Chapter 3
Natural Resource Protection Plan

INTRODUCTION

Overview

Located in the Delaware River Highlands, Delaware Township is known throughout the region for its scenic landscape and distinctive natural and historic features. This landscape gives Delaware Township its definitive character and has been an integral part of its unique history, attracting vacationers and recreation enthusiasts to the area since the early nineteenth century. Residents of Delaware Township and surrounding areas have enjoyed an abundance of natural resources—clean water, forests, and wildlife—providing a high quality of life for many years. As the area continues to grow, it is incumbent upon the township to preserve the health, safety, and welfare of its residents, as well as the identity and heritage of the community. Natural resource protection is a necessary step in accomplishing this task.

Scenic view along Wilson Hill Road

Protection of the township's natural resources is the foremost important desire expressed by township residents. The Natural Resource Protection Plan addresses residents' concerns related to land and water resources. It is intended to introduce contemporary practices to derive the maximum benefit for the health and safety of township residents.

GOALS & OBJECTIVES

Overview

The goals and objectives pertaining to natural resources were formulated by the Comprehensive Plan Task Force and Delaware Township residents during the initial monthly meetings and the first public meeting. Goals and objectives are statements of the community's desires and vision for the future.

Goal #1

Protect the township's exceptional value and high quality watersheds.

Objectives:

- Protect the supply and quality of drinking water.
- Protect water quality for recreational use.

Goal #2

Protect the township's natural and scenic features.

Objectives:

- Promote wetland, stream, and floodplain protection.
- Protect steep slopes.
- Protect forests and vegetative cover.
- Protect unique geologic features.
- Protect scenic viewsheds.

Goal #3

Protect the township's critical habitat areas.

Objectives:

- Protect sites of rare, threatened, and endangered species as identified in the Pike County Natural Areas Inventory.
- Protect large forested areas that provide habitat.
- Protect wildlife corridors, consisting of networked open space areas and stream corridors.

EXISTING CONDITIONS

Overview

The discussion of existing conditions provides an inventory of the township's natural features, issues related to their current state, and protections afforded by township and other regulatory agencies. The

inventory includes physiography, topography, and geology; soils; forest and vegetative cover; watersheds, streams and lakes; wetlands; floodplains; and critical habitat. The assessment of existing conditions forms the basis of future planning policy recommendations and implementation strategies.

Topography & Geology

Delaware Township is located within the Glaciated Low Plateau Section of the Appalachian Plateaus Province, a land classification based on geologic formations and landscape characteristics. The Glaciated Low Plateau Section of Pennsylvania occupies the northeast corner of the state stretching from Pike and Monroe counties across to Tioga County in north-central Pennsylvania. It is characterized by rounded hills and valleys formed by fluvial and glacial erosion and glacial deposition. Local relief is low to moderate. Elevations in Delaware Township range from approximately 303 feet to 1,500 feet, with higher elevations along the western boundary, sloping toward the Delaware River. Areas of very steep slope are found primarily in the stream valleys draining into the Delaware River (Map A-1 and Map A-2).

Silver Thread Falls

Geology is a fundamental natural feature, as it shapes all other features including topography, soils, vegetation, and hydrology. The physical characteristics and geographic patterns exhibited by these features are in large part a result of underlying geologic formations and processes. Groundwater supply is also largely dependent on geology.

The hills and valleys of Delaware Township, scattered with unique rock outcrops, lend themselves to the township's scenic and natural beauty and its rural character. They also pose constraints to development.

The geology of the township and the region is characterized as follows:

- The region's geologic structure is folded. Underlying rock types are primarily sandstone, siltstone and shale. Due to shallow bedrock depth, the geology of the region and of Delaware Township presents a challenge to the construction of housing and infrastructure.

