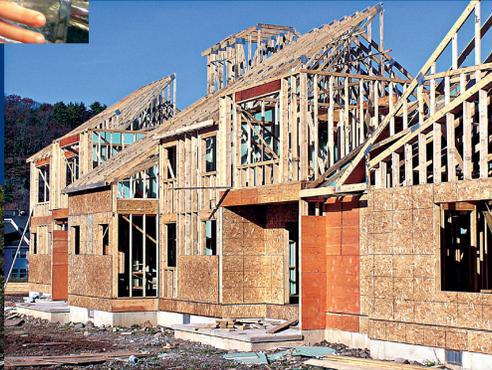


PIKE COUNTY: Where People, Land and Water Meet



*A Citizen's
Guide to
Clean Water*



***CLEAN WATER • SAFE HOMES
A HEALTHY ENVIRONMENT***



Pike County: Where People, Land and Water Meet

A Citizen's Guide to Clean Water

Protecting drinking water and water testing • Maintaining on-lot sewage treatment systems • Agency contact information for environmental problems & emergencies • Identifying and protecting wetlands on your property and much more.

Project Coordinator:

Pike County Conservation District

Project Partners:

Bushkill Watershed Conservancy
Delaware Highlands Conservancy
Delaware Township Supervisors
Twin and Walker Creeks Watershed Conservancy

Funded by:

The League of Women Voters of Pennsylvania Citizen Education Fund through a Section 319 Federal Clean Water Act grant of the US Environmental Protection Agency administered by the PA Department of Environmental Protection. Additional funding provided by the Delaware Highlands Conservancy.





Dedicated to the Children of our Communities

*They deserve a future that includes
clear-flowing streams and rivers,
clean and abundant drinking water supplies,
healthy lakes for recreation and aesthetic values,
and ecologically rich wetlands
with all the attendant benefits they offer.*

*It is our responsibility, as good stewards of Pike
County's water resources, to provide a future
that offers all these things.*

The people have a right to clean air, pure water, and
to the preservation of the natural, scenic, historic and
esthetic values of the environment.

Pennsylvania Constitution
Section 27, Article 1

**Your Opinion Counts.
We Want to Hear from You!**

Let us know what you think of this reference guide for Pike County residents. Take a minute to call, write, or send us an email message (contact information listed below). Your feedback will help us to improve this publication for future editions.

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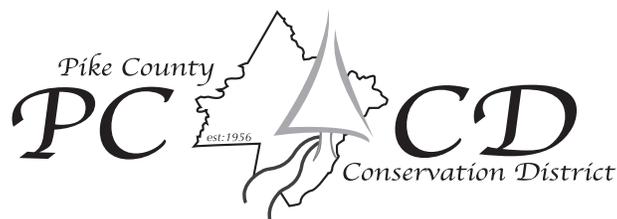


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Preface

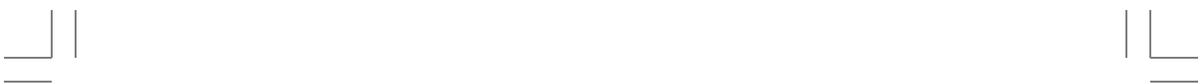
This reference guide is for any part or full-time resident who is interested in learning more about what they can do to contribute to the protection of Pike County's streams, rivers, lakes, wetlands, and groundwater resources. Emphasized throughout are good stewardship practices that residents can adopt as well as how these practices safeguard not only environmental health, but also personal property, economic investment and family well-being.

Each chapter closes with a **Summary**, a list of **Action Steps** as well as **Resources for More Information**. The **Introduction**, along with **Chapters 1** and **2**, covers what is unique and what is at stake with a focus on the County's high quality water resources. **Chapters 3, 4, and 5** cover three of the primary sources of water pollution in Pike County: On-lot sewage treatment systems, stormwater runoff and soil erosion. Options for homeowners and community associations are outlined.

Chapters 6, 7, 8 and 9 provide detailed information on groundwater and wetlands protection, pond and lake management and stream and river conservation. Last, but by no means least, are **Chapters 10, 11 and 12** on environmental regulations, smart growth strategies and how citizens can get involved in their communities.

The **Appendices** include, agency contact information for environmental complaints, problems and emergencies; meeting schedules and contact information for Pike County's thirteen municipalities; suggestions for home water testing; volunteer opportunities with local environmental organizations, including local watershed groups; water saving measures for the homeowner; and developing protection plans for community water supply wells.

We hope you find the information in this publication to be useful in answering any questions you have as well as in providing new ideas for protecting the water resources of Pike County. For more information, visit the Conservation District's Natural Resource Learning Site at www.pikeconservation.org, or contact us via email: pikecd@pikepa.org or by telephone at 570-226-8220.



Foreword

This publication is aptly named “Pike County: Where People, Land and Water Meet.” The land and the water have always been here and we are still blessed with exceptional natural resources today. But the equation is rapidly changing. The people factor is growing dramatically.

During the 150 years from 1820 to 1970, Pike County’s population never exceeded 10,000 people. However, by 2000 that number had reached 46,000 and predictions are that at “build-out,” our population could reach or even exceed 150,000. That’s at least three times as many people as we are today.

Being people, and living modern day lifestyles, we inevitably affect the land and the water. We cannot totally avoid that. Yet we must realize that the land and the water can only withstand a finite degree of “people impact” before they can no longer sustain us. They need our help.

This publication is designed, first, to help Pike County residents better understand how we as individuals, and collectively in our communities, affect the land and the water. Secondly – and very importantly – it also addresses what we can do to lessen the impacts we have.

We can make all the difference. Most of the things we can do are pretty simple and straightforward. All it takes is a little knowledge and the will to do our part.

Get involved – as an individual and as a member of your community. Do the things around your home that will contribute to the conservation of the land and the water. Then, encourage and support your municipal leaders in putting adequate planning and ordinances in place. These are key to our future.

We can save at least some part of the rural, scenic, historic, natural resource-rich atmosphere we all enjoy living in, while accommodating the growth in population that is now upon us and will continue. It’s up to us.

Roy Borgfeld
Board Chairman
Pike County Conservation District

1. Watersheds

Connecting People, Land and Water

by John Jose, Watershed Specialist, Pike County Conservation District

*“When the land does well for its owner,
and the owner does well by his land –
when both end up better by reason of their partnership –
then we have conservation.”*

– Aldo Leopold

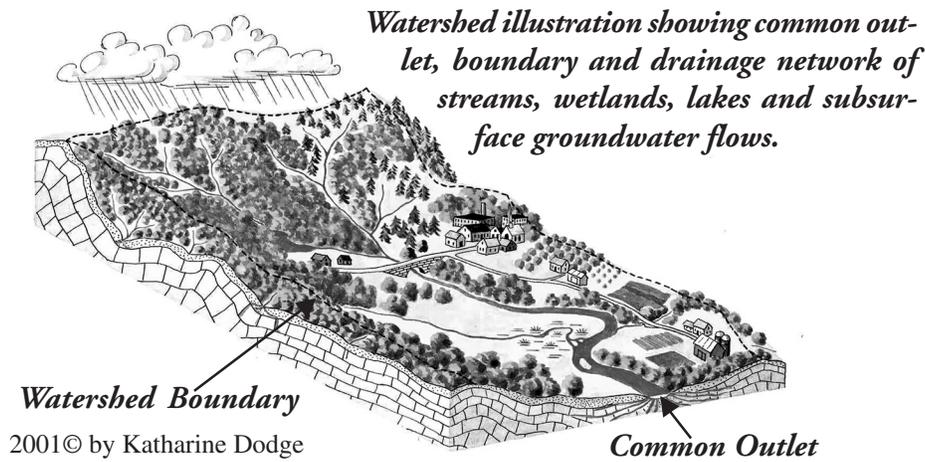
All lands covering the Earth’s surface are divided into **watersheds**. At any given time a person will find his or herself in the watershed where they live or as a visitor in a watershed that other people call home.

**All lands covering the Earth’s surface
are divided into watersheds.**

A watershed can be compared to a large basin that captures all the precipitation (rain, snow, etc.) that falls within its **boundary**. A watershed boundary is formed by highpoints in the landscape, where an unbroken, continuous ridgeline creates a divide between adjacent basins. Each watershed has its own uniqueness based on climate, differences in topography (flat vs. rolling hills or mountainous), the types of plants and soils found there and, very importantly, both past and present **land use activities** that have taken place. Examples of land use activities include commercial, industrial and residential development, farming, mining, logging, and recreational activities.

Watersheds vary greatly in shape and size from the greater Atlantic Basin that extends from the Continental Divide to the east coast of the U.S., down to a smaller **sub-watershed** – or watershed within a watershed – of less than an acre draining into a local backyard pond. Pike County watersheds are part of the larger Delaware River Basin that drains portions of New Jersey, New York and Pennsylvania. The County’s eighteen major watersheds range in size from the Lackawaxen River Watershed that encompasses nearly 600 square miles, occupying portions of two neighboring counties, to the Vandermark Creek Watershed that lies entirely within County boundaries and occupies less than 6 square miles of drainage area.

The precipitation that a watershed receives flows naturally from the upper, higher elevation areas downward through its **drainage system** – a network of interconnected streams, ponds, wetlands and subsurface groundwater flows – eventually reaching a **common outlet**. Sometimes referred to



as the “receiving body of water,” the common outlet serves as the potential destination for any water moving through a watershed’s drainage system. The health of the common outlet reflects both the condition of a watershed as well as the overall health of a basin’s water resources.

The health of the common outlet reflects the overall health of a watershed.

Pike County Major Watersheds

A watershed typically gets its namesake from its common outlet. Listed below are the eighteen major watersheds of Pike County.

- | | |
|--------------------------|-------------------------------------|
| 1. Bushkill Creek | 10. Vandermark Creek |
| 2. Saw Creek | 11. Cummins Creek |
| 3. Little Bushkill Creek | 12. Bush Kill (Millrift) Creek |
| 4. Toms Creek | 13. Little Walker/Twin Lake Creek |
| 5. Hornbecks Creek | 14. Shohola Creek |
| 6. Dingmans Creek | 15. Lackawaxen River |
| 7. Adams Creek | 16. Masthope Creek |
| 8. Raymondskill Creek | 17. Wallenpaupack Creek |
| 9. Sawkill Creek | 18. East Branch Wallenpaupack Creek |

Special Protection Watersheds

All of Pike County’s major watersheds have been granted **Special Protection** status by the PA Department of Environmental Protection (PA DEP). The streams that drain these watersheds are PA DEP classified as either **High Quality (HQ)** or **Exceptional Value (EV)** water resources affording them additional protection from potential adverse impacts from

land use activities – including residential and commercial development – through state environmental regulatory programs.

What does this mean to Pike County residents? Overall, residents enjoy good quality and generally abundant groundwater for drinking water supplies; healthy coldwater streams supporting diverse aquatic life; biologically rich wetlands that also provide for water



All Pike County watersheds drain to the Delaware River

filtration, groundwater recharge, and stormwater and flood control; and lakes offering recreational and aesthetic value among many other benefits.

The looming question is whether or not these water resources will be maintained in their current state in the face of the County's very significant and increasing land development pressures. Simply having Special Protection status does not guarantee the County's Exceptional Value and High Quality water resources will remain High Quality and Exceptional Value. However, managing these water resources on a watershed basis could provide officials and residents with an excellent framework from which to protect these water resources.

Watershed Management

Managing water resources on a watershed-basis provides a logical and highly effective framework for both surface and groundwater protection. Why? Because watersheds are natural systems that link the land and water resources and the living organisms, including people, within their boundaries.

Neither the water flowing through a stream nor the groundwater moving beneath the surface recognizes the political (municipal, county or state) boundaries drawn on a watershed. This makes cooperation between residents, community associations and neighboring governments, that share the water resources of a watershed, essential.

Intermunicipal cooperation is particularly important in Pennsylvania where decisions on land use and protection of natural resources, made in local townships and boroughs, in large part determine the future of communities. Neighboring municipalities, whose political boundaries fall partly or completely within the same watershed, can benefit residents by working together to manage natural resources and taking a more holistic, long-term

approach to stormwater management and flood control, groundwater protection and stream conservation, to mention a few of many advantages.

Do You Know Your Watershed Address?

Where does the water that rains on your home and the surrounding landscape go? After it leaves your lawn, street or driveway where is it headed? Does it flow downhill straight to a nearby stream or lake or wander into wetlands?

Whether it's a pond, stream or lake, that destination determines your watershed address. Just like there are towns, within counties within states, in a natural watershed system there are sub-watersheds within watersheds within drainage basins. A watershed address provides a natural reference point that orients residents to the watershed they reside in.

Watersheds are natural systems that link the land and water resources and the living organisms, including people, within their boundaries.

For example, the rain that falls on your driveway might flow into McConnell Pond, which flows into McConnell Creek, which flows into Shohola Creek, which flows into the Delaware River. So your watershed address would be: McConnell Pond, McConnell Creek, Shohola Creek, Delaware River even though your mail finds you through Hemlock Farms, Blooming Grove, PA.

Watershed Stewardship

As important as it is for landowners living next to a stream, pond or wetland to practice good water resource stewardship, it is just as important for the residents of the entire watershed to make their contribution. Although a resident may not feel that their individual efforts are significant, the collective efforts of all watershed residents can make a difference. Among the many options discussed throughout this book, good backyard stewardship practices include the following:

- Controlling non-point source pollution (Chapter 2)
- Maintaining on-lot sewage disposal systems (Chapter 3)
- Managing stormwater runoff (Chapter 4)
- Preventing groundwater contamination (Chapter 6)
- Maintaining streamside vegetation (Chapter 9)

Pike County Watershed Organizations

Although watershed groups vary as much as the watersheds they

advocate for, they all share one common goal: Conservation of the natural resources, particularly the surface and groundwater resources, of the watershed they represent. As this publication goes to press, there are four active watershed groups in Pike County:

- Bushkill Watershed Conservancy
- The Lackawaxen River Conservancy
- Lake Wallenpaupack Watershed Management District
- Twin and Walker Creeks Watershed Conservancy

These organizations assume many roles and responsibilities including:

- Promoting awareness of the importance and uniqueness of the water resources of their watershed and the need for good stewardship practices.
- Working cooperatively with municipal officials in land use planning efforts that incorporate smart growth strategies and conservation of community natural resources.
- Obtaining financial and technical resources to address problems affecting water quality of lakes and streams, including stream restoration efforts and controlling stormwater runoff.
- Providing a voice for the concerns of citizens, bridging the gap between residents, community associations and local, state and federal governments.
- Providing educational opportunities for a wide variety of audiences.
- Monitoring the water quality of streams, rivers and lakes.

Citizen-based watershed groups provide an invaluable service to watershed residents – both current and future – by working for the protection of the water resources so critical to the health of residents, the regional economy and the environment. To remain a vital and effective voice for the concerns of residents, watershed organizations need local support.

Contact information for Pike County’s four active watershed organizations is listed below. For more detailed information, including what current resource conservation initiatives they are undertaking and volunteer opportunities they offer, refer to Appendix A, “Watershed Organizations in Pike County: Information and Volunteer Opportunities.”

Citizen-based watershed groups provide an invaluable service to watershed residents by working for the protection of the natural resources so critical to the health of residents, the regional economy and the environment.



Bushkill Watershed Conservancy

P.O. Box 193 • Bushkill, PA 18324

Telephone: 570-226-8220 (Pike County Conservation District)

Email: pikecd@pikepa.org

Web site: www.bushkillwatershed.org/index.htm

Lake Wallenpaupack Watershed Management District

P.O. Box 143 • Hawley, PA 18428

Telephone: 570-226-3865

Email: lwwmd@ptrd.net

Web site: www.wallenpaupackwatershed.org

The Lackawaxen River Conservancy

P.O. Box 176 • Rowland, PA 18457

Email: TLRC@ltis.net

Web site: www.lackawaxenriver.org

Twin and Walker Creeks Watershed Conservancy

Peter Wulforth, President

100 Walker Lake Road • Shohola, PA 18458

Telephone: 570-296-3400

Email: PtW3@psu.edu

Web site: www.twcwc.com

Summary

Watersheds are natural systems linking land, people and water. What happens on the land can affect both surface and groundwater resources and in turn, the residents of a watershed.

All of Pike County's major watersheds have been designated Special Protection watersheds by the PA DEP. The streams of these watersheds are all classified as High Quality (HQ) or Exceptional Value (EV).

However, Special Protection, HQ or EV status cannot guarantee the County's water resources will remain in their high quality state as land development pressures continue to increase. A commitment that includes cooperative efforts on the part of residents, local officials, communities, resource conservation organizations and the business sector is needed. Residents can start right at home by learning their watershed address and what they can do in their own backyard.

Managing natural resources on a watershed basis provides an effective framework for water resource protection. Because the water flowing through a stream or beneath the surface as groundwater does not recognize

political (state, county, municipal, etc.) boundaries, cooperation – particularly among neighboring municipalities – is critical.

Citizens-based watershed organizations provide an invaluable service to watersheds residents, both current and future, by working toward the protection of the water resources so important to the health of residents, the regional economy and the environment. To remain a vital and effective voice, Pike County's watershed organizations need the support of local residents. Residents can contact the watershed organization representing their watershed to find out what volunteer opportunities exist and how they can lend their support.

Action Steps for Watershed Conservation

- ☞ Join and support a local watershed organization (Appendix A).
- ☞ Learn your watershed address and what you can do in your own backyard to protect the watershed you live in.
- ☞ Support local municipal officials (Appendix B) in their efforts to work with neighboring municipalities in watershed-based natural resource management.

Resources for More Information

Bushkill Watershed Conservancy: www.bushkillwatershed.org/

Lake Wallenpaupack Watershed Management District:
www.wallenpaupackwatershed.org

PA DEP: www.dep.state.pa.us/info.htm, select “Watershed Management.”

Pennsylvania Organization of Watersheds and Rivers:
www.pawatersheds.org/

Pike County Conservation District: www.pikeconservation.org. Select “Water.” Includes links to Pike County watershed group web sites and digital watershed maps.

The Lackawaxen River Conservancy: www.lackawaxenriver.org/

Twin and Walker Creeks Watershed Conservancy: www.twcwc.com/index.htm

US EPA, Watershed Academy Web. On-line training in watershed management: www.epa.gov/watertrain/.

2. Non-point Source Pollution

Living on the Landscape and How We Affect Our Shared Water Resources

by John Jose, Watershed Specialist, Pike County Conservation District

*“Water is the most critical resource issue
of our lifetime and our children’s lifetime.
The health of our water is the principle
measure of how we live on the land.”*

-Luna Leopold

For many people, the term “water pollution” conjures up an image of a river with litter-strewn banks and chemical pollutants discoloring the river. A walk along our imagined river’s edge may reveal a source of pollution such as a discharge pipe from an industrial manufacturing facility releasing chemical wastes.

Non-point source pollution now accounts for over 75% of Pennsylvania’s total water pollution problem.

Scientists interested in cleaning up and restoring this river would classify the discharge pipe as a **point source of pollution**. In the case of a point source of pollution a person can literally point to and readily identify the origin of a pollution problem, which, in the case of our river, would be the discharge pipe releasing chemical wastes.

Since the inception of the Federal Clean Water Act of 1972, much progress has been made in reducing the impacts of point sources of pollution. Today, many formerly severely contaminated rivers and lakes in the U.S. have recovered significantly due to clean-up efforts that included elimination or better control over point sources of pollution.

Discharges from stormwater and sediment control basins and sewage treatment plants to streams, lakes and wetlands are examples of point sources of pollution found in Pike County. While environmental regulations exist to minimize their impact, these sources of pollution still present a potential source of water degradation to the County’s state-designated High Quality and Exceptional Value water resources.

Non-point Source Pollution

In recent years, efforts at maintaining and restoring water quality have increasingly focused on another type of pollution known as **non-point**

source pollution, which, according to a 1998 PA Department of Environmental Protection (PA DEP) report, now accounts for over 75% of Pennsylvania's total water pollution problem. In addition, the U.S. Environmental Protection Agency estimates that non-point source pollution is now the single largest cause of degradation of our nation's water resources.

Non-point source pollution demonstrates the direct connection that exists between human activities on the land and how we affect our shared water resources.

Non-point source pollution demonstrates the direct connection that exists between human activities on the land and how we affect our shared water resources. Originating from many diverse, scattered sources across our watersheds, non-point source pollution is often a less obvious source of water degradation. While the cumulative effects can pose a challenge to maintaining Pike County's surface and groundwater resources, the good news is, there are many measures that residents, communities and municipal officials can take to help control this pollution problem.

Listed below are examples of locally occurring sources of non-point source pollution and steps that can be taken to lessen or prevent their impacts.

Stormwater Runoff

Stormwater runoff – created when rain or snowmelt accumulates and runs across the surface of the land – occurs naturally in undeveloped watersheds. However, increasing land development, particularly where land use regulations and planning for stormwater management are inadequate or lacking altogether, creates increasing volumes of stormwater impacting Pike County's natural resources, residents and communities.

Stormwater moving across the human-built landscape picks up and transports non-point source pollutants including soil sediment, fluids leaked from automobiles, road de-icing agents, lawn and garden chemicals, pet and livestock waste, and debris. As a consequence residents, community associations and municipalities must cope with pollution of surface waters and in some cases contaminated community drinking water supplies.

The most effective strategy for managing stormwater is to prevent it from being created in the first place. Options in stormwater management exist for residents, community associations and municipalities. See Chapter 4, "Stormwater Management," for more information.

Erosion and Sedimentation

Erosion and sedimentation – the wearing down of soil layers and the movement of soil particles from one place to another – are naturally occurring processes. However, rates of erosion and sedimentation increase in Pike County’s developing watersheds as land development activities, particularly residential and commercial development, expose bare soil to the erosive forces of stormwater runoff.

Soil sediment in stormwater is frequently carried and deposited in a nearby stream, river, pond, lake or wetland. The impacts of sediment pollution to these surface waters include loss of fish and other aquatic life and accelerated rates of aquatic plant growth. Excess soil sediments also pollute public water supplies increasing treatment costs.

Developing and following an Erosion and Sediment Control Plan (E&S Plan) – a requirement for both small-scale and large-scale land development projects in Pike County’s Special Protection watersheds – is a highly effective way to minimize soil erosion from land development sites. For more information on developing an E&S Plan, and controlling erosion and sedimentation pollution, refer to Chapter 5.

On-lot Sewage Treatment Systems

In Pike County, as throughout much of rural Pennsylvania, wastewater produced by households is typically treated and disposed of by on-lot sewage treatment systems. In effect, each homeowner has his or her own small-scale sewage treatment plant on site and it is the homeowner’s responsibility to ensure the proper use and functioning of their system.

The most important aspect of on-lot sewage treatment system maintenance and care is pumping a septic tank frequently enough to prevent system failure.

