

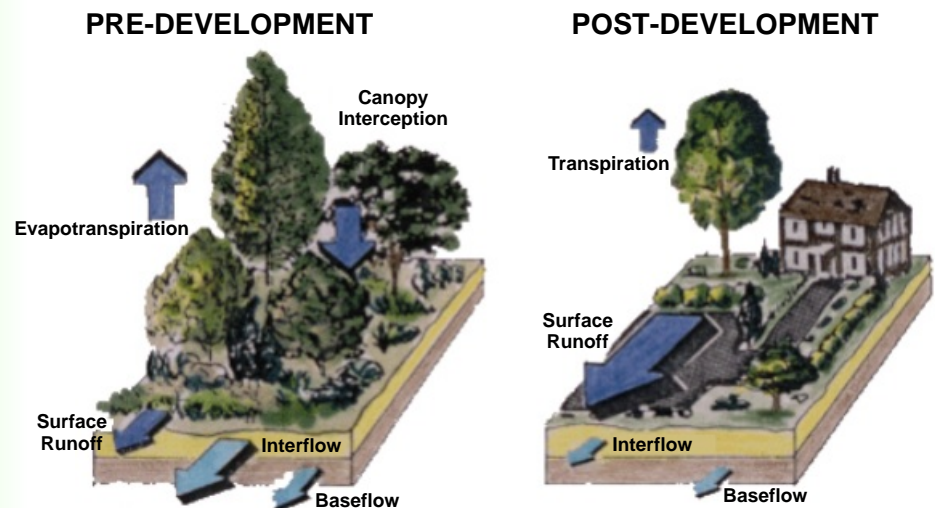


# Stormwater Management

Ten Towns Great Swamp Watershed Management Committee

## What is Stormwater Runoff?

Stormwater runoff is the water that runs off the surface of the land from rain or melting ice and snow. The type of land on which the rain falls affects the volume of stormwater runoff that is generated. In forests and grassy fields, most of the rain that falls percolates into the soil or evaporates into the air and only a small amount of stormwater runoff is generated. As an area becomes more developed, with more impervious area, the amount of water that percolates into the ground or evaporates into the air decreases, and the amount of stormwater runoff increases.



## What are the Problems with Stormwater Runoff?

Stormwater runoff can negatively affect water quality, aquatic biota, and stream temperature. As the stormwater runoff travels across the land, it picks up pollutants such as soil particles, oil and grease, nutrients, and toxic chemicals. It carries these pollutants to nearby streams and lakes. These pollutants can cause many water quality problems. Increased sediments can significantly alter the ecology of the water body. Sediments clog the gills of fish and smother newly-laid fish eggs and other aquatic life. Stormwater runoff from developed areas increases the stream temperature and can stress or kill temperature-sensitive aquatic life. Sediments often carry chemicals such as phosphorus, nitrogen and toxins which further pollute the water. Excessive stormwater runoff also increases the amount of water in streams, resulting in flooding and streambank erosion.

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# A stormwater management ordinance and

## What can be done to control Stormwater Runoff?

There are four major stormwater management principles that should be used to control stormwater runoff. These principles are:

- Reduce Site Runoff
- Maximize use of Natural Drainage
- Provide Pre-treatment of Runoff
- Treat the Water Quality Storm

### Reduce Site Runoff

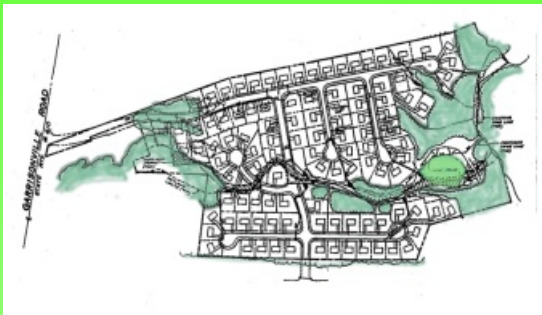
The best method of reducing runoff is to minimize the amount of impervious area, such as pavement, on a site. Therefore a major goal for proper stormwater management should be to minimize impervious areas and maximize vegetated areas. The amount of impervious area in a new development can be minimized by incorporating the following techniques:

- Construct narrower residential road widths
- Use shorter road lengths and networks
- Add "islands" to cul-de-sacs and parking lots
- Use smaller parking stalls
- Construct shared or shorter driveways
- Reduce lot frontage requirements
- Install no sidewalks or sidewalks on one side of street only

### Maximize Use of Natural Drainage

Natural drainage systems should be used in place of man-made storm sewer systems whenever feasible. Basic principles to follow include:

- Minimize disruption of natural channels and features
- Minimize the use of storm sewers and paved stormwater conveyance structures
- Promote filtering and infiltration of stormwater
- Minimize the use of curbs on roadways



*Medium Density Residential Site:  
Conventional Design*



*Medium Density Residential Site:  
Innovative Design minimizes impervious area*

(Source: Center for Watershed Protection)

# *BMPs are key tools for controlling stormwater runoff.*

## Providing Pre-Treatment of Stormwater Runoff

It is important that coarse sediments be removed before the stormwater enters the primary treatment facility. Many structural treatment facilities fail because they become clogged with coarse sediments. Some basic pre-treatment techniques include:

- Sediment forebay or micropool
- Grass filter strips and grassed swales
- Catch basin pre-treatment
- Sediment chambers

