
S. Harris

Resources

For professional advice, contact your county conservation district or state extension office:

PACD
Pennsylvania Association of Conservation Districts, Inc.

http://pacd.org/your-district/find-your-district/

PENNSTATE
Cooperative Extension
College of Agricultural Sciences

http://extension.psu.edu/counties

Published by:

pennsylvania environmental council

215-545-4570 www.pecpa.org

Watershed Coalition of the Lehigh Valley
www.watershedcoalitionlv.org

Cover photo: JIsett/PWC

Budget Considerations

Cost is typically a major factor when considering a basin retrofit project. After identifying the project area and collecting key information, it will be easier to outline goals that fit your budget.

- **Consider the budget in general terms.** Basin retrofits range from simple plantings to complex engineering designs. Although it is difficult to estimate, here are some rough calculations:
  - Simple Landscape retrofit: $500+
  - Simple Engineering retrofits: less than $15,000
  - Moderate Engineering retrofits: $15,000 - $50,000
  - Complex Engineering retrofits: $50,000+
- **Consider using existing resources** to reduce costs. Resources can include the use of municipal labor, machinery, compost and soil materials. Volunteer efforts can also be of enormous value.
- **Include maintenance costs.** Calculate the current maintenance costs for the basin, especially mowed turf. Then calculate the proposed maintenance costs for the retrofitted basin. Often there is significant cost savings over time for reducing basin mowing. Be sure to include costs associated with managing invasive plant removal for several years.
- **Grant funding may be available.** The following list of grantors fund basin retrofit projects:
  - Growing Greener (Pennsylvania Department of Environmental Protection)
  - Exelon Schuylkill River Heritage Area Grant Program
  - TreeVitalize
  - PENNVEST

Public Outreach

Basin retrofits involve a change from manicured, turf grass to natural looking meadow grass and shrubs. Because change can be a challenge, outreach to the community can be a critical factor in project success.

Reach out to landowners and community leaders. Send letters or hold an informational meeting to explain the proposed project and gather comments. Emphasize the benefits of the project and address concerns. Not all citizens realize that stormwater is an issue that can be addressed by retrofitting existing basins.

Continue to communicate to stakeholders during each phase of the project. Let the community know that more visually appealing basin retrofit will emerge over a several year period. Adding a mowed path around the edge of the basin and bird boxes may provide an opportunity for walking, bird watching, or nature contemplation. Signs explaining project features and benefits are essential.

JIsett/PWC

Public Health and Safety Concerns

The two most common concerns people have with naturalized landscapes involve the perception of increased populations of mosquitos and ticks.

West Nile Virus (WNV) is a mosquito-borne disease. Infiltration testing should be conducted during the design phase to assure that the water retained in the retrofitted basin will infiltrate into the ground (or drain) before mosquito breeding can occur. A retrofitted basin may actually reduce mosquito populations by creating a habitat with insects, birds and other animals which eat the mosquito larvae.

Lyme disease is transmitted to humans through the bite of infected deer ticks. To avoid contact with ticks, mowed paths can be established in and around stormwater basins that are used by the public.

Aesthetic Concerns

In order to manage the expectations of the public, basin owners should demonstrate that the naturalized basin is being maintained. Simple measures to indicate that the naturalized basin is intentional and not neglected may include: fencing, mowing the edge of a naturalized basin, providing mowed trails, installing interpretive signage, and removing invasive plants. The goal over time is to see well managed naturalized basins become the new landscaping norm.

