Land Use and Water Quality and Quantity

Surface water and groundwater quality and quantity can be affected by land use in the following ways:

- Large amounts of sediment can enter streams from farms and construction sites, and pollutants can wash off lawns, parking lots, and industrial properties.
- Removing vegetation adjacent to streams (riparian buffers) can increase stream bank erosion, raise water temperature, and allow non-point source pollutants to enter the stream.
- Channelizing streams during development can result in stream bank erosion and increase flooding and siltation problems downstream.
- Solvents and other liquids associated with non-residential development can leak or be spilled onto the ground, and eventually reach the groundwater.
- Homeowners who dispose of toxic household cleaners, pesticides, oil and other similar products can cause surface water and groundwater contamination as well.
- Failing on-lot sewage disposal systems can allow partially treated sewage to reach surface or ground water.
- Groundwater recharge can be hindered as impervious surfaces increase with development.
- Stormwater systems that remove stormwater quickly from a site and direct it into nearby streams reduce the amount of precipitation that infiltrates the ground (and eventually the underlying aquifers) and increases stream bank erosion and downstream flooding.

Source: *Upper Hanover Township Comprehensive Plan*, 1994, Montgomery County Planning Commission.

Planning Implications: Groundwater Quality

No less important is the issue of water quality. No significant groundwater contamination problems have been reported in the Township. However, the potential for groundwater contamination is always present. Bacterial contamination can occur from malfunctioning on-lot sewage systems or poor livestock husbandry, hydrocarbons can eventually reach groundwater from oil spills or leaking storage tanks, and nitrates and chloride can infiltrate as run-off from roads and parking lots, sewage systems, and farm fields. Similar to supply conservation, quality protection is important.

Given the reliance on groundwater for domestic purposes, in combination with the extensive use of on-site disposal systems, it is vital that groundwater quality be carefully monitored throughout the Township and region. Proper siting, design, installation and maintenance of on-site disposal systems and water supply wells, and groundwater quality, should continue to be a municipal concern and proper land use controls should be applied to protect groundwater recharge areas.

Soils

The land's suitability for development largely determines the character of a community's land use, and the most basic component of the land is its soil. Beyond the basic function of the production of food and fiber, soils may either limit or foster community growth depending upon specific soil characteristics. Soils influence local vegetative cover, hydrology, and land use patterns and activities. The *Natural Resources Map* accompanying this *Plan* shows steep slopes, wetlands, hydric soils and floodplain, all of which affect soil suitability for development.

Variables in the formation of soils include climate (precipitation and temperature affecting weathering), biological activity in the forming soil, the parent material (e.g., bedrock vs. glacial material), topography (e.g., steep slopes vs. flood plain), and time. Given this complexity, it is understandable that a number of soil series (i.e., groups of soils formed from a particular parent material and exhibiting similar soil horizons) and many different soil types are found in the Township.

