

Stormwater and flooding issues

Chris Kriley, PE
Permitting and Technical Services
Waterways and Wetlands Program
412-442-4315



Pennsylvania Department of Environmental Protection (DEP) often receives complaints about local flooding and erosion problems,

These problems may be related to recent and past development activity. More generally, they are usually a result of changes in land cover and land use that have occurred over a period of time.

Land Development, Stormwater, and Flooding:

Progressive development in an area increases the number and the density of roads, pavements, water obstructions and buildings. This increase of impervious areas also causes an increase in the amount of stormwater runoff when it rains.

Increasing the runoff subsequently increases the frequency and severity of stream flooding. This leads to damaging erosion to occur places where the runoff is directed, particularly in stream channels.

Floodplains are those areas alongside the stream channel, where water may be expected to go during overbank flow events. In natural settings, floodplains allow water to spread out and slow down, dissipating the power of the flood, and moderating its effects. Where people have built in the floodplain, those floodplain functions are lost. Placing buildings too close to a stream puts more people and more property at risk of damage.

Urban Stream Flooding:

Flooding is a natural phenomenon. All streams and rivers have overbank flows from time to time. The density of land development in urban areas, combined with the lack of appropriate stormwater management in older communities, has dramatically increased the volume and timing of runoff in these watersheds, resulting in stream flows that are considerably more flood-prone than they would have been in pre-development times.

A related problem is stream channel erosion. Urban streams sometimes suffer overwhelming erosion of their channels. This happens because of the increased frequency of high-flow events. Stream channels affected by this problem become deeper and wider, and the streambanks become unnaturally steep or undercut as large amounts of soil wash away.

The problems of increased flood flows and stream channel instability interact in complex ways, causing serious problems for people who have property close to a stream.

Stormwater regulations

The first serious regulatory response occurred in the 1970s, when basic runoff rate controls (mostly detention ponds) were mandated for new land development. Stronger stormwater controls were instituted in the 2000s, requiring the control of stormwater to meet runoff volume and water quality requirements , in addition to peak rate control.

Pennsylvania is improving the way that new development sites manage stormwater. However, many of our existing problems occur in our most densely-developed communities. These were substantially built out during the years before any stormwater controls were required. Problems with small stream flooding and stream erosion have long-standing and complex causes, and there are no easy solutions.

The roles of different levels of government:

Each level of government has some role in the regulation of stormwater runoff. Local government has the broadest range of responsibilities. Local governments have the lead role in controlling land use changes, which they do using subdivision and land development ordinances and the land use planning process. Land use planning is the first line of defense against the unwanted consequences of poorly managed stormwater.

County governments also take an important role in community planning, including planning for water resources. Through the Act 167 planning process, counties work with municipalities to determine appropriate minimum standards for post-construction stormwater controls on new development.



The Department oversees new land development proposals as follows:

DEP oversees CCDs and assists them in implementing the Erosion and Sedimentation Control program for earth disturbance activities associated with construction.

Under the Dam Safety and Encroachments Act, DEP regulates all structures and activities that physically obstruct or encroach on wetlands, waterways, and their floodways

The Municipal Separate Storm Sewer (MS₄) Program is required by Federal law, and is administered by Pennsylvania DEP, and its requirements apply to local governments.

Local Drainage Problems:

From a historical perspective, drainage systems in older communities (built before the 1970s) were designed to simply take runoff from the surface and convey it quickly and efficiently to a stream. These systems typically consist of inlets, pipes, and outfalls. Newer drainage systems are more diverse, and somewhat more complex. They often incorporate various kinds of stormwater control measures (also referred to as “Best Management Practices”, or “BMPs”). Control measures include things such as detention/retention ponds, infiltration facilities, rain gardens, and others; that are designed to slow, capture, and/or treat a portion of the runoff before it reaches the stream.

What can be done in and around streams to alleviate small stream flooding ?

1. Removing downed trees, large woody debris, and other flood debris: Debris dams can aggravate local flooding problems. Anyone may remove debris from the channel by hand without a permit or approval from DEP. If heavy equipment is used, it must be kept out of the stream and DEP approval is required.
2. Removing debris or sediment from under bridges and inside culverts: Bridge openings and culverts can act as restrictions on the flow of water and sediment. Sometimes the hydraulic capacity of an opening becomes further reduced by accumulation of sediment. The owner of the bridge or culvert has the right and responsibility to remove excess sediment from directly beneath the bridge or from the culvert, and within fifty feet upstream and downstream, without a permit. For further advice on means and methods, please contact your DEP regional office.
3. Removing sediment from the stream channel, not at a bridge or culvert: DEP authorization is required to perform excavation, earthmoving, or construction in any waterway. The removal of sediment from a stream channel is not recommended as a way to address flooding problems. Some people mistakenly believe that removing sediment, or deepening or widening a waterway, can create additional capacity to carry flood flows. Instead it is almost certain to be ineffective, and it may de-stabilize the channel and aggravate the problem.
4. Streambank stabilization measures: Structural remedies are sometimes necessary to protect property from a severely eroding streambanks. Usually this must be done by the property owner at their own expense. For most situations, there is more than one technical option. These options can range from restoring the stream to a natural condition with boulders and plants, to various kinds of engineered structures. All projects require a stream encroachment permit from DEP, and may also require a Federal permit.