

Chapter 12

Natural Resources Plan

This Chapter provides an overview of the major natural resources in the Borough and their importance to Borough planning. Current resource protection measures are discussed as well as recommendations for continued natural resource protection planning.

Natural resources, such as streams and forested ridges, do not stop at municipal boundaries. As a result, it is important for Malvern Borough to be aware of certain natural features, such as flood prone areas, that are just outside the Borough boundary but which could impact properties within the Borough. For this reason, parts of this Chapter discuss features that extend beyond the Borough's official borders.

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LAND AND BIOTIC RESOURCES INVENTORY

Land is a finite, non-renewable resource that, once degraded, may never fully recover. Land resources include underlying geology, the soils which form at the surface, and the topography which is shaped by the natural weathering process and centuries worth of human settlement and land development. Land resources need to be well-managed and properly developed to avoid impacts such as erosion and degraded water impacts. Such environmental damage can be costly to reverse, hurting both the Borough budget and the local economy.

Biotic resources include plants, animals, and ecosystems such as forests and wetlands. Street trees and vegetated public lands are also a form of biotic resources which add to the quality of life in the Borough and can significantly improve real estate values for Borough residents. The control of vector-borne¹ diseases, such as West Nile and Lyme, are also related to planning for biotic resources, along with health and environmental issues resulting from exotic invasive plants, and overpopulated species.

This Chapter discusses the importance of maintaining land and biotic resources to better sustain the Borough's natural diversity, ecosystems, quality-of-life, and economic well-being.

¹ A disease that is transmitted to humans or other animals via an insect or other arthropod.

GEOLOGY

Overview

The geologic formations that underlie Malvern Borough significantly influence its topography and soil characteristics which, in turn, influence drainage, difficulty of excavation, the soundness of foundations, and groundwater supplies.

Existing Conditions

As Map 12-1 shows, the northern two-thirds of the Borough is underlain by the Octoraro Phyllite (oct) formation, previously mapped as Wissahickon albite-chlorite-schist (Xwc), which is composed of slate-like metamorphic rock known as phyllite. There are sinkholes also in the northern part of the Borough along Old Lincoln Highway, perhaps with limestone geology. The southern one-third of the Borough is underlain by Wissahickon Schist (wb), which is a layered metamorphosed rock more solid than slate. Both formations provide good foundation stability, and are usually moderately easy to excavate. A geologic fracture transverses the southern portion of the Malvern Prep and St. Joseph's Retreat properties, and this fracture zone was historically a source of well water. The groundwater significance of this fracture zone is discussed in this Chapter in the groundwater section.

Table 12-1: Characteristics of Geological Formations in Malvern Borough

Geologic Formation	Description	Weathering	Drainage and Permeability	Foundation Suitability
Octoraro Phyllite (oct)	Bluish-grey to greenish grey, well formed chlorite phyllite with lustrous, smooth laminae; often contains quartz lenses parallel to the laminae. Locally, a purplish slate is present.	Weathering is moderately resistant; often highly weathered to a moderate depth resulting in uneven, small sized, plate-like rubble as the base of exposure. Overlying mantle is thin.	Surface water drainage is good. Joint and cleavage openings provide low secondary porosity. Permeability is low.	Ease of excavation is moderately easy to difficult in un-weathered rock. Cut slope stability is fair. Foundation stability is good.
Wissahickon Schist (wb)	Light- to medium-grey, schist and gneiss. Moderately high metamorphic grade, mostly in the amphibolite facies.	Same as above.	Same as above.	Same as above.

Source: Geology, Hydrology, and Groundwater Quality of Chester County, CCWRA and USGS, 1994.
Engineering Characteristics of the Rocks of Pennsylvania, PA Topographic and Geologic Survey, 1982.

Planning and Protection Efforts

Within the Borough's municipal planning documents and regulations, there are no provisions that apply specifically to geologic features or formations. However, Article IV Section 400 (B)(6) of the 2006 Subdivision and Land Development Ordinance (SLDO) requires that these features be referenced, located and mapped as part of the Existing Resources and Site Analysis Plan.

Planning Implications

There are no pressing issues regarding geology. However, potential long range future projects, such as upgrades to the Malvern Train Station or rail bridges, could impact geological resources.

The anticipated increase in use of geothermal heating/cooling systems is not expected to require ordinance language that addresses geologic formations, because they are closed systems that do not interact with the groundwater. Consideration should be given to determining the impact of deep geothermal system wells. On a related topic, monitoring geological stability related to systems installation as well as containing run-off from and disposal of extracted rock slurry resulting from systems construction is a consideration. Due to the mass and density of the extracted rock slurry, a silt fence does not provide adequate containment. As well, further investigation as to the depth of wells needed (this is particularly a consideration for the industrial area) and what types of ordinances, if any, are needed should be considered.

TOPOGRAPHY AND SLOPES

Overview

Limiting development on steep slopes is important for preventing soil erosion, minimizing pollution and sedimentation of surface waters, reducing flooding onto landowners' properties below the slope, preserving stream banks, and maintaining water flow in headwaters. Ideally, steep slopes should be planted and maintained under a wooded or meadow cover to prevent erosion and other problems associated with their development. Improper development of steep slopes can lead to increased stormwater runoff and higher construction costs.

Existing Conditions



Downtown Malvern Borough is located on high ground, which is common for many older towns. Highland Avenue, Monument Avenue and Roberts Lane follow along on a ridge line that more or less bisects the Borough. As Map 12-1 shows, steep and moderately steep slopes within the Borough are mostly located along streams, with a major concentration of steep slopes north of the rail line. These steep slopes formed because the geologic formations that underlie Malvern Borough are rather solid and moderately resistant to weathering. Within Malvern Borough, slopes of 15 to 20 percent cover 37 acres, or 5 percent of the Borough. Slopes that

exceed 20 percent cover 59 acres, or 7 percent of the Borough. Thus, 88 percent of the Borough has level to gently rolling topography with slopes of less than 15 percent. Most steep slopes are in the north of the Borough as shown in the photo, and on Map 12-1.

Planning and Protection Efforts

- ***Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations*** – The following provisions address topography and slopes:

⇒ **ZO Article XXII, Section 2202** designates slopes from 15 to 20 percent inclusive as “precautionary steep slopes.” Slopes greater than 20 percent are designated as “prohibitive steep slopes”. Landscaping plans, extra profiles, cross sections and special consideration are required whenever construction is proposed on slopes between 15 and 20 percent. Furthermore, no more than 40 percent of these areas can be built upon, and the maximum

impervious surface is allowed is 20 percent. The use of slopes over 20 percent is limited to open space, forestry, agriculture, and roads or driveways providing the sole access to a subdivision or lot. Storm sewers, additional roads and public water wells are permitted on slopes over 20 percent only by special exception.

- ⇒ **SLDO Article IV, Section 400** requires that topography and slopes be referenced, located, and mapped as part of the Existing Resources and Site Analysis Plan.

The 2010 Act 167 Stormwater Management Plan for the Valley Creek Watershed also addresses steep slope protection. (This effort is described further under *Groundwater Quality and Quantity*.)

Planning Implications

Prior to the 2003 Zoning Ordinance and 2006 SLDO, wooded areas on the north side of the Borough were not under steep slope protection regulations. Given that these steep slopes drain into the Valley Creek Watershed, for which a stormwater management plan was recently completed, it would be prudent to review existing regulations to ensure they are up to-date.

SOILS

Overview

Soils are a major factor in determining what kinds of land uses are appropriate on a given property. The United States Department of Agriculture (USDA) categorizes soils with similar features into a *Soil Series*. A soil series is then divided into soil types based on the slope of the soils and other features. Groups of related soil series are called a *Soils Association*. Soils within a soil association often form on the same geological formation.

In general, soils that are well suited for development are also well suited for agricultural cultivation. As a result, it is important to evaluate the agricultural capability of soils, even in suburban and urban areas. According to the USDA Natural Resources Conservation Service (NRCS), the *Land Capability Class* definitions are as follows:

- Class 1 soils have slight limitations that restrict their use.
- Class 2 soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
- Class 3 soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- Class 4 soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
- Class 5 soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- Class 6 soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- Class 7 soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.
- Class 8 soils have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for aesthetic purposes.