- Geologic formations in Delaware Township coincide with topography as formations change along with elevations. Water is in abundant supply. Geologic formations and their aquifer yields are as follows:

  + The Long Run and Walcksville Members of the Catskill Formation traverse the upland areas in the western portion of the township. The aquifer yield is approximately 20 gallons per minute (gpm)

  + The Toamensing Member of the Catskill Formation is in upper to mid elevations of the township. Its aquifer yield is approximately 10 gpm.

  + The Trimmers Rock Formation, in the middle elevations, yields approximately 30 gpm.

  + The Mahantango Formation in the lower elevations to the east yields approximately 20 gpm.

Planning Implications: Disturbance of steep slopes and vegetation alters topography and drainage, contributes to slope instability and erosion, and diminishes the quality of groundwater supplies. Furthermore, due to aging and inadequate wastewater disposal and stormwater management systems, the township's aquifers are at risk of contamination. The current zoning ordinance provides little to no protection for geologic and topographic features. Enhanced protection measures are needed to maintain slope stability, prevent erosion, and ensure a safe water supply for township residents.

Soils

Soils are formed by the weathering of bedrock and glacial deposition. Soil properties differ according to underlying rock types, climate and topography. They in turn influence local vegetative cover, hydrology, and land use patterns and activities.

For planning purposes, soils are analyzed in terms of suitability for development (i.e. septic absorption), cultivation, and groundwater recharge. Data provided by the USDA Natural Resource Conservation Service, Soil Survey Geographic Database (SSURGO) for Pike County, 2004 are used for this analysis. The data indicate that land use activities in Delaware Township are severely constrained by the soil types present in the township. Findings are as follows:

- Soil conditions, along with slope and underlying geology, pose severe limitations to septic absorption throughout the township. This presents a major challenge to the traditional development type found in Delaware Township consisting of single-family dwellings with on-lot septic. Many areas are experiencing difficulties with failing septic systems and lack of absorption. This poses a threat to the quality of surface and groundwater supplies.

- Hydric and seasonal high water table (SHWT) soils are found throughout the township in low-lying areas, along watercourses, and where a "perched" water table lies above bedrock (Map A-1). Hydric soils are soils that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are often indicative of a wetland. SHWT soils are defined for the purposes of this study as soils with a water table depth at 18 inches or less from the surface at various times of the year.

  Hydric and SHWT soils are unsuitable for development due to the risk of damage to structures caused by seepage of water and generally wet conditions. They frequently have poor stability and therefore cannot adequately support structures. These soils also serve as important groundwater recharge areas and should be left undisturbed.

- Very few areas of the township are suitable for cultivation. Class 1, 2, and 3 agricultural soils are found in very limited areas, primarily along the Delaware River, in stream valleys, and in lower elevations. The vast majority of soils are in capability classes 5, 6 and 7. Use of these soils is limited to pasture, range, forestland or wildlife food and cover.

Planning Implications: Problems associated with soil erosion and sedimentation are exacerbated by development of steep slopes and removal of vegetative cover. Limitations for septic absorption, failing septic systems, and the lack of sufficient ground for on-lot septic replacement threaten to contaminate soil and groundwater recharge areas. Current township ordinances provide little protection for hydric and seasonal high water table soils, and requirements for erosion and sedimentation control are limited. In addition, current practices related to on-lot septic systems are unsustainable.

Forest & Vegetative Cover

Forest and vegetative cover is important for several reasons: it provides habitat; it contributes to clean air and clean water; it regulates climate; and it stabilizes soils and steep slopes preventing erosion. Large, contiguous areas of forest and vegetative cover are desirable as they provide habitat for interior forest species and establish migration corridors for wildlife. Fragmentation of forests and vegetation leaves small, isolated island communities that degrade wildlife communities and ecosystem health.

Rhododendron, Courtesy Lisa Whiteman.

