Shoreland Best Management Practices

Amy Picotte, Vermont Shorelands Program

2020 Natural Shoreland Erosion Control Certification Training
Mergansers on Maidstone Lake by Rebecca Scott
Traditional Shoreland Development
The Greatest Density of Residential Development is Along Lakeshores

Period of Shoreland Restoration

800 Lakes
1480 Miles of Shoreland
45% Developed
55% Undeveloped
37% Increase in Impervious Surface and 10% Increase in TP
Nashoba Brook Watershed, MA

Traditional Suburban Development

- Runoff: 8.9 in/yr
- Infiltration: 28.1 in/yr
- TSS: 213 lb/ac/yr
- TP: 0.72 lb/ac/yr
- Runoff: 1.9 in/yr
- Infiltration: 35.2 in/yr
- TSS: 68 lb/ac/yr
- TP: 0.27 lb/ac/yr

Nashoba Brook Watershed, MA
What are Lake-friendly Practices?

95% of America Converted from Natural Landscape
**April 30, 2011**  
**Shoreline Erosion at North Point of Isle LaMotte, Lake Champlain**  
*Photo: Lake Champlain Basin Program*

<table>
<thead>
<tr>
<th>Vegetative</th>
<th>Structural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infiltrate</td>
<td>Infiltrate</td>
</tr>
<tr>
<td>Filter</td>
<td>Filter</td>
</tr>
<tr>
<td>Benefit Wildlife</td>
<td></td>
</tr>
</tbody>
</table>

**Shoreland BMPs**

**Driveway**
- Defined and minimized driveway
- Minimized soil compaction
- No erosion
- Runoff channeled away from the lake

**BMPs**
- Crowned driveways, good gravel, & rock or grass-lined drainage ditches
- Open-top culverts & rock aprons
- Infiltration trenches
- Vegetated Swales
- Turn-outs
- Waterbars
- Pervious pavement

**Driveway Standards**
- Minimum of 15 ft of vegetation from shoreline
- Minimal lawn area
- Soil erosion is not occurring on site
- No pet waste accumulation
- No solid waste scattered
- No pesticide, fertilizer, or runoff to lake

**Structures/Septic**
- Less than 20% of property contains impervious surfaces
- Properly functioning leach field
- No uncovered oil tanks
- No erosion caused from impervious surface runoff

**BMPs**
- Dripline trenches
- Infiltration trenches
- Rooftop downspout disconnection and drywells
- Rain gardens
- Vegetated swales
- Septic system primer
- Ensuring septic system quality
- Non-structural

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

**BMPs**
- Conserving lakeshores
- Managing shoreland vegetation
- Resloping, rock toe & riprap
- Live staking
- Establishing no-mow zones
- Planting and maintaining vegetated areas
- Planning pathways
- Waterbars
- Permits needed!
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 Roof
- Infiltration Trench
- Pervious Pavers & Pavement
- Storm Water Tree Pits
Cultural Services

Social benefits to being near nature
...Nature Makes Us Smarter!

Apple – Google – Facebook – Samsung - YouTube – Airbnb
They’re ALL using GSI and building Biophilic Offices

Apple 3 LEED-Platinum office in Santa Clara, CA

- 15% higher level of well-being
- 6% more productive
- 15% more creative overall
Google’s New Campus
Design by BIG and Heatherwick Studio

- Restored natural habitat shelters cafes and a bike path
- Parking is hidden underground, below gardens
Blueprint for the Planet

Architect Bjarke Ingels is drawing up a plan to save the world
By Clara Nugent

Bjarke Ingels can sometimes sound like a mad scientist. “One thing I’ve learned a lot about over the past year is stone flour,” the 46-year-old Danish architect says over Zoom from his couch in Copenhagen. A mischievous smile spreads over Ingels’ usual, boisterous face as he explains: during the last ice age, glaciers ground rocks down into a fine, nutrient-rich substance, which stimulated flora and fauna in some parts of the world. Geologists are now investigating stone flour’s ability to bring life to infertile areas. “It’s quite different,” Ingels says. “Say that in each container ship that sails across the oceans, you reserve four containers, fill them with stone flour and inject some whenever you cross a marine desert,” he says. As plants grow, they would draw down carbon from the atmosphere, reducing the greenhouse effect. “Then you can turn on the carbon-smoking capacity of the oceans.”