Important soil designations regarding suitability for agriculture (and therefore potential for development) include:

- **Prime Farmland** has the best characteristics for agriculture and is available for such use. In Chester County, Prime Farmland includes all Class 1 soils and most Class 2 soils.
- **Farmland of Statewide Importance** include all Class 3 soils and a few Class 2 soils. These soils do not meet the criteria for prime farmland, but nearly meet the requirements.
- **Prime Agricultural Land** is defined in PA Act 247, The Municipalities Planning Code, Section 107(a) as land “used for agricultural purposes that contains soils of the first, second and third class”. Prime *Agricultural Land* should not be confused with Prime *Farmland*.

Some soils are not well suited for development or agriculture because they are wet or have a shallow water table. However, these soils often have great ecological and economic value in terms of reducing flooding and improving water quality. Important wet soils include:

- **Hydric Soils** are poorly drained and commonly remain wet during the spring growing season, so much so that they undergo anaerobic chemical changes which make them distinct from better drained upland soils. These soils are typically found in low-lying areas, at the fringes of floodplains, and sometimes in upland depressions. Hydric soils often have a shallow water table depth, making them sensitive to alteration and susceptible to contamination of groundwater. Hydric soil areas can serve as indicators of poor drainage. Development in these areas is generally not appropriate for on-lot sewage systems.
- **Alluvial Soils** are those soils which have been eroded, transported, and deposited by flooding over time and, as a result, generally indicate a strong potential for flooding. In addition to the FEMA mapping, alluvial soils indicate a strong potential for floodprone areas. Most areas of alluvial soils are narrow and found immediately adjacent to streams, such as the Re-Med property just west of Malvern Prep.
- **Soils with a Seasonal High Water Table** remain wet during part of the year, usually spring or after periods of heavy rainfall when the ground becomes saturated. Due to low permeability, low run-off rates, and sub-surface saturation, these soils have a shallow depth to groundwater that presents limitations for on-site sewage systems, buildings with basements, and road construction. There is no specific designation for what constitutes a “high” water table soils, but in general soils whose water table could meet a building foundation are considered high.

Existing Conditions

All the soils located in the Borough belong to the Glenelg-Manor-Chester soils group. These soils were traditionally used for grazing livestock. The most common soils in this group are Glenelg and Manor soils, which are well drained upland soils that are generally well suited for development. Table 12-2 indicates that Glenelg and Manor soils are common in the Borough.

As Map 12-1 shows, most of the soils in the northern half of the Borough are designated as Urban Soils, which means that they have been highly altered by years of development. Map 12-1 indicates Class 1, 2, and 3 soils – which are best suited for agriculture but also tend to be well suited for development - are located on the gently sloping parts of the Borough. Hydric and alluvial soils in the Borough are mainly located along Massacre Run and the East Branch Crum Creek. Class 4 through 8 soils are also located along the slopes that border these streams.

Table 12-2: Characteristics of Soils Series in Malvern Borough

Soils Type (Symbol)	Class and Agriculture Designation	Depth to Seasonal High Water Table	Alluvial Designation	Hydric Designation
Baile silt loam, 0-3% slopes (Ba)	Class 5 None	8 feet	Alluvial	Hydric
Baile silt loam, 3-8% slopes (BaB)	Class 5 None	8 feet	Alluvial	Hydric
Glenelg silt loam, 0-3% slopes (GgA)	Class 1 Prime Farmland	201 feet	Not Alluvial	Not Hydric
Glenelg silt loam, 3-8% slopes (GgB)	Class 2 Prime Farmland	201 feet	Not Alluvial	Not Hydric
Glenelg silt loam, 8-45% slopes (GgC)	Class 3 Statewide Importance	201 feet	Not Alluvial	Not Hydric
Glenville silt loam, 0-3% slopes (GlA)	Class 2 Prime Farmland	53 feet	N/A	Partially Hydric
Glenville silt loam, 3-8% slopes (GlB)	Class 2 Prime Farmland	53 feet	N/A	Partially Hydric
Hatboro silt loam, 0-3% slopes (Ha)	Class 4 None	8 feet	Alluvial	Hydric
Manor loam, 3-8% slopes (MaB)	Class 2 Prime Farmland	201 feet	Not Alluvial	Not Hydric
Manor loam, 8-15% slopes (MaC)	Class 3 Statewide Importance	201 feet	Not Alluvial	Not Hydric
Manor loam, 15-25% slopes (MaD)	Class 4 None	201 feet	Not Alluvial	Not Hydric
Manor loam, 25-35% slopes (MaE)	Class 6 None	201 feet	Not Alluvial	Not Hydric
Manor loam, 35-60% slopes (MaF)	Class 7 None	201 feet	Not Alluvial	Not Hydric
Manor loam, 25-60% slopes, v. stony (MaF)	Class 7 None	201 feet	Not Alluvial	Not Hydric
Urban land-Udorthents, 0-8% slopes (UugB)	Class 8 None	201 feet	Not Alluvial	Not Hydric
Urban land-Udorthents, 8-25% slopes (UugD)	Class 8 None	201 feet	Not Alluvial	Not Hydric

Source: U.S. Department of Agriculture, Natural Resources Conservation Service: Soils Survey, 2007.

Planning and Protection Efforts

The Borough's planning documents and regulations have no provisions that apply specifically to the protection of Prime Farmland, Farmland of Statewide Importance, or Prime Agricultural Land; such provisions, however, are not typically necessary in developed areas. There are also no specific provisions relating to alluvial soils or soils with a seasonal high water table.

- **Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations** - The following provisions address soils:

- ⇒ **SLDO Article V, Section 5-18** addresses erosion and sedimentation control for all earth disturbance activities.
- ⇒ **ZO Article XXII, Section 2203** protects hydric soils that are part of wetlands and wetland margins.

Planning Implications

Most of the soils in the Borough are well suited for development. Because the Borough is a small town that has largely been developed, the Borough's soil regulations have never been extensive. Given that the Borough is a headwaters area, it may be prudent to review existing soils regulations to ensure they address increasingly stringent stormwater concerns and issues. As well, education about soils, stormwater control, and natural resources as pre-existing low cost (green) infrastructure is needed (see Action 12-35). For example, the use of chemicals and fertilizers, particularly non-organic, not only directly impacts the soil structures/nutrients, but has the potential negative impact of polluting surface and groundwater via stormwater run-off.

WETLANDS

Overview

Wetlands are ecosystems that include swamps, marshes and the edges of many ponds and streams. However, wetlands also include wet meadows or wet forested areas that most people would not regard as "wet." In Chester County, any area dominated by phragmites, cattails, or skunk cabbage is likely to be a wetland. Under Section 404 of the Federal Clean Water Act of 1977, as amended, wetlands are protected by the Army Corps of Engineers. The Pennsylvania Department of Environmental Protection regulates wetlands under Chapter 105 (Dam Safety and Encroachment Act and Dam Safety and waterway Management Rules and Regulations). According to federal guidelines, a wetland must have *all three* features described below:

- **Wetland hydrology** develops when water stays in a soil long enough to create anaerobic conditions that limit the types of plants that can grow. "Anaerobic" conditions occur when all the dissolved oxygen is removed from water, usually by the decomposition of organic matter.
- **Hydric soils** are soils that are saturated, flooded, or ponded long enough during the growing season - usually in the spring - to develop anaerobic conditions in the soil layer or layers of soil closest to the surface. The USDA periodically publishes a listing of these soils in *Hydric Soils of the United States*.
- **Hydrophytic vegetation** is plant life that grows in shallow water, on wet soil or on some other wet substrate, such as sand, that is at least periodically deficient in oxygen because of excessive water content. The US Fish and Wildlife Service periodically publishes a *National List of Plants that Occur in Wetlands*.

Wetlands improve surface and groundwater quality by removing suspended and dissolved materials and chemicals. This natural water filtration process occurs as water passes through wetland soils and through the roots and stems of wetland plants. Wetlands also help control flooding by storing water during times of heavy rain, snowmelt, or high-water discharge from adjacent streams. The root systems of wetland plants effectively control erosion by anchoring the soils along riverbanks and lakeshores. Thus, wetlands provide both ecological and economic benefits.