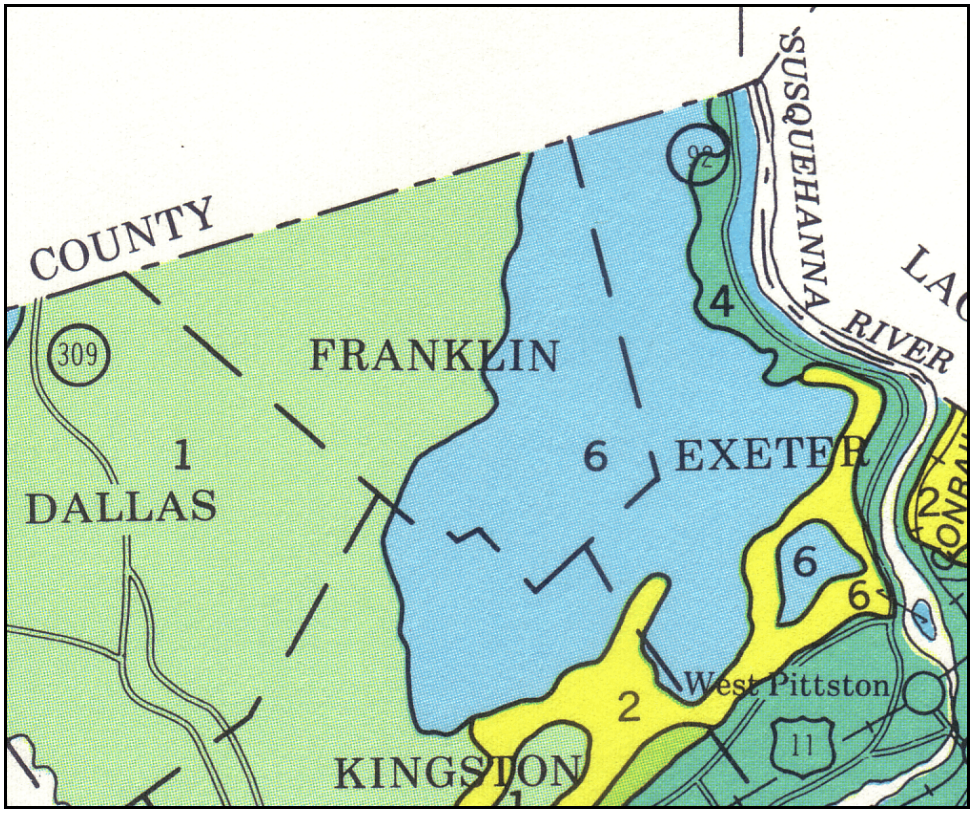
The soils have been evaluated for planning purposes by the US Department of Agriculture, Natural Resources and Conservation Service (NRCS) for suitability for such uses as agriculture, community development, recreation, and sewage disposal.

Fragipan: A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts toots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Hardpan: A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

This detailed information is reported in the *Soil Survey of Luzerne County Pennsylvania*, which must be consulted for site specific information. Two of the seven major soil associations, each comprised of several soil types, identified in Luzerne County are found in Franklin Township. The associations are shown on the *Soil Associations Figures*, and are described in the *Soil Associations Table*.

The origin of formation of soils in the Township resulted in the soil characteristics effecting sewage disposal alternatives -- permeability, depth to bedrock, high water table due to fragipan and stoniness. Most of the parent material of the soils in the Township was glacial till and outwash sand and gravel, resulting in stoniness in many areas and the occurrence of fragipan that inhibits the downward movement of water. It is important to remember that each of the broad associations is comprised of a variety of soil types of varying characteristics. The soil series is the most specific and consists of soils with similar horizons in terms of color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in profile.



Soil Associations (Soil Survey of Luzerne County, Pennsylvania)

1 — Oquaga-Wellsboro-Lackawanna association: Gently sloping to very steep, moderately deep and deep, well drained and moderately well drained soils on dissected plateaus

6 — Lordstown-Mardin-Volusia association: Gently sloping to very steep, deep and moderately deep, well drained to somewhat poorly drained soils on dissected plateaus

