9. Streams and Rivers

Where People, Land and Water Meet

by Susan Beecher, District Manager, Pike County Conservation District

"Water has a voice. It carries a message that tells those downstream who you are and how you care for the land."

~ Bernie McGurl, Lackawanna River Association

Throughout history, people have settled near waterways and Pike County is no exception. Rivers and streams are among the most important natural resources in the region. A network of waterways, from the smallest of headwater streams to the mighty Delaware River, grace the watersheds of Pike County, supporting a growing human population and a diverse array of fish and wildlife, and providing scenic beauty and countless opportunities for recreation. Local streams and the fish and other aquatic life they support are also barometers of the health of the lands they travel through.

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The Changing Character of Streams

Streams are dynamic systems, constantly changing and interacting with the landscape. The way streams look and behave depends on the geology and climate of a region. **Headwater streams**, which occur at the highest elevations of a watershed, tend to comprise the majority of stream miles in a watershed. Streams can also be defined by their flow characteristics. **Perennial streams** have year-round flow. **Intermittent streams** have seasonal flow which may disappear during drier periods of the year. Flow in an **ephemeral stream** generally occurs only during or immediately after rainfall events. All of these streams, regardless of whether they have year-round flow, are important to maintaining

The Lackawaxen River

both the hydrologic and the ecological balance of our watersheds.

It is the nature of streams to change course, adjusting their channels and banks in response to natural or human-made changes. The bottom or beds of streams are scoured during floods, channels move, floodplains are inundated, cross sections change, new gravel bars, riffles and pools are formed, banks erode and debris is constantly removed and redeposited. These are all natural processes associated with flowing waters.

Unfortunately, it is also the nature of people living near streams to try to interfere with these processes. Since many Pike County stream and river shorelines are privately owned, streamside property owners have a key role to play in the health of these resources both now and in the future. Understanding the dynamics of streams and rivers will help us to reduce the problems that may occur where land (and people) and water meet.

While streams are considered ecosystems within themselves they are also part of a "landscape continuum." What happens on the land has profound effects on streams. As watershed lands are developed, flow patterns are changed, native forest vegetation is removed and more areas are covered by rooftops, parking lots, roads and other impervious surfaces. Impacts associated with these human-made changes include stream bank erosion and channel changes, increased pollutant loading, stream warming and reduced diversity of aquatic life.

Riparian Buffers & Floodplains: Nature's Safety Net

Floodplains are lowland areas adjacent to streams and rivers that are susceptible to inundation by water during floods. The "100-year" floodplain is commonly referred to and includes the area that would be inundated by a flood having a 1% chance of occurring in any given year. A "100-year" flood can occur during any given year if conditions are right.

On left, vegetation has been removed, increasing the risk of flooding and jeopardizing stream health. On right, intact buffer of trees and shrubs aids in reducing flooding and is essential to protecting this stream and the aquatic life it supports.

Floodplains often contain wetlands and other areas vital to a diverse and healthy stream ecosystem. The **floodway** is a part of the larger floodplain, and includes the stream

channel and portions of the adjoining floodplain land that must be preserved in order to allow the discharge of the base flood without increasing flood heights more than a designated amount. By regulation in Pennsylvania, the floodway, in areas that do not have detailed floodplain mapping (this includes most streams in Pike County), is assumed, absent evidence to the contrary, to extend 50 feet back from the top of bank on both sides of the stream.

Floodplains perform a variety of functions and in the process prove valuable to both humans and fish and wildlife species. Important functions of stream floodplains include: flood water storage, water quality maintenance, erosion control, fish and wildlife habitat, and recreation/open space. What happens in a floodplain can have negative impacts both within a property as well as in areas located upstream or downstream.

What happens when human activities interfere with floodplains? Removing vegetation, compacting soil and placing fill or structures in floodplains all have the potential to diminish the flow capacity of floodplains, increase flow velocities in streams and raise flood levels so that areas formerly not at risk become endangered. Patterns of flow may also change, potentially increasing erosion and damaging infrastructure and streamside properties.

The ability of floodplains to carry and store floodwaters should be preserved and respected. By adapting our activities to the natural phenomenon of flooding, rather than trying to control floodwaters, we can maintain the invaluable services provided by floodplains, reduce infrastructure and property damage, protect critical natural and cultural resources and promote sustainable development of our communities.

A **riparian buffer** is a streamside area of trees, shrubs and other vegetation that serves as a transition zone between water and human land use. Forested areas are the most beneficial type of buffer because they most effectively slow and filter surface runoff, protect banks, provide shade, control temperature, and provide food and habitat for many aquatic and terrestrial species of wildlife. Streams whose banks are protected by a network of woody vegetation can also better accommodate the normal stresses of flooding, changes in flow patterns and other results of human activities on the land.