Existing Conditions

An on-site field investigation is required to definitively determine the presence of wetlands on a property. It is therefore likely that there are small naturally occurring or man-made wetlands

scattered throughout Malvern Borough. The National Wetlands Inventory (NWI) has identified certain wetland areas based on aerial photography. These areas are presented on Map 12-2, which shows that the only NWI Mapped Wetlands are located along the tributaries of Crum Creek in the southern half of the Borough. NWI classifies all these wetlands as “palustrine - unconsolidated bottom” indicating a marsh-like environment. Purple loosestrife and other invasive plants species are currently growing in the wetlands and are damaging to native wetlands plants. (See <http://www.invasiveplants.net/plants/purpleloosestrife.htm>)

Map 12-1 shows hydric soils, which are not necessarily wetlands, but may indicate likely locations where wetlands exist. Hydric soils are sometimes areas that were former wetlands that were drained for agricultural purposes. In general, hydric soils are ideal locations where wetlands can be created either on purpose or unintentionally as part of the development of land or changes to infrastructure. The absence of wetlands in most parts of the Borough is because the Borough is located on a well drained ridgeline.

Planning and Protection Efforts

- **Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations** - The following provisions address wetlands:
 - ⇒ **ZO Article XXII, Section 2203** contains protection measures for both wetlands and wetland margins. Zoning does not permit wetland areas to be altered, regraded, developed, filled, piped, diverted or built upon, except where state and federal permits have been obtained. No more than 20 percent of a wetland margin can be altered, regraded, filled or built upon.
 - ⇒ **SLDO Article IV, Section 400** requires that wetlands be referenced, located, and mapped as part of the Existing Resources and Site Analysis Plan submission.

Planning Implications

The Borough has few wetlands and its ordinances generally address the state and federal limitations on disturbing them. Recent digital mapping of wetlands is much improved from the older paper-based NWI maps. During ordinance updates, it may be prudent to update the Borough's wetlands regulations to better use emerging mapping technologies. There are also new techniques for restoring wetlands that could be addressed in ordinances to better position the Borough to receive state and federal restoration grants.

Many of the wetlands in Malvern Borough have been invaded to some degree by non-native species. Such a situation is common in densely developed areas. If left unchecked, invasive species such common reed (*Phragmites australis*) can eliminate most other plant species including tree saplings, reducing the beneficial function of wetlands. Wetlands, especially restored ones with new plantings, therefore need regular monitoring so that invasive species can be removed before they result in costly damage.

WOODLANDS AND STREET TREES

Overview

Trees provide wildlife habitat, reduce ambient temperatures in the summer, and can increase property values. Tree roots reduce erosion on steep slopes and in floodplains. Streams shaded by

trees have a wider diversity of plant and animal species that serve to purify water as part of their life cycles. Street trees improve air quality, reduce wind born dust, and help buffer buildings from strong winds. Woodlands and street trees include:

- **Forest Edge Environment** refers to the forest edge where trees grow next to an open area. This environment is favored by certain species, such as deer, who take cover in the forests, but search nearby open areas for food.
- **Interior Forest** refers to that part of a large forest which is at least 300 feet away from the forest edge. These deep forest areas support wildlife that prefer isolated habitat.
- **Forested Riparian Buffer** refers to a vegetated area with trees (naturally growing or subsequently planted) along a stream. (See Surface Water Quantity and Quality).
- **Street Trees**, also called shade trees, may be planted along streets, in parking lots, in homeowner association open space, and on the grounds of office parks and other campuses.
- **Heritage Trees** are usually older trees with historic or local community significance.

As was all of Chester County, Malvern Borough was originally covered by an Oak-Chestnut Forest Region. American Chestnut dominated this forest community until the 1920s, when this species was virtually eliminated by the Chestnut blight fungus. Currently, the County's forests are classified as Mixed Oak Forest, dominated by black, red, and white oaks, mixed with tulip poplar, red maple and beech. Virtually the entire County has been logged at least once, and many of the currently forested lands are located on steep slopes, wetlands, and other landscapes that are poorly suited for development. Quick growing tulip trees are common in areas cleared of woodlands but then allowed to regenerate. Typical understory shrubs include viburnums, sassafras, and spicebush.

Infestations of invasive non-native plants and high deer populations pose a threat to woodlands. Aggressive non-native plants, such as Japanese knotweed, multiflora rose, and mile-a-minute, shade out or parasitize native trees. Norway maples inhibit the growth of other trees. The unnaturally high populations of deer in this region excessively browse the buds and seedlings of native tree species, preventing forests from being able to regenerate.

Existing Conditions

The trees that naturally flourish on the Borough's Glenelg and Manor soils are red oak, white oak, black oak, tulip poplar, hickory and beech. As Map 12-2, shows, there are three major stands of woodlands in Malvern Borough. The largest is St. Josephs Retreat woodland, which has approximately 74 acres of forest, some of which is interior forest. The other woodlands are 32-acres of the Paoli Battlefield Site/northern part of the Malvern Prep property and the 36-acres of woodlands in Randolph Woods. Many of the steeply sloping hillsides in the northern part of the Borough are also wooded, and form a cluster of forested lands that fringe the headwaters of Warren Run. Randolph Woods, the Retreat grounds, and the stand of woods along the West Branch of Warren Run in the northern part of the Borough contain some invasive trees and plant species. The size and shape of the three smaller woodlands make it unlikely that they include interior forests. Overall, as of recent data (2008), woodlands accounted for about 24 percent (194 acres) of Malvern's land area. In comparison, in 1990 there were approximately 245 acres of woodlands in the Borough (30 percent of total land) and in 2000, with Malvern Hills I and II and Malvern Woods having been developed among other parcels, there were approximately 215 wooded acres (26.5 percent of total land).

Within the Borough, street trees are abundant and shade trees are common in residential yards. Many of these trees are quite mature, and may be approaching the end of their natural age. Like many older communities in the eastern United States, there is a possibility that in coming years the Borough could experience a mass die off of older trees. There are no heritage trees in the Borough, but there are many large “specimen trees” which may be located in yards or public settings and may be native or non-native.



Planning and Protection Efforts

- ***Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations*** - The following provisions address woodlands and street trees:
 - ⇒ **ZO Article XXII, Section 2204** contains protection measures for woodlands.
 - ⇒ **SLDO Article IV, Section 400.B.7** requires that woodlands be referenced, located and mapped as part of the Existing Resources and Site Analysis Plan submission.
 - ⇒ **SLDO Article V, Section 525.A through D** contains tree replacement standards and provisions for the protection of trees during construction.

Planning Implications

The Borough’s ordinances are up-to-date in terms of woodlands and street trees. However, there are now increasing funding opportunities to reforest riparian buffers; plant new and appropriate species of street trees; or plant trees on public property and homeowner association open spaces. It may be prudent for the Borough to conduct outreach with private landowners to make them aware of these new tree grant programs. Tree planting is already occurring at Randolph Woods as shown in the photo.



NATURAL DIVERSITY AND SUSTAINABILITY

Overview

Natural diversity and sustainability refers to the ability of natural ecosystems to maintain themselves as healthy living systems. A healthy natural environment provides wildlife habitat, but it also promotes public health and a strong economy. The destruction of natural areas can increase flooding and decrease clean water supplies, resulting in costs for insurance and public infrastructure upgrades. The advent of animal-carried, vector-borne illnesses, such as Lyme and West Nile, now make it necessary to address wildlife management as part of disease prevention.

Existing Conditions

As a small town, Malvern Borough has been extensively developed, and there are no known pristine wildlife areas. Because of the lack of streams, there are few habitats for aquatic species.

According to *Linking Landscapes*, the County's open space plan, there is one County-designated Wildlife Biodiversity Corridor within Malvern (shown on Map 12-2). This corridor is an area with a high potential to be restored as a regional wildlife corridor.

A cursory evaluation of the Borough via online mapping compiled by Pennsylvania Natural Heritage Program, indicated that, as of May 2009, there was a potential area of "special concern species and resources", according to Pennsylvania Natural Diversity Inventory (PNDI). Only a field view can determine the presence of a species of concern.