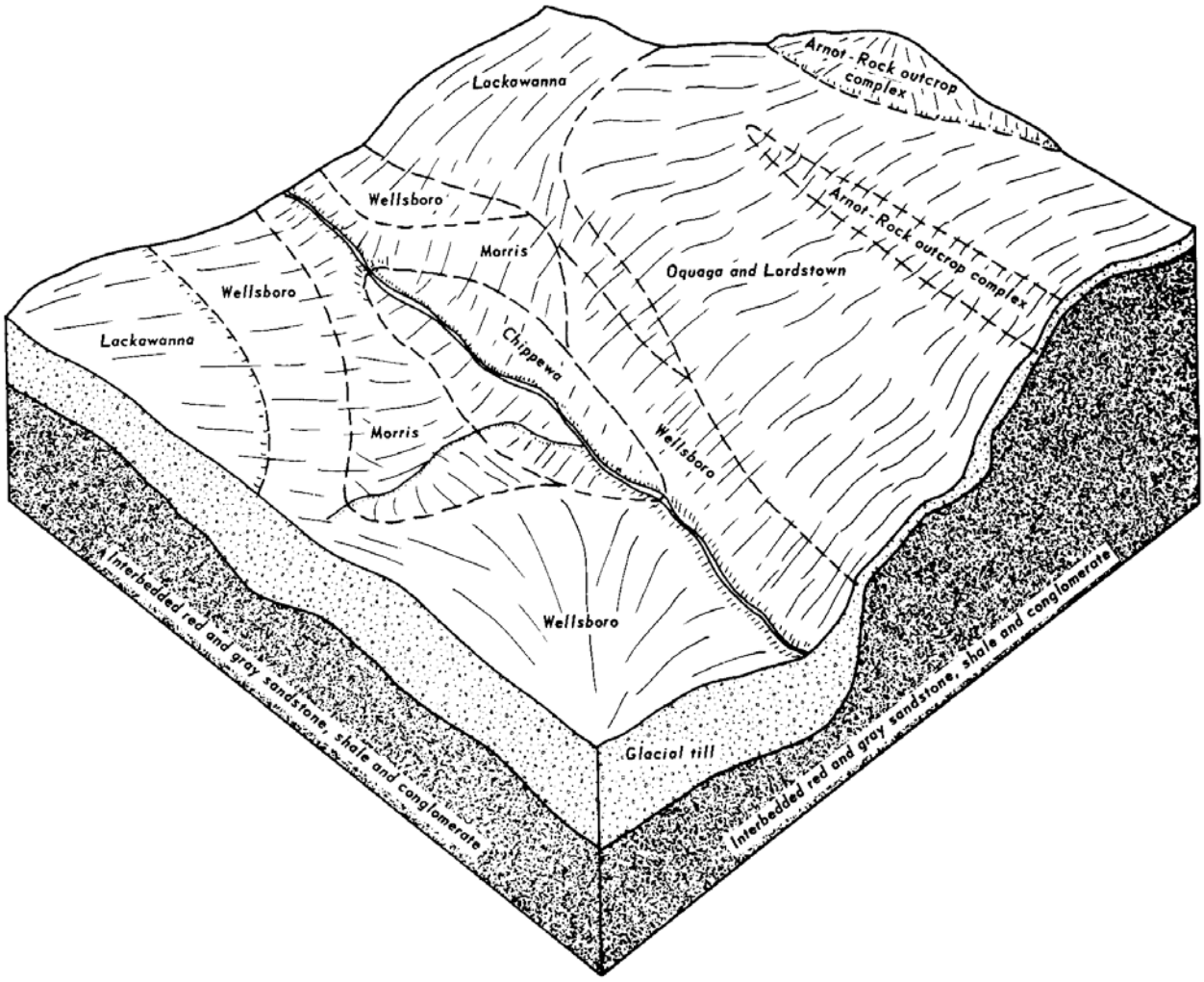
SOIL ASSOCIATIONS

Association 1 -- Oquaga-Wellsboro-Lackawanna Association

- formed in glacial till, derived from red sandstone and shale
- gently sloping to very steep
- Oquaga - moderately deep and well drained, on higher ridges, knolls and steep stream valleys
- Wellsboro - deep moderately well drained, with fragipan, on plateaus and inter-mountain basins
- Lackawanna - deep, well drained, with fragipan, on plateaus and inter-mountain basins
- dairying and truck farms
- minor in Association are Morris, Chippewa, Lordstown, Arnot
- major limitations - depth to bedrock, restricted permeability, seasonal high water table, stoniness

