: A weak ribbon < 1.5” is formed before breaking.
CLAY: A ribbon > 1.5” is formed.

Table 1	
Slope	Depth
< 4%	3-5 in
5-7%	6-7 in
8-12%	8 in+

Table 2	Depth		
Soil Type	3-5 in	6-7 in	8 in +
Sand	0.19	0.15	0.08
Silt	0.34	0.25	0.16
Clay	0.43	0.32	0.20

$$\frac{0.34}{\text{Size Factor}} \times \frac{1000}{\text{Drainage Area}} = \frac{340 \text{ sq ft}}{\text{Rain Garden Area}}$$

Vermont Green Stormwater Infrastructure (GSI) Simplified Sizing Tool for Small Projects

This tool is designed to:

- Treat the first 1” of stormwater runoff from developed sites.
- Treat between 2,500sqft to a 1/2 acre of impervious surface.
- No more than 10,000 sqft of impervious surface should be directed to any single BMP.

Example Rain Garden:

- Sited to receive and treat the max stormwater runoff.
- Size depends on impervious area, soil media and ponding depth.
- Minimum soil infiltration rate of 0.5 inches/hour.

Alternative Septic System Strategies

Minimal Disturbance Systems

- Dripline technologies can work on steep slopes

Minimal Disturbance Systems – Continued

Lake Wise Info Sheet

Shoreland Best Management Practices for Lake-friendly Living

Benefits

- Water Quality
- Small Spaces
- Protection & Resiliency

VT DEC suggested BMPs for wastewater

ALTERNATIVE WASTEWATER SYSTEMS

A guide to innovative lakeshore septic systems

Alternative bottomless sand filter dispersal system.

Description

Lakeshore lots may not be suitable for conventional wastewater systems due to shallow soil, a high water table, small lot size, or other constraining features. The good news is that there are permittable alternative and innovative wastewater systems that can work around these constraints and still treat wastewater effectively, protecting lake water quality and human health.

Approved Innovative and Alternative Wastewater Technologies designed by **Licensed Designers** can be permitted on sites where a conventional leachfield is not possible. These technologies create similar conditions as a leachfield - an aerobic environment that encourages the growth of aerobic bacteria (microbes) that break down organic waste and clean the wastewater. They can generally be categorized into three types:

A **Vermont State Wastewater Permit** is required for all new, replacement, and upgraded wastewater systems. Alternative systems are being reviewed and approved on an on-going basis by the VTANR Drinking

[Link To Factsheets]

Lawn and Recreation Area

Guidelines:

- Vegetated areas, minimal lawn
- Soil erosion is not occurring on site
- No pesticide, fertilizer, or runoff to lake

BMPs:

- Infiltration steps
- Rain gardens
- Water bars
- Vegetated swales
- Vegetated berms
- Establishing no-mow zones
- Planting and maintaining vegetated zones
- Planning pathways
- Lake-friendly yard maintenance

Recreation Area

Water Bars

Permeable Pavers

Silver Lake State Park, Barnard

Infiltration Steps

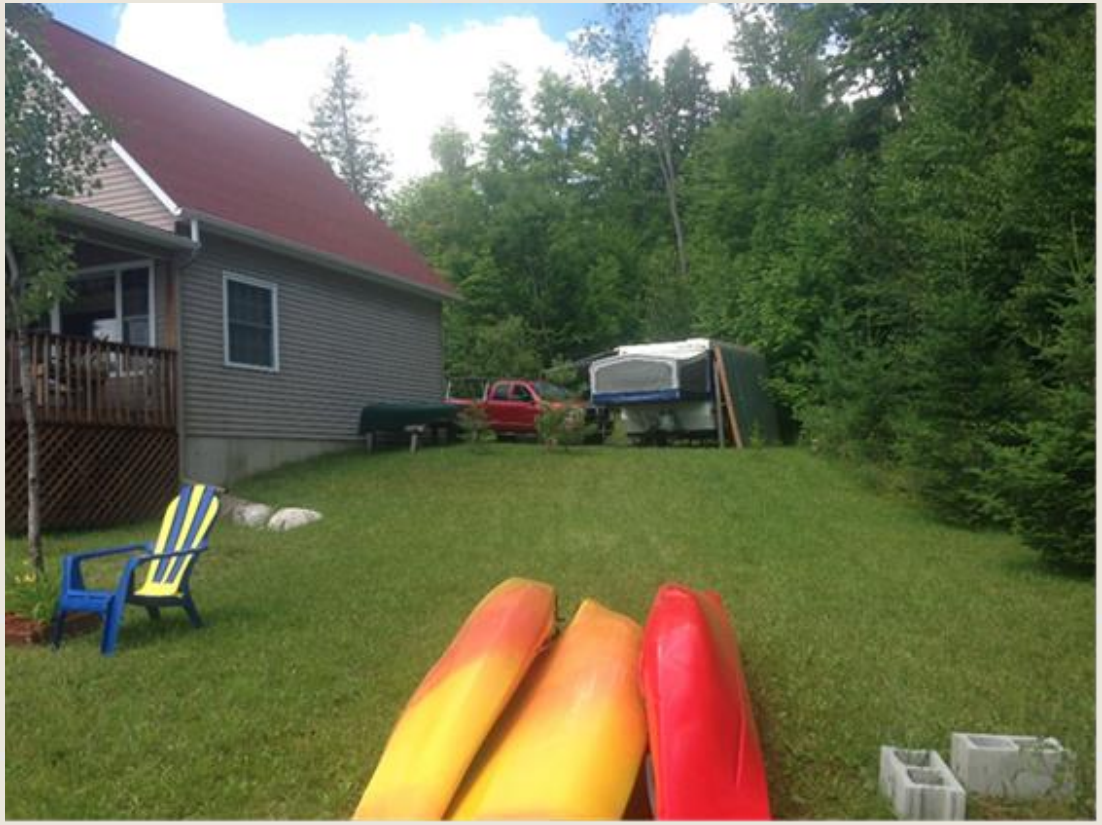
Before

After

Maidstone Lake

Reduce Lawn and Runoff with:

- Pathways
- Tree Skirts
- Rain Gardens



Reduce Compaction and Increase Infiltration with:

- Rain Gardens
- Vegetative Plantings
- Pathways

Persistent Problems with Beach Erosion

Stabilized Buffer Protects Beach from Road Runoff

Geese Only See Continual Buffer and Not the Entryway when Buffer Overlaps

Raponda Town Beach, Wilmington

2021 – Four years later

Shorefront

Standards:
- Natural conditions
- Stable bank
- Minimum of 15 ft width of vegetation area for developed sites
- Minimum of 100 ft width of undeveloped site
- No unfiltered runoff to the lake
- Shallow water area are natural and not “cleaned up”

BMPs:
- Conserving lakeshores
- Managing shoreland vegetation
- Resloping, rock toe, and riprap
- Live staking
- Establishing no-mow zones
- Planting and maintaining vegetated area
- Planning pathways
- Water bars

Revegetation of Shoreline

Revegetation of Shoreline


Lake Wise Award
Lake Friendly
Living

Lake Iroquois, Williston – No Mow

Thank you!

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