Like many communities in the eastern United States, Malvern Borough has lost much of its original biological diversity. Native grasses have largely been replaced by non-native lawn grasses, including Kentucky-bluegrass which is a European-Asian hybrid. Non-native Norway maples and Paulonia trees are common in forested areas and along roadways. Ground cover such as Japanese knotweed, lesser celandine, and garlic mustard aggressively shade out native plants. Invasive vines can be seen on many forest trees in the Borough. Large vines, as seen in the photo, can weaken older trees and pull them down. The PA DCNR website

includes a statewide invasive plants list. While all of the invasive species may not be found in Malvern, the list provides an indication of the primary invasive species that exist in the State, which the Borough should be aware of and monitor. Additionally, the PA Code² lists noxious weeds:

When native plants disappear, so do the animals that feed on them, which in turn impacts the broader environment, for example, the loss of fresh water mussels in Chester County has resulted in decreased stream water quality. A lack of plant diversity also impacts wildlife populations forcing some to decline, while allowing others, such as ticks, deer, Canada Geese, and mosquitoes, to boom in population. All of these creatures, now common in the Borough, are linked to public health concerns. It is prudent to assume that more wildlife-related public health concerns affecting the Borough will arise in coming years.

The Borough possesses built-up areas that promote certain forms of "habituated" wildlife. Squirrels, deer, and Canada geese flourish in suburban style landscapes with a mix of open lawn and trees. Mosquitoes breed in old tires and clogged gutters, but not in properly functioning wetlands or floodplains. Railroad corridors are a preferred habitat for Norway rats, and densely placed houses are preferred by house mice, who cannot survive outdoors.

Planning and Protection Efforts

Within the Borough's municipal planning documents and regulations, there are no provisions that apply to specifically to the protection or control of wildlife.

² Chapter 110, list amended up to November 2000.

• **Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations** - The following provisions address natural diversity and sustainability:

- ⇒ **SLDO Article IV, Section 400.B.15 and 16** requires that PNDI sites or any properties that pertain to conservation, protection, or both be referenced, located and mapped as part of the Existing Resources and Site Analysis Plan submission.
- ⇒ **SLDO Article V, Section 525.A through D** encourages the selection of native plant material and mitigating the disturbance of woodlands.

Planning Implications

The Borough is largely developed with limited opportunities to substantially improve natural diversity. Thus, any major natural resource initiatives should address public-private partnerships. The steep wooded hillsides in the north of the Borough could also be improved through forest management, which could be as simple as removing non-native plants. Even a small effort such as this could improve wildlife habitat and increased biodiversity.

Currently, the habitat in the Borough is ideal habitat for deer, geese, ticks, and mosquitoes. Thus, it may be prudent for the Borough to regularly update animal control efforts to employ new technical advances in wildlife management.

Such land management techniques are already in place, such as at the Malvern Prep school property shown in the photo. The stream and pond complex on this site attracts Canada geese. Planting trees and conducting seasonal mowing, which allows grass to grow tall, helps reduce runoff and also help detract geese who naturally fear that predators may be hiding in tall grass.



SUMMARY OF CURRENT LAND AND BIOTIC RESOURCE PROTECTION STANDARDS

Table 12-3: Current Malvern Borough Land and Biotic Resource Protection Standards

Protected Resource	Current Protection Standards*
Geology	<ul style="list-style-type: none"> • Geology not specifically addressed. • SLDO requires geology addressed as part of the Existing Resources and Site Analysis Plan.
Topography and Slopes	<ul style="list-style-type: none"> • Zoning places special requirements for construction on slopes of 15 to 20 percent inclusive. • Zoning limits the use of slopes over 20 percent. • SLDO requires that topography and slopes be addressed as part of the Existing Resources and Site Analysis Plan.
Soils	<ul style="list-style-type: none"> • Farm and wet soils not specifically addressed. • SLDO addresses erosion and sedimentation control for earth disturbance. • Zoning protects hydric soils that are part of a wetlands and wetland margins.

Protected Resource	Current Protection Standards*
Wetlands	<ul style="list-style-type: none"> • Zoning contains protection measures for both wetlands and wetland margins. • The SLDO requires that wetlands be addressed as part of the Existing Resources and Site Analysis Plan submission.
Woodlands and Street Trees	<ul style="list-style-type: none"> • Zoning contains protection measures for woodlands. • SLDO requires that woodlands be addressed as part of the Existing Resources and Site Analysis Plan submission. • SLDO also contains tree replacement standards and provisions for the protection of trees during construction.
Natural Diversity and Sustainability	<ul style="list-style-type: none"> • The protection or control of wildlife not specifically addressed. • SLDO requires that PNDI sites or conservation properties be addressed as part of the Existing Resources and Site Analysis Plan submission. • SLDO encourages the selection of native plant material and mitigates disturbances to woodlands.

Source: Malvern Zoning Ordinance 2003 and Subdivision and Land Development Ordinance 2006

* this provides a general overview of regulations.

LAND AND BIOTIC RESOURCES PLANNING RECOMMENDATIONS

The evaluation presented above suggests that the Borough's land and biotic resources have been significantly impacted by decades of development. For much of its history, the Borough was a small town surrounded by rural or low density residential communities. However, it has now become a downtown center surrounded by moderate to high density suburban and urban land uses.

From a natural resources perspective, the Borough should now be managed as an urbanized area, with the assumption that ongoing maintenance of wildlife habitat will be required, such as at Randolph Woods which is designated as an Important Bird Area. Given that the Borough's vegetated areas are small and isolated, it is likely that human intervention will be required to protect these natural areas from erosion, pollution, invasive species, or other forms of degradation.



The following recommendations address how the Borough can protect and maintain their land and biotic resources given current and anticipated conditions. A discussion of “general land and biotic recommendations” is also included at the end of this section.

Geology Recommendations

12.1 Encourage development that is compatible with the underlying geology and takes into account underlying structures.

Consider requiring that projects involving major excavations into bedrock evaluate potential impacts to underlying structures (such as voids and sinkholes) and groundwater quality/quantity. Such projects may include adding a parking garage near the train station or other multi-story buildings.

12.2 Stay abreast of geothermal technology trends.

Monitor if liquids other than water are being used during drilling/system installation. Be aware of geological stability related to geothermal systems installation. Consider methods to address run-off from and disposal of extracted rock slurry resulting from system construction. For example, due to the mass and density of the extracted rock slurry, a silt fence does not provide adequate containment.

Topography and Slopes Recommendations**12.3 Continue to limit development on steep slopes of 20 percent and greater, and to require special consideration for development on slopes of 15 to 20 percent.**

Consider clarifying in zoning regulations that steep slopes can be either natural or man-made. Consider a more detailed discussion of what types of vegetation should be planted on steep slopes with a preference for trees and woody plants with strong root systems. (See plant list in Zoning Appendix). Steep slopes in the Borough drain into the Valley Creek Watershed for which an Act 167 stormwater management plan was completed in 2010. Consider reviewing SLDO and zoning ordinance regulations to ensure they are up to-date and consistent with that plan in terms of stormwater management.

12.4 Ensure steep slope and stormwater regulations are cross referenced.

Ensure that future revisions to steep slope regulations in zoning and Borough stormwater regulations are completed in conjunction with one another. This will most likely involve first updating stormwater regulations and then ensuring existing steep slope zoning regulations are consistent.

12.5 Implement the restoration and re-vegetation of steep slopes.

Coordinate and cooperate with programs such as those administered by the Chester County Conservation Service, which serve to stabilize steep slopes in both new and existing developments, including re-vegetation.

12.6 Address stream bank erosion along North Warren Avenue.

There is significant stream bank erosion bordering North Warren Avenue, to the extent such that the slope eroding directly into and destroying North Warren Avenue stands as a possibility at some future point. The Borough should consider undertaking a stormwater and erosion and sedimentation management study to address this specific issue. Consider installing a stormwater control system and using green/natural resource based technologies to undertake this task (see Action 12.26).

Soils Recommendations**12.7 Consider appropriate development precautions where development is permitted in areas of hydric soils or seasonal high water table soils.**

Precautions could be addressed during the subdivision and land development review process or when a building permit application is submitted for sites containing these soils.

