



Good Neighbor Storm Water Guide



High water table between sand dunes by Alice Neiley

A Guide to Understanding Storm Water: What it is, why it's important, easy ways to protect it and how to be a better neighbor

First Edition © 2010

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This booklet is part of Safe Harbor’s Environmental Education Initiative. Safe Harbor uses Massachusetts *Smart Growth* and innovative techniques to create site specific systems, directing residential storm water into our ground water, with zero discharge off site. This means excessive runoff isn’t sent onto neighboring property. Storm water is excess runoff, usually created by impervious surfaces, such as driveways, roofs and sidewalks. When residential runoff is discharged onto town roads, town money is required to manage expensive engineering solutions. We believe that storm water management is made more relevant as we face predicted increased precipitation in the Northeast (28% in MA) due to climate change. This past spring groundwater levels in monitoring wells around Cape Cod reached record highs. As hydrologist Gabrielle Belfit states, **“We’re connected to the water table in places where we never were before”**.¹ All of the Cape’s groundwater, every well, kettle pond and swamp, is connected by a “sole source aquifer”. Safe Harbor feels this natural resource deserves protection by recharging our rainwater into the ground water table instead of sending it onto neighboring or town property.

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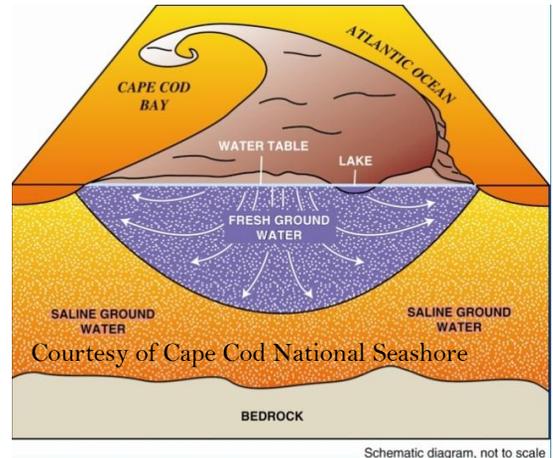
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Why should we care?

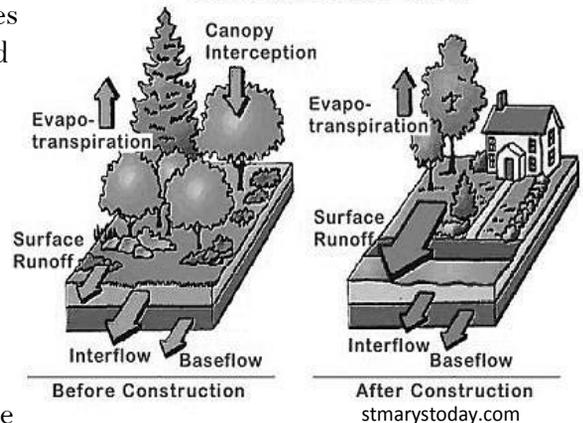
In a natural system, storm water would be captured by native tree canopy, vegetation, mulch and soil layers, to be slowly filtered into ground water. Native vegetation and soils act as a natural filter for pollutants, excess nutrients and chemicals. Residential development creates impervious surfaces that collect rain water as sheet flow and generate concentrated point sources, which are usually discharged off the property.

What does the term Ground Water mean?

Rain water would normally percolate vertically through the soil, into the ground, where it would become part of our water table, which moves in a horizontal flow towards the nearest water body. Cape Cod’s water bodies are all ground water fed. Significant, upslope sheet flow from impervious surfaces such as roofs and driveways contributes to down slope sheet flow. The weight of water moving down slope results in erosion and flooding. The steeper slopes create higher risks. All runoff has the potential to carry animal, vehicle, agricultural, and road waste directly into our inland and coastal wetlands.



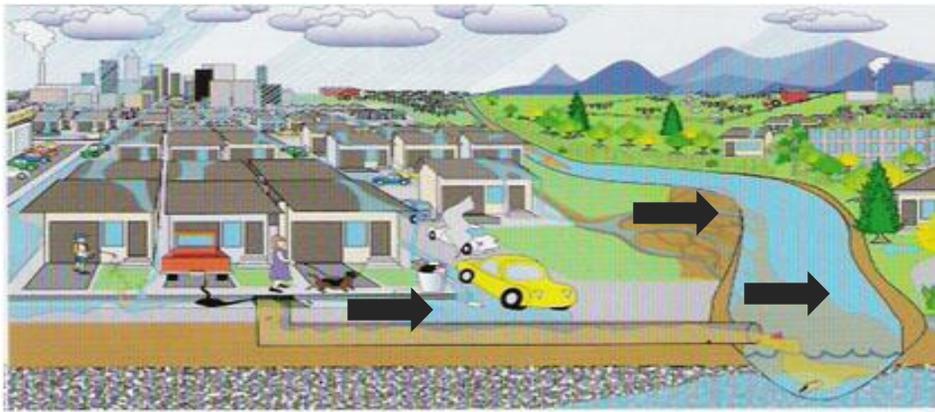
Local Hydrologic Cycle



Easy good neighbor suggestions.....