Association 6 - Lordstown-Mardin-Volusia

- gently sloping to very steep
- formed in glacial till, derived from red and gray sandstone, shale, conglomerate
- Lordstown - mapped only with Oquaga, moderately deep, well drained, on higher ridges and knolls
- Mardin - deep, moderately well drained, with fragipan, on lower areas adjacent to Lordstown
- Volusia - deep, somewhat poorly drained, with fragipan (not identified in Nescopeck Twp)
- minor in Association are Arnot and Oquaga
- dairying, much left wooded due to stoniness and poor drainage
- major limitations - restricted permeability, seasonal high water table, stoniness



Association 1

Typical pattern of soils and underlying material. (Soil Survey of Luzerne County, Pennsylvania.)

Soils: Findings

- A significant proportion of the Township is comprised of prime agricultural soils which should be preserved for agriculture.

- Soil conditions, along with slope and underlying geology, pose severe limitations to septic absorption throughout the Township. Poorly renovated effluent from existing sewage systems on poor soils poses a threat to the quality of surface waters and groundwater supplies. This is of particular concern for sewage systems installed prior to DEP sewage regulations adopted in the early 1970's.

- Soils with limiting zones at depths of 20 inches or more may be suitable for a sand mound, as determined by field investigations. This is evidenced by the number of dwellings constructed since 1970. As more research is conducted on on-lot sewage disposal and new types of systems are permitted by DEP, more areas may become suitable for on-lot sewage which relies on soils.

- Few areas of the Township are suitable for in-ground systems.

- Poor soil conditions in much of the Township uplands present a major challenge to the traditional development type consisting of single-family dwellings with on-lot septic. Site-specific investigations are required to identify suitable areas.

- Hydric and seasonal high water table soils are found throughout the Township in low-lying areas, along watercourses, and where a *perched* water table lies above bedrock or a fragipan. Hydric soils are formed under persistent conditions of saturation, flooding or ponding during the growing season to develop anaerobic conditions in the upper part. These soils are often indicative of a wetland.

- Hydric and seasonal high water table soils are unsuitable for development due to the risk of damage to structures caused by seepage of water and generally wet conditions. The poor stability of these soils results in inadequate support for structures. These soils also serve as important groundwater recharge areas and should be left undisturbed.

- A number of areas with slopes in excess of twenty-five percent are scattered throughout the Township, often associated with lakeside and stream side land, and which have extreme limitations for subsurface sewage disposal.

- In areas where slope is not a limitation, shallow bedrock and low permeability limit subsurface sewage disposal.

- Shallow bedrock and low permeability may contribute to shallow groundwater which carries nutrients from on-lot systems to lakes and streams.

- The proportion of flood plain soils in the Township with potential for development is relatively low.

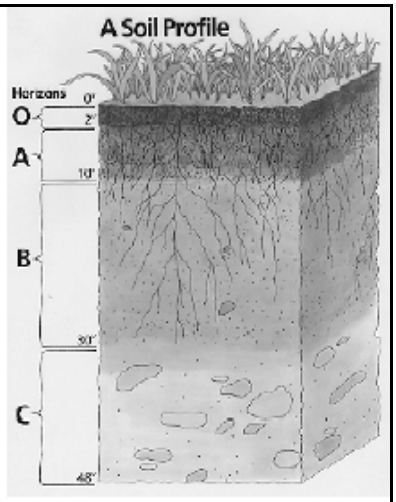
O Horizon: Organic material
Living things carry on life activities. Millions of dead plant and animal organisms are slowly decomposing. Takes from 100 to 600 years to form.

A Horizon: Topsoil containing humus
Organic matter, roots, worms, insects, and other living organisms, small rock and mineral fragments. Dark in color.

B Horizon: Subsoil
Some roots and other living organisms, materials leached by water from the A horizon, clay, rock fragments, minerals. Lighter in color than topsoil.

C Horizon: Weathered Parent Rock
Materials leached by water from the B horizon, partly weathered rock fragments. Orangish, yellowish color.