When properly used and maintained, on-lot systems can provide years of treatment of household wastewater and act as a safeguard for both environmental and human health. However, poor maintenance and improper use increase the risk of an on-lot system malfunctioning or even failing entirely, increasing the risk of contamination of community groundwater supplies.

The most important aspect of on-lot sewage treatment system maintenance and care is pumping a septic tank frequently enough to prevent system failure. On-lot systems, including their maintenance and proper use, are covered in more detail in Chapter 3.

Lawn and Garden Chemicals

Lawns and garden chemicals, including pesticides, herbicides (weed killers) and fertilizers, are all potential non-point source pollutants that can contaminate both surface and groundwater. While the amount of lawn and garden chemicals applied to a single lawn or garden may seem insignificant, the cumulative impacts within a watershed can raise concerns. There are several options available to residents and communities to reduce or eliminate the need for lawn and garden chemicals including the following:

- Have lawn and garden soils tested before applying fertilizers. The results of an inexpensive and simple **soil test**, available from your local Penn State Cooperative Extension Office, will provide the levels of soil nutrients present in a lawn or garden and the proper amounts of fertilizer needed, reducing the risk for pollution of surface and groundwater through over-application.
- Apply pesticides or herbicides according to label directions to avoid personal health hazard and over-application.
- Dispose of pesticides through the PA Department of Agriculture's **Chemsweep Program**. See resources for more information at the end of the chapter.
- Adopt **IPM (Integrated Pest Management)** strategies designed to minimize or eliminate the need for chemical applications to lawns and gardens.
- Learn **organic gardening** techniques including the use of "bio controls" that are generally less toxic and degrade more quickly causing less environmental impact.

For more information on IPM and organic gardening, refer to Resources for More Information at the end of this chapter. In addition to providing many other benefits, a buffer of trees and shrubs (Chapter 9) maintained along streams, ponds or wetlands, can intercept and greatly reduce the amount of fertilizers and other non-point source pollutants that would otherwise enter these surface waters in stormwater runoff from yard areas.

Automobile Fluids

For do-it-yourselfers who change their own automobile fluids, including motor oil, proper disposal practices should be followed. One gallon of used motor oil poured on the ground, down a household

One gallon of used motor oil can contaminate up to two million gallons of water!

drain, stormwater drain or an abandoned well can contaminate up to 2 million gallons of water! Automobile parts stores or service centers often accept used motor oil for recycling. Also, care should be exercised in storing and pouring gasoline to avoid spills. MTBE, a chemical constituent of gasoline, has been detected in water supply wells in Pike County.

While the fluids leaking from an individual car may not seem significant, thousands of cars within a watershed can create problems. Toxic automobile fluids, including gasoline, motor oil, grease and antifreeze that leak onto parking lots, roads and driveways are picked up in stormwater runoff and carried to lakes, streams or wetlands. Whenever feasible, repair leaks.



When used or disposed of improperly, household hazardous wastes, including paint products, lawn and garden chemicals, and auto fluids can pollute surface and groundwater

Household Hazardous Wastes

In addition to lawn and garden chemicals and automobile fluids discussed above, other examples of **household hazardous**

wastes (HHW) include paints and paint products, drain cleaners, commercial household cleaning products and old batteries. HHW are hazardous (corrosive, flammable, toxic, etc.) by nature, but because households produce them in relatively limited quantities, they are not regulated under federal or Pennsylvania state laws. According to the PA DEP, each person in Pennsylvania generates an average of four pounds of HHW each year that, if carelessly managed, can create an environmental and public health hazard.

The following are PA DEP guidelines for managing HHW:

1. The best way to manage HHW is to avoid creating it in the first place. Start by selecting the least toxic product to do the job and then use only as much as is needed.
2. After using a product, give the remainder away to a friend, neighbor, or community group that can use it.
3. If the product isn't usable, or you can't give it away, take it to a community HHW collection program.
4. If your community doesn't have a HHW collection program you may put it in your regular trash, provided:

- a. You have complied with any disposal instructions on the label.
- b. There are no freestanding liquids. If water-based, allow the liquid to evaporate. If not water-based, absorb the liquid with vermiculite, cat litter, saw dust or other absorbent material.
- c. You have carefully packaged any residue to prevent leakage while the material is being transported to a disposal facility.
- d. You have only a small quantity. Divide larger quantities and dispose of them over several collections.

Small-scale Livestock Operations

State regulations require large-scale livestock operations to follow **Nutrient Management Guidelines**, including establishing practices to minimize contamination of surface or groundwater caused by nutrients, such as nitrates, and disease-causing microorganisms, such as bacteria, originating from animal waste. Although small-scale livestock operations are often exempt from state regulations, residents and businesses that include even a limited number of horses, llamas, goats, sheep, cows or other livestock should consider voluntary efforts to manage and contain animal waste to reduce the potential for water pollution and to minimize the threat to human health.

Options to minimize pollution problems created by small-scale livestock operations include:

- Avoiding stockpiling of manure next to streams and other surface waters.
- Maintaining a vegetative buffer along streams adjacent to livestock areas to help minimize nutrient runoff.
- Directing soil and waste laden runoff away from surface waters and water supply wells.

Owners of small-scale livestock operations can contact the Pike County Conservation District for more information on managing animal waste.

The most effective option for managing non-point source pollution is to prevent it from occurring in the first place.

Summary

Controlling non-point source pollution presents many challenges. For instance, the presence of fecal coliform bacteria in a water supply well

may render community drinking water unsafe to consume. The question then becomes, ‘what is the source of the bacteria?’

Fecal coliform bacteria can originate from a variety of sources including on-lot sewage disposal systems, small-scale livestock operations and pet wastes. This is the dilemma of non-point source pollution: although a pollution problem may exist, it is often difficult to identify a particular source as the culprit. And removing non-point source pollutants from surface and groundwater can be as difficult as identifying the source.

The actions of each individual, family and community, doing their part to reduce non-point source pollution, can add up to significant protection and improvement of local water resources for both current and future needs.

Ultimately, the most effective option for managing non-point source pollution is to prevent it from occurring in the first place. The actions of each individual, family and community, doing their part, can add up to significant protection and improvement of local water resources for both current and future needs.

Action Steps for Controlling Non-point Source Pollution

- ☞ Limit use and properly dispose of household hazardous wastes and encourage local officials (Appendix B) to adopt a household hazardous waste disposal program.
- ☞ Have your on-lot sewage disposal system (Chapter 3) inspected and the tank pumped regularly.
- ☞ When considering the application of lawn and garden chemicals, determine whether they are really necessary and what alternatives are available. When applying, use judiciously and follow label directions.
- ☞ Dispose of used motor oil properly at a recycling center and, whenever feasible, repair automobile fluid leaks.
- ☞ Use less toxic alternatives to products that generate household hazardous waste. Buy only as much product as needed, give the remainder to someone else who can use it, recycle the rest or dispose of it properly.
- ☞ In addition to providing many other benefits, a riparian buffer (Chapter 9) or corridor of vegetation, maintained along streams,

ponds and wetlands, can intercept and greatly reduce the amount of fertilizer and other non-point source pollutants that would otherwise enter these surface waters via stormwater runoff.

☞ Support efforts of local municipal officials to control non-point source pollution through land use regulations that address stormwater management, groundwater protection, and on-lot sewage system maintenance.

Resources for More Information

Ecological Landscaping Association: www.ela-ecolandscapingassn.org/

Organic Gardening: www.organicgardening.com/

Non-point Source Education for Municipal Officials, University of CT: nemo.uconn.edu/

PA DEP, Household Hazardous Wastes: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “HHW.”

PA DEP, select “Non-point Source Pollution”: www.dep.state.pa.us/info.htm

Pennsylvania Integrated Pest Management Program: paipm.cas.psu.edu/

Pike County Conservation District: www.pikeconservation.org

US EPA, What is Non-point Source Pollution?: www.epa.gov/owow/nps/whatis.html

PA Dep’t. of Agriculture Chemsweep Program: www.agriculture.state.pa.us. Search “Chemsweep.” Free program available to residents and businesses for the disposal of unwanted pesticides. Download, complete and submit application form or call 570-836-2181 for information.

PA DEP, Hotline for more information on recycling and disposal of household hazardous waste: 800-346-4242.

3. On-lot Sewage Treatment System Maintenance

The Homeowner's Guide to Wastewater Management

by John Jose, Watershed Specialist, Pike County Conservation District

"The subject is a peculiar one..."

~ George Jennings

Nineteenth century English Sanitary Engineer and Inventor

In more densely developed urban and metropolitan areas, household wastewater is commonly piped off-site to a centralized sewage treatment plant. However in rural areas, often characterized by more widely scattered residential development, the infrastructure required for centralized systems is often impractical and financially prohibitive.

With some basic knowledge of proper use and maintenance, the homeowner can help ensure their on-lot system will provide years of treatment of household wastewater.

As a result, like much of rural Pennsylvania, Pike County residents must often rely on individual, on-lot sewage treatment systems (on-lot systems) to treat household wastewater. *In effect, each homeowner has his/her own small-scale sewage treatment plant right in their own yard and it is the homeowner's responsibility to ensure the proper use and maintenance of their system.*

The good news is, on-lot system management need not be a mystery. With some basic knowledge, the homeowner can help ensure their system will provide years of service treating household wastewater.

The Ins and Outs of On-lot Systems

While often bemoaned for their cost of installation and repair, properly functioning on-lot systems provide many benefits including:

- Minimizing pollution of surface and groundwater
- Providing a safeguard for family health by helping to reduce contamination of drinking water supplies and public swimming areas
- Protecting the financial investment of homes and property

Because of their widespread use in Pike County, proper use and care of on-lot systems is very important.

However, these benefits are only enjoyed when a system is:

- Placed in an appropriate location on a building lot

- Constructed properly
- Used and maintained properly

When any of these conditions are not met, on-lot systems have the potential to create water pollution and become a human health hazard. The negative impacts of improperly functioning on-lot systems can be felt by the individual homeowner experiencing bacterial contamination of well water, to community or even watershed-wide impacts on both surface and groundwater supplies. Because of their widespread use in Pike County, proper use and care of on-lot systems is very important.

Elevated Sand Mound Systems and Other Options

Traditionally, on-lot septic systems consisted of a holding or **septic tank** and an in-ground soil **absorption field**. While septic tanks are still a mainstay in on-lot systems, in-ground absorption fields are seldom used in Pike County today.

This is because in-ground absorption fields only work when the right type of soil is present at sufficient depth, conditions often not found over much of Pike County where shallow, rocky, poorly drained soils predominate. Due to these poor soil conditions and with the adoption of more stringent regulations designed to provide for more effective and safer on-lot wastewater treatment, in-ground soil absorption fields now often fail to meet the regulatory criteria set by the Pennsylvania Department of Environmental Protection (PA DEP).

Specially designed above-ground absorption fields called **elevated sand mounds** – also sometimes referred to as turkey, sand or raised mounds – are now widely used in place of in-ground absorption fields, and have become a fixture of community landscapes in Pike County. Given their wide use, this section will focus on on-lot systems that incorporate an elevated sand mound. For those who do have in-ground absorption fields, the basic principles of proper use and management covered here, apply.

Note: Additional **conventional** as well as **alternative** on-lot systems, approved by PA DEP, are available to the homeowner installing a new system or undertaking a replacement or upgrade of an existing system (See Resources for More Information at the end of this chapter). However, space limitations do not permit coverage of these systems here, which include, but are not limited to at-grade, spray irrigation and drip irrigation systems. Although they all serve the same purpose – processing residential wastewater on site – the differ-

ences between these systems provide a resident with more options in providing for on-lot treatment that can meet the specific requirements presented by a building site.

On-lot Sewage Treatment and Disposal

The primary components of a typical on-lot system in Pike County include a septic tank buried beneath the surface, the above ground absorption area, which includes sand and gravel material of the elevated sand mound, and underlying soils. On-lot sewage treatment and disposal is a two-stage process.

The first stage begins with any household wastewater from appliances, bathrooms and kitchens being directed through a network of pipes within the home to a central collecting pipe that runs out to the septic tank. The primary function of the septic tank is to provide for settling, breakdown, and storage of the collected wastewater.

Wastewater that enters a tank is held long enough to allow heavier solid waste to settle to the bottom while lighter matter, consisting of grease and fats, floats to the top. Structures called baffles prevent these materials from flowing out of a tank and into the absorption field. Inside the tank, solid waste is reduced in volume through bacterial decomposition.

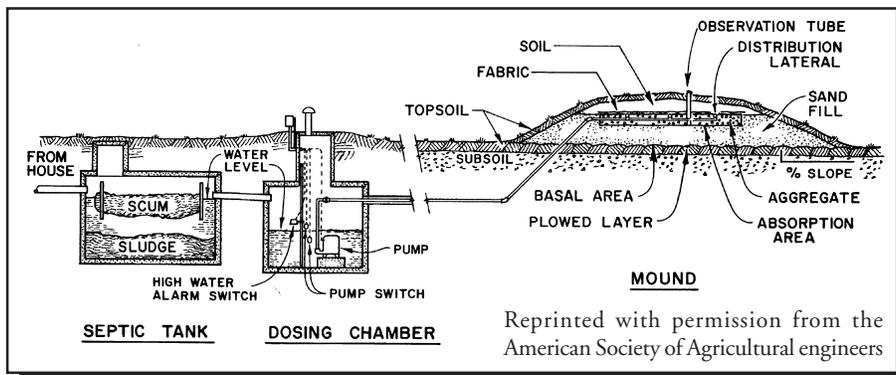


Diagram of an on-lot sewage treatment system with elevated sand mound

The Elevated Sand Mound

Although a septic tank provides initial or “primary” treatment of household wastewater, additional treatment is required to remove disease causing bacteria, viruses, protozoa and other contaminants. This is accomplished in the second stage of on-lot treatment that takes place in the absorption area that includes the elevated sand mound and soil layers beneath the mound.

With solid waste remaining in the tank, the partially treated liquid wastewater flows by gravity out of a port near the top of the septic tank and into a pumping chamber, which in turn, pumps the effluent up to the top of the absorption field. Here the effluent flows into a network of perforated distribution pipes, located just beneath the mound's surface.

These pipes distribute the effluent evenly over the absorption field. A portion of the wastewater released from the pipes evaporates up through the surface of the mound or is taken up by grass or other vegetation growing on the mound's surface.

The remaining wastewater trickles down through gravel, sand and soil layers within the raised mound. The sand serves to remove larger particles and disperse the wastewater evenly through the absorption field. Through complex physical, chemical, and biological processes the soil beneath the mound provides treatment, removing much of the remaining disease causing microorganisms and other pollutants. Finally, the now treated wastewater is released from the soil layers and eventually down into underlying groundwater.

A clogged absorption field, resulting from not pumping a septic tank frequently enough is one of the primary causes of on-lot system failure.

Maintaining On-lot Systems and Preventing System Failure

The rate at which solid waste enters a septic tank generally exceeds how quickly it is decomposed by bacteria. As a result, if not pumped out periodically, solid waste will accumulate and eventually exceed a tank's capacity.

A general rule of thumb is to have a septic tank pumped every three years or when solids occupy no more than 1/3 of a tank's volume.

This can result in excess solid waste from a septic tank overflowing into the distribution pipes of the raised mound eventually causing them to clog. The result is often wastewater backing up into households or seeping out of the surface of the raised mound. A clogged absorption field, resulting from not pumping a septic tank frequently enough to remove accumulated waste, is one of the primary causes of on-lot system failure in Pike County.

A general rule of thumb is to have a septic tank pumped every three years or when solids occupy no more than 1/3 of a tank's volume. A more accurate estimate of how often a tank should be pumped can be obtained using the chart in Table 1. Using this chart, based on the number of people in a household and the size of a tank, the frequency for pumping a tank can be determined.

Remember, pumping a tank out frequently will not harm a system! But not pumping a tank frequently enough can lead to costly repairs and water pollution.

| Tank Size (gal) | Household Size (number of persons living in household) | | | | | | | | | |
|---------------------|--|------------|------------|------------|------------|-----|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 500* | 5.8 | 2.6 | 1.5 | 1.0 | 0.7 | 0.4 | 0.3 | 0.2 | 0.1 | — |
| 750* | 9.1 | 4.2 | 2.6 | 1.8 | 1.3 | 1.0 | 0.7 | 0.6 | 0.4 | 0.3 |
| 900 | 11.0 | 5.2 | 3.3 | 2.3 | 1.7 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 |
| 1000 example | 12.4 | 5.9 | 3.7 | 2.6 | 2.0 | 1.5 | 1.2 | 1.0 | 0.8 | 0.7 |
| 1250 | 15.6 | 7.5 | 4.8 | 3.4 | 2.6 | 2.0 | 1.7 | 1.4 | 1.2 | 1.0 |
| 1500 | 18.9 | 9.1 | 5.9 | 4.2 | 3.3 | 2.6 | 2.1 | 1.8 | 1.5 | 1.3 |
| 1750 | 22.1 | 10.7 | 6.9 | 5.0 | 3.9 | 3.1 | 2.6 | 2.2 | 1.9 | 1.6 |
| 2000 | 25.4 | 12.4 | 8.0 | 5.9 | 4.5 | 3.7 | 3.1 | 2.6 | 2.2 | 2.0 |
| 2250 | 28.6 | 14.0 | 9.1 | 6.7 | 5.2 | 4.2 | 3.5 | 3.0 | 2.6 | 2.3 |
| 2500 | 31.9 | 15.6 | 10.2 | 7.5 | 5.9 | 4.8 | 4.0 | 3.5 | 3.0 | 2.6 |

Table 1: Estimated septic tank pumping frequency. Based on number of persons in household and size of tank. Illustration courtesy of Penn State College of Agricultural Sciences.

Another cause of on-lot system failure is **hydrological overloading** that results from overloading a system with excessive amounts of household wastewater. Excess amounts of wastewater flowing into a septic tank can cause solids to be flushed past tank baffles into the absorption field.

Also, an absorption field that remains saturated works less efficiently and can clog due to a build-up of organic material. Reducing water use by practicing basic water conservation measures at home, and spacing out heavy water use days, i.e. days when household laundry is done, can help prevent system overload. (See Appendix C, Water Conservation at Home).

At the very least, a failed system can cause significant inconvenience for the homeowner. At worst, pollution of lakes, streams and drinking water supplies can occur along with the need for costly repairs or system replacement.

Repairing and Replacing On-lot Systems

Postponing repair of a malfunctioning system can lead to further problems. Your local municipal **Sewage Enforcement Officer (SEO)**, as well as a reputable firm with experience in system installation and repair, can provide assistance in determining what repairs are needed to avoid further complications and financial expense.

Financial assistance in the form of low interest long-term loans is available for replacement or repairs of improperly functioning or failed on-lot systems, through the Pennsylvania Infrastructure Investment Authority (See Resources for More Information at the end of this chapter).

Costly system failure can be prevented by much less expensive periodic inspection and pumping. Check your local yellow pages under “Septic Tank and Systems Cleaning” or contact the Pennsylvania Septage Management Association for contractors in your area (See Resources for More Information at the end of this chapter).

The relatively minor investment in periodic inspections and pumping can save the homeowner significant costs down the road. In addition to repair costs incurred, a failed or malfunctioning on-lot system can present an obstacle in the sale of a home.

Financial assistance in the form of low interest long-term loans is available for replacement or repairs of improperly functioning or failed on-lot systems, through the Pennsylvania Infrastructure Investment Authority.

Permits and Testing

Before beginning installation of a new on-lot system, or making repairs or upgrades to an existing system, contact your municipal SEO to determine what permits will be required. Your local conservation district can provide assistance in determining if an Erosion and Sediment Control Plan (Chapters 5 and 10) will also be needed for your project.

There are numerous types of on-lot sewage disposal systems commonly in use throughout Pennsylvania. Each different type of on-lot system has its own requirements and testing procedures. It is important for a property owner to hire a qualified and reputable firm to ensure that proper testing and siting is performed for the specific type of sewage disposal system needed for their property.

Before beginning installation of a new on-lot system, or making repairs or upgrades to an existing system, contact your municipal Sewage Enforcement Officer (SEO) to determine what permits will be required.



Testing, to determine the suitability of a site for an on-lot system, generally involves digging one or more test pits. The SEO examines the soils in the test pits to determine their suitability for treating wastewater. If the soil is found to be suitable, a percolation test is usually conducted to determine the rate at which the soil can accept wastewater produced by a proposed system. Percolation test results found to be acceptable are then used to calculate a system's size.

Other considerations in determining the type of system required for a home, and where the system will be located, include the slope of the land and required isolation distances from wells, driveways and other important features. A reputable firm and your local SEO can provide assistance in ensuring that the appropriate system is selected, properly installed and located in a suitable location on a building lot.

Summary

On-lot sewage treatment systems are often used in rural areas, such as Pike County, for the treatment of household waste water. When installed, used and maintained properly, on-lot systems minimize pollution of surface and groundwater resources and help to protect family health and the financial investment of homes and property.

Considering their widespread occurrence in Pike County, proper use and care of on-lot systems becomes critical. With some basic knowledge, the homeowner can help ensure their on-lot system will provide years of household wastewater treatment.

The most critical aspect of maintaining an on-lot system is pumping the tank. Having a tank pumped out every three years is generally considered to be a good rule of thumb.

Negligence in maintaining a system can lead to system failure, water pollution and expensive repair costs. Financial assistance in the form of low interest, long-term loans for replacement or repairs of improperly functioning or failed on-lot systems is available through the Pennsylvania Infrastructure Investment Authority.

Before beginning installation of a new on-lot system, or making modifications or upgrades to an existing system, contact your municipal Sewage Enforcement Officer (SEO) to determine what permits will be required. Your SEO and a reputable firm can help ensure that a new system meets the requirements of a particular site, is correctly sited and installed, and can also provide assistance in determining what is needed to repair a malfunctioning or failed system.



Action Steps for Proper Use and Maintenance of On-lot Sewage Systems

In addition to regular inspections of on-lot systems and pumping of septic tanks, listed below are measures homeowners can undertake to ensure proper operation of a system, extending its life while protecting community drinking water supplies and minimizing environmental impacts.

- ☞ Exercise caution with the use of additives marketed as providing improvement to on-lot systems. Some products can actually create problems in on-lot systems.
- ☞ Use and dispose of household hazardous wastes (HHW) properly (Chapter 2). Excess amounts of HHW poured down household drains can impair on-lot system functioning and may lead to groundwater contamination.
- ☞ Grease and oils from cooking, poured down household drains, can accumulate in a septic tank and contribute to a clogged absorption field; save and dispose of with garbage.
- ☞ The root systems of shrubs and trees, planted over absorption fields, can penetrate, clog and damage distribution pipes. Maintaining a grass cover over a field is a safe bet.
- ☞ Avoid parking or driving automobiles, ATVs and other vehicles over absorption fields. Their weight can cause compaction and damage to distribution pipes. Average-sized riding mowers are generally O.K.
- ☞ Avoid placing large, inflatable swimming pools on absorption fields; their weight can cause compaction of mound materials resulting in system failure.
- ☞ Practice water conservation measures to avoid overloading and saturating an absorption field, which can lead to system failure.