Delaware Township remains largely forested. This is due to large holdings by the National Park Service, the Pennsylvania DCNR, and several private landowners. The analysis of forest and vegetative cover indicates that:

- Forest density throughout the township is generally greater than 40% with areas of 80% to 100% in some of the large privately owned and state owned lands.
- The township's upland areas are dominated by deciduous forest. Mixed forest and evergreen are found in the stream valleys, wetland areas, and lowlands. Meadow, cropland, and mixed vegetation are found primarily along the Delaware River and in small patches dispersed throughout the township.
- Stream corridors are dominated by Hemlock trees with Brichwood, Red Maple, and with Rhododendron, Witch Hazel and Viburnum in the unserstory.
- Upland forests are dominated by various Oaks, with White Pine, Sugar Maple, and Sweet Birch, and with understories of Amelanchier, Mountain Laurel, Witch Hazel, and Blueberry.

Rhododendron, Courtesy Lisa Whiteman.

Long-term forest pest management is a concern in the eastern United States, including Pike County and Delaware Township. Severe infestations of the gypsy moth caterpillar have occurred in the region in recent years, damaging thousands of acres of forest (according to the Pennsylvania DCNR, 333,335 acres were damaged throughout the state in 2005, mostly in the northeast). The PA DCNR has instituted an aerial suppression program. Delaware Township will continue to partner with Pike County and the DCNR and consider a joint suppression program with neighboring municipalities.

Infestations of the hemlock wooly adelgid are also problematic, especially in the Township's hemlock forested stream corridors.

Destruction to hemlock stands over the long term could negatively impact stream systems and water quality. The DCNR has increased efforts to control the hemlock wooly adelgid by improving surveying techniques (the General Hemlock Survey provides data at the township level), expanding its biological control program, and instituting a chemical suppression program to protect select, high-value trees in state and federal lands. In addition, the National Park Service (NPS) is conducting extensive research in the Delaware Water Gap National Recreation Ares. The Township can look to the NPS, the PA DCNR Division of Forest Pest Management, the Pennsylvania Cooperative Suppression Program, Pike County, and the USDA Forest Service for information and assistance on forest pest management.

Planning Implications: Despite infestations of the gypsy moth, hemlock wooly adelgid and other forest pests, Delaware Township has a healthy, diverse and expansive forest ecosystem. Although current protections are limited and there is no guarantee that land in private ownership will remain forested, the opportunity to preserve large tracts of forest and vegetative cover remains. The Township should act now to preserve its large forest expanses while opportunities still exist.

Wetlands

Wetlands are defined by the Pennsylvania DEP (25 PA Code, Chapter 105) as: “those areas that are inundated or saturated by surface 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.” Wetlands contain three main components: (1) water at or near the surface for significant parts of the year, (2) hydric soils, and (3) wetland indicator vegetation such as cattails and skunk cabbage. In addition to providing habitat, wetlands serve as important groundwater recharge areas.

Wetland, Courtesy USDA NRCS

Wetland data are limited to that provided by the National Wetlands Inventory and the USGS. These sources identify only the largest wetland areas (Map A-1). Findings based on these data are as follows:

- Large wetlands in the southwestern corner of the Township form part of the Stillwater Natural Area. These include Creek Swamp, Long Swamp, Big Bear Swamp and Little Bear Swamp. Some of this land lies in the Delaware State Forest; some is privately owned.

- Sap Swamp in the northwest corner of the Township lies within the Delaware State Forest. Long Swamp, to the west of Nichecronk Pond, is on privately owned land.

Numerous smaller wetlands are prevalent throughout the township. These wetlands are not captured by the NWI or USGS mapping. Their identification would require a detailed field survey.

Planning Implications: Wetlands receive protection under the federal Clean Water Act, which regulates the discharge of dredged and fill material into waters, including wetlands. Activities that are regulated include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. Any

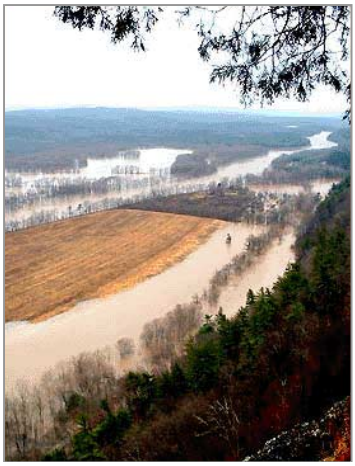
proposed activity within a wetland must receive a permit from the U.S. Army Corp of Engineers.