Solid Rock: Unweathered Parent Rock
Also called Parent Rock.



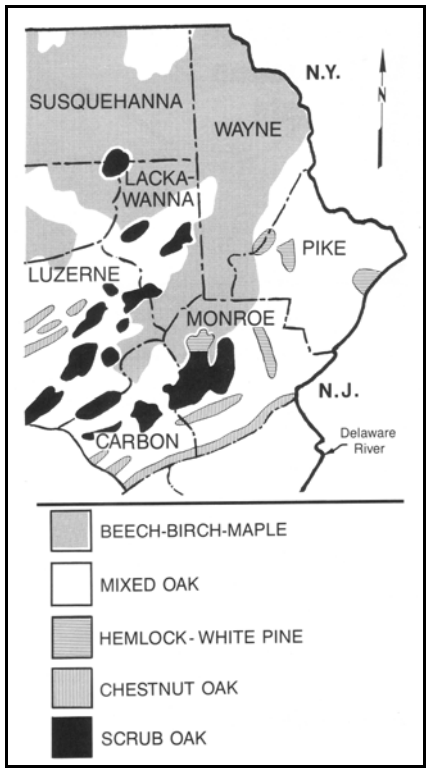
Source: http://home.earthlink.net/~pdf2krech/SoilProfile.pdf

Planning Implications: Soils

- Problems associated with soil erosion and sedimentation are exacerbated by development of steep slopes and removal of vegetative cover.
- Limitations for septic absorption, aging and unmaintained on-lot sewage systems on poor soils, and the lack of sufficient ground for on-lot septic replacement threaten to contaminate soil and groundwater and lakes and streams.
- Local subdivision and land development ordinances and zoning ordinances can include standards to conserve prime agricultural, hydric and seasonal high water table soils.
- Local standards for erosion and sedimentation control must be linked to County Conservation District and Pennsylvania Department of Environmental Protection requirements.
- Long-term maintenance of on-lot sewage systems is critical.

Forest and Vegetative Cover

Forest and other natural vegetative cover are important for many reasons and large contiguous, undisturbed tracts are desirable to provide habitat for interior forest species and establish migration corridors for wildlife.



Five Major Forest Types (*The Poconos, An Illustrated Natural History Guide*, Oplinger, C. S. And Halma, R., Rutgers, 1988, p. 44)

- *Large contiguous forested tracts . . . play an extremely important role in the protection of the current high quality and exceptional value watersheds and water resources.*
- *Forest canopy along stream and river corridors provides shade to minimize the warming of stream temperatures and reduce impacts to fish and other aquatic species.*
- *Forested riparian corridors help sustain stream and lake water quality by acting as nutrient filters and stabilizing soil against erosion.*
- *Large forested tracts with proper forest management and good timber operations support the local forest products industry.*
- *Undeveloped, forested landscapes allow for relatively high rates of infiltration or groundwater recharge and decrease stormwaler runoff.*[6]

Much of Franklin Township remains forested, primarily those areas which were not suitable for agriculture, such as hilltops, stony areas, and steep slopes. The analysis of forest and vegetative cover indicates that:

- The predominate forest type in the Township is mixed oak, with areas of the hemlock-white pine and beech-birch-maple forest types.
- *With the loss of the once magnificent chestnut the common element of this . . . forest is the blend of three oak species: black, red, and white. Frequently, white pine trees mingle among these three dominant oaks, as do scarlet and chestnut oaks.*

[6] *Pike County Comprehensive Plan*, p. 6-5.

- *The* (other) *common trees of the mixed oak forest* include red maple, tulip-tree, American beech, white ash, basswood and shagbark hickory. *Other large trees that occur with some regularity include sugar maple, black cherry, black gum, pitch pine, and hemlock. In places where the forest has been clear-cut or farmed recently, some of the sunloving trees, such as gray birch, the aspens, and red cedar, persist.*

- *There are relatively few sub-canopy tree species. Growing among the replacement saplings, one might find hornbeam, hop hornbeam, sassafras, dogwood, and shadbush (juneberry).*[7]

- A variety of shrubs are found in the Township including among many others, blueberry, huckleberry, mountain laurel, sheep laurel, rhododendron, sweet fern and witch hazel.