Resources for More Information

Dingman Township Web Site: www.dingmantownship.org. Good resource for information on on-lot systems. Note: Questions regarding on-lot systems should be directed to the local SEO of the municipality a resident resides in. Only Dingman Township residents should contact the Dingman Township SEO with questions or complaints regarding on-lot systems.

Pennsylvania Association of Conservation Districts: www.pacd.org/resources/lake_notes/septic.htm, “Lake Notes – Septic Systems.”

PA DEP, On-lot Sewage Treatment Systems: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “On-lot Disposal System.”

Pennsylvania Septic Management Association (PSMA): www.PSMA.net. Good resource for information on on-lot systems. Also provides assistance in locating PSMA-certified inspectors.

Penn State University, Department of Agricultural and Biological Engineering: www.abe.psu.edu/extension/factsheets/f/onlotsewageindex.htm. Find various publications on on-lot systems including fact sheets on alternative systems.

PENNVEST (Pennsylvania Infrastructure Investment Authority): www.pennvest.state.pa.us/pennvest. Select “Financial Assistance” and “On-Lot Sewage Disposal Funds.” Find information on financial assistance in the form of low interest, long-term loans for rehabilitation, improvement, repair or replacement of a malfunctioning or failed on-lot sewage treatment system.

U.S. EPA, Managing Septic Systems to Prevent Groundwater Contamination: www.epa.gov/safewater/protect/pdfs/septic.pdf.

4. Stormwater Management

The Rundown on Stormwater Runoff

by John Jose, Watershed Specialist, Pike County Conservation District

“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.”

~ Albert Einstein

Stormwater runoff is created when rain or snowmelt accumulates and runs across the surface of the land. Undeveloped, forested landscapes generate relatively low volumes of stormwater. However, as residential and commercial land development proceeds, the volume of stormwater in Pike County watersheds increases.

This increase is primarily the result of the **removal of forests**, the **compaction of soils** by construction equipment and the creation of **imperious surfaces** in the form of parking lots, driveways, roads and highways, as well as rooftops of homes and buildings. Rain and snowmelt that would have been absorbed by leaf litter, soil and plant roots or that would have filtered into the ground and provided groundwater recharge instead accumulates, creating excess levels of stormwater runoff. The lack of effective, long-term planning for stormwater management in the development of Pike County’s older residential communities is another primary factor underlying current stormwater problems being experienced by residents.

What does all this mean to the average Pike County homeowner? For many it means persistent stormwater-related problems including:

- Washed-out lawns and driveways
- Flooded basements
- Damaged septic systems
- Nuisance areas of ponded water
- Damage to public and private roads
- Declining property values
- Conflicts between residents
- Polluted swimming areas
- Contaminated groundwater supplies

Despite the challenge that managing stormwater presents, there are options available for residents, community associations and municipalities.

Correcting these problems “after the fact” is often difficult and costly for homeowners and places a financial strain on community association and municipal budgets. Despite the challenges that stormwater management presents there are options available for residents, community associa-

tions and municipalities to address both existing and potential future, stormwater-related problems outlined in this chapter.

Stormwater Control at Home

Solutions for residents may exist right in their own backyard. Homeowners can reduce stormwater runoff from their properties in a number of ways including the following:

- Minimizing impervious surfaces (sidewalks, driveways, patios, etc.)
- Planting native vegetation, wherever possible, in place of lawn areas
- Not removing trees and other growing vegetation from existing forested areas
- Directing rain gutters onto lawn or garden areas where more water can seep back into the ground
- Constructing rain gardens or infiltration trenches
- Using rain barrels to collect and recycle rooftop runoff

The most effective strategy for managing storm water is to prevent it from being created in the first place.

While the aforementioned measures can help to alleviate stormwater problems, a broader-scale approach is often necessary to effectively address the bigger picture of stormwater management. The remainder of this chapter will focus on the tools available to implement more comprehensive stormwater control measures.

Municipal Options for Stormwater Management

Stormwater is a natural resource that can be managed to the benefit of residents and the environment. The most effective strategy for stormwater management is to prevent it from being created in the first place.

This requires planning for managing stormwater upfront, in the beginning phases of land development planning efforts. Here, municipal land use regulations play a critical role by guiding the manner in which



Rain gutters direct rooftop runoff to this attractive rain garden reducing stormwater problems for the homeowner and neighbors

development takes place in Pike County townships and boroughs, including how stormwater is managed.

Municipal governments can provide for more effective stormwater management by adopting land use regulations that support **Conservation Design** and **Low Impact Development (LID)** principles (Chapter 11). Incorporating Conservation Design and LID principles into land development projects reduces stormwater runoff in communities by decreasing amounts of impervious surfaces, maximizing stormwater infiltration, maintaining natural vegetation and existing drainage patterns, and conserving open space.

Conservation Design standards also provide for maintaining buffer areas along streams, lakes and wetlands to help attenuate flood waters and to remove stormwater pollutants. Research has demonstrated that communities that adopt these principles enjoy cleaner, healthier water resources.

Managing Stormwater in Pike County Community Associations

Options for community associations include enlisting the services of a professional consulting engineer to conduct a **stormwater assessment** that evaluates problem areas and outlines potential solutions. A stormwater assessment can also include suggestions for measures to reduce the poten-

Stormwater and Pike County Streams

Stormwater Pollutes Streams

Increasing levels of stormwater runoff present significant challenges to protecting Pike County's streams, lakes and wetlands. Of particular concern are the County's High Quality (HQ) and Exceptional Value (EV) streams.

Stormwater moving across the human-built landscape, picks up and transports **non-point source pollutants** (Chapter 2). This now polluted stormwater frequently runs off the land into a nearby stream impacting the aquatic life found there, including species of fish, aquatic insects and aquatic salamanders that are less tolerant to a polluted environment.

Stormwater, heated as it travels across sun-baked impervious surfaces including roads, parking lots, roofs and driveways, creates another type of water pollution known as **thermal pollution**. Stormwater flowing into streams increases water temperatures resulting in decreased levels of dissolved oxygen. Lower levels of dissolved oxygen make it more difficult for fish, insects and other members of a stream's aquatic community, adapted to an oxygen-rich stream environment, to survive, particularly during warmer summer months.

Continued 

Stormwater and Pike County Streams (continued from previous page)

Stormwater Damages Stream Habitat

Increasing volumes of stormwater runoff also damage the physical habitat of streams. A typical Pike County stream works its way down through its watershed in a repeated, step-wise fashion from **pools** (deeper areas) to **riffles** (resembling small rapids) to **runs** (longer, slower stretches). This creates smaller “**microhabitats**” within the larger stream habitat that support a rich, diverse collection of aquatic life.

The tremendous amount of energy carried by excess amounts of stormwater runoff flowing through a stream can seriously damage the pool-riffle-run microhabitats leaving the overall stream habitat much less diverse. As a result, a less diverse assemblage of animals, characterized by fish, insects and other life that are able to withstand an altered, simplified and more polluted environment, will eventually predominate. Also, stream banks, washed out by high volumes of stormwater, release considerable amounts of soil particles or sediment (Chapter 5) that is detrimental to stream life.

Within a short amount of time, a stream can become seriously damaged from the effects of increasing stormwater volumes in a developing watershed. Many communities that have undertaken projects to repair stormwater-damaged streams find that this is often a labor and money-intensive undertaking and seldom will a stream be restored to its original state.

State environmental laws and municipal land use regulations incorporating effective, long-term stormwater management (Chapter 4) – integrated into watershed-based natural resource planning – provide an excellent framework for the conservation of Pike County’s streams.

tial for future increases in stormwater runoff that are created as remaining undeveloped parcels in, or adjacent to a community, are developed.

But communities don’t have to wait for a stormwater assessment to take proactive measures. Community associations can also utilize Conservation Design and LID principles by incorporating them into their **community covenants**.

Other community association options include programs that offer incentives to residents for lot consolidations or utilizing community funds for the outright purchase of vacant lots. Tax sales offer an opportunity for community associations to acquire remaining, undeveloped land parcels at relatively low cost.

Conservation of Forests and Wetlands for Stormwater Management

Conservation of open space, including Pike County forestlands, can be cost effective for communities and municipalities, over the long-term, in stormwater management. Why? Because protected land makes much less of a contribution to stormwater problems that would otherwise be created as a result of both compaction of soils and creation of impervious surfaces when a parcel of land is developed.

Efforts to provide long-term protection of forestlands can be initiated by individual landowners, community associations, fishing and hunting clubs, municipalities or county-level initiatives. **Conservation Easements** (Chapter 11), legally binding agreements that restrict or prohibit development on a parcel of land, are one very effective option that have been used successfully to preserve forested lands in Pike County.



Stormwater damage to community infrastructure

Wetlands (Chapter 7) – a naturally occurring yet critical component in a community’s stormwater management infrastructure – should be given high priority in land protection efforts. The **Delaware Highlands Conservancy** (Appendix D) is a local land trust that provides assistance to individuals, communities and municipalities interested in land conservation.

Watershed-based Stormwater Management

Managing water resources on a watershed basis (Chapter 1) provides a highly effective means of managing stormwater. This approach requires cooperative efforts between neighboring municipalities, whose boundaries fall partly or completely within the same watershed. Residents can support and promote these efforts by attending municipal meetings or by writing letters voicing support for cooperative efforts between their officials and adjoining municipalities to address stormwater management concerns for both present and future needs.

Summary

Stormwater occurs naturally in undeveloped watersheds. However, increasing land development, particularly where land use regulations and planning for stormwater management are inadequate or lacking altogether, often results in excessive volumes of stormwater impacting Pike County’s

natural resources, residents and communities. Stormwater causes flooding and infrastructure damage, pollutes and degrades surface waters and can lead to contaminated community drinking water supplies.

Stormwater need not be seen solely as a nuisance to be simply collected in ditches and pipes and moved off-site as quickly as possible. Overemphasizing these control measures, often the basis of conventional stormwater management strategies, often only shifts problems elsewhere, reduces groundwater recharge for community water supplies and fails to address protection of water quality.

Options for community associations include enlisting the services of a professional consulting engineer to conduct a stormwater assessment that evaluates problem areas and outlines potential solutions. Incorporating Conservation Design and Low Impact Development (LID) principles into land development projects can reduce stormwater runoff in communities by decreasing amounts of impervious surfaces, maintaining natural vegetation and existing drainage patterns, maximizing stormwater infiltration and conserving open space. Through comprehensive planning and the enactment of land use regulations that incorporate Conservation Design and LID principles, municipal governments can play a significant role in effective stormwater control.

Stormwater management on a watershed basis requires cooperation on many levels and provides an excellent model for a holistic approach to stormwater management. Various options exist, including the measures listed in this chapter, to address both existing stormwater problems and to plan to prevent future problems from occurring.

Need an NPDES Permit?

Although single home construction, addition and renovation projects usually do not require an NPDES (National Pollution Discharge Elimination System) permit for stormwater discharges, land development activities that involve 1 acre or more of disturbance, over the life of a project, may require an NPDES permit. (See Chapter 10 for more information on NPDES permits). Contact the Pike County Conservation District for assistance in determining whether or not your project will require an NPDES permit.

Action Steps for Stormwater Management

- ☞ Let your local officials (Appendix B) know you support intermunicipal, watershed-based stormwater management.
- ☞ Support local municipal officials in the implementation of land use regulations that incorporate Low Impact Development and Conservation Design principles.
- ☞ Encourage your community association to conduct a stormwater assessment that looks at solutions for existing as well as potential, future stormwater problems.
- ☞ Protect wetlands (Chapter 7) that remove pollutants from stormwater runoff and help to control flooding.
- ☞ For residents, directing downspouts onto lawn areas or into rain gardens or rain barrels, minimizing areas of impervious surfaces, maintaining native vegetation (including forests) and minimizing lawn areas can all help to reduce stormwater runoff.
- ☞ Support community association and municipal-level initiatives for open space conservation.

Resources for More Information

Low Impact Development Center: www.lowimpactdevelopment.org

Natural Resources Defense Council, Low Impact Development: www.nrdc.org/water/pollution/storm/chap12.asp

Non-point Education for Municipal Officials, University of Connecticut: <http://nemo.uconn.edu>

PA DEP, permitting information: www.dep.state.pa.us/dep/efacts/generalpermitslisting.htm

PA DEP, Stormwater Management: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “Stormwater Management.”

Pike County Conservation District: www.pikeconservation.org. Good source for technical information on obtaining permits for development activities. Downloadable forms available.

Delaware Highlands Conservancy (Appendix D): www.delawarehighlands.org



Master Gardeners at Pike County Cooperative Extension Office:
<http://pike.extension.psu.edu/>. Select “Horticulture/Gardening.” Telephone:
570-296-3400. Information on selecting and growing native plants.

Native Plant Society of New Jersey: www.npsnj.org/rain_garden_home.htm.
Downloadable manual on building a rain garden.

PA Bureau of Forestry: www.dcnr.state.pa.us/forestry. Select “Education and
Information” and “Wild Plant Program.” Information on landscaping with
native plants.

5. Erosion and Sedimentation

Soil + Water = Pollution!

by John Jose, Watershed Specialist, Pike County Conservation District

“The history of every nation is eventually written in the way it cares for its soil.”

~ Franklin D. Roosevelt

You may be surprised to learn that soil – yes, good old dirt – is a major cause of water pollution in Pennsylvania. The good news is much can be done to prevent soil or “sediment” pollution of the Commonwealth’s streams, rivers, lakes and wetlands. This section will explain how sediment pollution is created, applicable state and federal regulations and what Pike County residents can do to help reduce this pollution problem.

Wind and Water Move Mountains

Erosion and sedimentation are naturally occurring processes. Erosion is the wearing away of bedrock and soil layers by wind and water. Sedimentation occurs when rock and soil particles or “**sediments**” are carried by wind and water and deposited at another location – frequently a stream, river, pond or wetland (collectively referred to as “surface waters”). In Pike County’s developing watersheds, the primary source of increasing levels of erosion and sedimentation is residential and commercial land development that removes growing vegetation and leaf litter from forest floors, exposing bare soil to the erosive forces of stormwater runoff (Chapter 4).

Fish and Muddy Waters

The impacts of sediment pollution include:

- Loss of fish and other aquatic life.
- Accelerated rates of aquatic plant growth in lakes and streams, spurred by the release of excess nutrients, including nitrogen and phosphorus.
- Increased frequency and intensity of flooding as sediment clogs waterways.
- Pollution of public water supplies and, as a result, increased treatment costs.

Knowing Your BMPs

Any person proposing or conducting an **earth disturbance activity**

– defined as “A construction or other human activity which disturbs the surface of the land...” – in Pennsylvania is required by state regulations to develop, implement and maintain **Best Management Practices (BMPs)** to minimize the potential for erosion and sedimentation from project sites. Examples of BMPs utilized on Pike County earth disturbance sites include:

- Minimizing the area of disturbance created by a project
- Maintaining existing vegetation, including vegetated streamside “buffers”
- Installing silt fence and sediment traps
- Seeding and mulching disturbed areas as a project proceeds

It is important to remember that the most cost effective BMP for controlling erosion and sedimentation is to minimize the areas of earth disturbance on a project site. In other words, clear only the area needed to successfully complete a project and keep existing vegetation in place on the remainder of a site.

A Plan of Action

Developing and following an **Erosion and Sediment Control Plan (E&S Plan)** is a highly effective way to minimize soil erosion from land development sites. State regulations require that an E&S Plan be in writing and available at a project site during all stages of earth distur-



Silt Fence: A BMP used commonly in Pike County to control soil sediment on earth disturbance sites

bance activity whenever the potential exists for the discharge of soil sediment to surface waters designated as either High Quality (HQ) or Exceptional Value (EV), which includes almost all of Pike County.

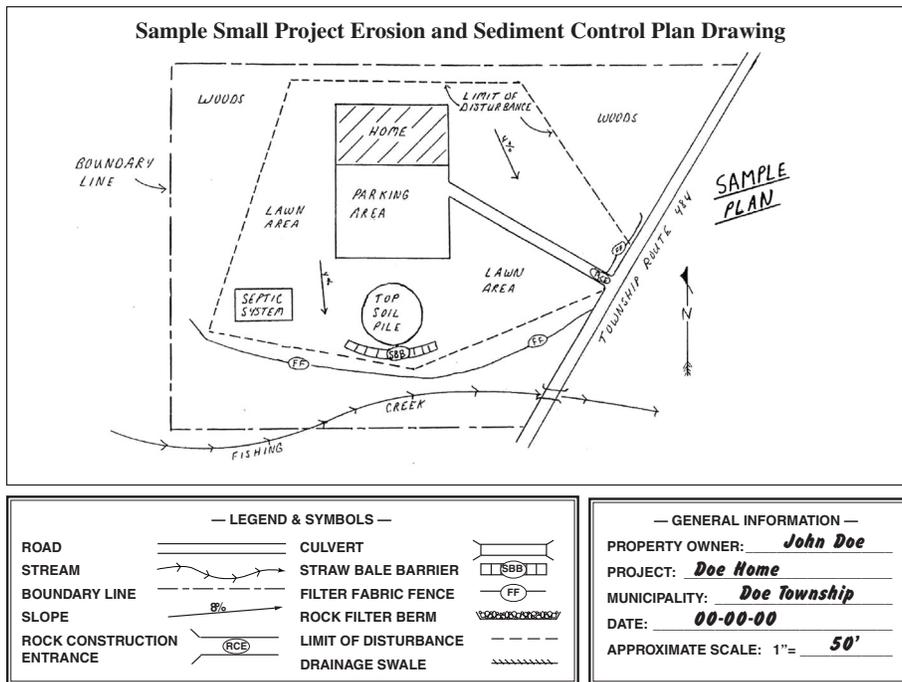
Among other requirements, an E&S Plan must include:

- Existing topographic features
- Soil types and locations
- Description of BMPs to be used
- Plan drawings
- A maintenance program for BMPs
- Description of the earth disturbance activity

In Pike County, whether it is a larger project, such as a residential subdivision or a smaller project for the homeowner including adding an addition, building a deck or shed or installing an in-ground pool or a drive-

way, an E&S Plan is required.

Resources available at the Pike County Conservation District to assist with the development of an E&S plan include *Erosion and Sediment Control Guidelines for Small Projects* and, for larger more complex projects, the PA DEP's *Erosion and Sediment Pollution Control Program Manual*. Check your local yellow pages for engineers or other consultants that develop E&S Plans. Conservation District staff are also available to answer questions and provide assistance.



Sample drawing of an Erosion and Sedimentation Control Plan

An E&S Plan is only effective in controlling soil sediment runoff when developed in advance and properly implemented through the life of a project. It is important that the person(s) responsible for an earth disturbance site have access to the E&S Plan for that site so that they have the following information:

- BMPs required for each different phase of a project
- Equipment and materials required to install structural BMPs as they are needed
- A BMP maintenance plan
- Areas on a site that must be avoided during construction

In addition to being required by state environmental regulations, creating and implementing an E&S Plan is an effective way to keep soil on land development sites and out of the HQ and EV surface waters of Pike County's Special Protection Watersheds. Prior to starting any earth disturbance activity, check with your local municipality (Appendix B): local ordinances and permit requirements may apply.

In addition, an NPDES or National Pollution Discharge Elimination System permit may also be required for projects that involve over one acre of earth disturbance over the life of a project (See Chapter 10 for more information on NPDES permits). Contact the Pike County Conservation District for assistance in determining whether or not a project will require an NPDES permit.

Summary

Soil provides for life by supporting agriculture that provides food and by supporting forests that filter air and water, absorb green house gases and produce oxygen. But soil carried in stormwater, from sites where land development is occurring, into streams, lakes and wetlands, creates a serious pollution problem. Soil sediment can kill aquatic life by smothering spawning and nesting areas and clogging gills of fish and aquatic insects.

It is the responsibility of any person undertaking an earth disturbance activity to implement and maintain Best Management Practices to minimize erosion and sedimentation from a project site.

Pollutants attached to soil particles worsen the impacts of soil sedimentation. Excess levels of nutrients can spur excess growth of aquatic plants. The build-up of soil sediments in streams can lead to flooding and increased treatment costs for public water supplies.

It is the responsibility of any person undertaking an earth disturbance activity in Pennsylvania to implement and maintain Best Management Practices (BMPs) to minimize erosion and sedimentation from a project site.

In addition, when earth disturbance creates the potential for the discharge of soil sediment to surface waters designated as either High Quality (HQ) or Exceptional Value (EV) – which includes almost all of Pike County – a written Erosion and Sedimentation Control Plan must be developed and implemented.

Failure to implement an E&S Plan can result not only in pollution of surface waters, but is also a violation of state regulations. Properly implementing an E&S Plan, including maintaining Best Management Practices on a project site, assists in protecting Pike County's surface water resources.

Action Steps for Controlling Erosion and Sedimentation

- ☞ Plan for erosion control before beginning a project.
- ☞ Have and implement an Erosion and Sedimentation Control Plan for projects with earth disturbance. Not only will this control sediment pollution, having a written plan is also required by state law in Pike County's Special Protection Watersheds.
- ☞ Maintain Best Management Practices as a project proceeds.
- ☞ Contact your local conservation district to report a project site that is causing sediment pollution of a stream, river, lake or wetland.

Resources for More Information

Non-point Education for Municipal Officials, University of Connecticut:
<http://nemo.uconn.edu>

PA DEP, Permitting Information:
www.dep.state.pa.us/dep/efacts/generalpermitslisting.htm

Pike County Conservation District: www.pikeconservation.org. Good source for technical information on obtaining permits for development activities. Downloadable forms available.

6. Groundwater

Protecting Pike County's Water Supply

by John Jose, Watershed Specialist, Pike County Conservation District

“High quality water is more than the dream of conservationists, more than a political slogan; high quality water...is essential to health, recreation, and economic growth.”

~ Edmund S. Muskie

Former Secretary of State & U.S. Senator

While “surface waters” such as lakes, ponds, streams, rivers and wetlands are visible and familiar to us, groundwater often remains an out-of-sight and out-of-mind issue. As a result, a great deal of misunderstanding and misinformation about this vital resource exists. This chapter will cover basic yet essential concepts in understanding groundwater, challenges to protecting this resource in Pike County and measures that can be taken by individuals, communities and municipalities to conserve local groundwater supplies.

Pike County is entirely dependent on groundwater to meet its water needs.

Who Needs It? We all do!

Pike County is entirely dependent on groundwater to meet its water needs. With the exception of bottled water originating from sources outside of the County, all water that is consumed at home, in school, and in the work place originates as groundwater from private, community and municipal wells, and springs.

The challenge now faced lies in maintaining regional groundwater reserves for both present and future needs.