12.8 Review current regulations to ensure they address up-to-date stormwater management requirements.

The Borough is a headwaters area. The Borough should review soils and soil-related regulations in zoning and SLDO to ensure they are up-to-date and consistent with the 2010 Valley Creek Watershed Stormwater Management Plan, as well as the future Crum Creek Watershed Plan.

Wetlands Recommendations**12.9 Ensure wetland definitions reference U.S. Army Corps of Engineers (ACOE) and PADEP definitions.**

Periodically the ACOE and PADEP wetland definitions and guidelines undergo changes, and these changes should be updated in the Borough's studies and zoning and SLDO regulations. In the case of a conflict, require that the more restrictive definition apply.

12.10 Consider revising the wetland margin definition.

Examine the current zoning and SLDO definitions, evaluate including a minimum 50-foot non-disturbance margin beyond the boundary of the wetlands.

12.11 Permit allowable appropriate exceptions for disturbance of wetland margins.

Exceptions to federal and state protection requirements include specific (regulatory exemption) categories, which generally require maintenance of some level of function, and activities that fall below minimum (regulatory) thresholds. Normal land use activities that are generally exempted from federal and state regulations include silviculture, agriculture, ranching, and sometimes mining activities. Borough zoning should include allowable appropriate exceptions for specific limited activities such as removal of invasive plant species and regulated activities permitted by the Commonwealth. These exceptions would not count towards the 20 percent disturbance allowance.

12.12 Ensure wetlands are evaluated using the most up-to-date available mapping technologies and sources, and cite these sources in ordinances.

New digital aerial photography and multi-spectral imaging mapping of wetlands provide a more accurate delineation than existing older paper-based NWI maps. As new and emerging mapping technologies become available, they should be used and cited in ordinance updates. As well, any new or emerging wetlands restoration techniques could be addressed in Borough ordinance updates.

Woodlands and Street Trees Recommendations³**12.13 Encourage the planting and maintenance of street trees and shade trees.**

Such an effort should promote urban forestry in residential, commercial and other developed settings, including parking lots. Investigate funding opportunities to plant new and appropriate street trees or to plant trees in public and other areas.

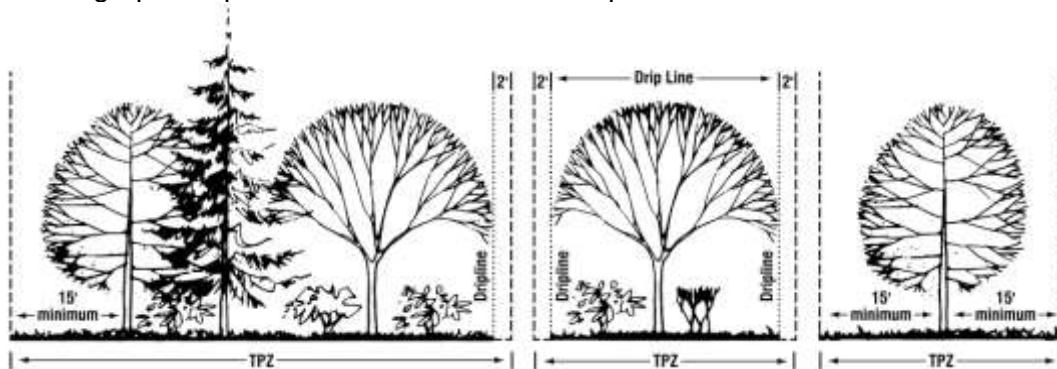
³ Recommendations regarding vegetated or forests riparian buffers are included under Surface Water Quantity and Quality, because riparian buffers are usually established primarily as a means for improving water quality and slowing stormwater runoff.

12.14 Promote the preservation, restoration, and maintenance of woodlands.

This effort could include a special focus to expand interior forests by planting appropriate trees at forest edges and filling in unwooded gaps. In general, such an effort is done through outreach and educational efforts. Create a maintenance plan for woodland areas in the Borough. Reach out to businesses, schools, and the public to have a volunteer woodlands 'clean-up' day event.

12.15 Consider requiring a tree protection zone (TPZ) or similar spatial specifications to protect woodlands and other vegetation during construction.

Such a provision could be considered as part of a zoning or SLDO update and should include a graphic representation such as the one presented here:

**12.16 Encourage the reforestation of sensitive areas.**

Such reforestation could include planting trees on steep slopes, along un-wooded streams, and in areas subject to erosion. Investigate funding opportunities to reforest riparian buffer areas.

12.17 Review tree replacement ordinance standards to ensure long term survival of trees.

Techniques for improving the survival rate of tree saplings are being constantly developed and Borough zoning, SLDO, and street tree or vegetative and property maintenance regulations should reflect current silviculture practices made available from organizations such as the County Conservation District.

12.18 Create a street tree maintenance inventory and specimen tree inventory.

Street trees are an important factor for the quality of life in the Borough (aesthetics, shade) and for economic reasons (green infrastructure, increased property values). Except for the King Street corridor, in the Borough most street trees are required to be planted only during land development and maintained for only five years thereafter. In order to help ensure that street trees remain intact and are maintained, the Borough should develop an inventory of current street trees and establish a recommended maintenance schedule.

The amount of healthy specimen trees is unmistakable in the Borough. Specimen trees are those trees that are good examples of a tree species due to size, shape, age, and traits that epitomize the species' character. Specimen trees are important focal points in the landscape and help create the character of a place. The Borough could consider completing an inventory of these trees and requesting, through a Borough newsletter, that residents offer types of specimen trees on their properties and in the Borough at large.

12.19 Inform residents and property owners about tree maintenance, native species, and selecting and planting the most suitable tree for a given location.

Such an effort can be implemented through providing information or links on the Borough's website or through cooperation with other organizations. Proper tree selection can avoid damage to sidewalks or utility lines caused by planting fast or tall growing trees in areas with extensive infrastructure.

A suggested plant list for street trees and general landscaping is presented below. Trees and shrubs marked with an asterisk are native species, the use of which is encouraged. This list presents common species. There may be other appropriate species not listed.

Street Trees			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Acer rubrum</i> *	Red Maple	<i>Platanus occidentalis</i> *	American Sycamore
<i>Acer saccharum</i> *	Sugar Maple	<i>Pyrus calleryana</i>	Callery Pear
<i>Celtis occidentalis</i> *	Hackberry	<i>Quercus rubra</i> *	Red Oak
<i>Fraxinus Americana</i> *	White Ash	<i>Tilia Americana</i>	American Linden
<i>Fraxinus pennsylvanica</i> *	Green Ash	<i>Tilia cordata</i>	Littleleaf Linden
<i>Gingko biloba (male)</i>	Gingko	<i>Ulmus x 'Homestead'</i>	Homestead Elm
<i>Nyssa sylvatica</i> *	Black Gum	<i>Ulmus parviflora</i>	Chinese Elm
<i>Platanus acerifolia</i>	London Plane Tree	<i>Zelkova serrata</i>	Japanese Zelkova

Shade Trees (All street trees are shade trees along with these trees.)			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Betula nigra</i> *	River Birch	<i>Quercus coccinea</i> *	Scarlett Oak
<i>Cladastris lutea</i>	Yellowwood	<i>Quercus palustris</i> *	Pin Oak
<i>Gymnocladus dioicus</i> *	Kentucky Coffee Tree	<i>Quercus phellos</i> *	Willow Oak
<i>Koelreuteria paniculata</i>	Golden Rain	<i>Quercus rubra</i> *	Red Oak
<i>Liriodendron tulipifera</i> *	Tulip Poplar	<i>Sassafras albidum</i> *	Sassafras
<i>Liquidambar styraciflua</i> *	Sweet Gum	<i>Sophora japonica</i>	Japanese Pagoda
<i>Quercus alba</i> *	White Oak	<i>Taxodium distichum</i> *	Bald Cypress

