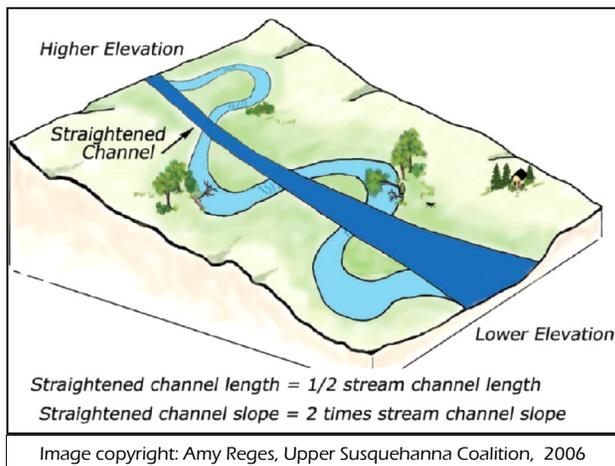


## Restore Natural Stream Features

Restoring the natural features of streams, such as meanders (bends and curves), riffles and pools:

- Provides resistance and dissipates the stream's energy
- Reduces erosion
- Provides habitat for fish and wildlife
- Reconnects the stream to its floodplain



### A stream is like a water slide

- Although the straightened stream and the meandering stream are flowing down the same slope, the straightened stream is faster and has more energy because it is traveling a shorter distance
- Restoring the natural meanders and reconnecting the stream to its floodplain reduces this often destructive energy

A cubic meter of water weighs almost as much as a mid-sized car (1000 kg or 2200 lbs). When moving at high speed, it has a lot of energy and has the ability to do some serious damage. If it cannot use up the energy by meandering onto the floodplain, the energy will be used to erode the banks or cause other destruction.

## It Has Been Done!

### Other urban watersheds are being successfully restored

#### Sligo Creek Watershed, Silver Spring, MD

- Problems: 55% impervious surfaces, large amounts of stormwater, erosion, flooding, degraded ecosystem
- Restoration is being performed successfully on a watershed-wide scale
- Stormwater detention used to control stormwater runoff and improve flow conditions
- Channel modifications used to restore stream function and improve habitat
- Collaborative efforts of community and watershed groups, agencies, local and state governments have been essential to success
- Sligo Creek relies on continued local stewardship to ensure lasting success

For more information: <http://restoringrivers.org/oldsite/example/chesapeake/3sligocreek.html>

## How do we get started?

### Get Involved!

#### For more information:

Darby Creek Valley Association: [www.dcva.org](http://www.dcva.org)

Darby-Cobbs Watershed Partnership:  
[www.phillyriverinfo.org/Watersheds/Darby-Cobbs.aspx](http://www.phillyriverinfo.org/Watersheds/Darby-Cobbs.aspx)

Delaware County Conservation District:  
[www.delcocd.org](http://www.delcocd.org)

Delaware County Planning Department:  
[www.co.delaware.pa.us/planning/](http://www.co.delaware.pa.us/planning/)

Keystone Stream Team: [www.keystonestreamteam.org](http://www.keystonestreamteam.org)

Center for Watershed Protection: [www.cwp.org](http://www.cwp.org)

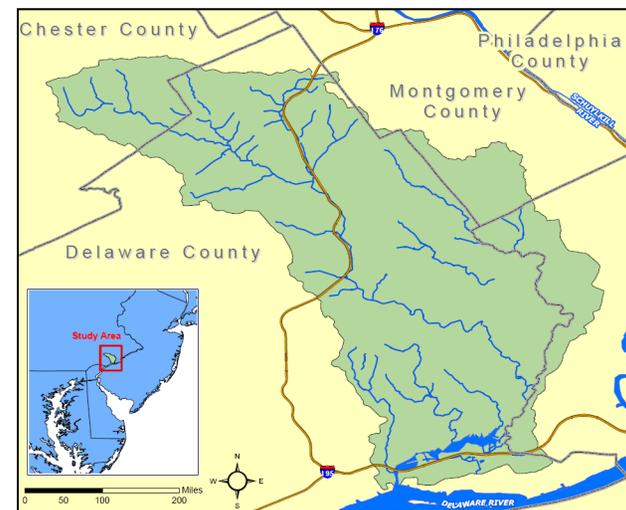


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Click the Darby-Cobbs link on:  
[www.nap.usace.army.mil](http://www.nap.usace.army.mil)