The challenge now faced lies in maintaining both the quantity and quality of regional groundwater reserves for both present and future needs. This challenge is made all the more clear and urgent with the realization that, for the last three and a half decades, Pike County has experienced a level of development distinguishing it as the fastest growing county in Pennsylvania and among the most rapidly developing in the nation.

Groundwater for Human Health

Clean water is required not only for basic human survival, but is also necessary for maintaining good health. With some exceptions, groundwater supplies underlying Pike County generally meet these needs for resi-

dents. However, it is a resource that is vulnerable to pollution from a variety of sources.

As residential and commercial development continues, more homes, buildings, roads and highways are built and more underground storage tanks and on-lot sewage treatment systems are installed. The catch is, *all of this development activity is literally taking place on top of the water supply that Pike County depends on.* In addition, residents, through activities around the home, may unknowingly be contributing to the pollution of the groundwater they consume.



A clean and adequate supply of water is essential to maintaining good health

Although overall, Pike County's groundwater resources are generally of good quality, contaminants, both naturally occurring and of human origin, have been detected in private and community water wells. For more discussion on causes and prevention of groundwater contamination refer to "Maintaining Groundwater Quality: Let's Keep it Clean Folks!" later in this chapter and Chapter 2 on non-point source pollution. Information on water testing can be found in Appendix E.

The Dollars and Cents of Groundwater

Clean and adequate groundwater supplies are also essential to a healthy economy. Tourism is a significant component of Pike County's economy and the County's high quality natural resources are one of the primary draws for people visiting the region. Polluted groundwater could negatively impact tourism by making the area a less desirable vacation destination.

In addition, any small or large-scale industry considering Pike County as a potential location to establish a facility, will be looking for clean groundwater supplies in order to avoid costly treatment measures needed to make water suitable for its manufacturing processes; contaminated groundwater could be a disincentive to such industry.

Groundwater is, in a sense, the lifeblood of Pike County. Not only does it provide residents with a generally clean and abundant water supply, it is also vital to the regional economy and to sustaining a healthy environment.

Last, but not least, are the catastrophic financial impacts that indi-

vidual homeowners and communities experience when contamination renders groundwater supplies unpotable. Costs to locate and develop new water supplies and carry out cleanup efforts can run into the millions of dollars and very seldom is polluted groundwater restored to its original contaminant-free state.

Clean Groundwater for Clean Streams

Good groundwater stewardship practices are essential to maintaining the health of the County's state designated High Quality and Exceptional Value streams. Why? Because groundwater and surface water resources are interconnected through the hydrological cycle. As groundwater migrates up to the earth's surface, "discharging" to lakes, streams and wetlands, contaminants in groundwater can enter these surface waters and impact the aquatic life they support. Additionally, conservation initiatives should focus not only on ensuring that adequate groundwater supplies are maintained for human needs but should also focus on ensuring that adequate amounts remain to provide "base flow" to streams during dry periods, particularly under drought conditions.

Groundwater is, in a sense, the lifeblood of Pike County. Not only does it provide residents with a generally clean and abundant water supply, it is also vital to the regional economy and to sustaining a healthy environment.

The Water Cycle

The amount of water present on Earth today has remained constant for millions of years. In fact, the water in this morning's coffee may have been the same water a dinosaur sipped from a pond millions of years ago. This water continually circulates and is recycled through the **hydrological (water) cycle** (Figure 1).

In the hydrological cycle, **evaporation** from the earth's surface and **transpiration** from the surface of plant leaves releases water vapor into the atmosphere. Eventually, water in the atmosphere condenses and falls back to the earth as some form of precipitation (rain, snow, sleet, etc.). A portion of the precipitation falling on Pike County's watersheds will travel across the land's surface as stormwater runoff (Chapter 4), entering nearby surface waters.

Rain and snowmelt that does not run off as stormwater or return to the atmosphere through transpiration and evaporation can percolate down through soil layers and into the open spaces of underlying sand, gravel and bedrock providing **recharge** of groundwater supplies.

A Story of Rocks, Sand and Water

The idea that groundwater is found beneath the earth's surface in underground rivers or lakes is largely a myth. In Pike County, local groundwater supplies are found in either of two basic types of earth materials: **consolidated bedrock** such as sandstone or shale or **unconsolidated glacial debris** consisting of silt, sand, gravel and rocks.

Bedrock: The majority of Pike County residents obtain their groundwater from wells drilled into bedrock. "Solid" bedrock acts as a sponge storing and moving groundwater through minute, interconnected pore spaces. Significant quantities of groundwater also move through the cracks and fractures running throughout bedrock. This interconnected system of cracks and fractures acts as a subterranean plumbing system that residents tap into when a well is drilled into bedrock.

Glacial deposits: The last glacial period that impacted Pike County ended approximately 20,000 years ago. A sheet of ice, upwards of three thousand feet thick and covering much of Northeast Pennsylvania, began to melt as climatic changes brought increasing temperatures. As a result, large quantities of sand, gravel and rock that were embedded in this ice sheet were deposited over much of the County.

While some of this material simply dropped out directly onto the surface of the land, much was transported in vast quantities of melt waters, flowing downward across the landscape, eventually reaching the Delaware River Valley where these materials settled out, leaving behind deposits up to 500 feet deep. Groundwater supplies in these glacial deposits occupy the open spaces in sand, rocks, and gravel.

The most significant deposits of glacial material in Pike County occur along the County's eastern edge, particularly in the Milford-Matamoras corridor area. Water wells in this area draw their water from groundwater stored in this glacial material.

Groundwater, Aquifers, Water Tables and Streams

The **water table** marks the top of the **zone of saturation**. *All water found below the water table within the zone of saturation, occupying the open pore spaces in sand, gravel and bedrock, is **groundwater**.*

The water table is not static but falls as groundwater continuously migrates to the earth's surface into springs, streams, wetlands and lakes. Water tables, or groundwater levels, fall more quickly during dry periods

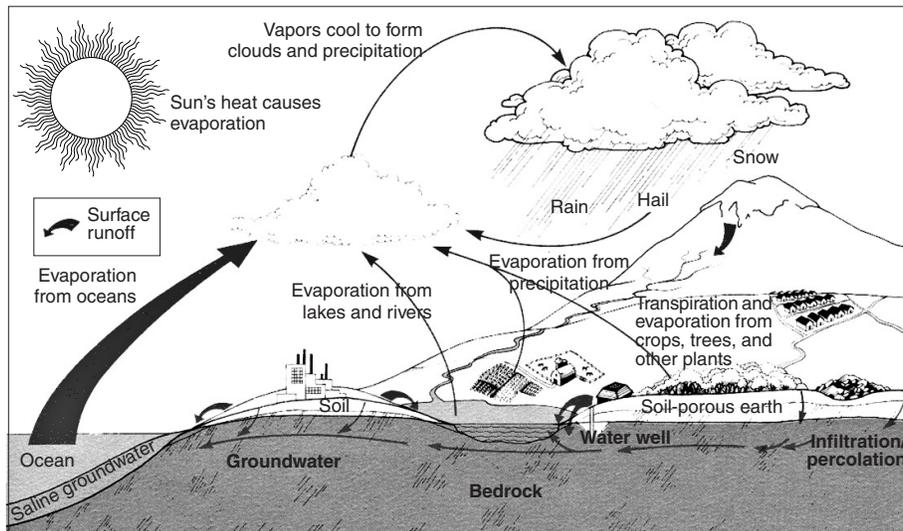


Figure 1: Water cycle illustration. Courtesy of the League of Women Voters of PA, Citizen Education Fund

when precipitation is not available to provide recharge. Conversely, precipitation and snowmelt will raise the water table, bringing it closer to the earth's surface as the zone of saturation rises. When a well stops providing water during a drought, it is often because the water table has dropped below the depth of the water pump in that well.

Areas beneath the earth's surface where sufficient quantities of groundwater are found that can be extracted to meet human demand are referred to as **aquifers**. An aquifer may be as small as a few acres or may underlie an entire watershed.

Gravity and **pressure** are the primary forces causing groundwater to flow underground and eventually return to the surface. Groundwater generally flows along a natural gradient from upland recharge areas, in the higher elevations of watersheds, to lowland discharge areas where groundwater returns to the surface forming springs and entering lakes, streams and wetlands. How quickly groundwater travels beneath the surface depends on several factors and varies from only a few inches per year up to several feet per day.

It is significant that 70-80% of the water that flows through Pike County streams is supplied by groundwater. In fact, during dry periods, 100% of the water moving through many streams originates as groundwater discharging up from below. At a temperature of approximately 50 de-

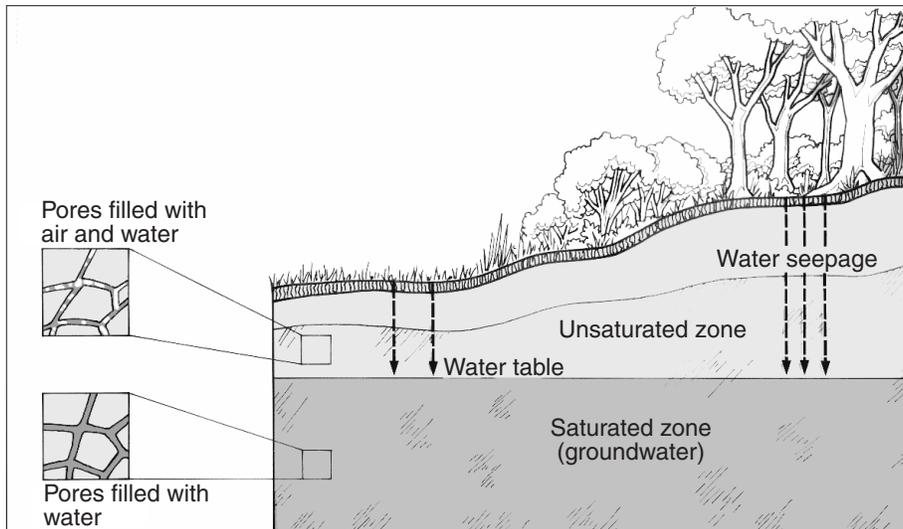


Figure 2: Groundwater illustration. Courtesy of the League of Women Voters of PA, Citizen Education Fund

grees, groundwater flowing into streams helps to maintain colder water temperatures, which in turn enables streams to hold more dissolved oxygen. This becomes critical during drier, warmer summer months when colder, oxygen-rich water is needed to keep fish, including Pike County’s native brook trout, and other aquatic stream life, alive.

Groundwater Quantity: When is Enough, Enough?

Pike County’s undeveloped, forested landscapes allow for relatively high rates of infiltration or groundwater recharge by rain and snow melt. This recharge replenishes and sustains the supply of groundwater that residents and businesses depend on.

However, as residential and commercial development proceeds, forests are cleared and replaced by **impervious surfaces** in the form of parking lots, highways, secondary roads, driveways and rooftops, disrupting the groundwater recharge process. Simultaneously, increasing numbers of wells are drilled, putting increasing pressure on underlying aquifers. Droughts, occurring with increasing frequency and intensity in recent years, are a third major factor.

These factors all affect groundwater supplies, impacting both people and streams and pointing to the need for conservation measures practiced by residents (see Appendix C) and businesses as well as proactive planning for long-term management of groundwater resources.

Summer = Groundwater Drought

During the summer growing season, rainfall from showers and thunderstorms may cause stream, river and lake levels to rise quickly and reach capacity or even spill their banks causing flooding. The appearance of this abundance of water may lead residents to believe that a drought has been broken and water conservation measures can be relaxed. But what is going on beneath the surface with groundwater supplies may be an entirely different story.

Why? Because during the growing season the process of groundwater recharge is “short-circuited” by growing vegetation. When leafed out, plants (including Pike County’s forests) act as living pumps drawing water from soil, transporting it up through vascular tissue in trunks and branches and releasing it through the surface of leaves into the atmosphere.

As a result, during the summer season, a considerable amount of rain must fall before any significant recharge or replenishment of groundwater supplies occurs. Only when plants have absorbed as much water as they need and soil layers have become saturated is water from rainfall able to move past the root zone of plants and down through soil layers and bedrock into the zone of saturation providing groundwater recharge and raising the water table.

However, droughts affecting Pike County have been broken during the growing season when the remnants of tropical storms or hurricanes have moved through the region and dropped significant amounts of rain that has fallen steadily over a period of days. Under these conditions soils become saturated, thirsty plants have their water needs met and water from rainfall is able to reach the water table, replenishing groundwater supplies for Pike County’s private, community, and commercial wells.

Groundwater Quality: Let’s Keep it Clean Folks!

Leaking underground storage tanks, hazardous wastes released from transport trucks involved in highway accidents and improperly or illegally disposed of toxic wastes all present a threat to groundwater supplies. While these potential sources of contamination must be addressed there is another less obvious, but potentially widespread source of groundwater pollution known as **non-point source pollution** (Chapter 2).

In Pike County’s watersheds, non-point source pollution originates from many diverse, scattered sources including on-lot sewage treatment systems, road de-icing agents, small-scale livestock operations, household haz-

ardous wastes including lawn and garden chemicals, leaking automobile fluids and improperly disposed of motor oil.

These types of pollutants can potentially enter the water cycle, following the same route as rain or snowmelt, moving down through soil layers and bedrock into groundwater supplies and eventually flowing into wells or up into a nearby stream. In addition, household hazardous wastes (Chapter 2) dumped down household drains can move through a septic system, eventually reaching groundwater and potentially contaminating drinking water wells. As a general rule of thumb, “If you wouldn’t want to drink it, think twice before pouring it on the ground or dumping it down a drain!”

70-80% of the water that flows though Pike County streams is supplied by groundwater.

The impacts of contaminated groundwater are felt on many levels in affected communities including:

- Social impacts and psychological stress as normal day-to-day lives of individuals, families and communities are disrupted
- Sub-acute and acute illness among residents
- Short and long-term financial liability incurred by residents, businesses and community associations

While the groundwater supplies underlying Pike County’s watersheds are generally considered to be of good quality, contaminants, either naturally occurring or introduced by human activities, have been detected in residential water samples. These include lead and copper (released from household plumbing by corrosive groundwater), bacteria, radon and in some cases MTBE, a chemical component of gasoline. Information on water testing can be found in Appendix E.

Even with state of the art technology and even when sufficient monetary resources – possibly in the millions of dollars – can be obtained, cleanup of contaminated groundwater is a lengthy process and very often groundwater is not completely restored to its original contaminant-free state. To protect community drinking water supplies, and to avoid these consequences, the ultimate solution is preventative measures taken by residents, the business sector, community associations and municipalities that focus on maintaining groundwater supplies in a state as free of contamination as possible.

Summary

Pike County residents, visitors and businesses depend entirely on

Underground Storage Tanks for Home Heating Oil and Groundwater Contamination

Underground storage tanks (USTs) are often used to store home heating oil. Usually constructed of metal, USTs are subject to the corrosive forces of their subsurface environment. As a result, over time, these tanks have the potential to rust through and develop leaks releasing heating oil to surrounding soil and to groundwater. Even tanks that are coated to resist corrosion are prone to failure.

USTs have been known to begin leaking as quickly as twenty years after installation and a leaking tank may go undetected, allowing for the release of its contents. Signs of a leaking UST include a strong petroleum odor around a tank or in a basement, the need to refill a tank more often than would be expected, a dark staining of soil around the area where a tank is located, water accumulating in a tank or sudden erratic behavior of a furnace caused by water that has become mixed with heating oil.

Contamination of the homeowner's and neighboring wells can occur and as a result, the owner of a failed UST can incur significant financial liability not only for cleanup and removal of a tank and contaminated soil, but also for costs associated with groundwater cleanup and damage to neighboring homes and property. To help ensure against an undetected failure one option for a property owner is to remove and replace a UST with an above ground tank.

The cost of removing a UST and replacing it with an above ground tank before it fails can provide significant cost savings down the road. Financial assistance for the removal and cleanup of failed USTs is available through the PA DEP's Underground Storage Tank Heating Oil Clean-up Program (See Resources for More Information at the end of this chapter). When having a new home built the homeowner can request installation of an aboveground tank outside a home or in a basement.

groundwater to meet their water needs. The groundwater found beneath Pike County watersheds is generally of good quality and adequate in supply to meet current, local demand.

However, groundwater is a resource that is vulnerable to over-withdrawal and contamination. Rising rates of residential and commercial de-

velopment in Pike County will continue to present significant challenges to maintaining adequate and clean groundwater supplies. Because groundwater contamination is often difficult to detect, expensive to cleanup and a threat to both human and environmental health, the best approach is to prevent contamination from occurring in the first place.

Groundwater protection requires a multi-faceted approach including educational efforts from school students to community leaders, implementation of Source Water Protection (SWP) plans (Appendix F), and participation by all residents doing their part as “groundwater guardians.” Refer to the suggestions listed below for measures that residents, community associations and municipal officials can take to protect Pike County’s groundwater resources.

Action Steps for Groundwater Protection

- ☞ Attend meetings or write letters to local municipal officials supporting their efforts to create municipal ordinances designed to protect groundwater including ordinances for private well construction, on-lot sewage treatment system maintenance, Conservation Design principles for land development and the start of a household hazardous waste collection program.
- ☞ Support your community association in the adoption of restrictions, covenants and codes designed to protect groundwater and in any efforts undertaken to establish and improve Wellhead Protection plans for community wells.
- ☞ Have your septic tank inspected and pumped on a regular basis to minimize groundwater contamination from your on-lot system.
- ☞ Join or form an environmental committee for your community association and start a groundwater protection program.
- ☞ Properly dispose of household hazardous wastes including not pouring down household drains or onto the ground.
- ☞ Support efforts to conserve wetlands. Wetlands act as filters, removing many water pollutants and providing recharge to underlying aquifers.
- ☞ Replace underground storage tanks for heating oil with above ground tanks to prevent a potential undetected leak.

☞ Have your water tested. While water testing does not protect groundwater, it can provide valuable information on the quality of well water and treatment measures that may be needed to remove pollutants that are present. Refer to Appendix E for more information on water testing.

Resources for More Information

PA DEP, Groundwater Protection: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “Groundwater Protection.”

PA DEP, Home Heating Oil Underground Storage Tank Clean-up: www.depweb.state.pa.us/dep/site/default.asp. Select “Storage Tank Cleanup Program.” Includes information on procedures and financial assistance available for cleanup of failed underground, residential heating oil tanks.

PA League of Women Voters Water Resource Education Network: pa.lww.org/wren/library.html#groundwater. Downloadable groundwater educational materials.

Penn State Water Resources Extension: www.sfr.cas.psu.edu/water

Pennsylvania Groundwater Association: www.pgwa.org

Pike County Conservation District: www.pikeconservation.org

US EPA, Citizen’s Guide to Groundwater Protection: www.epa.gov/safewater/protect/citguid.pdf

US EPA, Groundwater and Drinking Water: www.epa.gov/ogwdw

U.S. Geological Survey, Water Resources of the U.S.: water.usgs.gov

7. Wetlands Conservation

Mucking Through the Myths

by Ellen Salak, Resource Conservationist and Susan Beecher, District Manager, Pike County Conservation District

“The very existence of our nation, and of all the rest, depends on conserving the resources which are the foundations of its life.”

~ Gifford Pinchot

Swamps, marshes or bogs, whatever you choose to call them, wetlands play a vital role in the overall balance of the environment. Long regarded as wastelands, wetlands are now recognized for the numerous benefits they provide for both people and the environment including supporting a wide diversity of plants and wildlife, providing stormwater and flood control, improving water quality, supporting ecotourism, sustaining groundwater supplies and supporting recreational opportunities.

What Makes a Wetland a Wetland?

Wetlands generally occur in low-lying areas and depressions in the landscape, or in shallow water areas along rivers, lakes or ponds. Some wetlands, however, are found on slopes where groundwater seeps

Conserving wetlands, and the many benefits these ecosystems provide, becomes especially critical in rapidly developing areas such as Pike County.

to the surface. Wherever they are found, wetlands all have the following characteristics in common:

- **Hydric soils** – soils that show characteristics of being periodically saturated
- **Hydrophytic vegetation** – plants adapted to life in wet environments
- **Wetland hydrology** – the presence of water for extended periods of time at or near the surface

State and federal agencies responsible for wetlands protection use the following definition to describe wetlands and the conditions that create them:

“Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.”

Wetlands Are Vital Yet Vulnerable Natural Systems

In the 1600s, over 220 million acres of wetlands are thought to have existed in the lower 48 states. Since then, extensive losses have occurred, with over half of these original wetlands drained, filled or converted to other uses.

The picture is similar in Pennsylvania. In the late 1700s, the Commonwealth had over 1 million acres of wetlands. Today, less than half remains, covering about 2 percent of the state's total land area. Most remaining wetlands in PA are located in the glaciated northwestern and northeastern Pocono Mountains regions of the state, including Pike County.

Regulatory Protection for Wetlands

Wetlands are protected by federal, state and local laws. Commonly prohibited activities include filling, dredging or draining. Construction of bridges, walkways, docks, roads or levees across wetlands and alteration of wetland areas along streams, lakes or ponds all require state and/or federal permits.

Wetlands, particularly smaller wetland areas, are not always an obvious feature of the landscape. Seek professional advice if you plan any activities on your property in or around wetland areas. Assistance and information is available to determine if wetlands are present on your property through the Pike County Conservation District, Regional Offices of the PA Department of Environmental Protection, the US Army Corps of Engineers and private consultants. For a list of private consultants that provide wetland delineations, check your local yellow pages or contact the Pike County Conservation District.

The Human Impact

Despite what we know today about the benefits provided by wetlands, an estimated 60,000 acres are still lost each year in the U.S. The loss of wetlands is directly linked to a number of human activities that have direct or indirect impacts including:

- Draining and filling wetlands for land development
- Residential, commercial and industrial development adjacent to wetlands that releases pollutants and withdraws groundwater that would otherwise sustain wetlands, particularly during dry periods
- Agriculture practices that drain or otherwise degrade wetlands

- Certain mosquito control practices
- Diking or damming wetlands to form ponds and lakes
- Increased levels of stormwater runoff (Chapter 4) that carry pollutants into wetlands
- The introduction of non-native invasive plant species that crowd out beneficial native wetland plants

Whether the impacts to wetlands are direct or indirect, the result is the same: the loss of the many values and functions of wetlands. Conserving wetlands and the benefits they provide becomes especially critical in rapidly developing areas such as Pike County.

Wetland Benefits

Flood Protection - Wetlands provide flood control by absorbing rainfall and stormwater runoff, slowly releasing this water over time, helping to prevent downstream flooding. The role that wetlands play in flood control is critical for Pennsylvania, the most flood-prone state in the nation.

Wetlands act as natural filters, removing harmful substances that otherwise accumulate in surface and groundwater affecting humans and wildlife.