Evergreen Trees			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Abies Concolor</i>	Concolor Fir	<i>Picea omorika</i>	Serbian Spruce
<i>Ilex opaca</i> *	American Holly	<i>Pinus strobus</i> *	Eastern White Pine
<i>Juniperus virginiana</i> *	Eastern Red Cedar	<i>Pseudotsuga menziesii</i>	Douglas Fir
<i>Picea abies</i>	Norway Spruce	<i>Thuja occidentalis</i>	Eastern Arborvitae
<i>Picea glauca</i>	White Spruce	<i>Tsuga canadensis</i> *	Canadian Hemlock

Ornamental Trees			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Amelanchiar canadensis</i> *	Serviceberry	<i>Koelreuteria paniculata</i>	Golden Rain Tree
<i>Betula nigra</i> *	River Birch	<i>Magnolia soulangeana</i>	Saucer Magnolia
<i>Carpinus caroliniana</i> *	Ironwood	<i>Magnolia virginiana</i> *	Sweetbay Magnolia
<i>Cercis canadensis</i> *	Redbud	<i>Malus species</i>	Crabapple
<i>Chionanthus virginicus</i> *	Fringetree	<i>Oxydendrum arboreum</i> *	Sourwood
<i>Cornus florida</i> *	Flowering Dogwood	<i>Prunus cerasifera</i>	Purpleleaf Plum
<i>Cornus kousa</i>	Chinese Dogwood	<i>Prunus sargentii</i>	Sargent Cherry
<i>Cornus mas</i>	Cornelian Dogwood	<i>Prunus subhirtella</i>	Weeping Cherry
<i>Halesia carolina</i> *	Carolina Silverbell	<i>Pyrus calleryana</i>	Flowering Pear
<i>Koelreuteria paniculata</i>	Golden Rain Tree		

Native Deciduous Shrubs			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Aesculus parviflora</i> *	Bottlebrush Buckeye	<i>Hydrangea quercifolia</i> *	Oakleaf Hydrangea
<i>Aronia arbutifolia</i> *	Red Chokeberry	<i>Itea virginica</i> *	Sweetspire
<i>Callicarpa Americana</i> *	Beautyberry	<i>Ilex verticillata</i> *	Winterberry
<i>Calycanthus floridus</i> *	Carolina Allspice	<i>Lindera benzoin</i> *	Spicebush
<i>Clethra species</i> *	Summersweet	<i>Potentilla fruticosa</i> *	Bush Cinquefoil
<i>Cornus stolonifera</i> *	Redosier Dogwood	<i>Vaccinium species</i> *	Blueberry
<i>Fothergilla species</i> *	Fothergilla	<i>Viburnum dentatum</i> *	Arrowwood
<i>Hamamelis virginiana</i> *	Common Witchhazel	<i>Viburnum trilobum</i> *	American Cranberry

Native Evergreen Shrubs			
Scientific Name	Common Name	Scientific Name	Common Name
<i>Ilex glabra</i> *	Inkberry	<i>Myrica pennsylvanica</i> *	Bayberry
<i>Kalmia latifolia</i> *	Mountain Laurel	<i>Rhodo. Maximum</i> *	Rhododendron

Natural Diversity and Sustainability Recommendations

12.20 Ensure PNDI sites are evaluated using the most up-to-date available mapping technologies and sources, and cite these sources in ordinances.

On-line mapping and advances in electronic mapping should be used by land developers to reduce impacts to habitat of species of concern and referenced in Borough ordinances. These habitats are constantly being discovered or de-listed.

12.21 Consider updating ordinances to address the control of wildlife and habituated species, and the promotion of beneficial species.

Wildlife, such as white tailed deer and Canada geese, whose high population densities have become un-naturalized, need to have their population be controlled. These species also need to have their health maintained in order to protect human health and safety.

12.22 Promote the restoration of vegetated areas that are currently dominated by non-native or invasive native species.

The removal of non-native species could be valuable in undermanaged woodlands and meadows, such in residential yards and nonresidential landscaped areas, as well as along railroad tracks or steep sloped areas such as in the northern central areas of the Borough. Such an effort can reduce the spread of non-native species to more pristine woodlands and greenways within the Borough and can help to increase native flora and fauna in reestablishing and thriving locally. For example, the Borough could work with the Boy Scouts to set up a project whereby boy scouts could remove invasive vines wrapped around trees trunks.

12.23 Educate property owners about invasive, non-native, and native species.

The Borough could add a link on its website to publications on other websites that discuss the benefits of planting and landscaping using native species and address the negative impacts of invasive species on the Borough. For example, the Borough could link to publications on the PADEP's website. Furthermore, beneficial species can be promoted, such as by constructing bird houses and bat boxes, to encourage insect eating species.

General Land and Biotic Recommendations

12.24 Address major natural resources initiatives via public-private partnerships.

The Borough is largely developed and is small in size. Despite its small size, it still includes several significant properties which are privately owned but that could be managed to substantially improve natural diversity in the Borough. Any major natural resource initiatives should address public-private partnerships.

12.25 Consider implementing “dark sky” friendly standards to address light pollution.

Although public lighting is important to public safety, inappropriate or excessive lighting can negatively impact plants and animals. Too much light can also overwhelm the traditional style of street lighting in the Borough’s historic neighborhoods. “Dark sky” standards can be included in Borough zoning and SLDO and/or in a separate free-standing lighting ordinance.

12.26 Consider using natural resource-based technologies to improve water resources quality and cite these in ordinances.

Planted vegetation or landscaping can be used instead of conventional manmade hardscaped constructed structures. Suitable planted-based alternative technology standards should be included or other sources should be cited in Borough zoning, SLDO, and stormwater management ordinances. There are emerging techniques for improving and restoring the quality of water resources through constructing or restoring wetlands, swales, meadows, or woodlands that could be referenced in ordinances. This would also better position the Borough to receive state and federal restoration grants.

WATER RESOURCES INVENTORY

Water resources include surface water bodies (such as streams and ponds), subsurface groundwater (such as underground springs), and stormwater runoff (that crosses land surfaces and collects in desired and undesired locations). Water resources impact wildlife and the environment, and are also a major financial and public safety concern. Insufficiently managed stormwater runoff can result in erosion that can cause property damage; improperly maintained headwaters and floodplains can result in increased flood damage; and degraded surface and groundwater quality can drive up potable water costs.

Surface water and groundwater are interconnected into one system, and thus must be managed as one entity. For example, fertilizer deposited on a lawn may seep into the groundwater below, and then bubble up into a stream. The quality of water in any part of the system impacts the entire system. Similarly, the quantity of water affects the entire hydrologic system. For example, when stormwater runoff is piped away from a property, it does not infiltrate into the ground to recharge the amount of groundwater. The balance of surface and groundwater is called “water balance.”

This section discusses the importance of maintaining water resources and ecology to better sustain the environment and to avoid costly damage from flooding and water pollution.