# Urban Streams in the Darby-Cobbs Watershed

Working with Nature to Address  
Complex Problems



## The Darby-Cobbs Watershed

- Drainage area= 77 square miles
- Highly urbanized
- >50% impervious (paved) surfaces
- ~500,000 residents
- 4 counties, 31 municipalities

### Problems

- Lots of stormwater
- Erosion of stream banks and stream beds
- Excess sediment in the stream channel
- Flooding
- Degraded ecosystem



Darby Creek

### Why is this happening?

**Urbanization** is the major cause of the stream problems in the Darby-Cobbs Watershed. The combination of a large percentage of **impervious surfaces** and **inadequate stormwater management** results in a large quantity of stormwater runoff during rain events. This increased runoff causes flooding and erosion.

**Traditional flood control** and **stream bank erosion protection structures** have been constructed throughout the years.

In many cases, these structures and other traditional flood and erosion control practices make the initial problem worse by :

- increasing the speed & height of flood waters thereby eroding the stream bed and banks;
- separating the river channel from its floodplain, destroying the system that provides natural flood control; and
- impairing the health of streams & wildlife.

Flooding, erosion, and habitat damage aren't pretty. Floodwaters often carry debris into the stream and erosion exposes manholes and pipes.

## Destruction of the Floodplain

**Floodplain**- flat vegetated land bordering a stream that floods periodically as part of a natural cycle. Floodplains perform a critical part of stream function and provide important habitat to plants and wildlife.

Building structures, such as homes, businesses, and roads, on the floodplain causes serious problems. These structures are prone to flooding and the floodplain cannot do its job. A missing or damaged floodplain:

- Cannot absorb floodwater or sediment
- Does not provide adequate habitat for plants or animals

### Dredging

Removing sediment from streams can have unintended consequences. It destroys streambed habitat, including the gravel beds where fish lay their eggs. It can also affect stream function:

- Widening a channel can cause erosion and buildup of excess sediment (deposition)
- Lowering the streambed separates the stream from its floodplain and can cause erosion upstream

### Hardening or Rip-Rap

- Can increase erosion of adjacent unprotected stream banks and stream bed, which disconnects the stream from its floodplain
- Increases flow for several miles downstream, which causes erosion of stream banks and the stream bed
- Reduces and destroys stream bank and stream bed habitat for fish and wildlife

### Channel Straightening

- Creates a shorter, steeper channel
- Primary cause of upstream bank and channel erosion
- Separates the stream from its floodplain
- Increases the velocity of water
- Reduces in-stream habitat



Naylor's Run

## How can this be fixed?

### Stormwater Management

- Reduces the volume of peak storm flows by mimicking the natural process of absorbing and slowly releasing floodwaters
- Options in confined areas include constructing detention basins or planting streamside riparian buffers
- More elaborate wetlands can be constructed where space is available
- Watershed-wide stormwater management in combination with small-scale stormwater treatments, such as porous pavement, vegetated ponds, riparian buffers, and detention basins, is essential to the success of future stream restoration

### Expand, Restore, & Reconnect the Floodplain



Darby Creek

Floodplains:

- Reduce the force, height, and volume of floodwaters
- Act like a sponge: 1 acre can absorb 330,000 gallons of water
- Slowly release water back into the main channel after storm events
- Trap storm debris carried by stormwater reducing potential damage
- Are self-maintaining: storm damaged vegetation regrows minimizing or eliminating maintenance cost
- Floodplain vegetation transfers thousands of gallons of water to the atmosphere daily