Groundwater Recharge - Water held by wetlands can soak down through soil and rock layers providing replenishment or “recharge” of groundwater supplies, a benefit that becomes particularly important during dry periods. Pike County’s relatively abundant supply of groundwater is most certainly linked to the abundance of wetlands found here.

Water Filtration - Wetlands act as natural filters, removing harmful substances that otherwise accumulate in surface and groundwater affecting humans and wildlife. Heavy metals and nutrients such as nitrogen and phosphorus are taken up by wetland plants removing these pollutants and others often carried in stormwater runoff. Wetland plants also help to slow down the movement of stormwater allowing eroded soil sediment to settle out.

Although wetlands aid in stormwater control and can improve water quality, they should not be seen simply as storage areas for excess, polluted stormwater runoff. Despite their effectiveness in removing many pollutants, the natural filtering capabilities of wetlands can be exceeded by excess amounts of soil sediment and chemical pollutants reducing or eliminating the important functions they provide as well as endangering the diverse assemblage of unique plants and animals they are home to.

Economic Value - Preserving wetlands can save taxpayer dollars by re-

ducing flood-related property damage and reducing or eliminating the need for expensive flood control structures. For example, the U.S. Army Corps of Engineers found that protecting wetlands along the Charles River in Boston, Massachusetts saved over \$17 million in potential flood damage. Wetlands can add to property values by keeping waterways and drinking water supplies clean and by providing open space. Human-made wetlands have been used as cost-effective alternatives to expensive wastewater treatment technologies. Conserving wetlands is also critical to ecotourism, which includes bird watching and hiking and generates millions of dollars annually.



Watershield and other aquatic plants are common along shorelines and in shallow lakes

Wildlife Habitat - Wetlands are among the most dynamic ecosystems in the world, comparable in plant and animal diversity to rain forests and coral reefs. An immense variety of plants, insects, amphibians, reptiles, birds, fish and mammals live in wetland ecosystems. Physical features such as climate, topography, geology and the movement and abundance of water all help to create a particular wetland habitat, which in turn determines the types of plants and animals that will be found there.



Pickerel frog: Wetlands provide habitat for a variety of wildlife

Wetlands can be thought of as “biological supermarkets” producing great volumes of food for many animals for part or all of their life cycles. The enriched organic material created by plant decomposition in wetlands is an important component of food chains, feeding aquatic insects, shellfish and small fish that in turn provide food for larger fish, reptiles, amphibians, birds and mammals, including humans.

Many plant and animal species are entirely dependent upon wetlands for survival. Animals spawn, nest, breed, rest and raise their young in wet-

lands. Wetland-adapted plants find suitable conditions to germinate, grow and flower.

More than 140 species of birds spend part of their life cycle in Pennsylvania's wetlands, including 8

of 13 state endangered or threatened species. More than 100 species of fish in PA spawn and/or feed in wetlands, including important recreational species.

Nationwide, over \$10 billion in fish and fish products are harvested from wetland and deepwater habitats annually. The high biological productivity of wetlands makes them vital ecosystems, not only to the plants and animals that directly depend on them for food and shelter, but to humans as well.

Recreation and Aesthetic Values - Wetland areas provide opportunities for hiking, bird watching and nature photography among other recreational pursuits. Hunters and anglers of wetland-dependent animals and fish rely on wetlands to support and maintain their recreational activities. For many people, wetlands also provide a peaceful place to reflect while escaping from the stress and strain of everyday life.

Identifying Wetlands on Your Property

Wetlands that have standing water year-round are relatively easy to identify. Others, particularly forested wetlands and smaller patches of wetlands on building lots, can be more difficult to recognize especially during drier parts of the year. Many wetland areas exist in developing areas of Pike County including the many residential subdivisions found here.

To avoid degrading wetlands – resulting in potential violation of environmental laws (Chapter 10) – before a property is developed, the landowner should have locations where wetlands exist identified and their boundaries mapped through a **wetland delineation**. Common techniques and tools utilized by professionals in conducting wetland delineations include the following:

Maps - Although they should not be relied on as the sole source to determine the presence or absence of wetlands on a parcel of land, County Soil Surveys and National Wetlands Inventory Maps are generally a good place to start. These large-scale, aerial photo-based maps show approximate locations of hydric soils, a good indicator of the presence of wetlands. These maps also show some, but not all wetlands present. Wetland delineations should also include a site inspection to field check mapped locations, to identify smaller, unmapped wetlands and to accurately mark the boundaries of wetlands that are present.

Plant Identification - In the field, wetland delineation professionals

More than 140 species of birds spend part of their life cycle in Pennsylvania's wetlands, including 8 of 13 state endangered or threatened species.

also look for trees, shrubs and ground cover known to grow in wet areas. Among the many types of wetland plants that exist, some more common examples include rushes, sedges, cattails, willows, high bush blueberries, cottonwood, sycamore and box elder.

Hydric Soils - Hydric soils are soils that are saturated with water for extended periods of time. These soils possess certain characteristics that can be observed in the field. Wetland delineators dig pits or use core soil samples to analyze soil coloration, organic material content, drainage characteristics and depth of water saturation. The resulting information is compared to known soil characteristics to determine if hydric soils are present.

Wetland Hydrology - To determine if water is present at or near the soil surface for a significant portion of the year, the wetland delineator examines rainfall data and looks at a site's topography and plant cover. Clues to periodic flooding or ponding of water include water-stained or blackened leaves in low spots and watermarks or water-carried debris at the bases of trees.

Summary

Once regarded as wastelands, wetlands are now recognized for the numerous benefits they provide for both people and the environment including supporting a wide diversity of plants and wildlife, providing stormwater and flood control, improving water

quality, supporting ecotourism and providing groundwater recharge. Conserving wetlands, and the many benefits these ecosystems provide, becomes especially critical in rapidly developing areas such as Pike County.

Wetlands are protected by federal, state and local laws. Commonly prohibited activities include filling, dredging or draining of wetlands. Other land use activities, in and around wetlands, require state and/or federal permits.

Seek professional advice if you plan any activities on your property in or around wetland areas. Assistance and information is available to determine if wetlands are present on your property through the Pike County Conservation District, Regional Offices of the PA Department of Environmental Protection, the US Army Corps of Engineers and private consultants. For a list of private consultants that provide wetland delineations, check your local yellow pages or contact the Pike County Conservation District.

Wetland delineations should also include a site inspection to field check mapped locations, to identify smaller, unmapped wetlands and to accurately mark the boundaries of wetlands that are present.

Action Steps for Protecting Wetlands

Because much of Pike County's wetlands are located on private property, it is important that the public participates in wetland conservation. The following are measures that residents can take to prevent wetland degradation and loss:

- ☞ Identify and take steps to protect wetlands on your property. Technical assistance can be obtained from the Pike County Conservation District, the PA DEP, the US Army Corps of Engineers or private consultants experienced in wetland delineation.
- ☞ Plan ahead to avoid “encroaching” on wetlands and maintain buffers around delineated wetland areas to minimize impacts when developing or improving a site.
- ☞ Support your local community association or municipality in any efforts to incorporate wetland protection into community codes, comprehensive plans, and land development ordinances.
- ☞ Support your local land conservancy, watershed group or community association in efforts to acquire and permanently protect wetlands in your community.
- ☞ Purchase federal duck stamps from your local post office to support wetland acquisition nationally.
- ☞ Before engaging in any activity that could affect wetlands, check with your local Conservation District.

Resources for More Information

Environmental Concern Inc. – Publications on constructing wetlands and selecting and growing wetland plants: www.wetland.org/ecpubs.htm

PA DEP, Wetlands: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “Wetlands, Wetlands Report.” Technical and general information on wetland protection, ecology and management.

U.S. EPA, Wetlands Education: www.epa.gov/owow/wetlands/education/

U.S. Fish and Wildlife Service: National Wetlands Inventory and general information on wetlands: wetlands.fws.gov/

U.S.G.S. National Wetlands Research Center: www.nwrc.usgs.gov/

8. Pond and Lake Ecology and Management

Protecting Community Water Resources

by John Jose, Watershed Specialist, Pike County Conservation District

(Adapted from *Reflecting on Lakes: A Guide for Watershed Partnerships*, a publication of the Pennsylvania Association of Conservation Districts)

“We, as adults, have recently begun to realize that the future we are building is one in which our children will live.”

~ Lakeline Magazine of the North
American Lake Management Society

Pike County’s abundant ponds and lakes are a highly valued natural resource offering numerous recreational opportunities, aesthetic value and critical habitat for plants and animals, while playing

a vital role in the Northeast Region’s economy. Many lake-based recreational pursuits, including swimming, skiing, boating and fishing, are enjoyed by residents and visitors alike. Lakes figure prominently in the regional tourism sector by providing a destination for thousands of visitors annually, resulting in millions of dollars entering the local economy. In addition, property values not only on the lakeshore, but also throughout a watershed, can benefit from a healthy lake.

Lakes, along with adjacent wetlands and forests, provide critical habitat areas for a variety of wildlife including several species of birds, reptiles and amphibians. Among the high diversity of aquatic plants found in Pike County lakes are PA threatened and endangered species.

Lakes can also provide an escape from the stresses of modern life. Last but not least, where supplies are limited, lakes provide a source of water for fighting fires. Taking into account the numerous benefits that lakes and ponds provide for Pike County communities, their conservation for long-term sustainable use becomes essential.

Taking into account the numerous benefits that lakes and ponds provide for Pike County communities, their conservation for long-term, sustainable use becomes essential.

Residents are finding that Pike County’s numerous lake are becoming increasingly degraded from the environmental impacts of both already existing & continued residential and commercial development.

How it All Started

Over the past three and half decades, Pike County has remained the most rapidly developing county in Pennsylvania. By providing a focal point around which Pike County's numerous lake-based communities have grown, the abundance of both naturally occurring and human-made lakes has played a pivotal role in the history of the County's development, particularly through the 1970s to the present. Many communities have developed to the point where hundreds of homes are now found within the watersheds (Chapter 1) surrounding local lakes.

Ironically, residents are finding that Pike County's numerous lakes, so highly valued by those relocating here, are becoming increasingly degraded from the environmental impacts of both already existing and continued residential and commercial development. This deterioration in lake quality comes in the form of decreased water quality, degraded wildlife and fish habitat, and a loss of lake-based recreational activities.

Predictions that the county's rapid rate of development will continue provide all the more reason to increase efforts to protect lakes as community resources. This chapter will focus on what residents can do as individuals, and together as a community, to work toward restoring degraded lakes as well as maintaining the quality of healthy lakes.

Lake Ecology: the "In-lake Environment"

Understanding lake ecology can be helpful in understanding measures that need to be taken to protect lakes. The ecological or "in-lake environment" is influenced by many factors including the following:

- Size, shape and depth of a lake
- The volume of water going into and leaving a lake, which will affect the concentration of nutrients, soil sediments and other potential pollutants
- How long it takes for a lake to completely renew its water volume, which affects nutrient concentrations and, in turn, aquatic plant growth
- The seasonally occurring stratification or layering of



White Deer Lake, Blooming Grove Township

water in a lake that results from differences in water temperature from the top to lake bottom

- The types and density of aquatic plants
- The biological productivity of a lake controlled largely by the availability of plant nutrients

A basic understanding of these ecological factors can be very helpful in making lake management decisions. However, lake ecology is a complex topic, and space limitations of this publication prohibit a more in-depth discussion. Readers interested in increasing their knowledge of lake ecology are encouraged to utilize the additional resource materials listed at the end of this chapter.

The Lake-Watershed System

Piecemeal efforts at controlling stormwater runoff, soil sediment pollution, and other threats to lake quality, can be financially intensive and are often ineffective over the long-term because they frequently fail to address the larger picture taken into account through management of a lake on



Painted turtles are commonly found in lakes that support abundant, aquatic plant growth

a watershed level. Understanding and incorporating the relationship between a lake and its watershed – the land area draining into a lake – is essential to providing effective, long-term management. So closely related are they that it is very useful to look at them as a **lake-watershed system**.

Indeed, the condition of a lake is largely a reflection of its surrounding watershed, including the human land use activities taking place there. In Pike County, the primary land use activities of concern are residential and commercial development as well as the daily activities of residents that can affect lake quality (See Chapter 2, Non-point Source Pollution).

The characteristics of a particular lake-watershed system depend on a number of variables including the ratio of drainage area to lake area, how the land is used, human population density, climate, soils and vegetation, the presence or absence of wetlands, as well as existing or absent conservation measures. The interplay between these and other variables varies from region to region and even from lake to lake.

The importance of the relationship between a lake and its water-

shed cannot be overemphasized. The characteristics of a particular lake, and its associated watershed, will become the basis for developing the most appropriate and effective lake management strategies.

Threats to Pike County Lakes and Ponds: Non-point Source Pollution

While some sources of pollution originating outside of a lake's watershed are more difficult to control, including atmospheric forms of pollution such as acid rain, much of the pollution that affects lakes originates from within contributing watershed drainage areas. In Pike County, this pollution occurs primarily in the form of **non-point source pollution** (Chapter 2).

Ongoing residential and commercial land development creates increasing levels of stormwater runoff (Chapter 4), along with the many pollutants carried in this runoff into lakes, including soil sediment (Chapter 5) from construction sites, bacteria and other microorganisms, and petroleum products from automobiles. On-lot sewage treatment systems and leaking underground storage tanks can also impact lake quality when contaminated groundwater flows beneath the surface and eventually into lakes.

Other Threats to Lakes and Ponds

Removal of aquatic plants growing from lake bottoms by lakeshore homeowners, or as a result of wave action from boats, degrades fish and wildlife habitat and releases soil sediments by removing root systems that hold lake-bottom sediments in place.

Sewage treatment plants, discharging directly to lakes or indirectly through releases to streams that feed into lakes, can contribute to lake pollution. Whenever feasible, outdated or poorly functioning treatment equipment should be repaired or replaced and facilities should be upgraded to include more advanced treatment options to further reduce pollutant levels in treated wastewater.

Residents served by central sewage can contribute to lake protection by avoiding pouring household hazardous wastes (Chapter 2) down household drains. When these wastes reach treatment plants, they can inhibit the process of decomposition and can also pass through a treatment



A lakeside buffer of tall grass, shrubs, and trees provides many benefits including intercepting pollutants carried in stormwater runoff

plant and be released to a stream or lake.

Clearing of shoreline vegetation removes a naturally occurring buffering system. If left intact, shoreline vegetation is very effective at stopping and absorbing many non-point source pollutants, including excess nutrients and sediment carried in stormwater runoff. Generally, the wider a buffer of shoreline vegetation, the greater the level of protection it provides.

Motorboats, particularly when traveling at high speeds, can churn up lake bottom sediment. Not only can sediment smother fish and amphibian eggs and clog fish gills, accompanying the release of sediments is the potential for the release of excess nutrients and toxic substances such as

The Effects of Excess Nutrients in Lake Ecosystems

Among the many forms of non-point source pollution, excess nutrients, particularly **nitrogen** and **phosphorus**, are often of primary concern in lake management. Typically, in sparsely developed watersheds, the existing low levels of these nutrients act as a **limiting factor** to the growth of aquatic plants.

However, excess amounts of nitrogen and phosphorus, released with soil sediments during land development activities and carried in stormwater runoff into lakes, can lead to a state of nutrient enrichment or **eutrophication** of a lake ecosystem (other sources of these nutrients include eroding stream banks, lawn and garden fertilizers and on-lot sewage treatment systems). Under these conditions, the growth of aquatic vegetation, no longer inhibited by a lack of nitrogen and phosphorus, can result in nuisance algal blooms and excessive growth of other aquatic plants, which in turn can lead to depleted oxygen supplies for fish and other aquatic life, nuisance issues for recreational pursuits, clogged spillways of dams, and aesthetically unappealing lake conditions.

Lake eutrophication is a naturally occurring process. However, excess nutrients released as a result of human activities in a watershed can greatly accelerate the rate at which this process occurs in local lakes and ponds.

Some lakes will more naturally and more quickly become eutrophic. Conditions conducive to eutrophication include shallow water depths and lakes that were created by flooding wetland areas. Under these conditions, attempts to control aquatic plant growth often result in prolonged, financially-intensive efforts. The result is often an uphill battle as efforts are made to reverse a naturally occurring process.

heavy metals.

Boats also leak fluids and produce exhaust that can contaminate lakes. This becomes a problem particularly with improperly maintained gas powered engines. Options for communities include requiring the use of electric motors in place of gas-powered motors and enacting speed limits for boating activity.

Perspectives in Lake and Pond Conservation

Conservation efforts are designed to protect natural resources to the greatest extent possible. This applies to the conservation of Pike County's numerous lakes and ponds. Both existing and future residential and commercial land development will continue to affect these community water resources. However, residents and communities as a whole can work toward sustaining and even improving lake quality to the greatest extent possible.

Along with preventative measures to lessen future impacts to lakes, remedies for existing lake management concerns can often be found. Lakes, however, are complex ecological systems. Efforts to address existing problems can create additional unintended problems and can have unforeseen environmental consequences. In addition, when the underlying causes of a particular problem are not effectively addressed, management of a lake can become an ongoing and costly venture.

Environmental Regulations for Lake Protection: Lakes, as water resources, are protected by law. Community, municipal, state and federal regulations may apply. Before undertaking any activities that involve construction adjacent to a lake or any activity that could involve "encroachment" into a lake or adjacent wetlands, such as modification of or construction of docks, building a lakeside structure or installation of beaches, check with your local conservation district to find out what permits, plans or approvals may be required.

Getting Assistance

A professional aquatic consultant can provide expertise in identifying the source(s) of problems for a lake and finding effective, environmentally-sound solutions. Check your local phone book, the references listed at the end of this chapter or contact the Pike County Conservation District for a list of consultants.

Another source of assistance for community associations is the **PA DEP Citizens' Volunteer Monitoring Program (CVMP)**, which provides



information and technical support for citizen-based, volunteer lake-monitoring programs. On-demand programs and lake monitoring training are available. (See Resources for More Information at the end of this chapter).

Partnerships in Lake Management

Another challenge often encountered by communities and lake management professionals is meeting the needs of the varied uses that lakes are valued for, including sport fishing, water skiing, swimming, plant and wildlife habitat and aesthetic values. One of the most effective means to meeting this challenge is through a **cooperative effort** that brings all stakeholders, including residents, into the process of developing a lake management plan. Involving all key players in the initial planning stages, and continuing to seek active participation through implementation of a plan, will help to identify and avert future conflicts and can be the key to success in lake management.

Community Association Codes and Covenants, Municipal Ordinances and Forestlands Conservation

Through the implementation of restrictions, codes and covenants, community associations have a number of options available in lake protection. An on-lot sewage treatment system inspection and maintenance program, requirements for setbacks and buffers, not only for lakes, but also along streams that contribute to lakes, and land preservation programs, along with numerous options for regulating how building lots are developed, are all considerations for community associations to improve protection of lakes.

In Pennsylvania, municipal governments, through the enactment of land use regulations designed to protect community water resources, can play a significant role in conservation of local lakes. Protection of forestlands can also contribute to long-term conservation of a lake by reducing levels of non-point source pollution that would otherwise be created by residential and commercial development within a lake's contributing watershed. Private land owners, community associations and municipalities all have options available to them to conserve forestland in Pike County. See Chapter 11 and Appendix D, Delaware Highlands Conservancy, for more information.

Summary

Conservationist Luna Leopold once said, "Water is the most critical resource issue of our time. The health of our waters is the principle measure of how we live on the land." What Mr. Leopold was referring to is the direct connection that exists between how we develop and live in our



watersheds, and what happens to our water resources, including the numerous lakes and ponds of Pike County. Ultimately, how well residents, local officials, conservation organizations, governmental agencies and the development community recognize and respect this connection will be the legacy they leave behind for future generations that will rely on these water resources for the many benefits they provide, including recreational opportunities, aesthetic values, plant and wildlife habitat, and regional economic benefits.

Action Steps for Protecting Ponds and Lakes

- ☞ Get to know your particular lake and not only what is happening right around the lake, but also throughout the lake's contributing watershed.
- ☞ Voice support for community association efforts in the development of an overall lake management plan that incorporates the relationship between a lake and its watershed and provides a blueprint for long-term management.
- ☞ Support the formation of an environmental committee that can facilitate the development and implementation of a lake management plan for your community association. Associations that already have an environmental committee can consider a sub-committee for lake management oversight.
- ☞ Join or start a community lake-monitoring program. The information provided by a monitoring program can be very useful in assessing current factors affecting lake health, identifying measures that may be required to correct existing problems as well as measuring the effectiveness of future efforts to improve lake quality.
- ☞ Form a partnership among all interested parties. This provides many benefits including combining financial resources, expertise and getting all stakeholders involved.
- ☞ Take steps to reduce non-point source pollution (Chapter 2), particularly nutrients, as an essential component of any lake protection plan.
- ☞ Support community association efforts to implement restrictions, codes and covenants designed to protect lakes.
- ☞ Attend meetings of local municipal officials and voice sup-

port for any conservation efforts they undertake to benefit community lakes.

☞ Support wetlands conservation, particularly wetlands adjacent to lakes for wildlife species dependent on both types of habitat to complete their life cycles. Wetlands also help with the removal of non-point source pollutants as well as controlling stormwater runoff and flooding of lakes.

Resources for More Information

Consortium for Scientific Assistance to Watersheds (C-SAW): pa.water.usgs.gov/csaw/. Find information on services provided, eligibility and a downloadable application for assistance. Comprised of a team of specialists, sponsored by the PA DEP Growing Greener Program, who provide program management and scientific technical assistance, including support for lake assessment and management initiatives.

Illinois Environmental Protection Agency, Lake Fact Sheets: www.epa.state.il.us/water/conservation-2000/lake-notes/

PA Association of Conservation Districts, Water Pollution Fact Sheets: pacd.org/resources/print.htm

PA DEP, CVMP: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “Citizens’ Volunteer Monitoring Program.” A state-sponsored program providing information and technical support for citizen-based, volunteer lake-monitoring programs. CVMP also provides technical assistance in lake management to private lake owners, lake managers and organizations (including community associations, resorts, hunting and fishing clubs, and summer camps). For more information telephone: 1-717-772-5651.

PA Lake Management Society, Fact Sheets: www.palakes.org/publications.htm

Penn State Cooperative Extension and PA Fish and Boat Commission, Pond Management: www.sfr.cas.psu.edu/water/pond%20management.htm

US EPA, Monitoring and Assessing Water Quality: www.epa.gov/owow/monitoring/

US EPA, Watershed Academy Web, on-line training in watershed management: www.epa.gov/watertrain/

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.

It is the nature of streams to change course, adjusting their channels and banks in response to natural or human-made changes. Unfortunately, it is also the nature of people living near streams to try to stop or alter these processes.

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



The Lackawaxen River

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

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.

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



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.



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.

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.