- Herbaceous plants include a variety of wildflowers and ferns.

- In many areas, the over-population of white-tailed deer has resulted in poor forest regeneration and the loss of many understory herbaceous species and the expansion of invasive species.

Forest Pests

Long-term forest pest management is a concern in the eastern United States, including Franklin Township. Two pests of particular concern are the gypsy moth and the wooly adelgid. 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 Department of Conservation and Natural Resources (DCNR), 333,335 acres were damaged throughout the state in 2005, mostly in the northeast. DCNR has instituted an aerial suppression program. The gypsy moth was first discovered in Pennsylvania in Luzerne and Lackawanna Counties near Pittston in 1932. During the 1930s and 1940s it continued to spread to Pike, Lackawanna, Wayne, Monroe, and Carbon Counties. By 1969, it had spread west of the Susquehanna River, and by 1980, 38 Pennsylvania counties were infested. The Luzerne County Environmental Special Projects Department coordinates the local DCNR gypsy moth suppression program.

Gypsy Moth Caterpillar

Infestations of the hemlock wooly adelgid are also problematic, especially in 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.

Wooly Adelgid on Hemlock

In addition, the National Park Service (NPS) is conducting extensive research in the Delaware Water Gap National Recreation Area. The Township can look to the NPS, the PA DCNR Division of Forest Pest Management, the Pennsylvania Cooperative

[7] *The Poconos, An Illustrated Natural History Guide*, Oplinger, C. S. And Halma, R., Rutgers, 1988, p. 53 - 54.

Suppression Program, Luzerne County, and the USDA Forest Service for information and assistance on forest pest management.

Invasive Species

Purple Loosestrife
(Linda Wilson, Univ. of Idaho, www.forestryimages.org.)

"Invasive plant" is a name for a species that has become a weed pest, a plant which grows aggressively, spreads, and displaces other plants. Invasive plants tend to appear on disturbed ground, and the most aggressive can actually invade existing ecosystems. Invasive plants are generally undesirable because they are difficult to control, can escape from cultivation, and can dominate whole areas. In short, invasive plant infestations can be extremely expensive to control, as well as environmentally destructive. A small number of invasives are "native," meaning they occurred in Pennsylvania before settlement by Europeans but became aggressive after the landscape was altered. However, most invasive plants arrived from other continents and are often referred to as "exotic," "alien," introduced," or "nonnative" invasives. An aggressive plant freed from its environmental, pest, and disease limits, can become an invader of other ecosystems. Invasive plants are noted for their ability to grow and spread aggressively. Invasive plants can be trees, shrubs, vines, grasses, or flowers, and they can reproduce rapidly by roots, seeds, shoots, or all three. Invasive plants tend to:

- *not be native to North America;*
- *spread, reproducing by roots or shoots;*
- *mature quickly;*
- *if spread by seed, produce numerous seeds that disperse and sprout easily;*
- *be generalists that can grow in many different conditions;*
- *and be exploiters and colonizers of disturbed ground.*

Japanese Knotweed

Leslie J. Mehrhoff, Univ. of Connecticut, http://invasives.eeb.uconn.edu/ipane

The best insurance against future problems is to avoid the use of known invasive plants and educate others about the problems of invasives.

- *Avoid using known invasive plants.*
- *Minimize landscape disturbance.*
- *Protect healthy native plant communities.*
- *Use fertilizers wisely.*
- *Have a land management plan for maintenance over time.*
- *Scout regularly.*
- *Remove invasive plants when they are present in low numbers or when they are confined to a small area before they become a problem.*
- *Dispose of removed invasive plants wisely.*
- *Replace invasive plants with native or noninvasive species.*
- *Clean equipment that has been used in an area having invasive plants.*[8]

The most commonly known invasive species in the Township include Japanese knotweed, purple loosestrife and Japanese barberry. Many other flowers, grasses, shrubs, trees and vines are also classified as invasive by the Pennsylvania Department of Conservation and Natural Resources.