The outlandish scale of Ingels’ thinking won’t come as a surprise to anyone who’s followed his career. Over the past decade, Ingels has gone from the enfant terrible of architecture—known for head-turning innovations like a mountain-shaped apartment block or a pair of twisting towers in Miami—to one of the busiest architects in the world. Bjarke Ingels Group, best known as BIG, has worked on projects in New York, London, Beijing, and beyond.

November 9, 2020 Time Magazine
GSI High Tech Solutions
Minimal Disturbance for Maximum Benefits

THIS

Not THIS
Roads and Driveways
Open Top Waterbars
Infiltration Trenches
Defined Parking Areas
Bioengineering – Encapsulated Soil Lifts
Municipal Roads General Permit

What does this mean for Lakes?

NO Cutting of Vegetation within 250 feet of a Lake!
Septic and Structures
Drip Line Trenches

Dry Wells
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
Street Edge Alternatives (SEA)

Functional Landscape

Reduced Impervious Area

98% Stormwater volume reduction for 2-year storm
1. Calculate area of impervious surface runoff
   1000 sq ft

2. Calculate Slope
   < 4%, then 3-5” depth

3. Determine soil type
   SILT

4. Plug info into the Sizing Table
   
   \[
   \text{Size Factor} \times \frac{1000}{\text{Drainage Area}} = \frac{340 \text{ sq ft}}{\text{Rain Garden Area}}
   \]
Sizing BMPs

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 Raingarden

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.
Septic - Alternatives
Recreation Area
Permeable Pavers
Silver Lake State Park, Barnard
Before After

Infiltration Stairs

Maidstone Lake
Open Top Waterbar Draining to Raingarden

Shadow Lake, Glover
Harvey’s Lake, Barnet
Federation of Vermont Lakes and Ponds
Shoreland
Create New Homegrown National Park
Tallamy’s Challenge: Give Back Half of the 40 Million Acres of Lawn

<table>
<thead>
<tr>
<th>Under 20 Million Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adirondacks +</td>
</tr>
<tr>
<td>Yellowstone +</td>
</tr>
<tr>
<td>Yosemite +</td>
</tr>
<tr>
<td>Grand Tetons +</td>
</tr>
<tr>
<td>Canyonlands +</td>
</tr>
<tr>
<td>Mount Rainier +</td>
</tr>
<tr>
<td>North Cascades +</td>
</tr>
<tr>
<td>Badlands +</td>
</tr>
<tr>
<td>Olympic +</td>
</tr>
<tr>
<td>Sequoia +</td>
</tr>
<tr>
<td>Grand Canyon +</td>
</tr>
<tr>
<td>Denali +</td>
</tr>
<tr>
<td>Great Smoky Mountains</td>
</tr>
</tbody>
</table>

**REMOVE Lawn to Make More Habitat**

- Up to 40% of fresh water fish protein comes from insects dropped into the water from native plants
Vegetated Swale
Lake Raponda
Wilmington

Waterbars

Lake Wise Award
Lake Elmore – Lamoille County NRCD Lake Wise Project – No Mow Plantings
Echo Lake, East Charleston - No Mow Zone
Lake Iroquois, Williston – No Mow
Lake Wise participation mapped on Google Earth

Summer TP Trend: p = 0.3183 | CV = 22

Stable

Summer TP Annual Means

Phosphorus ug/L

Year
Governor Phil Scott Awards The FIRST GOLD LAKE AWARDS to Seymour & Echo Lakes
Amy Picotte, Vermont Shorelands Program

Amy.Picotte@Vermont.Gov