Benefits of Forested Riparian Buffers

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

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

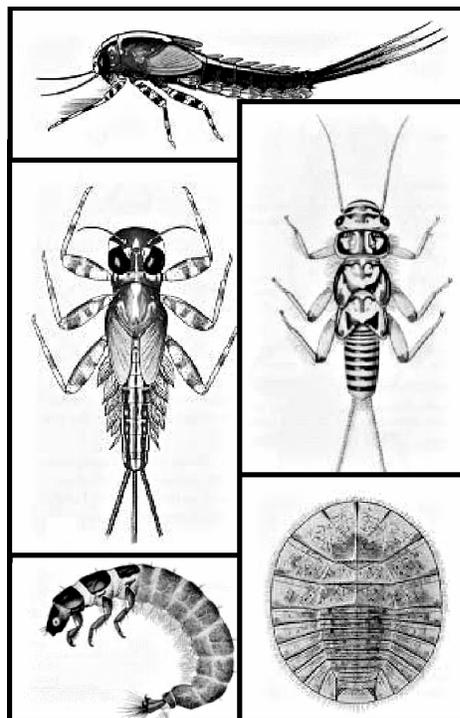
In 1987, in the face of rapidly increasing residential and commercial development and concerns over potential impacts from this development, the Pike County Conservation District initiated a stream-based water quality

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.

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



"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.

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 stream-side 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 Relief.”

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

10. Understanding Environmental Regulations

Playing by the Rules to Protect Pike County's Natural Resources

by Will Whitehead, Resource Conservationist and Susan Beecher,
District Manager, Pike County Conservation District

“The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic, and esthetic values of the environment. Pennsylvania’s public natural resources are the common property of all the people, including generations yet to come. As trustees of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.”

~ Pennsylvania Constitution – Section 27, Article 1

Environmental regulations are designed to protect natural resources and the people and other life that depend on those resources. Environmental regulations also help to safeguard personal property and financial investment and provide numerous other economic benefits to individuals and communities.

Environmental regulations are sometimes misunderstood in their intent or criticized as being over burdensome and infringing on individual rights. In addition, environmental regulations do not always provide the level of protection they are intended to. While they may not be perfect in their intended purpose and are often subject to controversy, environmental regulations do serve a critical purpose: protection of the natural resources – air, water, soil, forests, fish and wildlife – that support people, communities, economic well-being, and the quality of life enjoyed by Pike County residents.

This chapter will not cover all existing environmental regulations nor all the land use activities with the potential for environmental impact, occurring in Pike County. Instead, the reader will be introduced to the local, state and federal regulatory frameworks designed to guide and minimize the impacts of the more commonly occurring land use activities (residential and commercial development, stone quarrying, timber harvesting, road building and maintenance, sewage waste processing and disposal, etc.).

Having a basic understanding of the environmental regulations described here will benefit residents as these regulations may require permits, plans or approvals that can apply to both small projects around the home as well as larger land development projects, such as residential subdivisions. More information on environmental regulations, along with downloadable forms, is available on the Pike County Conservation District web site: www.pikeconservation.org.

I. Chapter 102 and 105 and Chapter 92 NPDES Permits

Earth Disturbance Activities Large and Small

PA Code Title 25 - Chapter 102 - Erosion & Sediment Control

Earth disturbance activity – defined as “a construction or other human activity which disturbs the surface of the land...” – removes living vegetation, including trees, shrubs, flowering plants and grasses, as well as leaf litter, from forest floors. Stormwater runoff (Chapter 4) can pick up and carry exposed soil from disturbed areas to streams, wetlands or lakes resulting in pollution of these surface waters.

- Purpose of Chapter 102: To minimize the release of sediment-laden stormwater runoff from earth disturbance sites during construction in order to protect and maintain water quality
- Chapter 102 requires that an **Erosion & Sediment Control Plan (E&S Plan)** (Chapter 5) be *developed, implemented* and *available on-site* at all times during earth disturbance activities

Examples of Earth Disturbance Activities Requiring an E&S Plan

- Construction of individual houses, driveways and on-lot sewage systems
- General, large-scale land development activities
- Clearing areas and grubbing (removing tree roots)
- Moving and stockpiling soil, rock or other earth materials
- Excavations (removing dirt) and grading (distributing dirt over a site)
- Timber harvesting including developing trails and logging roads
- Road maintenance including grading dirt and gravel roads, ditches and drain pipes



**Pike County Conservation District
Erosion & Sediment Control Guidelines
for Small Projects**

Use of this Guide
This Guide is only for use in developing Erosion & Sediment (E&S) Control Plans for small projects that meet the following criteria:

- ✓ Slopes do not exceed a 10% grade
- ✓ There are no surface waters in close proximity to the proposed project
- ✓ Erosion control practices being used do not require calculations.
- ✓ Total area of disturbance is less than 1 acre

This Guide may also be used to develop E&S Control Plans when the landowner is submitting a Chapter 105 General Permit for acknowledgement. In addition, check with your municipality to determine if any local ordinance provisions or permit requirements apply to your project.

Please Note: This Guide is not appropriate for every project! Your project must meet the criteria listed above in order to use this Guide to develop your E&S Control Plan. For larger, more complex projects, a detailed *Erosion and Sedimentation Pollution Control Manual* is available through the Conservation District. Check your yellow pages for engineers or other consultants that can assist in developing E&S Control Plans. Contact the Pike County Conservation District if you are unsure of the suitability of this Guide for your project. Telephone: 570-266-8220.

Erosion and Sedimentation is a Serious Pollution Problem
Soil sediment is the number one pollutant to Pennsylvania's water resources. Sediment reduces water quality, degrades aquatic habitats killing fish and other aquatic life, and increases the frequency and intensity of flooding events. Any activity that disturbs the surface of the land can cause erosion and sedimentation. Completing and properly implementing an E&S Control Plan for your earth disturbance project will help protect Pike County's soil and water resources as well as the County's economic sustainability and quality of life.

State and Federal Regulations Require E&S Control Plans
To address the problem of sediment pollution, the Commonwealth of Pennsylvania, Department of Environmental Protection (DEP), adopted Chapter 102, Erosion and Sediment Control Rules and Regulations. Chapter 102 requires persons proposing or conducting earth disturbance activities to develop, implement and maintain *Best Management Practices* to minimize the potential for accelerated erosion and sedimentation. A written E&S Control Plan is required for all earth disturbance activities with the potential for discharge to waters classified as "High Quality" or "Exceptional Value" waters (which includes most of Pike County). In addition, the E&S Plan must be available at the project site during all stages of the earth disturbance activity. The Plan must be submitted to the Conservation District for review if required by the local municipality (or, in some cases, a Community Association) or requested by the Conservation District. Both landowners and contractors may be held responsible for any violations of Chapter 102 regulations.

A Note about Streams, Floodways, Wetlands & Other Bodies of Water:
Any encroachment on any watercourse, floodway, or body of water without the appropriate federal and state permits is strictly prohibited by the Federal Clean Water Act, the Commonwealth of Pennsylvania's Dam Safety and Encroachments Act, The Clean Streams Law and Chapter 105 rules and regulations. In addition, some local municipalities have setbacks and other ordinance provisions related to water resources that may be applicable to certain land development activities. Plan ahead to avoid these areas or inquire about permit and other requirements well BEFORE beginning your project.

*Guide for developing E&S Plans
for small projects available at the
Pike County Conservation District*

For small-scale earth disturbance activities on low-risk sites (sites where pollution of surface waters from soil erosion is unlikely), a hand-drawn E&S Plan, prepared by the landowner or contractor, is often all that is necessary. The Conservation District is available to provide technical assistance for these plans and can also provide an **Erosion Control Guidelines for Small Projects** booklet, a step-by-step guide for creating an E&S Plan.

Larger more complex projects, such as residential subdivisions or commercial developments, typically require more technical information and the design expertise of an engineer or other professional to create an E&S Plan. The PA Department of Environmental Protection's **Erosion and Sediment Pollution Control Program Manual**, with more detailed guidance for the preparation of more complex E&S Plans, is available in both paper and digital format at your local conservation district.

For more information or for assistance in determining if a Chapter 102 plan is required for a project, contact:

Pike County Conservation District
Telephone: 570-226-8220
Email: pikecd@pikepa.org

Discharges to Surface Waters

PA Code Title 25 - Chapter 92 & the Federal Clean Water Act – National Pollutant Discharge Elimination System (NPDES) Permitting, Monitoring & Compliance

An NPDES permit for stormwater (Chapter 4) discharges from construction activities requires the implementation of practices to minimize stormwater impacts to surface waters, both during and after construction is completed. The Pike County Conservation District and PA DEP share responsibility for reviewing applications for NPDES Permits for stormwater discharges. Other types of NPDES permits, such as those involving sewage discharges, are handled exclusively by DEP.

- Purpose of NPDES permits: Regulation of different types of pollutant discharges to surface waters & pollution prevention
- Chapter 92 sets requirements for publishing public notices of all NPDES permit applications submitted to PA DEP, allowing for public comment periods and providing notice of and holding public hearings on permit applications

Examples of Activities that Require NPDES Permits:

- Stormwater discharges from construction activities where five acres or more is disturbed over the life of a project
- Stormwater discharges from construction activities where earth disturbance is between 1 and 5 acres and which have a **point source discharge** (Chapter 2) to Waters of the Commonwealth (streams, rivers, lakes, ponds, wetlands, reservoirs, canals, stormwater ditches, etc.)
- Discharge of treated sewage effluent from a wastewater treatment plant
- Industrial discharges

For more information or for assistance in determining if an NPDES permit is required for a project, contact:

Pike County Conservation District

Telephone: 570-226-8220

Email: pikecd@pikepa.org

or

PA DEP Northeast Regional Office

Telephone: 570-826-2511

Work In or Around Waterways (Ponds, Lakes, Rivers and Streams) and Wetlands

PA Code Title 25 - Chapter 105 - Dam Safety and Waterways Management

Land development activities that “encroach” on surface waters can degrade habitat, impacting aquatic life and causing or aggravating flooding, resulting in property and infrastructure damage. Land use activities that involve disturbance of areas adjacent to surface waters or activities that involve crossing or entering surface waters, are regulated under Chapter 105.

- Purpose of Chapter 105: To assure the proper design, construction and maintenance of dams, reservoirs, water obstructions (e.g. structures including bridges and culverts) and encroachments (e.g. placing fill in floodways or excavating in wetlands); to protect public health, safety, welfare and property and to conserve and protect streams
- Chapter 105 regulates the building of structures and activities that take place in, along or across, or projecting into a watercourse (streams, creeks, seasonal drainages),

floodways (areas adjacent to streams), or bodies of water (including ponds, lakes, swamps, bogs, etc.)

Examples of Activities that May Require a Chapter 105 Permit

- Installing a road across a stream (even a seasonally dry stream) using culvert pipe(s).
- Building a bridge, including foot bridges, across a stream
- Repairing eroded stream banks with rock, fill dirt or other material
- Removing gravel deposits from streams
- Building a retaining wall along the edge of a stream or pond
- Crossing a stream with a utility line (such as water, natural gas or sewer lines).
- Installing a road across a wetland using fill or pipes or a combination of both
- Building a foot path or boardwalk through wetlands
- Extending a lawn or filling in low spots within 50 feet of a stream
- Placing fill in wet areas
- Building a ditch to drain a wet area
- Dredging a pond or lake
- Installing a boat ramp or dock
- Creating a sand beach area
- Building or repairing a dam

The cost, complexity and time frame for obtaining a permit under Chapter 105 depends on the size, scope and potential environmental impact of a project. The Pike County Conservation District administers PA Department of Environmental Protection (DEP) Chapter 105 **General Permits** for relatively simple projects that generally have minimal adverse environmental impacts when properly constructed. There is currently no fee for a permit, the forms are fairly simple and review time is relatively short.

More complex projects or projects that have the potential for greater environmental impact and do not fall within one of the Chapter 105 General Permit categories require a higher level **Individual Permit**. Most often the services of a professional consultant are enlisted to conduct the more in-depth environmental assessments and design requirements of Individual Permits. The PA DEP administers these permits.

Federal permits are required for many of the activities listed above. In many cases, state and federal agencies coordinate permit application reviews. However, there are activities that require separate federal authorization from the US Army Corps of Engineers. Authorization from other agencies, such as PA Fish and Boat Commission or the U.S. Fish and Wildlife may also be required depending on the scope of your project. Your local conservation district is a good first point of contact to determine if a Chapter 105 permit is required for a project.

For more information or for assistance in determining if a Chapter 105 permit is required for a project, contact:

Pike County Conservation District

Telephone: 570-226-8220

Email: pikecd@pikepa.org

II. Additional PA Regulatory Programs for Water Resource Protection **Work In or Around Waterways - PA Fish & Boat Commission** **PA Code Title 58, Part II**

Examples of Activities that May Require Permits under PA Code Title 58, Part II

- Drawing down water levels of lakes or ponds inhabited by fish
- Removal, breach or disturbance of a dam or similar device in waters inhabited by fish
- Application of algaecides, herbicides or fish control chemicals to surface waters
- Alteration or disturbance of a stream, streambed, fish habitat, water or watershed in any manner that might cause damage to fish
- Allowing any substance deleterious to fish to enter surface waters

For more information or for assistance in determining if a PA Code Title 58, Part II permit is required for a project, contact:

PA Fish and Boat Commission

Northeast Regional Office

Telephone: 570-477-5717

PA Code Title 25 - Chapter 93 - Water Quality Standards

- These regulations require maintenance and *protection of existing water quality* for Special Protection Waters (High Quality and Exceptional Value).
- Chapter 93 standards affect state permitting of activities with the potential to impact water resources. Generally, requirements are more stringent for discharges to High Quality and Exceptional Value water resources.
- These regulations are very applicable in Pike County, as nearly all of the water resources in the county are designated either High Quality or Exceptional Value by the PA DEP.

Refer to the list of activities listed above in the section on NPDES discharge permits, for activities that Chapter 93 applies to.

For more information or for assistance in determining if PA Code Title 25, Chapter 93 Standards apply to a project, contact:

Pike County Conservation District
Telephone: 570-226-8220

or

PA DEP Northeast Regional Office
Telephone: 570-826-2511

Extraction (Mining) of Sand, Gravel, Rock and other Materials

PA Code Title 25 - Chapter 77 – Non-coal Mining

- Purpose: Regulation, permitting, licensing, monitoring of non-coal surface mining activities and operators.

Examples of Activities that May Require Mining Permits

- Excavation/removal of minerals from the earth including: sand and gravel, rock and stone (including blue-stone), earth fill, slag, vermiculite and clay

There are various exceptions to the requirements for mining permits for the extraction of minerals by a private landowner for the landowner's own non-commercial use and for the extraction of minerals from a building construction excavation site under certain circumstances.

For more information or for assistance in determining if a mining permit is required for a project, contact:

PA DEP Bureau of Mining and Reclamation
Pottsville District Mining Office
Telephone: 570-621-3118

Local Municipal Land Use and Building Regulations, Zoning, Subdivision & Land Development Ordinances, Building Permit Requirements, etc.

Land use regulations in effect in Pike County municipalities may apply to the land use activities discussed in this chapter. Before beginning a project, check with the municipality (Appendix B) where a project will take place to find out what regulations may apply.

A good rule of thumb: When in doubt about permit requirements for a particular project, Ask Questions Before You Begin!

The Pike County Conservation District is a good place to start: 570-226-8220

Summary

Being aware of and abiding by municipal, state and federal environmental regulations is important for several reasons. These rules help Pike County to “grow smarter,” balancing development with protection of environmental and community resources. Understanding and following these regulations also helps to protect financial investment in personal property and helps to safeguard the health, safety and welfare of Pike County communities. And finally, failure to pay attention to these regulations, whether done knowingly or not, can delay project construction significantly and subject landowners and/or contractors to fines or other penalties. When in doubt about permit requirements for a particular project, it’s best to ask questions before you begin. The Pike County Conservation District is a good place to start.

Action Steps for Protecting Natural Resources Through Compliance with Environmental Regulations

- ☞ Before beginning a project, check with your Conservation District and your local municipality to determine what plans, approvals and permits may be required.
- ☞ To avoid unnecessary delays, begin the process of determining what a project will require and obtaining permits, well in advance of an anticipated start date.

- ☞ For large projects, hold a pre-application meeting with your local conservation district before project plans are drawn-up.
- ☞ Report environmental emergencies and problems (Refer to Appendix G for agency contact information).

Resources for More Information

Pike County Conservation District: www.pikeconservation.org, select “Resources/Services”

PA DEP, Chapter 105 Forms and Permits:

<http://www.dep.state.pa.us/dep/efacts/generalpermitslisting.htm>

PA Fish and Boat Commission, Environmental Services:

sites.state.pa.us/PA_Exec/Fish_Boat/environ.htm

PA DEP, Stormwater Management: www.depweb.state.pa.us/dep/site/default.asp. Select “Search” and “Stormwater Management.”

PA DEP, Bureau of Waterways Engineering: www.dep.state.pa.us/dep/deputate/watermgt/WE/We.htm, select “Dam Safety”

PA DEP, List of General Permits: www.dep.state.pa.us/dep/efacts/generalpermitslisting.htm

11. Smart Growth

Strategies for Creating Viable, Environmentally Sustainable Communities

by Susan Beecher, District Manager, Pike County Conservation District

“Smart growth helps communities shape the future. With appropriate planning, local governments can make land use control and development decisions that will improve their communities’ overall quality of life by protecting the best of their unique economic, political, social and environmental characteristics.”

- Javier Gonzales, President, National Association of Counties

Pike County owes its economic and social well being to the scenic beauty and natural resources that attract people and businesses and provide quality of life to residents and visitors: clean and abundant water resources, clean air, intact forests, abundant wildlife, scenic vistas, readily accessible public recreational lands and natural areas. In the next decade and beyond, Pike and other counties in the Northeast region will absorb thousands of new residents. Efforts to accommodate this growth, while protecting the County’s natural resources, could be greatly enhanced by proactively planning and implementing sustainable, community-oriented patterns of growth and development.

Sprawl Hurts

Growth may be inevitable, but sprawl doesn’t have to be. Sprawl can be defined as scattered, poorly planned development, such as large-lot subdivisions, spreading across rural areas and commercial strips along roadways. Sprawl is generally associated with rapid consumption of open space, prime farmland, forests, historic sites, and scenic landscapes accompanied by a loss of distinctive community character and quality of life.

We All Pay for Sprawl

A 2000 study on The Costs of Sprawl in Pennsylvania by Clarion Associates, Inc. for the 10,000 Friends of Pennsylvania found that sprawl:

- **Consumes natural areas, agricultural lands and open spaces**
- **Increases air & water pollution**
- **Increases the costs of roads, housing, school and utilities**
- **Increases the costs of transportation**
- **Concentrates poverty and accelerates socio-economic decline in cities, towns and older suburbs**

Environmental Impacts of Sprawl

The increasing number of environmental challenges Pike County residents are faced with – water pollution, loss of streamside forests, wetlands and floodplain encroachment, stormwater and flood damage, habitat fragmentation, and wildlife conflicts – is in part due to the way in which land has been developed over the last decade. Sprawling land development patterns and the resulting loss of open space impact the environment in multiple ways. Not only do we lose the natural landscape features we value – stream corridors, forests, wetlands, etc. – we also lose the essential functions and values that these features provide: stormwater runoff control, pollutant filtration, groundwater recharge, flood mitigation and storage, wildlife habitat, recreational and scenic values, to name just a few.

Can We Grow Smarter?

Smart growth strategies are helping communities throughout the country to plan for and accommodate growth in ways that meet both economic and environmental needs. Smart growth strategies help many communities face concerns about the impacts of sprawling development patterns including environmental degradation, dwindling open space, long commutes, spotty or stagnant economic development and the loss of community character.

Smart growth strategies provide local governments, community groups, lenders, developers, transportation officials and state governments, faced with the pressing challenges of growth, with alternative approaches to land development that provide for the long-term preservation and enhancement of communities. While there is no “one size fits all” solution, there are

Smart Growth Principles

- **Mix land uses**
- **Take advantage of compact building design**
- **Create a range of housing opportunities and choices**
- **Create walkable neighborhoods**
- **Foster distinctive, attractive communities with a strong sense of place**
- **Preserve open space, farmland, natural beauty and critical environmental areas**
- **Strengthen and direct development towards existing communities**
- **Provide a variety of transportation choices**
- **Make development decisions predictable, fair and cost-effective**
- **Encourage community and stakeholder collaboration in development decisions**

a number of planning practices, techniques and options available to local government officials that have been used successfully in a variety of urban, suburban and rural settings in Pennsylvania and across the country.

Tools for Smart Growth Comprehensive Planning

A **comprehensive plan**, also known as a “master plan,” is the basic foundation for local planning, providing a blueprint of a community’s vision and priorities and establishing reasonable goals for conservation and development. Comprehensive plans may be developed on the county, township or borough level. The most effective comprehensive plans are developed with broad-based citizen participation and updated regularly to reflect the values and goals of the general public. Comprehensive plans include an inventory of what currently exists in a community and what growth in population and changes in land use can be expected to occur over the next 5 to 10 year period.

- Some Elements of
Comprehensive Plans**
- **Statement of community development objectives**
 - **Plan for land use**
 - **Plan to meet housing needs**
 - **Transportation Plan**
 - **Plan for community facilities and utilities**
 - **Plan for protection of natural and historic resources**
 - **Plan for the reliable supply of water**
 - **Short and long-range implementation strategies**

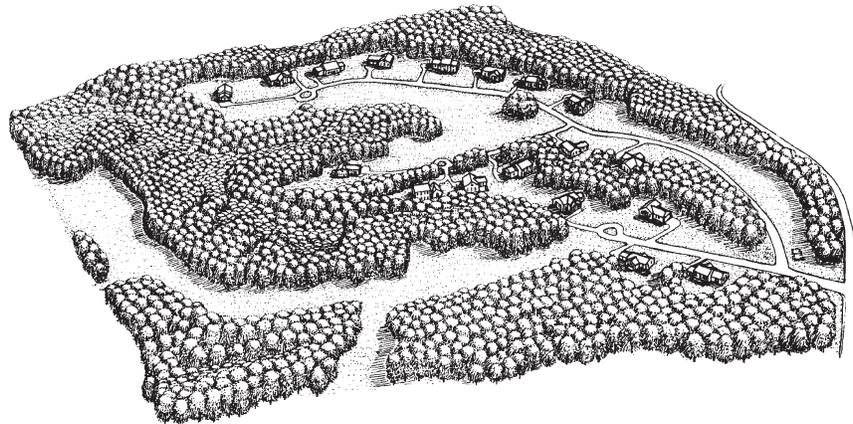
Land Use Regulations

In the process of enacting land use regulations to guide growth and development in their communities, well-meaning local officials may inadvertently encourage the sprawling land use patterns they are seeking to avoid. To address this problem and turn the tables on sprawl, zoning regulations may need to be modified to mandate or at least encourage and allow **Conservation Design** principles to be incorporated into land development projects.