The basic premise of the federal wetlands protection program is that no discharge or dredged or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the waters would be significantly degraded. A permit applicant must demonstrate that he has taken steps to avoid wetland impacts where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining unavoidable impacts through activities to restore or create wetlands (Source: US Environmental Protection Agency, Wetland Regulatory Requirements).

Township ordinances currently provide little to no protection for wetlands. Due to risk of contamination from problematic wastewater treatment systems and stormwater runoff, township ordinance should be updated to augment federal wetland regulations.

Floodplains

Floodplains are formed by the frequent shifting of streams as they meander through valleys. The shifting of a stream produces an increasingly broad, flat valley floor covered by alluvial soils deposited by the stream. The stream usually occupies only a small portion of the flat valley floor; however, during periods of flood, the entire floor may be inundated, thus the term floodplain. Floodplains are important for controlling flood waters and accommodating the natural shifting of watercourses.



Floodplain cropfields, Spring Flood of 2005, Courtesy National Park Service

Digital floodplain data have been provided by the Environmental Resources Research Institute (Map A-1). The data show:

- 100-year floodplains are delineated along the Delaware River, the lower reaches of Dingman's Creek and Hornbecks Creek, and along Little Bushkill Creek.
- Because they lie mostly within federal and state parkland, floodplains in Delaware Township are largely free of development. However, portions of floodplain are on private land and have experienced some development.

Planning Implications: Construction and development in the 100-year floodplain is currently regulated by township ordinance. These regulations apply only to the 100-year floodplain identified on the Flood Insurance Rate Maps or where revision to the floodplain is warranted by a flood study and approved by the Federal Insurance Administration.

Watersheds & Streams

A watershed (or drainage basin) is an area of land that contributes overland flow and groundwater to a common stream or water body. It includes the land across its surface, the streams that drain the land, and the underlying soils, geology and groundwater. Watersheds are defined by drainage divides (ridgelines), which direct surface and groundwater down the valley and into the stream channel or water body. Ridgelines separate adjacent watersheds.

Watersheds function as a series of natural processes related to the hydrologic cycle. In general, when rainfall reaches the land, it either evaporates, runs downward across the surface (surface runoff) into a

stream or water body, or infiltrates through the soil, migrating under the surface as groundwater.

Groundwater may be stored in an aquifer, eventually reaching the surface again through a seep or spring. Thus, the protection of unconfined (surface) aquifers is essential to maintain the base flow volume and water quality in streams.

Dignmans Falls

Watershed form and function is dependent upon geology, topography, soils and vegetative cover. These features influence surface runoff, flow, and accumulation; water quality; and the health of aquatic habitat. The important contributing components of a watershed are groundwater recharge areas, stream baseflows, tributary streams (especially first order streams), stream channels, floodplains, and riparian and aquatic habitats. Each is critical to ensuring the proper function of the watershed and the hydrologic cycle.

Watersheds are organized in a hierarchy whereby the drainage basin of a principal stream encompasses the smaller drainage areas of its tributary streams. The terms frequently used to describe this hierarchy are as follows from the largest unit to the smallest: drainage basin, watershed, sub-basin, and first order stream drainage area.

Stream size, flow and water quality are directly related to the watershed's natural features (soils, vegetation, etc.) and land use. These factors influence the flow and accumulation of stormwater runoff, as well as infiltration, groundwater storage and seepage, and filtration of pollutants. The quality and function of stream systems, therefore, depend on the health of these other natural inputs.