[8] www.dcnr.state.pa.us/forestry/wildplant/invasive.aspx

Planning Implications: Forest Land

Despite infestations of the gypsy moth, hemlock wooly adelgid and other forest pests and past development, the Township has a healthy, diverse and expansive forest ecosystem. However, there is no guarantee that land in private ownership will remain forested. Nevertheless, the opportunity to preserve large tracts of forest and vegetative cover remains and Township and County officials should continue to take action to preserve its large forest expanses while opportunities still exist.

- *Development of forested lands can fragment habitat for plant and animal species unique to* (the Township and) *Pennsylvania.*
- *Removal of forested riparian corridors has implications on water quality and clarity.*
- *Loss of these resources could have implications on quality of life and tourism.*
- *Poor forest management and timber harvest operations can have lasting impacts on the long range sustainability of . . . forests.*
- *Improper development and management of forest resources can allow invasive species to proliferate.*[9]

Typical Emergent Wetland

Typical Forested Wetland

Wetlands

Wetlands have in past times been considered wastelands, and, as a result, it is estimated that over half of all wetlands in the nation have been lost to development. Wetlands are an integral part of the environment and provide such benefits as groundwater recharge, stormwater control, surface water quality improvement and habitat for unique plant and animal species. The environmental value of wetlands in the Township is significant and the development which does occur must provide for the conservation of wetlands.

A wetland, as defined by the *Federal Manual For Identifying and Delineating Jurisdictional Wetlands* is any area which supports hydrophytic plants (adapted to growth in saturated soil), contains hydric soils (wet soils) or where water is present at or near the surface of the soil at some time during the growing season. Site specific investigations must be conducted by trained individuals to accurately delineate wetlands. Given the national interest in wetland conservation, and the overlapping jurisdiction of federal and state agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, and the PA Department of Environmental Protection) wetland delineation and protection has evolved into a complex regulatory process.

In recent years the identification and protection of wetlands have surfaced as key elements of environmental protection. Three types of wetlands have been identified in Pennsylvania according to vegetation type and standing water, or even saturated soil, need not be present to qualify an area as a wetland.

[9] *Pike County Comprehensive Plan*, p. 6-5.


Franklin Township Wetland

- Emergent - vegetation includes freestanding, non-woody plants such as cattails, reed canary grass, and rushes.
- Scrub-shrub - characterized by woody plants less than twenty feet in height.
- Forested - presence of trees such as red maple, hemlock, yellow and river birch, pin oak and ash over twenty feet tall.

The National Wetlands Inventory (NWI) Maps, published by the U.S. Fish and Wildlife Service, are the best tools for the preliminary identification of wetlands. Wetlands are superimposed over USGS 1:24,000 scale topographic maps and are identified and classified based on vegetation, visible hydrology, and geography. The accuracy of the maps is described as being at the ninety-five percent confidence level, but local experience indicates that the maps are not accurate for detailed site planning and site specific investigations are necessary for a final wetlands determination. (A composite of the NWI maps is included on the *Natural Resources Map* included with this *Plan*.) In addition to the NWI maps, hydric soils descriptions found in the County Soil Survey and as shown on the *Natural Resources Map* provide a good indication of wetland locations.

The NWI Maps identify relatively few wetlands in Franklin Township. However, as shown on the *Natural Features Map* accompanying this Plan, many of soils in the Township are very wet and are classified as hydric or partially hydric. A wetland delineation in an area with such soils will likely identify wetlands which are not shown on the NWI Maps.