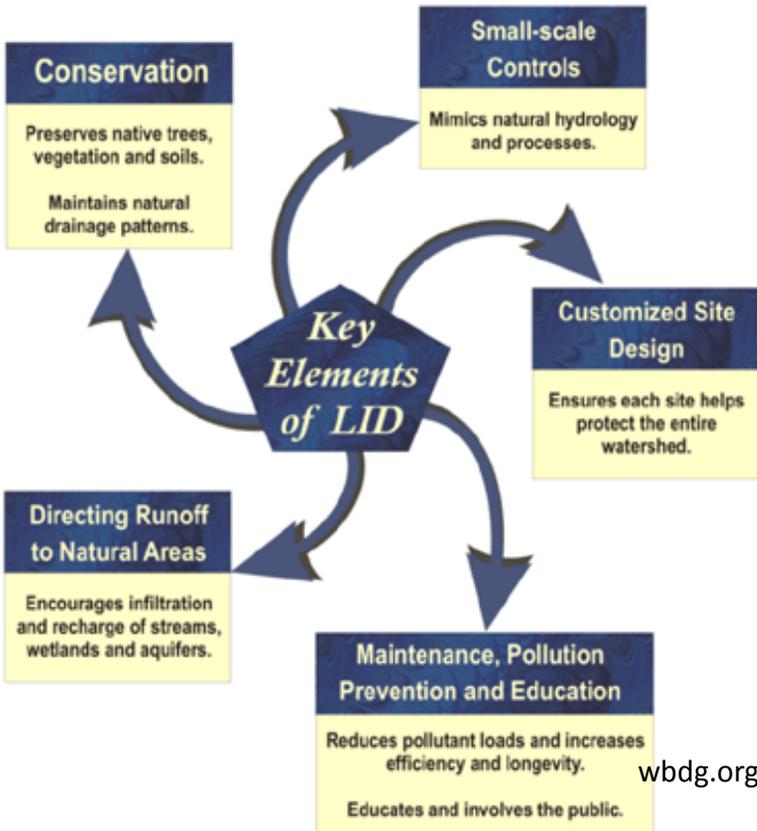
Massachusetts encourages homeowners to incorporate **Low Impact** techniques (known as Low Impact Development or **LID** tools) that infiltrate, filter, store, evaporate, and detain runoff, as close to its source as possible. Safe Harbor recommends this basic principle, modeled after nature: *manage rainfall at the source* using a variety of practical methods. Storm water management should not continue to use traditional methods of conveyance and treatment, in large, costly end-of-pipe facilities located at the bottom of drainage areas. Storm water is not a disposable product to be discharged but an important natural resource to be protected. LID addresses storm water through small, low profile, low cost, landscape features. When rain water is returned to ground water close to the source, energy is saved, a resource is saved and taxes and fees for local large-scale sewer and management systems are avoided.

Traditional Storm Water Management:



blackwarriorriver.org

Preferred LID Storm Water Management Concept



wbdg.org

Safe Harbor has put together the following list of residential storm water management tools as part of this “Good Neighbor Storm Water Initiative”:

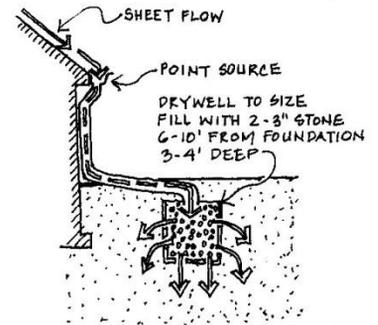
Stone drip lines-

Gravity driven sheet flow runoff from roofs infiltrates through 1-1/2” stone filled swale located under edge of roof line. Depth ranges from 6”-24” deep and 12-24” wide, depending on size of roof.



Dry wells-

A passive, underground structure that manages storm water sheet flow runoff by collecting it as a point source and directing it into stone filled, underground basins, where it infiltrates into the local groundwater. Simple dry wells can consist of a pit filled with gravel, riprap or concrete rubble.