Stream size is categorized according to stream order. First order streams are the uppermost perennial tributaries in the watershed and have not yet intersected another perennial stream. When two first order streams intersect, they form a second order stream; when two second order streams intersect, they form a third order stream, and so on. The quality and health of first order and headwater streams is extremely important in that they impact all subsequent streams in the hierarchy. For example, if a pollutant is introduced to a first order stream, it has the potential to flow into the downstream channels polluting those streams as well. Thus, protection of headwater streams is important to the health of the entire watershed.

Dignmans Creek

The federal Clean Water Act establishes regulations that prohibit the degradation of streams and water quality. In accordance with these regulations, the Commonwealth of Pennsylvania has instituted a classification system that designates certain streams as Exceptional Value or High Quality. Exceptional Value (EV) streams are those that constitute an outstanding national, state, regional or local resource. These streams are granted special protection from potentially harmful activities. High Quality (HQ) streams are those that have excellent quality waters and environmental or other features that require special protection.

Special protection (i.e. protection beyond basic standards) is afforded to EV and HQ streams under the state's Antidegradation policy. This policy protects and maintains the existing water quality of EV and HQ streams,

and protects existing in-stream water uses and water quality necessary to maintain those uses for all surface waters. It pertains specifically to point and non-point source discharges, and requires the use of cost effective and environmentally sound non-discharge alternatives. In cases where non-discharge alternatives are not feasible, there must be evidence that the discharge will not degrade existing water quality or use, or it must be demonstrated that the discharge method is socially or economically necessary. However, all discharge methods must use the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies (Antidegradation Best Available Combination of Technologies) (Source: PA Title 25, Chapter 93, Water Quality Standards).

In addition to stream quality designations, the state administers the Pennsylvania Scenic Rivers System. This program classifies rivers meeting certain criteria as scenic, wild, pastoral or recreational. A Scenic River is defined as a river that is "free-flowing and capable of, or under restoration, to support water-based recreation, fish and aquatic life. The view from the river or its banks shall be predominantly wild, but may reveal some pastoral countryside. The segment may be intermittently accessible by road." (Source: Pennsylvania Scenic Rivers Act)

Watershed and stream quality characteristics of Delaware Township are as follows (Map A-2):

- Delaware Township lies within the Delaware River drainage basin. It contains portions of three watersheds—Adams Creek, Dingmans Creek, and Hornbecks Creek—and 11 sub-basins. (A fourth watershed, the Little Bushkill Creek, drains the western portion of the township through Lehman Township).

- Adams Creek is an Exceptional Value watershed; Portions of the Little Bushkill Creek Watershed were upgraded to Exceptional Value in 2002; the watersheds of Dingmans Creek, Hornbecks Creek, Raymondskill Creek, and the unnamed tributaries to the Delaware River are all designated as High Quality.

- Many of the township's streams were dammed in the 1970s and 1980s to form recreational lakes around which community associations were developed. This activity significantly altered the natural flow of streams and the natural state of the township's watersheds.

Planning Implications: Delaware Township's watersheds are most at risk from intensive development on small lots with inadequate wastewater systems and stormwater control. Neglected septic systems cause risk of contamination of surface and groundwater sources. Excessive stormwater runoff introduces pollutants into the stream system, increases peak flows, increases downstream flooding, and damages stream banks. Existing township ordinances do not sufficiently promote watershed and stream protection.

Habitat

Delaware Township's large expanses of forest cover, prevalence of wetlands, and surface water features provide diverse habitat for an abundance of plant and animal species.

The Pike County Natural Areas Inventory, compiled by the Pennsylvania Science Office of The Nature Conservancy, documents the best natural areas in the county and the locations of all known animal and plant species of special concern (endangered, threatened, or rare). The inventory also identifies areas that represent good examples of habitat types that are relatively rare in the county or that provide exceptional wildlife habitat. The purpose of the inventory is to guide planning and conservation efforts and to assist in prioritizing areas to be protected.

According to the Natural Areas Inventory, numerous threatened, rare and endangered plant and animal communities exist in Delaware Township:

- Silver Lake is a natural lake that supports two species of state-rare plants. These species are at risk from development surrounding the lake.