Wetland Regulation

Wetlands are protected by the federal Clean Water Act, which regulates the discharge of dredged and fill material into *waters of the United States*, 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 steps have been taken to avoid wetland impacts where practicable. Impacts must be minimized and compensation may be required for any remaining unavoidable impacts via the restoration or creation of wetlands.

Planning Implications: Wetlands

- The presence of wetlands will temper, but not significantly limit, the overall development of the Township.
- State and federal regulations protect wetlands but do not require a buffer around wetlands. Local municipalities can include wetland protection in zoning and subdivision and land development ordinances to augment federal wetland regulations.
- *Potential encroachment into, filling in or draining of wetlands during development inhibits the continued important values and functions of wetlands.*

- *Disturbance of wetlands and surrounding areas by development increases the potential for introduction of non-native Invasive plant species that crowd out beneficial native wetland plants.*

- *Development adjacent to wetlands can release pollutants that impact the water quality and the groundwater recharge capacity of wetlands.*

- *Groundwater withdrawals can impact water levels that would otherwise sustain wetlands, particularly during dry periods.*[9]

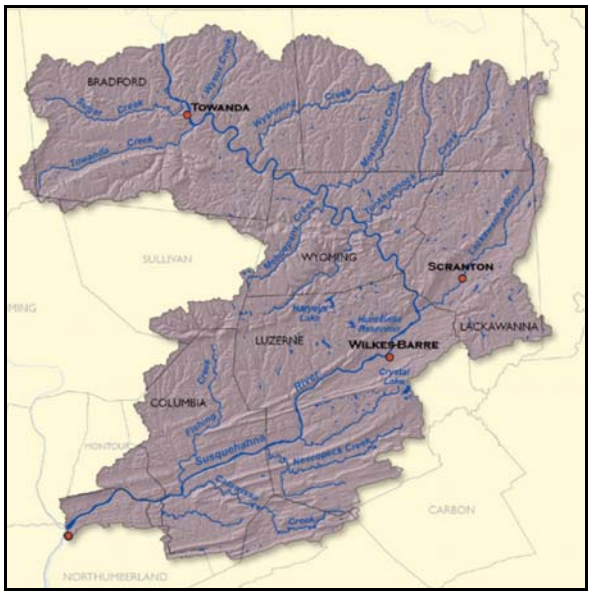
Watersheds and Surface Waters

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 surface of the land, the streams that drain the land, and the underlying soils, geology and groundwater. Groundwater stored in an aquifer eventually reaches the surface again through a seep or spring or direct discharge to a stream. Each is critical to ensuring the proper function of the watershed and the hydrologic cycle. Watersheds are defined by drainage divides (ridge lines), which direct surface and groundwater down the valley and into the stream channel or water body. Ridge lines separate adjacent watersheds.

Susquehanna River Basin (www.srbc.net)

Franklin Township lies in the Middle Susquehanna section of the Susquehanna River Basin which drains to the Chesapeake Bay which has long been a focus of restoration. Locally, the Township is comprised of seven small watersheds: Abrahams Creek, Cider Run, Dymond Creek, Leonard Creek, Sutton Creek and Whitelock Creek. (See the *Watersheds and Water Quality Map* on the following page.)

Stream size, flow and water quality are directly related to the watershed's natural features (soils, vegetation, etc.) and land use and quality of development. These factors influence the flow and accumulation of stormwater runoff and sediments, as well as infiltration, groundwater storage and seepage, and filtration of pollutants. The protection of headwater and smaller streams is important to the health of the entire watershed.



Middle Susquehanna (www.srbc.net)

The Chesapeake Bay Program *is a unique regional partnership that has led and directed the restoration of the Chesapeake Bay since 1983. The Chesapeake Bay Program partners include the states of Maryland, Pennsylvania and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the Environmental Protection Agency, representing the federal government; and participating citizen advisory groups.* (www.chesapeakebay.net)

[9] *Pike County Comprehensive Plan*, p. 6-14.