Permitting

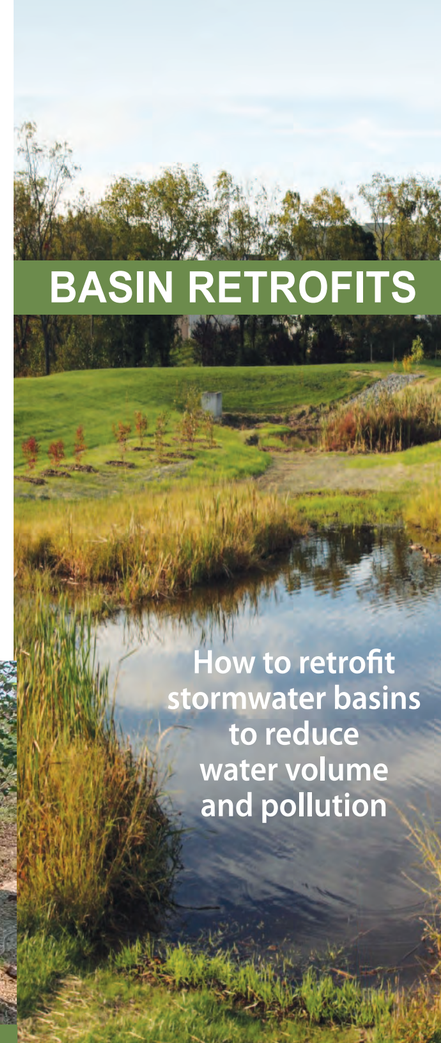
All earth disturbance activities in Pennsylvania are regulated by the Pennsylvania Code. When the ground surface is disturbed, loose soil can be carried into waterways during storm events as pollution called *sediment*. Regulations require the implementation of erosion and sediment control best management practices and may require an approved erosion and sediment plan from the County Conservation District. Contact your municipality and your local county conservation district about plan and permit requirements prior to starting the project.

Maintenance and Schedules

After a retrofit is complete, a maintenance plan must be developed and implemented. Regular maintenance will ensure that the basin continues to function as designed, complies with regulations and is aesthetically pleasing. General maintenance activites include: preventing sediment and litter accumulation, erosion control, ensuring proper drainage, regular inspections after storm events, and maintaining the native plant community.

JIsett/PWC

BASIN RETROFITS



How to retrofit stormwater basins to reduce water volume and pollution

Why Retrofit?

Retrofitting existing stormwater basins offers a relatively low cost opportunity to slow down and clean the water before it reaches streams, thereby reducing flooding, erosion and water pollution.

Stormwater causes flooding, erosion, loss of stream habitat and water pollution. Hundreds of stormwater basins have been constructed in Southeastern Pennsylvania to manage runoff from development. Most basins were designed to convey smaller storms quickly through the basin, detaining only larger storm events.

In order to improve water quality and reduce volume, the smaller storms must be managed by the basins as well. The runoff from the very beginning of any storm picks up all of the surface contamination and contains more pollution than runoff from later in the storm. This is called the *first flush*. In traditional basins, this initial water passes through the basin very quickly.

The inside poster will show you how basin retrofits work.

The Case for Basin Retrofits

- **Reduction of flooding and erosion can be costly**. Retrofits can reduce the damage at a reasonable cost.
- **Retrofits can reduce mowing costs over time.** Retrofitted basins require less frequent mowing, using less gas, fewer man hours and causing less equipment wear and tear.
- **Naturalized basins can enhance the aesthetics of engineered basins.**
- **Regulatory compliance for stormwater regulations.** Basin retrofits can help communities required to limit non-point source pollution discharges reach their new goals by slowing and filtering stormwater runoff.
- **Naturalized basin landscapes have habitat benefits** that attract birds, butterflies and beneficial insects while deterring geese.

Retrofit Basics

Gather information about basin access, size, structural features, historic design plans, current field conditions, visibility and note unique conditions of the basin. A site visit is critical.

Soil Test and Percolation/Infiltration Test

A key consideration for retrofitting a basin is how quickly water infiltrates into the ground if it is detained in the basin. Water in a dry detention basin should drain within 48 to 72 hours. Infiltration will be impeded if bed rock or the water table are at a shallow depth or if there is compaction or hard layers of soil. Check available records for the types of soil present and whether soil testing has been conducted since the basin was constructed. It is recommended that infiltration rate testing be carried out.

Survey

In order to design the retrofit, it may be necessary to collect survey information to verify the elevations of basin features such as berms, spillway, and the basin floor. Often basins will accumulate sediment over time, which can lead to changes in their holding capacity and it is important for the designer to account for the changes.

Inspection and maintenance records combined with survey information can reveal the current capacity of the basin, how much sedimentation has occurred since the basin was constructed, how much sediment can be removed to achieve original design conditions, and what the potential is to gain additional volume via a retrofit expansion.