- Long Swamp is a large Boreal Conifer Swamp community. It supports a population of state-threatened sedge. Long Swamp is part of the Camp Speers/Eljibar property and is used for educational purposes with access via a boardwalk.

- Dry Brook Cliffs is a shale cliff community that supports a population of a state-rare plant. This site is part of the Delaware Water Gap National Recreation Area.

- Minks Pond contains a population of plant species considered by The Nature Conservancy to be threatened.

Waterfall Habitat, Dingmans Falls

- Dingmans Falls and Fulmer Falls are two very impressive Waterfall and Plungepool communities. Dingmans Falls are 150-foot falls that cut through shale to form a deep, scenic gorge. The falls create a misty microclimate that supports a variety of mosses, liverworts, and ferns. Dingmans Falls also supports several species of state-endangered plants. Both Dingmans and Fulmer Falls are on Delaware Water Gap National Recreation Area property. Both sites have a network of trails, stairways, and bridges to access the falls' scenic vantage points. Visitors to the falls have caused some erosion, trampling, graffiti, and litter that threaten the natural communities and plant species.

- Big Bear Swamp is a good quality Broadleaf-Conifer Swamp. It is part of the Stillwater Natural Area and lies within the Delaware State Forest.

Planning Implications: The Township's woodland habitat is relatively healthy, as large and diverse areas of vegetation remain. However, steps should be taken to ensure that large contiguous forest communities remain in tact. Wetland and aquatic habitats, and in particular habitats identified by the Natural Areas Inventory, are most at risk from disturbance of their contributing watersheds. This includes degradation due to encroaching development, logging and forestry operations, contamination from wastewater and stormwater runoff, and, in the case of Dingmans and Fulmer Falls, overuse by visitors.

Protection of habitat and Natural Areas Inventory sites requires a combination of township-administered environmental regulations and

state and federal resource management and use regulations. For its part, the township needs to strengthen ordinances related to environmental resource protection and promote open space protection among landowners. Areas designated as Conservation/Open Space on the Future Land Use Plan and Park, Recreation & Open Space Plan include properties that contain sites identified in the Natural Areas Inventory. Some of these sties are on private land and will require an outreach effort by the township to inspire voluntary protection by the land owners (e.g. establishment of conservation easements). It is the responsibility of the PA DCNR and National Park Service to mitigate impacts on habitats within their jurisdictions.

Additionally, deer have become a nuisance throughout the state and in Delaware Township. This is due to an exploding deer population and increasing development in woodland habitats. Management of the deer population will require cooperation between the township, county and state.

FUTURE PLANNING POLICIES & RECOMMENDATIONS

Overview

The following **f**uture planning policies and recommendations are measures intended to achieve the township's natural resource protection goals. These policy recommendations will guide future decisions and actions related to natural resource protection (Map A-1).

Topography & Geology

Preservation of topographic and geologic features is important for maintaining natural drainage patterns, slope stability, erosion control, and surface and groundwater quality. The following policy recommendations are intended to promote the protection of these features:

- Limit soil removal, grading, and fill.
- Strictly limit disturbance (tree and vegetation removal, soil removal, grading) of steep and very steep slopes.
- Exclude 100% of very steep slope (slopes 25%+) areas from lot area determination.
- Exclude 50% of steep slope (slopes 15%-25%) areas from lot area determination.
- Limit the use of very steep slopes to open space and passive recreation (Prohibit buildings or structures on very steep slopes).
- Establish design and performance criteria for buildings or structures on steep slopes.
- Preserve rock outcrops and unique geologic features.

Soils

Soils play an important role in the hydrological cycle, allowing infiltration of stormwater and recharge of groundwater sources. They are also important determinants of vegetation type and cover. Soils can also inhibit development—due to their wet conditions, hydric and seasonal

high water table soils are not suitable for development. Policy recommendations aimed at preserving soils and promoting sound development are as follows:

- Strictly limit soil removal, especially on steep and very steep slopes.
- Prohibit building on hydric soils and seasonal high water table soils.
- Exclude 100% of hydric soils from lot area determination.
- Exclude 50% of seasonal high water table soils from lot area determination.