In addition, overlay districts can be created to protect important resource areas such as stream corridors, floodplains, wetlands and steep slopes. Subdivision/land development ordinances can also be used to ensure incorporation of conservation design strategies early in the planning process. A detailed site analysis and identification of natural features to be protected is most useful if created before the location of lots, roads, buildings, etc. are established.

Stormwater Management Planning

Natural landscapes, such as forests, fields and wetlands, absorb rain



Conservation Design subdivisions conserve open space and community natural resources for the benefit of residents. Reprinted with permission of the Natural Lands Trust, Inc.

water and snowmelt, allowing them to slowly filter into the ground. As more and more land becomes covered with **impervious surfaces**, such as roads, parking lots and buildings, precipitation does not percolate into the ground, but instead runs off the surface quickly and in large quantities. Such accelerated runoff, resulting from development throughout a watershed, increases flooding and streambank erosion, carries pollutants to surface and groundwater and reduces groundwater recharge, essential to drinking water supplies and stream flows. Studies have shown a direct relationship between impervious cover and water quality; as impervious surfaces increase, water quality declines.

County and municipal governments can develop and carry out **Stormwater Management Plans**, which focus on reducing stormwater impacts in a particular watershed. Successful stormwater management strategies include those that maintain natural vegetation and drainage patterns, minimize impervious cover, promote infiltration and groundwater recharge and protect water quality.

Regional Cooperation

In Pennsylvania, in the absence of joint planning, every municipality must provide for every type of land use within municipal boundaries. This mandate is widely acknowledged as contributing to duplicative development and land consumption. Local governments wrestle with a variety of issues - including water resources planning and protection - that extend beyond their municipal boundaries.

In addition, the water resources of a watershed do not recognize the

political boundaries that people create. For instance, a stream's watershed area often encompasses a number of municipalities or even counties and underground aquifers

don't stop at township lines. Cooperative, multi-municipal planning efforts provide a logical means of addressing these issues and protecting community water resources.

Cooperative, multi-municipal planning efforts provide a logical and highly effective means of protecting community water resources.

Citizen Participation

Opinion polls and community visioning consistently indicate strong public support for protecting the environment, saving open space, preserving historic and cultural buildings and landscapes, and keeping water and air clean. Successful planning and growth management however, must have the active support of local elected officials and citizens alike.

Often the threat of a proposed development provides the catalyst that arouses people to action; unfortunately, once a development proposal reaches a municipality for review, it is often too late to require substantive changes in the project's design. Citizens for whom such issues are important need to be involved early on in shaping long-term planning and land use strategies and in the election of leaders committed to the same. Rather than attempting to protect the environment by challenging each land development project individually, citizens and officials must work together to identify resources that are important to the community, then prepare a plan and land use regulations that preserve those resources and promote sustainable development.

Elected officials need to hear constructive input from a broad range of individuals and groups in order to make tough

decisions about their community's future. They also need the support and added level of expertise and person-hours afforded by volunteer planning commission members, Environmental Advisory Councils, municipal authorities and the like. Effective planning cannot happen in a vacuum; it must be a reflection of community values.

Effective planning cannot happen in a vacuum; it must be a reflection of community values.

Land Acquisition and Conservation Easements

In Pennsylvania, it is estimated that we are annually losing three acres of open land for every one conserved, and the rate of loss is accelerating. In fast-growing areas like Pike County, the demand for land, rising

Conservation Design Principles

Conservation Design strategies can play a vital role in accommodating growth while protecting land and water resources. These strategies can also assist land developers in meeting regulatory requirements relating to erosion control, water quality protection and stormwater management. These include but are not limited to the following general concepts:

Minimize Disturbed Areas

- Plan construction to limit the area of earth disturbance
- Keep building and parking areas as compact as possible
- Retain and utilize natural site conditions
- Maintain buffers along streams and other water resources
- Work with existing topography. Fit the project to the site vs. making the site fit the project

Maintain Natural Hydrologic Cycles

- Maintain the pre-development water budget to the greatest extent possible
- Maintain natural drainage patterns
- Control net increases in post-development stormwater runoff volume
- Minimize impervious areas
- Provide opportunities for groundwater recharge

Protect Water Quality

- Fully evaluate non-discharge alternatives
- Utilize low maintenance non-structural stormwater controls
- Maintain native vegetation including riparian buffers
- Avoid excessive earthmoving
- Limit high-maintenance water- and chemical-dependent landscape areas

land values and rising taxes all combine to increase pressures on landowners to sell or develop land.

There are a variety of options available to private landowners who wish to preserve land; many of these strategies also offer tax incentives. Some of the most commonly used techniques include fee simple donation, conservation easement, bargain sale and conservation-based development. For more information on land conservation options,

There are a variety of options available to private landowners who wish to preserve land.

see Resources for More Information at the end of this chapter.

In addition to options available to private landowners, there are opportunities for local governments to purchase land for parks, recreation and open space protection purposes. An example of this is the Pike County Scenic Rural Character Preservation Bond. Passed in November 2005 by a majority of Pike County residents this initiative will provide \$10 million to conserve drinking water, wildlife habitat, scenic ridges, and critical open space. A portion of the funds could be utilized to support acquisition and management of conservation easements, parks and forestland.

Summary

Development pressures will continue to present significant challenges to maintaining the quality of life, including the abundant natural resources that make Pike County a desirable place to live and a sought after destination for visitors. Unplanned or poorly planned communities that encourage sprawling development patterns could experience considerable long-term consequences including environmental degradation, dwindling open space, fragmented or stagnant economic development and a loss of community character.

Smart growth strategies provide an antidote to the negative impacts of sprawl. Comprehensive planning, land use regulations that link development with sustainable use of natural resources, protection of open space, innovative stormwater management strategies, enlisting the participation of residents in community planning, and multi-municipal cooperative efforts are all part of the tool kit of options that smart growth strategies provide.

Action Steps for Implementing Smart Growth Strategies

- ☞ Support community association and municipal efforts to conserve open space through land acquisition and conservation easements.
- ☞ Support municipal initiatives to manage stormwater on a regional or watershed basis through cooperative efforts between neighboring municipalities.
- ☞ Get involved in the community planning process. Attend monthly public municipal meetings or volunteer to serve on a municipal planning board.
- ☞ Voice support for municipal efforts to adopt land use regulations that support conservation design and low impact development strategies.

☞ Let local officials know you support the creation and implementation of comprehensive plans that provide a blueprint for community development.

Resources for More Information

Delaware Highlands Conservancy. A local, non-profit land trust:
www.delawarehighlands.org

Low Impact Development Center: www.lowimpactdevelopment.org

Natural Resources Defense Council:
www.nrdc.org/water/pollution/storm/chap12.asp

PA DCNR, Pennsylvania's Wildlife and Wild Places; Our Outdoor Heritage in Peril: www.dcnr.state.pa.us/pawildlifebook/pawildlife.pdf

Scenic America: <http://www.scenic.org/>

Sierra Club report: www.sierraclub.org/sprawl/factsheet.asp

Smart Growth America: smartgrowthamerica.org/index.html

Smart Growth Network: www.smartgrowth.org

Sprawl Watch Clearinghouse: www.sprawlwatch.org

Using Conservation Easements to Preserve Open Space: A Guide for Pennsylvania's Municipalities and Land Conservation Strategies, A Guide for Landowners. Publications available at www.heritageconservancy.org/.

12. Citizen Action

Getting Involved and Making it Happen in Your Community

by John Jose, Watershed Specialist, Pike County Conservation District

“Healthy communities need involved citizens. A civil society depends on citizen concern and citizen action as its lifeblood.”

~Grassroots Leadership Development
W.K. Kellogg Foundation

Pike County is at a crucial point in its history. Ever-increasing growth pressures will continue to present many challenges. Rapid rates of development raise several important questions about the future including:

Residents, both long-term and the newly arrived, can make an important contribution in planning for the future of Pike County communities.

What will Pike County communities look like 10, 15, 20 or even five years from now?

Will residents retain the quality of life the County offers including the highly valued water resources, the many miles of streams and rivers as well as the abundant lakes and wetlands, found here?

Will groundwater resources remain abundant and clean and continue to meet the needs of residents and businesses?

Will Pike County suffer the fate of so many other areas of Pennsylvania as “sprawling” growth patterns dominate the development of communities?

The Window of Opportunity is Still Open

Despite these challenges and unanswered questions, opportunities still exist to address continuing land development pressures while conserving the natural resources that support the quality of life that Pike County residents enjoy. While local, state and fed-

Citizen groups play an important role as a voice for the concerns of residents bridging the gap between residents and community associations and municipal, county, state and even federal government agencies.

eral agencies, the business sector and environmental organizations all have a significant role to play in charting a course for the future of the County's communities, residents – both long-term and the newly arrived – also have an important contribution to make.

Bringing about positive change and making a difference may seem like a daunting task. But when people as individuals, and as a community, begin to look at what they collectively bring to the process of community planning and development, they begin to see that any number of options and possibilities exist. Each person brings his or her own unique perceptions, knowledge and concerns. By coming together to share concerns and visions for the future, residents can begin to build on the expertise and talents of the group as a whole.

Where resources are limited, including constraints on time, finances and experience, citizen volunteers can help fill the vacuum and make a significant contribution to meeting community needs. Citizens groups can also play an important role as a voice for the concerns of residents, bridging the gap between residents and community associations and municipal, county, state and even federal government agencies.

Getting Involved

Listed below are volunteer opportunities for residents interested in getting involved in the conservation of the natural resources of their community. If you see something that you'd like to get involved in, but that has not yet been started, don't wait for someone else – take the initiative!

Municipal Government

Pike County is divided into thirteen local government entities – eleven townships and two boroughs – referred to as **municipalities** (Appendix B). Elected municipal officials – Township Supervisors and Borough Council Members – are empowered by the Pennsylvania **Municipalities Planning Code (MPC)** to provide for the protection of the natural resources of their respective communities. This is accomplished primarily through adoption of comprehensive plans and land use regulations (zoning laws, subdivision regulations, etc.) that incorporate natural resource protection.

Elected officials are empowered by the Pennsylvania Municipalities Planning Code to provide for the protection of the natural resources of their respective communities.

Through participation in the democratic process of local decision-making, firmly rooted in Pennsylvania communities, citizens have the right

and the ability to influence the decisions that municipal officials make in planning for the future, including planning and land use decisions that affect the natural resources of their community. Residents have various options from voting in local elections to attending monthly public meetings of local officials and Planning Commissions, participating in an Environmental Advisory Council or joining a watershed group (see below) that is working cooperatively with local officials.

Unfortunately, residents often do not get involved in their community until a proposed land development project is announced and concerns arise over potential environmental impacts. Residents may demand that officials stop a development or at least “do something about it.”

Attempting to protect community natural resources by taking a reactive, “development-by-development” approach is much less effective than getting involved & staying involved in the overall community planning & development process.

However, without the appropriate land use regulations already in effect, to minimize the environmental impacts of a development, there is often little public officials can do by the time a proposed project is on the table. Citizen attempts at protecting community natural resources by taking a reactive, “development-by-development” approach is much less effective than getting involved as soon as possible and staying involved in the overall community planning and development process, including supporting and working with local officials to plan for “smart,” environmentally sustainable development of communities (Chapter 11).

Environmental Advisory Councils

The role of an Environmental Advisory Council (EAC) is to advise the planning commission, park and recreation board and elected officials of a municipality, on issues related to the conservation of the natural resources within the municipality’s borders. EACs are established by enactment of a municipal ordinance. Once established, municipal officials select residents to serve on an EAC.

EACs may be tasked with identifying community environmental problems and making recommendations, promoting environmental programs or creating an inventory of open, undeveloped lands and sensitive natural areas in the municipality to prioritize for protection. It is often up to residents of a community to propose to their elected officials that an EAC be established. Residents can offer to volunteer their time on the EAC

established by the municipality in which they reside. As this publication goes to press, Delaware Township is the only Pike County municipality that has created an EAC.

Community Associations

Most Pike County residents live in a residential development represented by a community association (CA) (also referred to as a property owners' association). The typical CA consists of an elected board of directors and officers, answerable to all community residents.

CAs have the ability to create committees to help residents address particular issues and concerns including Environmental Committees tasked with examining and developing ways of protecting community natural resources. Committees, or sub-committees, can also be created to look at specific natural resource concerns such as stormwater management, water supply protection, lake management or open space conservation.

Utilizing covenants, codes and restrictions, a CA can also create rules and regulations for natural resource protection including provisions to address stormwater impacts, provide for groundwater protection as well as the conservation of community lakes, streams and wetlands.

Citizens of lake-based communities can also participate in water quality monitoring programs that keep tabs on lake health. The information collected can be used to support efforts to identify and correct pollution problems affecting a lake.

Pike County Watershed Organizations

Watershed organizations strive to protect the natural resources, particularly the water resources, of the watershed they represent. As this publication goes to press, there are four major watershed groups active in Pike County:

- Bushkill Watershed Conservancy
- Lake Wallenpaupack Watershed Management District
- The Lackawaxen River Conservancy
- Twin and Walker Creeks Watershed Conservancy

For more information on Pike County watershed groups and how residents can get involved and lend their support, refer to Chapter 1 and Appendix A.

Additional Conservation Groups Offering Volunteer Opportunities

Listed below are additional agencies and organizations committed to the conservation of Pike County's natural resources that offer volunteer opportunities:

- Alliance to Keep Pike Green
- Delaware Highlands Conservancy
- The Eagle Institute
- Grey Towers National Historic Site
- Pocono Environmental Education Center (P.E.E.C.)
- Promised Land State Park/Varden Conservation Area

For more information on these organizations and how residents can get involved, refer to Appendix D.

Summary

Increasing growth pressures will continue to present significant challenges to creating and maintaining economically viable communities while maintaining Pike County's high quality natural resources. However, a window of opportunity still exists for residents and local officials to act.

An involved and active citizenry plays an essential role in creating communities that reflect their shared vision. Residents individually, and collectively as a group, bring their own unique perceptions, knowledge, and concerns to the planning process.

Where resources are limited, including constraints on time, finances and experience, citizen volunteers can help to fill the vacuum and make a significant contribution to meeting community needs. Community volunteers can also provide a vital voice for citizen concerns on environmental issues bridging the gap between residents and local, state, federal and regional governments, the business sector and non-governmental groups.

Many opportunities exist for citizen involvement including attending public meetings, volunteering for local environmental organizations, getting active in a community association or supporting a local watershed group. For anyone who doubts how effective local residents can be in shaping the future, recall the words of Margaret Mead:

"Never doubt that a small group of thoughtful, committed people can change the world: indeed it's the only thing that ever has!"



Citizen participation in an educational workshop on non-point source pollution

Action Steps for Citizen Involvement

- ☞ Get involved with your community association. Options include volunteering to serve on a committee, starting a lake monitoring program and supporting association efforts to protect community natural resources.
- ☞ Let your municipal officials (Appendix B) know you support their efforts to enact regulations to manage stormwater, protect groundwater, and conserve streams, lakes and wetlands.
- ☞ Read local newspapers and attend public meetings to stay up-to-date on what is happening in your community.
- ☞ Join and volunteer for a local organization (Appendix A & D) that reflects your concerns and the direction you want for your community's future.
- ☞ Voice support to your local municipal officials for the formation of an Environmental Advisory Council and volunteer to participate.

Resources for More Information

PA DEP Update, electronic environmental newsletter: www.dep.state.pa.us/newsletter/

Pennsylvania League of Women Voters: <http://www.pa.lwv.org>

Pennsylvania Environmental Council: www.pecpa.org/index.htm

Pike County web site with links to local municipal sites: www.pikepa.org/

10,000 Friends of Pennsylvania: www.10000friends.org/



APPENDICES

- A. Watershed Organizations in Pike County:
 - Information and Volunteer Opportunities
 - Bushkill Watershed Conservancy
 - Lake Wallenpaupack Watershed Management District
 - The Lackawaxen River Conservancy
 - Twin and Walker Creek Watershed Conservancy
- B. Pike County Municipalities:
 - Contact Information and Public Meeting Schedules
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 - Eagle Institute
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- E. Water Testing
- F. Source Water Protection for Community Water Supply Wells
- G. Environmental Problems, Complaints and Emergencies:
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APPENDIX A: Watershed Organizations in Pike County: Information and Volunteer Opportunities

Bushkill Watershed Conservancy

The Bushkill Watershed Conservancy (BWC) is dedicated to promoting stewardship for the protection and preservation of the high quality recreational land and water resources of the Bushkill Creek, Little Bushkill Creek and Saw Creek Watersheds. The Conservancy seeks to promote a forum for sharing information on watershed issues, to foster the development of local natural resource protection and restoration programs and to encourage cooperation on all levels of watershed conservation.

BWC hosts educational programs for the general public related to conservation issues in the Northeast Region. BWC accomplishments include a program that established stream signs throughout the watershed and development of a web site. Future plans include developing a stream-based water quality monitoring program. The majority of the Bushkill watershed lies within the boundaries of Pike County and includes all or portions of Porter, Lehman, Delaware, Dingman, Greene and Blooming Grove Townships.

Volunteer Opportunities:

- Participating in BWC's water quality monitoring program
- Assisting with membership/volunteer recruitment
- Maintaining the BWC web site
- Providing educational outreach programs for grade school to adult audiences
- Manning a display and information booth at community events
- Contributing to the BWC newsletter

Contact Information:

Bushkill Watershed Conservancy
P.O. Box 193 • Bushkill, PA 18324

Telephone: 570-226-8220

Email: pikecd@pikepa.org

Web site: www.bushkillwatershed.org/index.htm



The Lackawaxen River Conservancy

The Lackawaxen River Conservancy (TLRC) is a cohesive group of local residents who have joined together for a common purpose: the protection of the Lackawaxen River, its wildlife, watershed and natural beauty. Formed in 2001, TLRC strives to promote both community awareness of the ecological importance of the Lackawaxen River's environment and good stewardship of the natural resources of the Lackawaxen River Watershed for the benefit of both current and future residents.

TLRC provides a proactive community voice and actively participates as a partner with other organizations, local governments and residents in regional affairs, legislation, and planning issues that affect the river and its watershed. The Conservancy also works with local municipalities to encourage planning for sustainable development and conservation of water resources.

TLRC offers public education programs throughout the year on a wide variety of topics. Future plans include establishing a water quality monitoring program. The lower, southeastern portion of the Lackawaxen River Watershed lies within the boundaries of Pike County and includes all, or portions of, Lackawaxen, Blooming Grove, Palmyra and Greene Townships.

Volunteer Opportunities:

- Organizing TLRC's public outreach program including enlisting speakers and advertising events
- Manning TLRC informational booths at community events
- Increasing resident participation in the Conservancy through membership recruitment
- Participating in TLRC's water quality monitoring program

Contact Information:

The Lackawaxen River Conservancy

P.O. Box 176 • Rowland, PA 18457

Email: info@lackawaxenriver.org

Web site: www.lackawaxenriver.org



Lake Wallenpaupack Watershed Management District

The Lake Wallenpaupack Watershed Management District (LWWMD) is among the nation's first watershed organizations. Created in 1980 to address declining water quality in Lake Wallenpaupack, LWWMD continues today in its mission to protect and restore the lake and its contributing watershed.

The LWWMD Board of Directors is comprised of county commissioners, township supervisors, conservation district representatives, area business people and interested citizens. Since its inception, LWWMD has worked with F. X. Browne, Inc. in the analysis and improvement of water quality of Lake Wallenpaupack.

Accomplishments include creation of an innovative, watershed-based, model stormwater ordinance; obtaining federal and state grant funding totaling over one million dollars for water quality analysis and implementation of projects to improve farming practices and reduce soil sediment and nutrient pollution; and development of an award-winning environmental curriculum in cooperation with the Wallenpaupack Area School District.

Volunteer Opportunities:

The work of the Lake Wallenpaupack Watershed Management District is accomplished by its Board of Directors and the scientists, water quality specialists, and engineers, of F.X. Browne, Inc.

Contact Information:

Lake Wallenpaupack Watershed Management District

P.O. Box 143 • Hawley, PA 18428

Telephone: 570-226-3865

Email: LWWMD@ptd.net

Web site: www.wallenpaupackwatershed.org



Twin and Walker Creeks Watershed Conservancy

The Twin and Walker Creeks Watershed Conservancy (TWCWC) is a non-profit organization dedicated to promoting a better understanding of the Twin and Walker Creeks Watershed and its ecosystems, and to protecting, restoring and enhancing the watershed through proper management and watershed stewardship. Organized in 2000, TWCWC currently has a membership of 200 watershed residents.

The Conservancy maintains a water quality monitoring program for Twin and Walker Lakes, publishes a watershed newsletter and hosts educational programs and workshops for residents and community associations. To better direct its conservation efforts, TWCWC initiated a watershed assessment which identified priority issues affecting the Twin and Walker Creeks Watershed. TWCWC is continuing an on-lot sewage system assessment and education outreach program. The watershed lies entirely within the boundaries of Pike County and includes all or portions of Shohola and Dingman Townships.