## Provide Treatment of the Water Quality Storm

Most existing stormwater management facilities are designed to treat large storms that occur infrequently (i.e. every 2, 10, 25 or 100 years). They were not designed to treat the smaller, more frequent storms, nor were they designed to treat for water quality. The Water Quality Storm is typically the storm that delivers 1.25 inches of rain in 2 hours. This storm accounts for 70 to 90 percent of the average annual rainfall. A stormwater facility designed to treat the Water Quality Storm will treat 70 to 90 percent of the average annual runoff. If possible, the Water Quality Storm should be infiltrated into the ground. Basic principles of stormwater treatment and infiltration include:

- Put runoff control measures near the source
- Create a series of treatment devices using the natural features of the site

In order to effectively control stormwater runoff, a stormwater management ordinance should be adopted by the local municipality. The stormwater management ordinance should be based on the environmental performance standard that post-development stormwater quantity and quality should not exceed pre-development conditions. Both the volume and peak flow of post-development stormwater runoff should be controlled to pre-development conditions. Stormwater volume should be controlled using infiltration practices. Basic objectives of stormwater ordinances are:

- No Net Increase in Nonpoint Source Pollution
- No Net Increase in Runoff Rates
- No Net Increase in Runoff Volume
- No Net Decrease in Aquifer Recharge Areas

## Controlling Stormwater Runoff (continued)



Flooding caused by poor stormwater management

### Key Elements of a Stormwater Ordinance

1. Integrate into Regional Plan
2. Use Nonstructural Practices First
3. Infiltrate the Water Quality Storm
4. Control Runoff at Source
5. Use Stormwater Treatment Trains
6. Minimize Concentrating Stormwater

## Stormwater Management Ordinance

# Stormwater Management

## Ten Towns Great Swamp Watershed Management Committee

Stormwater Best Management Practices (BMPs) should be incorporated into the design of all new land developments. BMPs can be designed and constructed for existing subdivisions to solve existing stormwater runoff and nonpoint source pollution problems. Typical urban BMPs include wet ponds, constructed wetlands, pond/wetland systems, infiltration systems, and filtration systems.

Wet Ponds are a very effective water quality BMP and can achieve a high removal rate of sediment, organic matter, nutrients, and other pollutants. Wet ponds can also provide peak runoff control and can be used in urban areas. They can treat stormwater runoff from relatively large areas. Shading should be used to maintain lower water temperatures.

Constructed Wetlands are also a very effective stormwater BMP that can be incorporated into urban development projects. Constructed wetlands are typically designed for areas of one acre in size or greater. They control peak runoff, provide water quality benefits, and also provide valuable wildlife habitat. Constructed wetlands typically consist of a sediment forebay, high and low marsh areas, and a micropool.

Infiltration Systems provide some or all peak runoff control, provide water quality benefits, and reduce the total volume of runoff. Some types of infiltration systems include dry wells, infiltration trenches, infiltration basins, and porous pavement. Infiltration systems must be carefully designed to prevent system failure. High rates of failure occur due to poor soils, soil clogging, poor design, and soil compaction during construction.

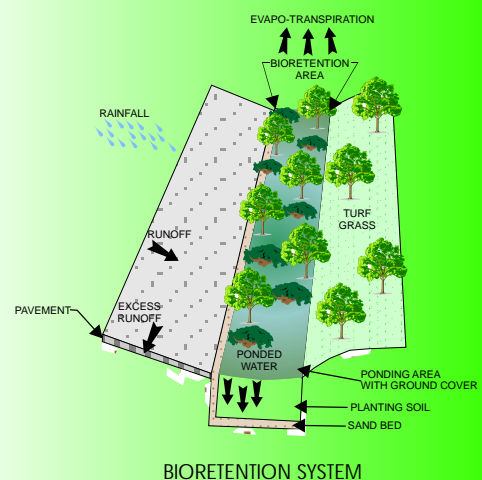
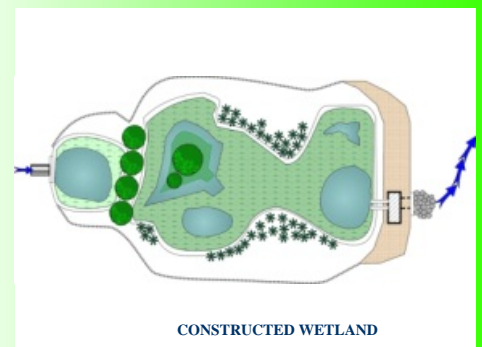
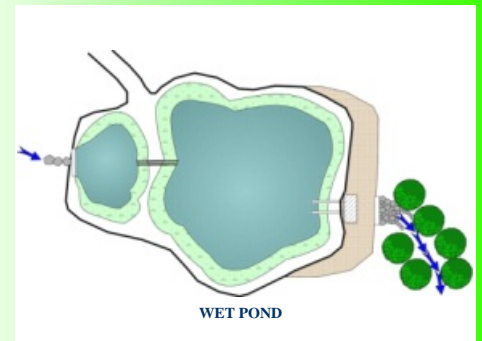
Filtration Systems provide water quality benefits, some flow attenuation, and some volume control. Filtration systems include sand filters, peat filters, and bioretention systems. Filtration systems should be designed for the water quality storm.

The Ten Towns Great Swamp Watershed Management Committee was formed in 1995 through an Intermunicipal Agreement for the specific purpose of developing and implementing a watershed management plan for the Great Swamp watershed. The organization has 501 (c) (3) status and is supported by annual financial contributions from each of the ten Municipalities that have lands within the Great Swamp watershed and by Somerset and Morris Counties in New Jersey.

The ten municipalities that make up the Ten Towns Great Swamp Watershed Management Committee are as follows; Bernards Township, Bernardsville, Chatham Township, Harding Township, Long Hill Township, Madison Borough, Mendham Township, Mendham Borough, Morris Township, and Morristown.

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## Stormwater Best Management Practices



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