Forest & Vegetation

Because of the value of forests and vegetative cover in climate, air quality, habitat, and hydrological functions, the following policies are recommended:

- Protect dense and mature forested areas especially on steep and very steep slopes, along stream courses, and in headwater (first order) drainage areas.
- Protect the diversity of vegetative cover and native plant communities.
- Promote the establishment of large contiguous areas of permanently protected forests including, but not limited to, areas identified on the Park, Recreation & Open Space Plan and areas containing natural and scenic resources.
- Strictly limit disturbance and removal of forests and vegetation.
- Encourage the use of native species and prohibit the use of invasive plants.
- Pursue a forest pest management program.

Wetlands

Wetlands provide unique habitat and serve as important groundwater recharge areas, filtering water before it enters an aquifer. Wetland buffer areas are necessary to ensure proper filtration of runoff prior to its entry into the wetland system. Buffers also diminish the opportunity for degradation of the wetland itself, and provide edge habitat for transitional wetland species. The following policies for wetland protection are recommended:

- Prohibit disturbance of wetlands and within a 100-foot wetland buffer area.
- Exclude 100% of wetlands from lot area determination.
- Exclude 50% of wetland buffer area from lot area determination.
- Obtain detailed wetland data that identifies wetlands that are not captured by the NWI. Wetland protection measures would apply to these wetlands as well as the NWI wetlands.

Floodplains

Floodplains are important for their natural functions and the hazards associated with them. They play an important role in flood flow conveyance, stream channel formation and water filtration. Building within floodplain areas upsets flood conveyance and increases risks to human life and property. Because of their natural functions and potential hazards, this plan recommends strict limitations on development activities within 100-year floodplains, as follows (policies and regulations would apply to the FEMA 100-year floodplain or, if available, 100-year floodplains delineated by a detailed flood study approved by the Federal Insurance Administration):

- Permit only agricultural use and passive recreational use in the 100-year floodplain and ensure that floodplain disturbance associated with these uses is minimized.
- Permit installation of utilities and public infrastructure (i.e roads, stormwater management facilities) only if no feasible alternative location exists and only if Best Management Practices are employed to achieve minimal floodplain disturbance.
- Prohibit impervious cover (i.e. paved areas and surfaces that do not allow for infiltration of water) within the 100-year floodplain.
- Ensure that improvements to existing buildings and structures will not increase the 100-year flood elevation and require flood proofing of permitted improvements.
- Exclude 100% of the 100-year floodplain area from lot area determination.

Watersheds & Streams

Protection of watersheds is imperative for ensuring a safe and sufficient water supply and maintaining water quality. This is particularly true of first order drainage areas and the township's Exceptional Value and High Quality streams. These streams rely upon certain water quality levels and stream flows. They must be protected from pollutants, high sediment loads, stormwater runoff, and excessively low base flows. The state Antidegradation policy is intended to protect surface waterbodies by requiring non-discharge alternatives and the use of Antidegradation Best Available Combination of Technologies. Local policies that protect individual natural features, including steep slopes, soils, forests and vegetation, wetlands, and floodplains, also advance the health of the township's watersheds and streams, and more specifically, support the state's anti-degradation policies. In addition to policy recommendations related to the protection of these individual features, the following are suggested:

- Prohibit disturbance within a 100-foot riparian buffer surrounding streams (100 feet from each stream bank) and other surface water bodies (100 feet from the water's edge) within Exceptional Value and High Quality watersheds.
- Exclude 50% of the riparian buffer (outside of the FEMA 100-year floodplain) from lot area determination.
- Limit the extent of impervious cover and promote the use of pervious materials throughout the township.