How Buffers Work to Protect Streams:
Sediment Filter - Riparian buffer soils and vegetation help catch, settle and filter out sediment and debris from surface runoff.
Pollution Filter, Transformer, and Sink - The riparian buffer traps pollutants such as phosphorus and nitrogen that could otherwise wash into streams.

Benefits of Forested Riparian Buffers

- **Water Quality Protection**
- **Erosion Control**
- **Flood Protection**
- **Stormwater Management**
- **Temperature Moderation**
- **Wildlife Habitat**
- **Recreational Greenways**

Chemical and biological activity in the soil, particularly of streamside forests, can capture and transform nitrogen and other pollutants into less harmful forms. These buffers also act as a sink when nutrients and excess water are taken up by root systems and stored in the biomass of trees.

Stream Flow Regulator - By slowing the velocity of runoff, the riparian buffer allows water to slowly infiltrate the soil and recharge the groundwater supply. This helps control flooding and maintains stream flow during the driest times of the year.

Bank Stabilizer - Riparian buffer vegetation helps to stabilize streambanks and reduce erosion. Roots hold bank soil together, and stems protect banks by deflecting the cutting action of waves, ice, boat wakes, and stormwater runoff.

Bed Stabilizer - Riparian buffers can also reduce the amount of streambed scour by absorbing surface water runoff and slowing water velocity. When plant cover is removed, more surface water reaches the stream, causing the water to crest higher during storms or snowmelt. Stronger flow can scour streambeds, impacting aquatic life.

Wildlife Habitat - The distinctive habitat offered by riparian buffers is home to a multitude of plant and animal species, including those rarely found outside this narrow band of land influenced by the river. Continuous stretches of riparian buffer also serve as wildlife travel corridors.

Aquatic Habitat - Forested riparian buffers benefit aquatic habitat by improving the quality of nearby waters through shading, filtering, and moderating stream flow. Shade in summer maintains cooler, more even temperatures, especially on small streams. Cooler water holds more oxygen and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on their survival. Woody debris feeds the aquatic food web. It also can create stepped pools, providing cover for fish and their food supply while reducing erosion by slowing flow.

Recreation and Aesthetics - Forested buffers are especially valuable in providing a green screen along waterways, blocking views of nearby development, and allowing privacy for river front landowners. Buffers can also provide such recreational opportunities as hiking trails and camping.

How Big Should a Buffer Be?

There is no "one-size-fits-all" width for the ideal riparian buffer that will keep water clean, stabilize banks, protect fish and wildlife and satisfy human demands on the land. Many factors play a role, including slope, soil and vegetation types, floodplain, surrounding land uses, watershed area and what functions the buffer is expected to perform.

Forests provide as much as 40 times the water storage of a cropped field, and 15 times that of grass turf.

A basic buffer of 50' from the top of both stream banks may provide protection against bank erosion, but a wider buffer (100 feet or more) is generally recommended to filter nutrients and provide flood control. If fish and wildlife populations are considered, even wider buffers of 300 to 600 feet may be necessary for habitat and movement corridors. *As a rule, you get more benefits with every foot of buffer, and wider buffers are needed in areas of steep slopes, intensive land use or along larger streams and rivers that drain large land areas.*

Natural riparian buffers have been lost in many places over the years. Fortunately, many streams in Pike County watersheds still have at least a portion of these protective buffer zones intact. This is one of the primary reasons that many of the County's waterways are classified by the PA Department of Environmental Protection (PA DEP) as High Quality or Exceptional Value, with an abundance of desirable fish species and other aquatic organisms and the habitats and water quality necessary to support them.

The 2005 PA Fish & Boat Commission's List of Streams Supporting Wild Trout (naturally reproducing trout populations) had 37 listings for Pike County. In addition, some of Pike County's streams are designated in the County Natural Areas Inventory as important **Waterfall and Plungepool Communities** and **High-gradient Clearwater Creeks** that support rare plant and/or animal species.

However, in the next decades, Pike is expected to absorb thousands of new residents, which in turn will result in the development of thousands of acres of land for residential and commercial purposes. Riparian forest buffers are perhaps the simplest and the single most important means for protecting our water resources in the face of this growth.