WATERSHEDS, HEADWATERS, AND STREAMS

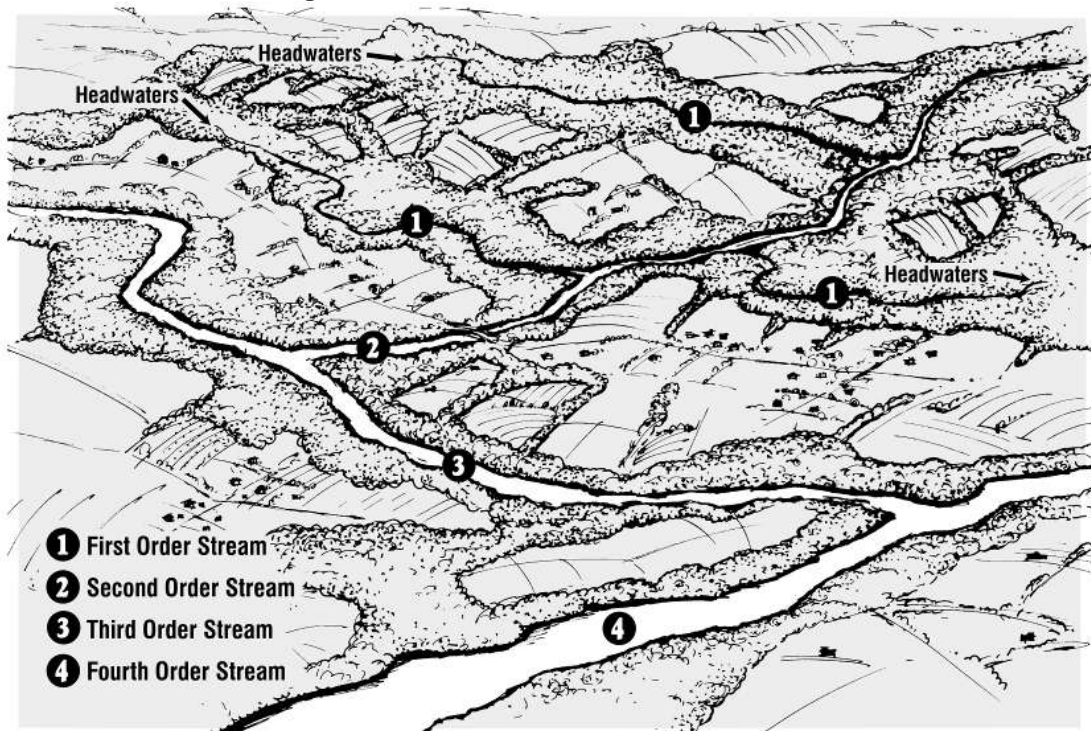
Overview

All land on Earth is in a watershed. A watershed is an area of land, bounded by a continuous ridgeline, which captures rain and snow and then stores, seeps, or drains the majority of the precipitation into the area's streams, rivers, lakes, and groundwater. The remainder of this precipitation is transpired by plants or evaporated. Because watersheds do not follow political boundaries, planning and management of water resources within a watershed is most effective on a regional level. Municipalities should always maintain awareness that the conditions within their jurisdiction can seriously impact flooding and water pollution in downstream communities.

Rivers, streams, and their tributaries within a watershed are classified using a method called "stream ordering." The smallest streams in the network have no tributaries and are called first order streams. Headwater areas are land areas that drain into first order streams and may contain springs, marshes, or intermittent streams, as shown in Figure 12-1. Headwater areas provide stream recharge into first order streams during periods of low flow and are important for maintaining groundwater flows.

In headwater areas, the exchange between ground and surface waters is the most rapid and direct. Streams in headwater areas are highly susceptible to degradation because of their modest flows and inability to flush themselves. Furthermore, headwater areas around first order streams often contain hydric or wet soils. As a result of these factors, the ecological health of first order streams, and consequently the watershed, is dependent on how land in headwater areas is used and maintained. Headwater areas maintained under a forest or dense meadow cover tend to yield streams with higher water quality and greater biodiversity than those that are not.

Figure 12-1: Headwaters and Stream Order

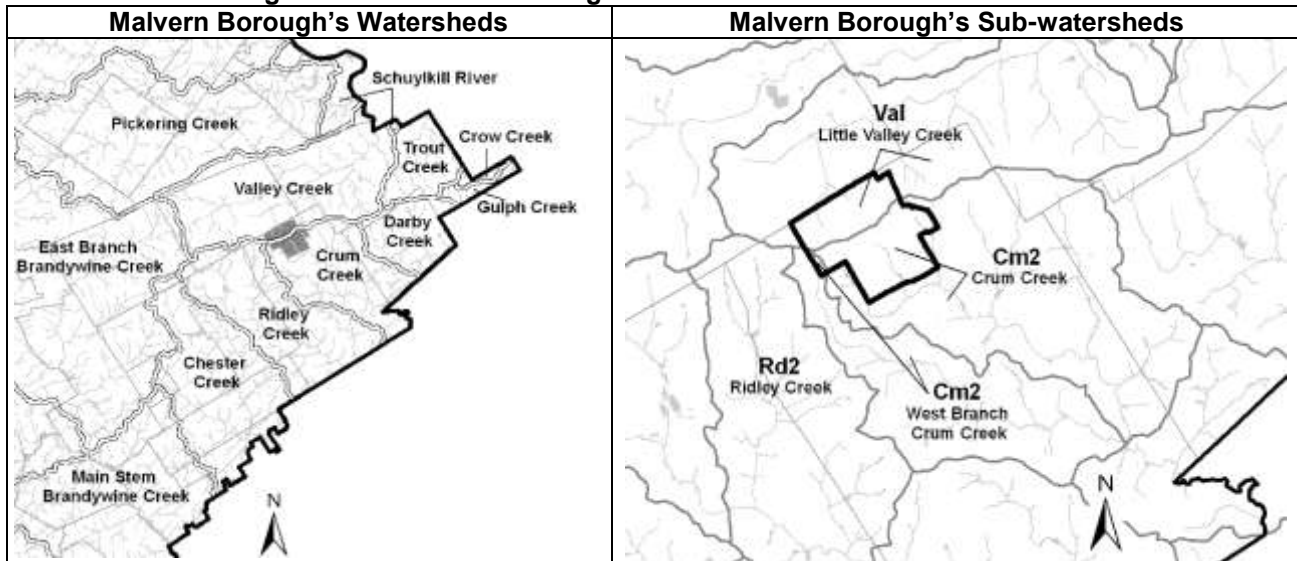


Source: Chester County Planning Commission, 2004. Crum Creek

Existing Conditions

Malvern Borough is located on a ridgeline, which more or less parallels Monument Avenue. Streams to the south of the ridge flow into the Crum Creek watershed which is part of the Delaware River Drainage Basin shown in Figure 12.2. Streams to the north flow into the Valley Creek Watershed, which is part of the Schuylkill River Major Drainage Basin. There are two streams named “Valley Creek” in Chester County, and so Valley Creek in Malvern Borough is sometime called “East Valley Creek,” but in this document it will be called “Valley Creek.”

Figure 12-2: Malvern Borough's Watersheds and Sub-watersheds



Source: Chester County Planning Commission, 2009.

Malvern Borough's sub-watersheds are presented in Figure 12-2 above and also on Map 12-1. These sub-watersheds and the streams that flow into them are described in Figure 12-3 below. Because of the Borough's ridge location, it has but a few permanently flowing waterways.

Table 12-4: Streams in Malvern Borough

Stream Name (Length in Borough)	Location	First order stream	Minor Watershed (% of watershed in the Borough)	Watershed (% of watershed in the Borough)	Major Drainage Basin
Warren Run (758 feet)	Flows from Quaker Lane northward along PA 29 to Little Valley Creek.	Yes	Little Valley Creek Minor Watershed (39%)	Valley Creek Watershed (39%)	Schuylkill River Basin
West Branch Warren Run (1,374 feet)	Flows from west of the Pennsylvania Ave cul-de-sac, north to Warren Run.	Yes	Little Valley Creek Minor Watershed (39%)	Valley Creek Watershed (39%)	Schuylkill River Basin
East Branch Crum Creek (801 feet)	Flows from west of Remington Lane, southward through Willistown Township.	Yes	Crum Creek Minor Watershed (59%)	Crum Creek Watershed (61%)	Delaware River Basin
Massacre Run (3,056 feet)	Flows from west of South Warren Avenue, southward to Crum Creek.	Yes	Crum Creek Minor Watershed (59%)	Crum Creek Watershed (61%)	Delaware River Basin
Ruth Run (1,218 feet)	Flows from east of Ruthland Avenue, southward to Crum Creek.	Yes	Crum Creek Minor Watershed (59%)	Crum Creek Watershed (61%)	Delaware River Basin

Source: Chester County Planning Commission, 2009

All of the streams in the Borough are first order streams. Nearly the entire Borough falls within headwater areas for two watersheds. The northern portion of the Borough drains into Little Valley Creek which flows into the Valley Creek, while the southern portion of the Borough drains into three tributaries of the Crum Creek.

Headwaters are most vulnerable to pollutants and over-withdrawal of groundwater from their drainage areas. Significant alterations to these drainage areas by development and the creation of large areas of impervious surface by development can have serious implications for the health of the watershed. The photo shows how erosion has impacted Ruth Run.