- Promote comprehensive stormwater management that incorporates alternative systems and methods, including Best Management Practices (BMPs), stormwater recharge techniques, and control of non-point source pollution.

- Integrate utilities and development planning: Water supply and wastewater systems are an important part of watershed planning, affecting water balances and overall watershed health. A coordinated growth pattern, where development is directed to areas that have existing sewer and water infrastructure, or are programmed to have such infrastructure, will help to safeguard water supply and quality.

- Conduct aquifer studies to determine water quality and availability of potable water.

Habitat

Protection of habitat is accomplished by maintaining and promoting the health and diversity of natural areas as follows:

- Protect critical habitat areas through protection of topography and geology, soils, forest and vegetative cover, wetlands, floodplains, watersheds and streams.

- Protect as open space those properties that contain sites identified in the Pike County Natural Areas Inventory.

- Establish a networked system of large contiguous areas of open space.

- Establish a network of riparian corridors and greenways.

IMPLEMENTATION STRATEGIES

Overview

Implementation strategies are the specific means by which the township can execute the future planning policy recommendations. They take the form of regulatory provisions included in the zoning, subdivision and land development ordinance, and other ordinances, as well as non-regulatory initiatives. The following implementation strategies are organized according to zoning ordinance amendments, subdivision and land development ordinance amendments, and additional measures.

Zoning Ordinance

Zoning Ordinance amendments intended to implement the Natural Resource Protection Plan are as follows:

- Create a natural resources protection ordinance to include:

  - Limits on grading, fill and soil removal.

  - Limits of disturbance of steep and very steep slopes.

  - Prohibition of building and earth disturbance on hydric soils and seasonal high water table soils.

- 100-foot riparian and wetland buffer regulations.

- Strengthen the floodplain ordinance to prohibit the use of impervious surfaces in the floodplain and limit construction activities in the floodplain.

- Create a Transferable Development Rights ordinance to promote open space preservation and establish large and contiguous conservation areas.

- Amend the Lot Area definition to include:

  - Exclusion of conservation easements.

  - Exclusion of 100% of the area in very steep slopes, 100-year floodplains, surface water bodies, hydric soils, and wetlands.

  - Exclusion of 50% of the area in steep slopes, seasonal high water table soils, riparian buffers, and wetland buffers.

SLDO

Subdivision & Land Development Ordinance amendments intended to implement the Natural Resource Protection Plan are as follows:

- Require large developments to conduct aquifer studies for water quality and water supply.

- Include tree protection & replacement standards.

- Revise design standards to promote environmental protection.

- Develop landscaping ordinances to promote native plant species and prohibit introduction of invasive species.

Additional Measures

Additional measures intended to implement the Natural Resource Protection Plan are as follows:

- Obtain updated mapping of the 100-year floodplain (this would most likely require a detailed flood study conducted by a qualified agency or individual and approved by the Federal Insurance Administration, which could be cost prohibitive).

- Require a Dam Inspection Review as most dams in the township are earthen and subject to erosion. There are currently 13 DEP classified High Hazard Dams in the Township, the most of any township in the state. All dams require a quarterly inspection by the owner; High Hazard Dams also require an annual inspection by an engineer and by the DEP. Inspection report are submitted to the DEP. The township should require reports to be submitted to its offices as well.

- Update the Stormwater Management Ordinance to include provisions for the use of Best Management Practices.

- Update the Act 537 Sewage Management Plan.

- Enable the township's Environmental Advisory Council (EAC), or appoint an Open Space Committee, to work with landowners, conservation organizations and land trusts, and state and county representatives to promote natural resource protection and land preservation among landowners.

- Consider the use of the Open Space Lands Act and other legislation that enables the protection of natural resources.

- Consider the use of funding options, such as an Earned Income Tax, for the protection of open space and natural areas.

- Consider an Official Map to designate areas for future public open space and passive recreation.

- Partner with neighboring municipalities, Pike County, the PA DCNR, and the USDA Forest Service to manage forest pests.