Mapping

If possible, **obtain a copy of the stormwater system map or plan** that shows location of the basin itself, the inlets, ditches, pipes and other conveyance systems that direct water into and out of the basin. For more complex basin retrofit projects, the size of the land area that drains into the basin (the catchment area) will also need to be determined. Municipalities are required to develop maps of their stormwater systems. When considering a basin retrofit, first check with the municipality's engineer or manager to determine the status of basin and stormwater system mapping. Also, review your project with municipal officials to determine the need for any permits.

Questions to Ask:

Who owns the basin and has the authority to retrofit it?

Does the basin have an impervious (e.g. concrete) low flow channel? If so, this makes the basin a good candidate for a retrofit that includes removal of the low flow channel.

Is there an opportunity to lengthen the flow path? Larger basins are likely to provide more opportunities to lengthen the flow path between the inlet and outlet structure so water has an opportunity to stay in the basin longer.

Is the vegetation in the basin mowed turf grass or a mix of grasses and woody plants? Planting diverse vegetation in a basin that is presently mown lawn can provide substantial water quality benefits.

Was the basin constructed more than ten years ago? Older basins have may lost volume capacity due to years of sediment buildup. Removal of this sediment can restore the basin's lost capacity.

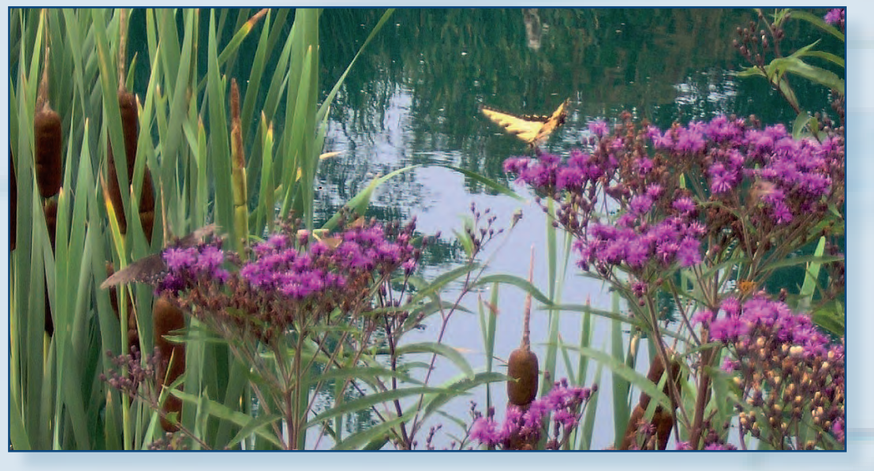
Is the basin in a highly visible area where there could be public concerns? Be aware of citizens perceptions. Area residents may need to adjust to the change in landscape aesthetic from highly manicured lawn to more naturalized plantings.

Does the basin have the capacity to infiltrate water? Standing water in a basin is a sign that the bottom of the basin does not infiltrate water well. This can be due to many reasons: compaction during construction, sedimentation of the basin over time, high water table, bedrock close to the surface or high clay content soils. Restoring or improving the capacity for infiltration may involve soil amendments; however, in some cases infiltration may not be possible.