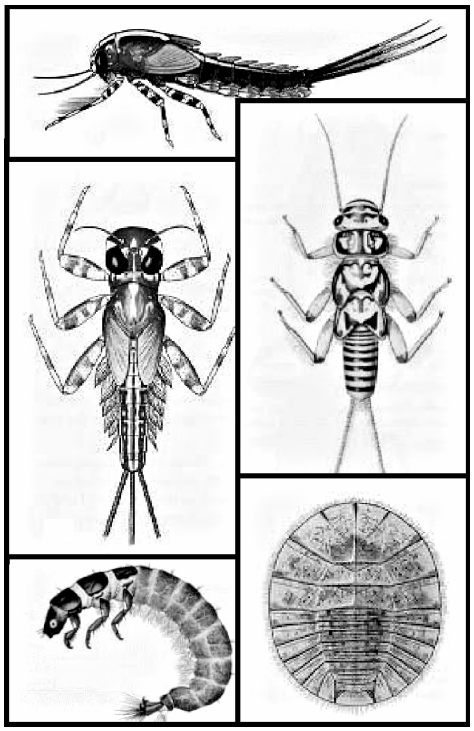
Tracking the Health of Pike County Streams

In 1987, in the face of rapidly increasing residential and commercial development and concerns over potential impacts from this development, the Pike County Conservation District initiated a stream-based water quality

monitoring program. Since 1991 the District's program has included sampling at the mouths of the County's 18 major watersheds, sites above and below the discharges of up to 20 wastewater treatment plants and a number of other sites in watersheds to measure non-point source pollution impacts from various land uses throughout the County. The monitoring program includes sampling for physical (air and water temperature), chemical (pH, dissolved oxygen, etc.) and biological (aquatic insect and fish) parameters.

What Insects and Fish Tell Us About Streams

Aquatic insects that inhabit streams are good biological indicators of stream health and water quality. They represent important links in the food chain as recyclers of nutrients and food for fish. Because they are relatively sedentary residents of stream bottoms these insects can be affected over the short-term by even subtle changes in stream habitat or pollutant levels. There are many types of aquatic insects, each with specific requirements for survival. Some are very intolerant of pollution, while others are quite tolerant. The abundance and diversity of these insects, including the presence or absence of species that are tolerant and intolerant to water pollution, provides an indication of overall stream health.



"Pollution sensitive" aquatic insects: Stonefly and mayfly nymph and larvae of water penny and caddis fly. Their presence and relative abundance in a stream provides an excellent indicator of water quality and stream habitat conditions.

Fish are also good "bio-indicators" of longer-term water quality and habitat conditions because they are relatively long-lived. In addition, the environmental requirements of most fish, including pollution tolerance, are well known. Fish are also sensitive to changes in water temperature, dissolved oxygen, turbidity and food sources. External deformities observed on fish, such as tumors or ulcers, can indicate stress resulting from

chemical pollutants.

Over the years, the monitoring data collected, has been used by the Conservation District, PA DEP, the Delaware River Basin Commission, PA Fish & Boat Commission, National Park Service and others to highlight Pike County's high quality water resources, to support stream classifications and other conservation initiatives and to address ecological and public health issues related to wastewater treatment facilities in the County. The data provides an excellent representation of the condition of the County's State-designated High Quality and Exceptional Value streams, reflecting not only the condition of stream habitat and water quality but also the overall health of the County's watersheds.

Summary

Streams and rivers are unique cultural and ecological resources that figure prominently in the history of Pike County. The streams of Pike County's major watersheds are all designated as High Quality and Exceptional Value water resources by the PA DEP. These streams, whether they run year-round or seasonally, are protected under local, state and federal laws.

Human activities, whether in or adjacent to streams, can negatively impact streams and the aquatic life they support and can result in damage to personal and public property. Very important to stream health are the land use activities that occur throughout a watershed and the conservation practices of residents. Avoiding encroaching on streams and maintaining streamside buffers are two important measures that residents can take to protect Pike County streams and the many benefits these waterways provide.

Streams and the aquatic life they support act as barometers of the health of a watershed, reflecting not only the land use activities taking place but also the manner in which those land use activities are happening and the land use regulations in place to guide them. Streams are also community resources providing aesthetic value and recreational opportunities. Effective long-term conservation of the streams of Pike County's watersheds depends in large part on the willingness of residents to practice watershed stewardship measures to protect these valuable, yet highly vulnerable, natural resources.

Action Steps for Stream and River Protection

☞ Maintain or replant a riparian or streamside buffer of trees and shrubs to capture non-point source pollutants in stormwater runoff, stabilize stream banks and provide shade.

☞ Respect floodplain areas – avoid placing roads, struc-

tures, rubbish and storing personal property in areas adjacent to streams.

☞ Prior to doing any work in or adjacent to streams, check to make sure any required local, state and federal permits have been obtained.

☞ Support municipal officials in the adoption of ordinances for requirements for buffers and setbacks and other ordinances designed to protect streams.

☞ Avoid mowing down to the edge of streams.

☞ Keep horses and other livestock away from stream banks and out of stream channels.

☞ Keep yard waste off of stream banks and out of streams.

Resources for More Information

Pike County Conservation District: www.pikeconservation.org

PA DEP, Restoring and Conserving Stream Buffers: www.depweb.state.pa.us/dep/site/default.asp. Select "Search" and "Stream Releaf."

U.S. EPA: Water Quality Monitoring: www.epa.gov/owow/monitoring/volunteer/