Volunteer Opportunities:

- Collecting water samples as a part of the Conservancy's water quality monitoring program on both the Twin and Walker Lakes
- Participating in TWCWC's ongoing on-lot sewage system assessment and education program

Contact Information:

Twin and Walker Creeks Watershed Conservancy
Peter Wulfhorst, President • 100 Walker Lake Road
Shohola, PA 18458
Telephone: 570-296-3400
Email: PtW3@psu.edu
Web site: www.twcwc.com

APPENDIX B:
Pike County Municipalities Contact Information
and Public Meeting Schedules

Abbreviations:

ARB – Architectural Review Board meeting BC – Borough Council meeting
PC – Planning Commission meeting S – Supervisor meeting

Blooming Grove Township Supervisors

Ms. Jo-Anna Donahue, Secretary/Treasurer
488 Route 739 • Blooming Grove, PA 18428-9039
Phone: (570) 775-6461 • Fax: (570) 775-9322
Email: joanna.donahue@bloominggrovetownship.com
Web site: www.bloominggrovetownship.com
S - 1st & 3rd Mon @ 7:00 pm • PC - 2nd Wed at 6:00 pm
Office Hours: M-F 8:00 am - 4:00 pm

Delaware Township Supervisors

Ms. Ileana Hernandez, Secretary/Treasurer
116 Wilson Hill Road • Dingmans Ferry, PA 18328
Phone: (570) 828-2347 • Fax: (570) 828-8705
Email: dtbos@ptd.net
S - 2nd & 4th Wed. @ 7:30 pm • PC - 1st & 3rd Wed @ 7:30 pm
Office Hours: M-F 8:30 am - 3:00 pm

Dingman Township Supervisors

Mrs. Karen Kleist, Secretary/Treasurer
118 Fisher Lane • Milford, PA 18337
Phone: (570) 296-8455 • Fax: (570) 296-2150
Web site: www.dingmantownship.org
S - 1st & 3rd Tues @ 7:30 pm • PC - 4th Wed @ 7:30 pm and
2nd Wed workshop session
Office Hours: M-F 8:30 am - 3:30 pm

Greene Township Supervisors

Mrs. Linda Kramer, Secretary
P.O. Box 243 • Greentown, PA 18426
Phone: (570) 676-9325 • Fax: (570) 676-9867
S - 1st Wed @ 7:00 pm • PC - 2nd Wed @ 7:00 pm
Office Hours: M-W-F 9:00 am - 12:00 pm

Lackawaxen Township Supervisors

Mrs. Shawn Roe, Secretary
P.O. Box 205 • Lackawaxen, PA 18435
Phone: (570) 685-7288 • Fax: (570) 685-2550
Email: township@ltis.net
Web site: www.lackawaxen.org
S - 3rd Wed @ 6:30 pm • PC - 1st Wed @ 7:00 pm
Office Hours: M-F 7:00 am - 3:00 pm

Lehman Township Supervisors

Mr. Robert Rohner, Secretary
RR #4 Box 4000 • Bushkill, PA 18324
Phone: (570) 588-9365 • Fax: (570) 588-1864
Email: lehmanpk@ptd.net
Web site: www.lehmantownship.com
S - 1st & 3rd Thurs @ 7:30 pm • PC - 2nd Thurs @ 7:00 pm
Office Hours: M-F 8:00 am - 4:00 pm

Matamoras Borough Council

Mrs. Nancy Buchanan, Secretary
P.O. Box 207 • Matamoras, PA 18336
Phone: (570) 491-2771 • Fax: (570) 491-2090
Email: mataboro@optonline.net
BC - 1st Tues @ 7:30 pm • PC - 3rd Tues @ 7:00 pm
Office Hours: T-W-TH 11:00 am - 2:00 pm

Milford Borough Council

Ms. Lizanne Samuelson, Secretary
111 West Catherine Street • Milford, PA 18337
Phone: (570) 296-7140 • (570) 296-4255 zoning office
Fax: (570) 296-6877
BC - 1st Mon @ 7:30 pm, PC - 2nd Mon @ 7:30 pm
ARB - 3rd Mon @ 7:30 pm
Office Hours: M-W-TH-F 9:00 am - 5:30 pm

Milford Township Supervisors

Mrs. Viola Canouse, Secretary
P.O. Box 366 • Milford, PA 18337
Phone: (570) 296-5540 • Fax: (570) 409-8348
Email: milfrdtp@ptd.net
S - 1st & 3rd Mon @ 7:00 pm • PC - 4th Tues @ 7:00 pm
Office Hours: M-TU-TH-F 9:00 am - 1:00 pm

Palmyra Township Supervisors

Mrs. Jo-Ann Rose, Secretary
HCR Box 15C • Paupack, PA 18451
Phone: (570) 226-2230 • Fax: (570) 226-2936
Email: palpike@ptd.net
S - 1st & 3rd Tues @ 7:30 pm • PC - 2nd Tues @ 7:30 pm
Office Hours: M-TH 8:00 am - 2:00 pm

Porter Township Supervisors

Ms. Theresa Rome, Secretary
HC 12 Box 461, Rt. 402 • Dingmans Ferry, PA 18328
Phone: (570) 775-7737 • Fax: (570) 775-7734
Email: portertw@ptd.net
S - 1st Mon @ 6:00 pm • PC - 1st Mon @ 5:00 pm
Office Hours: Call for appointment

Shohola Township Supervisors

Mrs. Nelia Wall, Secretary/Treasurer
159 Twin Lakes Road • Shohola, PA 18458
Phone: (570) 559-7394 • Fax: (570) 559-7523
Email: shohtwp@ptd.net
S - 2nd Thurs @ 7:30 pm • PC - 3rd Thurs @ 7:30 pm
Office Hours: M-F 8:30 am - 2:00 pm

Westfall Township Supervisors

Mrs. Lisa Green, Secretary
P.O. Box 247 • Matamoras, PA 18336
Phone: (570) 491-4065 • Fax: (570) 491-6353
Email: westfallsec@optonline.net
S - 1st Tues @ 7:00 pm • PC - 4th Tues @ 7:00 pm and
2nd Thurs 7:00 pm workshop
Office Hours: M-F 8:30 am - 3:00 pm

APPENDIX C:

Water Conservation at Home

(Adapted from the PA DEP fact sheet, “Drop by Drop: Use Water Wisely”)

Pike County’s groundwater supplies generally meet the water demands of residents and businesses. However, with rising levels of residential and commercial development, recurring drought conditions and increasing human demand, water conservation measures, practiced by businesses and residents, become increasingly important.

While the water withdrawn by an individual household well may not seem significant, many wells in the same watershed can have a cumulative effect. In addition to the potential impacts on residents and businesses, over withdrawal of groundwater also affects surface waters (streams, rivers, wetlands and lakes). Of particular concern are the many miles of streams draining Pike County watersheds. Over the course of a year, groundwater, flowing up from beneath the surface, supplies up to 80% of the water flowing through many of these streams and during dryer, hotter periods, 100% of the water flowing through many streams is supplied by Pike County’s groundwater resources.

Saving water at home also saves money. Residents on community water supplies that are charged a fee for water they use can lower their water bills. And any resident, whether on their own private well or a community well, can save money over the short-term by reducing energy costs, and over the long-term by lessening the wear-and-tear on water-using appliances (dishwashers, washing machines and water heaters) and extending the life of on-lot sewage treatment systems.

The primary water-saving options available to residents include:

- Installing low flow plumbing fixtures
- Purchasing water saving appliances
- Checking for household leaks
- Changing water use habits

Low Flow Plumbing Fixtures

Water saving plumbing fixtures and appliances are cost effective, providing short and long term economic advantages. Low-flow toilets, showerheads and faucet aerators save valuable water and energy used to heat water without requiring a change in personal use habits.

Bathroom

- If your present toilet was manufactured before 1994, consider placing a plastic gallon container in the toilet tank to save water with each flush. (Toilets manufactured since 1994 are designed to use less water).
- Install low flow showerheads and faucets that use no more than 2.5 gallons per minute at maximum flow.

Kitchen/Laundry

- Replace a top loading clothes washer with a front loading unit that uses about 30% less water and 40-50 % less energy.
- Operate a clothes washer or dishwasher only when fully loaded.
- Set the proper water level and load size selection on clothes washers according to the amount of laundry being washed.
- Install low flow aerators on all faucets.

Repair Leaks

- Fix leaky faucets and connections. Hot water leaks waste water, energy and money.
- A leak inside a toilet can waste up to 200 gallons of water a day. Toilet leaks can be detected by adding a few drops of food dye to water in the toilet tank. If the colored water appears in the bowl, the tank is leaking.

Changing Water Use Habits

In addition to installing low flow plumbing fixtures, purchasing water saving appliances and repairing leaks, water use can be reduced by changing your water use habits inside and outside the home.

Water Saving Tips Inside the Home

- Turn the faucet off while brushing teeth and use a glass of water for rinsing.
- When shaving, use a sink filled with rinse water instead of letting the faucet run.
- Take short showers instead of baths and consider bathing small children together.
- If the shower has a single hand control or shut-off valve, turn off while soaping or shampooing (some low flow shower heads offer a convenient shut-off valve for easily



turning a shower off and back on again without needing to adjust water temperature).

- Keep a container of water for drinking in the refrigerator instead of letting a faucet run until cold water flows.
- Rinse vegetables in the sink with the drain closed or in a pan of water and use leftover water for plants.
- If you wash dishes by hand, do not let the faucet run for rinsing. Instead, use a dish rack and spray device to rinse them. If you have two sinks, fill one with rinse water.

Water Saving Tips Outside the Home

- Use a broom, instead of a hose or power sprayer, to clean driveways, steps and sidewalks.
- Wash the car with water from a bucket. If a hose is used, control the flow with an automatic shut-off nozzle.
- Water the lawn only when needed. Grass that grows little or goes dormant during dry periods will generally rebound when rain returns.
- Water the lawn or garden during the coolest parts of the day in early morning or early evening. Avoid watering on windy days.
- Set sprinklers to water the lawn or garden only and not streets, driveways or sidewalks.
- Reduce the water use in the garden by 20 to 50 percent by using soaker hoses and drip or trickle irrigation systems. These systems also save time that would otherwise be spent watering.
- Use mulch around shrubs and garden plants to reduce loss of water from soils and to cut down on weed growth.
- In landscaping, use native plants that require less care and water.
- When not in use, cover swimming pools to prevent evaporation.
- Adjust lawn mowers to a higher setting to provide natural ground shade and to promote water retention by soil.



APPENDIX D: Resource Conservation Organizations in Pike County: Information and Volunteer Opportunities

Alliance to Keep Pike Green

The Alliance to Keep Pike Green is a coalition of conservationists, business people, builders, landowners, local officials and community residents who are committed to preserving Pike County's high quality of life through effective, long-term planning and active conservation. The goal of the Alliance is to find balanced solutions to the population pressures that are threatening the high quality water resources, the forested landscapes and rural way of life that make Pike County unique.

The Alliance recognizes the importance of and supports residents in publicly expressing their support for wise and balanced planning – through Smart Growth strategies – that strives to accommodate increasing levels of commercial and residential development while conserving Pike County's highly valued natural resources.

Volunteer Opportunities:

- Staffing a booth at events, answering questions and handing out flyers on upcoming programs
- Hosting a meeting with neighbors or with a community group
- Providing general office support, scheduling meetings, stuffing envelopes for mailings and sending email notifications
- Writing articles on innovative growth and land development options
- Making updates to the Alliance website

Contact information:

Alliance to Keep Pike Green
P.O. Box 218 • Hawley, PA 18428
Telephone: 570-226-3164
Email: info@keeppikegreen.org
Web site: www.keeppikegreen.org



Delaware Highlands Conservancy

The Delaware Highlands Conservancy is dedicated to conserving the natural and cultural heritage of the Upper Delaware River region. Since its creation in 1994, the Conservancy has helped to protect over 5,500 acres of land providing ecological, recreational and economic benefit to residents of the region. The majority of land conserved through the Conservancy's efforts is protected through land preservation agreements between landowners and the Conservancy.

The Delaware Highlands Conservancy provides technical and, when available, financial assistance to landowners interested in protecting all or a portion of their property. In addition to working with individual landowners, the Conservancy runs a variety of educational events from environmental education programs for children to workshops for adults on protecting the land and water resources of their communities.

Volunteer Opportunities:

- Supporting the Conservancy's public relations and outreach by promoting and organizing education programs and outings and fundraising events
- Conducting field work on protected properties to collect information on existing cultural and natural resources
- Participating in annual field monitoring of protected sites
- Assisting with the annual Meadow Party
- Staffing informational displays at public events
- Crafting grant proposals to generate funding to support the Conservancy's activities
- Contributing to the Conservancy's quarterly newsletter including writing articles
- Providing office support including preparing mailings and website updates

Contact Information:

Delaware Highlands Conservancy
P.O. Box 218 • Hawley, PA 18428
Tel 570-226-3164
Email: info@delawarehighlands.org
Web site: www.delawarehighlands.org



The Eagle Institute

The Eagle Institute is a non-profit, volunteer organization dedicated to protecting the bald eagle in the Upper Delaware River watershed in New York and Pennsylvania and the lower Hudson River Valley of New York. To achieve this, the Institute promotes a stewardship ethic for bald eagle conservation through education, research and public awareness programs.

During the winter months, when approximately 150 eagles migrate to the region, the Institute assists visitors to find, identify and view bald eagles by posting volunteers at public viewing locations and providing guided eagle viewing trips. The Institute is also involved in the collection of scientific data on both the wintering and, in recent years, the growing breeding population of bald eagles in the region.

Volunteer Opportunities:

- Assisting at public events and programs, including the annual EagleFest
- Collecting data and monitoring habitat conditions
- Locating and identifying eagles
- Assisting visitors and answering questions about eagles and their habitat needs
- Providing clerical and administrative help including mailings and publicity
- Staffing the Institute's winter field office in Lackawaxen, PA

Contact Information:

The Eagle Institute
P.O. Box 182 • Barryville, NY, 12719
Telephone: 570-685-5960
or 845-557-6162
Email: eagleinstitute@yahoo.com
Web site: www.eagleinstitute.org

Grey Towers National Historic Site

Grey Towers National Historic Site is the ancestral home of the eminent conservationist Gifford Pinchot, first chief of the U.S. Forest Service and former two-term governor of Pennsylvania. The Grey Towers mission is to perpetuate the Pinchot conservation legacy.

The stone mansion and manicured gardens of the 100 acre estate are



managed by the U.S. Forest Service. Public interpretive tours and conservation education programs are available for school students, educators and visitors. Grey Towers also maintains a heritage resource program and functions as an active conference center for conservation and natural resource issues.

Volunteer Opportunities:

- Working with the Grey Towers horticulture team on maintaining garden areas
- Assisting the trails team with pedestrian trail upkeep
- Participating in conservation education youth programs
- Assisting with cultural events
- Supporting curatorial staff with historical research
- Providing guided tours

Contact Information:

Grey Towers National Historic Site
P.O. Box 188 • Milford, PA, 18337
Telephone: 570-296-9630
Email: greytowers@fs.fed.us
Web site: www.fs.fed.us/gt

Pocono Environmental Education Center

The Pocono Environmental Education Center (PEEC) strives to enhance environmental awareness, knowledge and appreciation through hands-on experience in a natural outdoor classroom. PEEC provides educational and recreational programs on a year-round basis to a widespread audience of school students, educators, families, scout and youth groups, individuals and local community members throughout the region.

PEEC uses a one-of-a-kind, 70,000-acre classroom, the Delaware Water Gap National Recreational Area, in which the complexities of nature and natural systems are available to every visitor to study. “Volunteers in PEEC” (VIP) share their skills and knowledge in managing the Center’s library, performing clerical duties, maintaining buildings and grounds and leading programs.

Volunteer Opportunities:

- Providing general office support including data entry
- Assisting with general grounds maintenance
- Providing support for special events
- Maintaining grounds and trails
- Providing instruction and presentations to a

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- variety of audiences
- Leading interpretive hikes
 - Assisting at the Center's library
 - Helping with mailings and marketing
 - Patrolling the Center's trail system

Contact Information:

Pocono Environmental Education Center
RR 2 Box 1010 • Dingmans Ferry, PA 18328
Telephone: 570-828-2319
Email: peec@ptd.net
Web site: www.peec.org

**Promised Land State Park and Varden Conservation Area,
PA Department of Conservation and Natural Resources**

Promised Land State Park provides educational and recreational opportunities for park visitors and the general public including families and various youth and adult groups. Programs focus on fostering an awareness and understanding of natural, cultural and historical resources found locally and regionally both within and outside of park boundaries.

Volunteer Opportunities:

- Staffing the museum located at Promised Land State Park
- Assisting with educational programs
- Maintaining trails and lake shorelines
- Providing educational programs for park visitors
- Conducting historical research and surveying of natural resources
- Participating in work parties for annual community events

Contact Information:

Jen Naugle
Environmental Education Specialist/Volunteer Coordinator
Promised Land State Park/Varden Conservation Area
RR 1 Box 96 • Greentown, PA 18426
570-676-0567 or 570-676-3428
Email: promisedlandenedsp@state.pa.us
Web site: <http://www.dcnr.state.pa.us/stateparks/parks/promisedland.aspx>
and <http://www.dcnr.state.pa.us/stateparks/parks/varden.aspx>

APPENDIX E:

Water Testing

In Pennsylvania, protection and maintenance of a private well is largely the responsibility of the homeowner. A private well is typically a safe, dependable source of water if sited wisely and constructed properly.

However, even the best constructed well, placed in an appropriate location, is still vulnerable to contamination. The homeowner, interested in learning more about the quality of their well water, must take the initiative to have their water tested.

Based on groundwater contaminants that have been detected in residential and community wells in Pike County, listed below are some of the main water quality parameters to consider testing along with suggestions for how often to test for them:

Primary Concern:

- Total Coliform bacteria. Test annually (see note below).
- pH (measures acidity). Test every 3 years.
- TDS (Total Dissolved Solids). Test every 3 years.

If some or all of the pipes carrying your household drinking water are made of copper or other metals, test for the following*:

- Corrosivity
- Copper
- Lead (Testing for lead is recommended when metal pipes, installed prior to 1991, are part of a home's plumbing system).

*Test for these parameters in a new home or when testing a water supply for the first time. Consider repeating if a change is made to a home water supply system, such as the installation of a new well or if plastic plumbing is replaced with copper pipes.

Note:

- If total Coliform bacteria tests positive, follow-up with a test for E. coli.
- Nitrates: Consider testing if you have knowledge of your own or a neighbor's on-lot sewage system malfunctioning, if on-lot systems occur in high densities in your community or if there are any small-scale livestock operations (horses, llamas, goats) in the

Continued 

vicinity of your residence, particularly in proximity to your wellhead.

Secondary Concern: These parameters are related to any observed stains, tastes, odors, etc.

- Iron – test if orange stains or a metallic taste in your water is present. Common in this region.
- Manganese – test if black flecks or metallic taste in your water is present. Common in this region.

To help ensure accurate results, follow instructions for taking and storing water samples. PA DEP recommends that residents use a state certified lab to perform testing of samples collected. Check your phone book, visit the DEP website, at www.dep.state.pa.us/labs/ or contact the Conservation District for a list of certified labs offering water testing. Residents can also contact the Conservation District (570-226-8220) or their local Penn State Cooperative Extension office (570-296-3400) for more information on water testing.

Resources for More Information

Penn State University: www.age.psu.edu/extension/factsheets/f/. Includes fact sheets on water treatment.

Penn State University. Water Tests: What do the Numbers Mean? pubs.cas.psu.edu/freepubs/pdfs/agrs90.pdf

Wilkes University Drinking Water Testing and Information: www.water-research.net/helpguide.htm

APPENDIX F:

Source Water Protection for Community Water Supply Wells

Source Water Protection (SWP) plans are designed to protect community water supplies. A **Wellhead Protection (WHP)** plan is a specific kind of SWP plan that focuses on protecting the groundwater that supplies a community water well. WHP plans provide an excellent foundation on which Pike County communities can build for long-term groundwater management and protection.

Creating a WHP plan involves the following steps:

1. **Create a local community-based advisory committee** to provide input and assistance in directing the development of a WHP plan. In addition to community residents, elected officials, water system operators, watershed organization representatives, emergency management coordinators and conservation district staff are all candidates to participate on an advisory committee.
2. **Identify the area to be protected** by mapping the boundaries of the aquifers or community groundwater supplies found beneath the earth's surface. To accomplish this, a professional hydrogeologist or scientist with expertise in the field of groundwater management and protection is typically employed.
3. **Within the mapped area, identify and inventory risks for groundwater contamination** including commercial and industrial facilities, stockpiles of road salt, underground storage tanks, small-scale livestock operations, on-lot sewage disposal systems, abandoned wells and transport trucks hauling home heating oil and other potential contaminants on roads that cross over community aquifers.
4. **Develop a management and protection program** including risk management strategies, prioritizing potential sources of contamination for action, educating residents and developing emergency response plans including identifying alternative water sources.
5. **Implement your community Wellhead Protection Plan**

As a voluntary program, citizen involvement is critical to the success of the development and implementation of any WHP plan. Residents

Continued 



can encourage their community association and the operators of their community water supply to develop a plan.

For any community interested in creating a new WHP plan or building on an existing plan, a community representative can contact the Pennsylvania Rural Water Association (www.prwa.com/v2/index.asp) at 800-653-PRWA or the PA DEP, Bureau of Watershed Management at www.depweb.state.pa.us/dep/site/default.asp, select “Water Topics” and “Source Water and Groundwater Protection” or call 717-787-5259.

| Appendix G: Agency Contact Information for Environmental Complaints, Problems and Emergencies | |
|---|--|
| Complaint, Problem or Emergency | Contact |
| Air Pollution – Burning materials (including waste from construction activities or demolished buildings) other than household garbage | PA DEP Regional Complaint Line |
| Air Pollution – Burning household garbage | Municipality (Appendix B) |
| Dumping waste (construction debris, furniture, appliances, rubbish, etc.) on land | PA DEP Regional Complaint Line and Municipality (Appendix B) |
| Dumping waste in surface waters* | PA DEP Regional Complaint Line and PA Fish & Boat Commission |
| Encroachment** on surface waters and floodways | Pike County Conservation District |
| ENVIRONMENTAL EMERGENCIES including chemical spills from transport trucks, trains and industrial facilities | PA DEP Regional Complaint Line |
| Floodplain disturbance | Municipality (Appendix B) |
| Groundwater Contamination (including underground storage tank failures and pollution of water supply wells) | PA DEP Regional Complaint Line |

*Surface water: stream, river, pond, lake, wetland, spring, etc.

**Encroachment: A structure or other activity which changes the course, current or cross section of a watercourse, floodway or other body of water.

Continued 

| Appendix G: Agency Contact Information for Environmental Complaints, Problems and Emergencies | |
|--|--|
| Complaint, Problem or Emergency | Contact |
| Mining/quarrying Operation Problems | PA DEP Bureau of Mining and Reclamation |
| Soil Sediment Pollution to surface waters from earth disturbance*** sites | Pike County Conservation District |
| Recycling Locations | Pike County Office of Human Development |
| Sewage Problems (private, individual on-lot systems) | Municipality (Appendix B) |
| Sewage Problems (industrial, commercial, & multi-lot systems) | PA DEP Regional Complaint Line and Municipality (Appendix B) |
| Stormwater Runoff Problems (non-construction related) | Municipality (Appendix B) |
| Stormwater Runoff related to earth disturbance | Pike County Conservation District |
| Water pollution: chemical wastes, sewage treatment plant discharge, etc. | PA DEP Regional Complaint Line and PA Fish & Boat Commission |
| Wildlife (Fish, Reptiles, Amphibians) – Nuisance Problems or to Report Violations | PA Fish & Boat Commission |
| Wildlife (Mammals or birds) – Nuisance Problems or to Report Violations | PA Game Commission |

***Earth disturbance: Construction or other activity that disturbs the surface of the land.

Agency Contact Information

Agency Contact Information: Telephone Numbers

| | |
|---|----------------------|
| PA DEP Bureau of Mining and Reclamation | (570) 621-3118 |
| PA DEP Regional Complaint Line | (866) 255-5158 Ext 2 |
| PA Fish & Boat Commission | (570) 477-5717 |
| PA Game Commission | (570) 675-1143 |
| Pike County Conservation District | (570) 226-8220 |
| Pike County Office of Human Development | (570) 296-3434 |



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For Information or Assistance Contact:

Pike County Conservation District

HC 8 Box 6770

Hawley, PA 18428

Phone:(570) 226-8220

Fax:(570) 226-8222

Email: pikecd@pikepa.org

Or visit our website at

www.pikeconservation.org



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