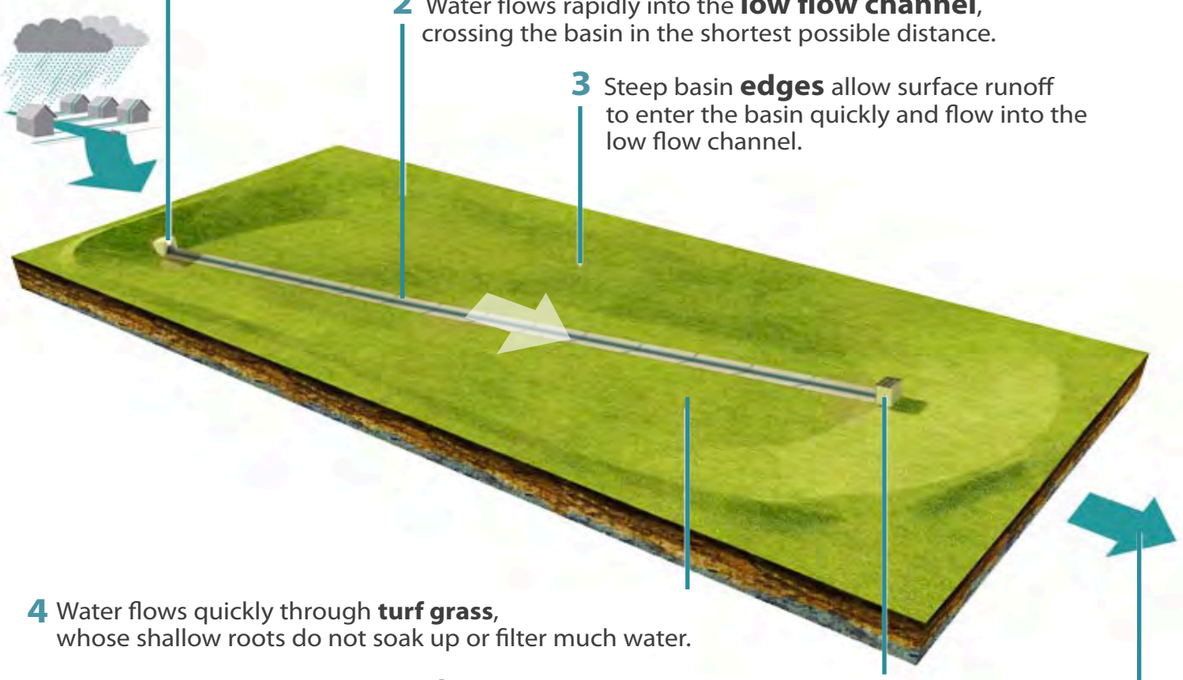
Can the basin be expanded to manage more water? Any available adjacent land can offer an opportunity to expand a basin. Basin expansion can increase water quality benefits and allow for managing additional volume.

How does a retrofit work?

Basin retrofits **slow**, **spread**, **soak** and **filter** water before it leaves the basin, resulting in better water quality. Water quantity is also reduced through evaporation and uptake by plants.



What Happens to Stormwater in a *Traditional* Detention Basin?



1 Water from the neighborhood enters the basin through the **inlet**, carrying trash, pollutants and sediment from the ground.

2 Water flows rapidly into the **low flow channel**, crossing the basin in the shortest possible distance.

3 Steep basin **edges** allow surface runoff to enter the basin quickly and flow into the low flow channel.

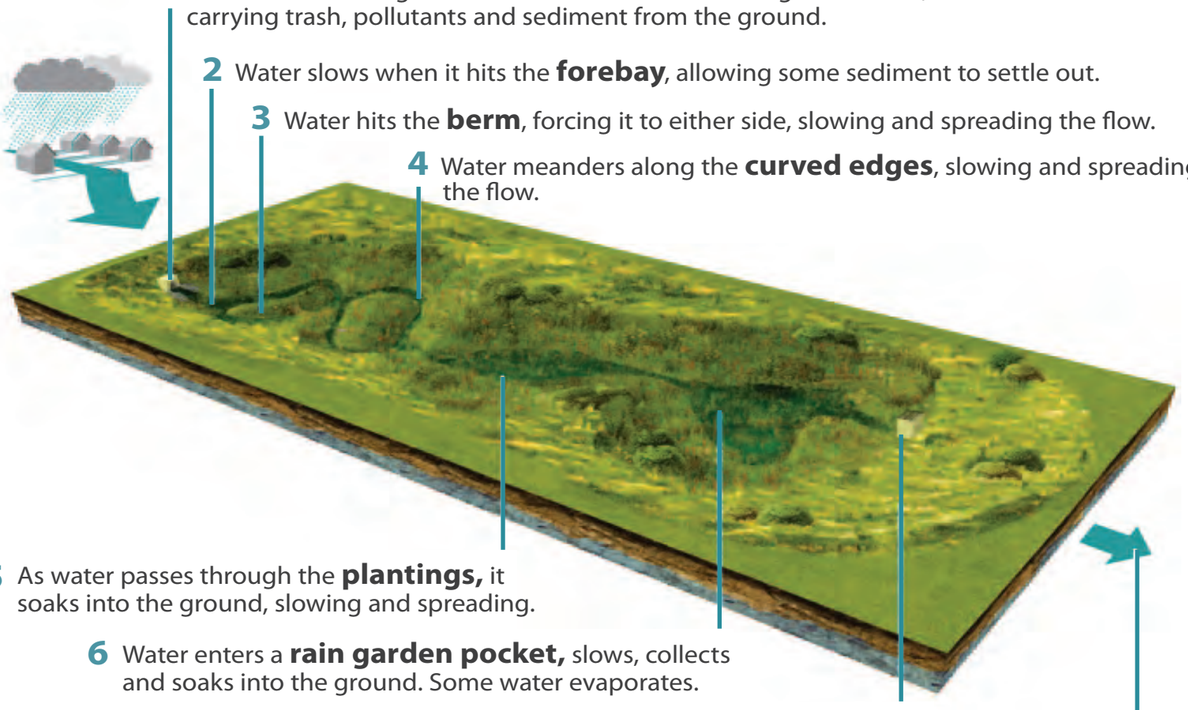
4 Water flows quickly through **turf grass**, whose shallow roots do not soak up or filter much water.