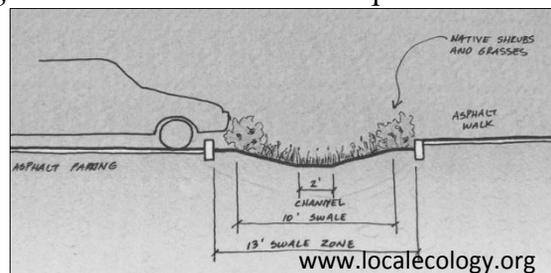
Drawn by: J.A. Cuming
www.alinearchitecture.com

Bioretention-

Landscaped features adapted to retain and infiltrate storm water runoff. Surface runoff is directed into shallow, landscaped depressions. These depressions incorporate vegetation systems, designed to also function as pollutant removal mechanisms that operate in forested ecosystems. During storms, runoff water is retained above the mulch and soil in the system and may return to the atmosphere through evapotranspiration, or filter through the soil to the groundwater. Some examples of bioretention systems include:

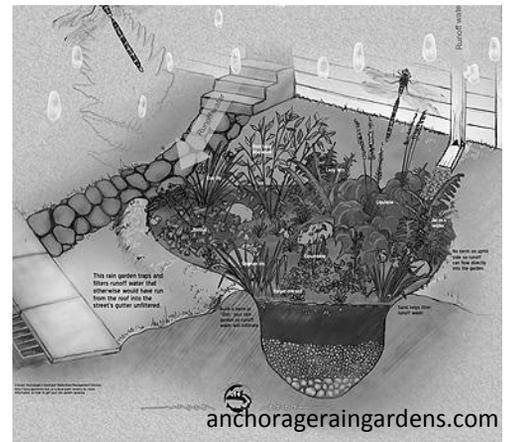
- **Vegetated swales-**

Shallow channels with thick vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. They can replace curbs, gutters and storm drain systems.



• **Rain gardens-**

Gardens that provide a way to use and optimize any rain that falls, reducing or avoiding the need for irrigation; rain water infiltrates the ground within a day or two.



• **Storm water planters-**

Small, contained vegetated areas of native, hydrophilic (water loving) plants that do not require a large amount of space and add aesthetic appeal and wildlife habitat.



Rain Barrels and Cisterns-

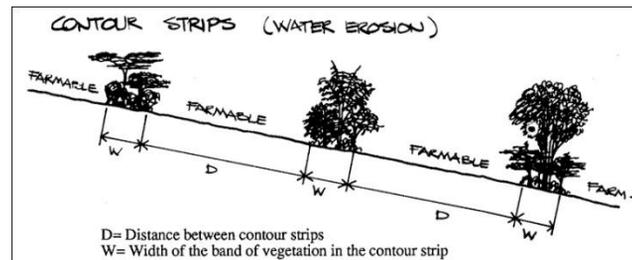
Sheet flow runoff from roofs, collected at a point source through downspouts, to tanks or barrels, above or below ground (50-10,000 gallons). Excess water can be diverted to drywell. Collected water can be reused for irrigating gardens or lawns, car washing, and other non-potable uses (toilet flushing, evaporation coolers).

Left image: A tile spout that funnels water into a circulating cistern. Right image: typical residential system.



Filter strips-

Densely vegetated, uniformly graded areas that manage sheet flow from adjacent impervious surfaces by reducing velocity and increasing infiltration of storm water.



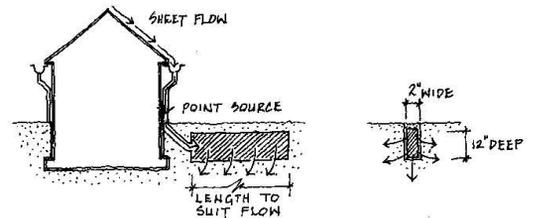
Open-celled concrete pavers-

Sometimes called grid pavers or grass stones— are made with an open-void or lattice design. They consist of a flat surface that forms a continuous pattern of concrete when installed. The concrete grid reinforces grassy areas that are subject to pedestrian or vehicular traffic, while the open void allows for on-site infiltration of storm water and revegetation. These areas create less runoff and generate less heat than normal paved surfaces, creating a very environmentally-sound project.



Innovative Systems for Sub-surface Dispersal

An innovative, passive system that directs point source runoff underground, for dispersal and infiltration through a semi-permeable, geotextile matrix mitigating infiltration. This system minimizes excavation.



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Green Roof Systems-

An extension of the existing roof which involves a high quality water proofing, a root repellent system and a drainage system. Using filter cloth, a lightweight growing medium and plants. Green roof development involves the creation of "contained" green space on top of human-made structures.



References and links:

¹Patrick Cassidy, Groundwater levels set records on Cape, The Cape Cod Times

<http://www.lid-stormwater.net/index.html>

<http://www.rainharvesting.com.au>

<http://www.pavestone.com>

An invitation:

*Please feel free to contact **Safe Harbor** with your questions. Our office overlooks Duck Creek Marsh at 95 Commercial Street in Wellfleet, MA. Give us a call and come by for a cup of coffee.*

Email: gordonsafeharbor@yahoo.com or phone: 508.237.3724

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