

Your Water, Your Future

by Dauphin County Conservation District

Dauphin County's Stormwater Publication for Municipalities
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**COMING MAY 9th -
Stormwater management
planning & design
workshop at DCCD.
Please see enclosed
flyer for details!**

DEVELOPMENT: IMPACTS ON WATER QUALITY

The next two issues of *Your Water, Your Future* focus on development. This issue is a summary of the impacts of conventional development on water resources. The next issue will follow up this topic by covering new environmentally sensitive methods of development.

Water Cycle Impacts

Land development causes changes to the way water is transported and stored. Manmade impervious surfaces, such as roofs, streets, sidewalks, and compacted earth on development sites, prevent rain from infiltrating into the soil. The effect is increased surface runoff and decreased groundwater recharge, because the water that would be soaking into the ground to replenish the groundwater supply is now being sent downstream.

Studies on this subject link high levels of impervious cover in a watershed with increases in the annual volume of runoff by 2 to 16 times the amount before development – along with proportional reductions in groundwater recharge rates. The more the watershed's natural water cycle is disrupted, the greater the water resource problems, both above and below the surface.

On the Surface: Frequent Flooding

Increasing impervious surface area in your watershed results in larger volumes of runoff flowing at higher velocities, rising in proportion to the level of development. This creates several serious problems. First, greater peak storm flows occur, resulting in more severe and frequent floods that can cause significant damage to aquatic ecosystems and private and

public property. Flooding also causes damage to wetlands and streamside vegetation and soils that naturally filter and store runoff. Another consideration is the expense added to your municipal budget to repair infrastructure – roads, sewers, bridges, utilities and culverts – damaged by flooding.

(Continued on reverse)

Quiz - True or False

1. Depending on the degree of impervious cover created by development, the annual volume of stormwater runoff can increase by 2 to 16 times its predevelopment rate, with proportional reductions in groundwater recharge.
2. Many studies suggest that aquatic biological systems begin to degrade when impervious levels in the watershed reach 10%.
3. Research has shown that stormwater pollutant loads decrease when the percentage of impervious cover in a watershed increases.
4. Polluted runoff from development activities is recognized by environmental professionals as a major threat to water quality in Dauphin County.

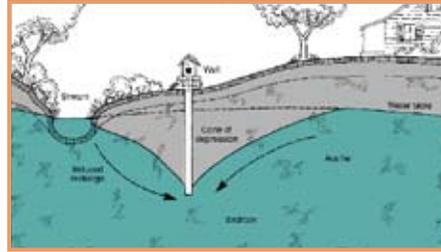
Answers on reverse side.



In 2004, Hurricane Ivan caused major flooding along the Susquehanna River in Dauphin County. Courtesy of Susquehanna River Basin Commission.

Below the Surface: Groundwater Supply Reductions

Groundwater – a source of public drinking water and stream flow during periods of dry weather – is also affected by development that creates impervious cover. When runoff cannot seep into the ground, less water is available for use – whether it be for drinking, washing, or even going for a swim in the creek. Further, with each new development site, more water is pumped from the ground to support the new site's water needs, whether it is to feed a well or to supply the local public water provider. Placing additional demands on the groundwater system can cause wells to run dry, even during a minor drought.



Pumping water from a well pulls groundwater toward the well, creating a cone of depression. This effect can cause streams and other wells nearby to run dry.

Groundwater keeps streams and rivers flowing during periods of dry weather. Waterways in developed areas are more likely to flow at shallow depths during periods of little precipitation.



Rocky road? No, it's Armstrong Creek in Halifax Twp., affected by drought conditions.

In severe cases, the stream will disappear until the groundwater levels are replenished. Under these conditions, public water providers that use streams as the source of their community's water supply face potential shortages. This can lead to temporary restrictions on public water usage. Also, as you can imagine, a stream without water is unable to sustain its aquatic habitat.

Overall: Decline in Water Quality

Runoff from developed areas carries pollution directly into our local waters. These pollutants include bacteria, nutrients, sediment, toxic chemicals, and trash. Research shows that the amount of pollutants in runoff is directly related to the percentage of impervious cover in a watershed. Polluted runoff from development activities is recognized by environmental professionals as a major threat to the water quality of Dauphin County's streams and groundwater. Toxins flowing into local waterways affect the health of the stream over time. Eventually, the impact of pollution can lead to biologically sterile streams that are nothing more than conduits for conveying stormwater runoff.



Paxton Creek

Habitat Loss and Economic Impact

Development methods that do not factor stormwater management into account create negative effects on stream, river and lake habitats. Runoff flowing at an increased volume and velocity erodes streambanks and carries large loads of sediment into the stream. According to the University of Connecticut, aquatic biological systems begin to degrade as impervious cover levels in a watershed reach 10%. As the percentage of imperviousness climbs above 10%, degradation tends to rise accordingly.

Additional sediment is washed into the stream from construction and other land disturbance activities. All this results in substantial loss of aquatic habitat, as natural streambeds of pebbles, rock ledges and deep pools are covered by a uniform blanket of eroded sand and silt. Habitat is further degraded by pollutants being washed into the stream, as mentioned in the previous section.

Flooding and bank erosion can wipe out valuable streamside riparian buffers that protect the stream channel and its banks. When buffers are in place, they are beneficial in that they: increase groundwater infiltration, decrease streambank erosion, filter sediment and pollutants from runoff, provide floodwater storage, cool water temperatures, and enhance wildlife habitat.

Maintaining pristine conditions in and around our waterways can also benefit the local economy by drawing outdoor enthusiasts with fishing, boating, hiking and bird watching opportunities. These activities can generate revenue for local businesses and, in turn, local governments.



Clockwise from above: Runoff carries sediment into Clarks Creek; trash in streams degrades in-stream habitat; signage posted near Paxton Creek, warning of Combined Sewer Overflows that release toxins and bacteria into the stream

Conclusion

Conventional forms of development can cause a host of water resource problems. However, these negative impacts can be minimized by municipal decisions that support natural resources-based planning, environmentally sensitive site design, and incorporating stormwater Best Management Practices (BMPs). Finding the balance between expanding development and protecting our natural resources will take some effort, but the potential benefits in terms of quality of life issues and enhancing the landscape far outweigh the consequences of inaction. □

Next Issue: Environmentally Sensitive Methods of Development

Quiz Answers

1-True; 2-True; 3-False; 4-True