5 The **outlet** is designed to move water out of the basin quickly and into receiving streams.

6 Water discharges into the stream at the **outflow**.

Naturalized basin landscapes have habitat benefits that attract birds, butterflies and beneficial insects while also deterring geese.

What Happens to Stormwater in a *Retrofitted* Detention Basin?



1 Water from the neighborhood enters the basin through the **inlet**, carrying trash, pollutants and sediment from the ground.

2 Water slows when it hits the **forebay**, allowing some sediment to settle out.

3 Water hits the **berm**, forcing it to either side, slowing and spreading the flow.

4 Water meanders along the **curved edges**, slowing and spreading the flow.

5 As water passes through the **plantings,** it soaks into the ground, slowing and spreading.

6 Water enters a **rain garden pocket,** slows, collects and soaks into the ground. Some water evaporates.

7 Water flows through the **outlet,** after a certain volume is contained by the basin.

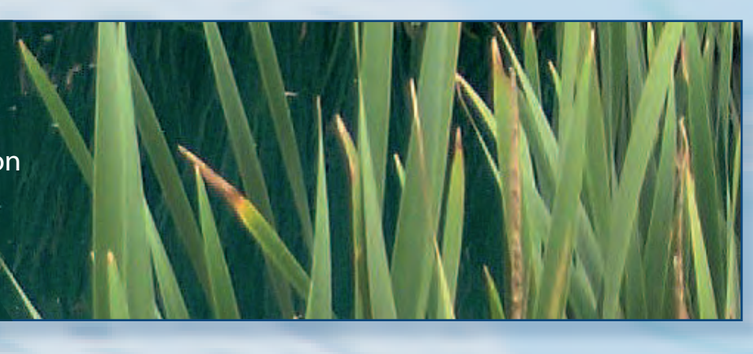
8 **Outflow** discharges a smaller volume of water than enters the basin, and during some small storms, no water flows out of the basin.

Basin modifications:

Basin retrofits range from naturalized basin plantings to more complicated, engineered solutions. Typically a basin naturalization retrofit involves converting the vegetation from mowed grass to a more diverse mix of native plant species with longer root systems. A simple engineering retrofit will slow the water down and retain some of it in the basin for longer periods of time. Complex engineering retrofits may alter the hydrology, flow path, and outflow characteristics of a basin.

Benefits:

- improved water quality
- reduced flooding and erosion
- reduced maintenance costs
- improved aesthetics
- improved wildlife habitat



		Slow	Spread	Soak	Filter
Simple Landscape Retrofits	Naturalize basin plantings	■		■	■
Simple Engineering Retrofits	Removal of low flow channel	■	■		
	Outlet structure modification			■	
Moderate Engineering Retrofits	Grading to create longer flow path and berms	■	■		
	Grading to reduce steep slopes	■			
	Rain garden pockets	■		■	■
	Install forebay for collection of sediment	■			■
Complex Engineering Retrofits	Excavate basin to increase holding volume	■			
	Expand basin to increase holding volume	■			

Level of Retrofit Complexity: − to +

Level of Water Quality Improvement and Water Volume Reduction: − to +