The entire Schuylkill River Drainage Basin, which covers the northern one-third of the Borough, has been designated as a state and federal Heritage area called the Schuylkill River Basin National and State Heritage Area. This heritage area extends from Pottsville in Berks County to the Philadelphia, and focuses on historic, recreational and cultural resources along the Schuylkill River under the theme of the “Revolutionary River.” (Also see www.schuylkillriver.org)

The Pennsylvania Stormwater Planning Act of 1987 (Act 167) requires stormwater management plans to be completed for all watersheds in order to identify stormwater and flooding issues and to develop strategies to address these issues. Act 167 requires municipalities to adopt minimum ordinance standards for controlling stormwater runoff. The goal of an Act 167 plan is to establish a consistent set of minimum stormwater management standards which are applied throughout the entire watershed. After the plan is approved by the PADEP, they will reimburse some of a municipality’s costs for implementing and enforcing the minimum stormwater standards. Malvern is in two watersheds that are, or will be, addressed by an Act 167 Plan.

In 2004, Chester County initiated a study to develop an Integrated Stormwater Management Plan for the Valley Creek Watershed. This Plan was completed in 2010 accepted by PADEP in 2011. It consists of a Phase I and Phase II Stormwater Management Study based on the requirements of Act 167. It also consists of an assessment (referred to as a fluvial geomorphology or FGM) of the streams in the watershed to identify stream reaches that are well functioning and those in need of restoration. The Plan combines the results of the FGM and Act 167 studies and presents recommendations for watershed restoration and stormwater management.

In 2003, Delaware County, in coordination with Chester County, initiated an Act 167 Plan for Crum Creek. Delaware County completed Phase I of this Plan which addressed stormwater management needs throughout the Crum Creek watershed. Phase I assessed key watershed characteristics and land use patterns, and promoted awareness of the Plan among municipalities in the watershed. Phase II, which is ongoing, will provide a model ordinance tailored for different sections of the watershed. Municipalities in the watershed will adopt their own version of the model ordinance as minimum guidelines for regulating stormwater in development projects.

Planning and Protection Efforts

- **Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations** – The following provisions address watersheds, headwaters and streams:

⇒ **ZO Article XXII, Section 2201** contains protection measures for a floodplain overlay district. Since this district contains most of the Borough's streams, it serves to provide some level of protection for streams.

The Act 167 Valley Creek Watershed Plan (2010) and the Act 167 Crum Creek Watershed Plan (draft underway as of 2011) address watershed protection and stormwater management. Planning efforts dealing with the quantity and quality of streams, surface water runoff, and groundwater are addressed below under Surface Water Quality and Quantity.

Planning Implications

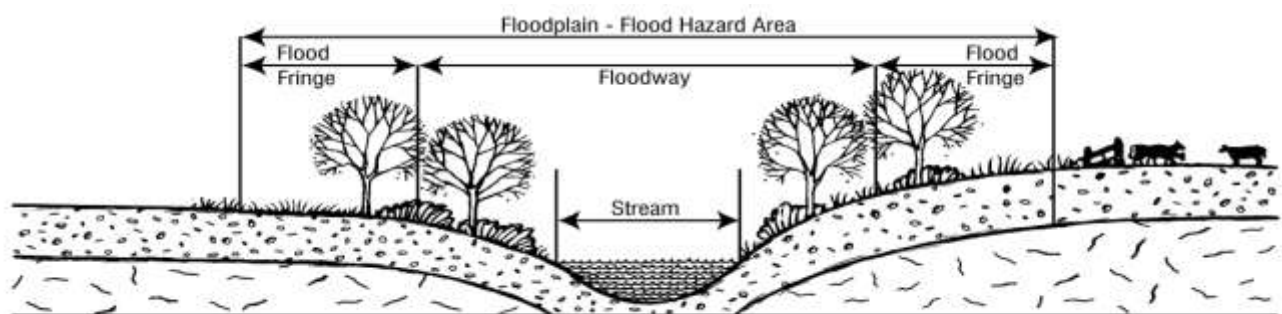
Malvern Borough does not have an extensive network of streams, but most of the Borough is a headwaters area. Given the existing level of development in the Borough, there are few opportunities to preserve headwaters in an undeveloped condition. Thus, the focus should be on maintaining and improving the condition of already built lands. There are opportunities for the Borough to work with surrounding municipalities on projects that will improve the overall health of the Valley and Crum Creek Watersheds. These initiatives might include restoring and reforesting stream corridors, or even promoting pervious pavers or downspout rain-barrels that reduce the volume of stormwater runoff. A watershed-wide multi-municipal approach could be attractive to grant funding programs, but would also require regional cooperation.

FLOODPLAINS

Overview

A floodplain is the portion of a stream valley that is adjacent to the stream channel and covers with water when the stream overflows its banks at flood stage. The Federal Emergency Management Agency (FEMA) defines a floodplain as "the flood elevation that has a 1 percent chance of being equaled or exceeded each year." FEMA's definition of a floodplain is divided into the floodway and the flood fringe, as shown in Figure 12-3.

Figure 12-3: Floodplain Cross-Section



Source: Chester County Planning Commission, 2004.

According to FEMA, the floodway must be reserved to carry the base floodwaters without increasing the base flood elevation more than one foot. This area should be the most strictly regulated portion of the floodplain; any obstructions within the floodway that might raise the base flood elevation should be prohibited. The remainder of the 100-year floodplain beyond the floodway, known as the flood fringe, may be developed if structures are elevated or appropriately flood-proofed. However, many communities choose to prohibit all or most development within the entire 100-year floodplain.

Vegetated floodplain areas, such as forested riparian buffers and grasslands, help to catch and filter sediment from floodwaters and reduce the velocity of sediment-laden water. The vegetation in floodplains also filters stormwater runoff by collecting and holding nutrients and pollutants. Floodplains attract wildlife because they provide drinking water, a diversity of plants, and they are largely buffered from human activity, noises, and odors. Because they are linear, floodplains can serve as wildlife migration routes, or open spaces that wind through communities.

Existing Conditions

As Map 12-3 indicates, the only mapped floodplains within Malvern Borough are along Massacre Run and the far southern tip of the Borough south of Remington Lane. These floodplains cover 22 acres, or 3.0 percent, of the Borough. As Map 12-3 shows, the floodplain complex within and just south of the Borough is mostly 100-year floodplain with a small area of 500-year floodplain. As the map shows, the 100-year floodplain within the Borough has no base flood elevation determined. This means that FEMA has not determined the water surface elevation that would occur during a 100-year flood. Floodplains without such a determination are common.

The Borough also contains areas of alluvial soils as discussed previously in Table 12-2. These soils are typically associated with flood prone areas. For example, Hatboro silt loam soil, which is alluvial, extends north of the floodplain running along Ruth Run in the eastern part of the Borough. As Map 12-3 shows, the floodplains within the southern part of the Borough are hydrologically connected to a larger floodplain area to the south in Willistown Township. Therefore, floodplain conditions in the Borough could have a significant impact on landowners downstream.

Planning and Protection Efforts

- ***Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations*** – The following provisions address floodplains:
 - ⇒ **ZO Article XXII, Section 2201** regulates activities and prohibits structures in the 100-year floodplain.
 - ⇒ **SLDO Article IV, Section 400.B.5** requires that FEMA floodplains be referenced, located and mapped as part of the Existing Resources and Site Analysis Plan submission.

Planning Implications

There are limited floodplains within the Borough and most are located away from the more densely developed residential core. In general, the current municipal regulations are up to date. However, there are opportunities to restore un-vegetated floodplains in the Borough. Current ordinances should be reviewed to ensure that they do not discourage such restoration.

SURFACE WATER QUANTITY AND QUALITY

Overview

Streams and other water bodies can be negatively impacted by their quantity of water. When there is too little water flow, aquatic plants and animals that help purify the water and plants that hold the stream bank in place can not survive. Likewise, too much water can result in erosion of the stream's banks causing sediment to fall into the stream, which can harm needed plant and animal life and result in degraded water quality. Water quality refers to the chemical, biological, physical, and cleanliness traits of water as related to its suitability for a particular use. Water quality can be degraded by air pollution, point-source contamination, and non-point sources.

Streams with low water quality can pose a public health threat to drinking water supplies and reduce opportunities for water-based recreation. Streams with too much or too little water quantity can result in erosion of property or create an eyesore that reduces property values. Simply put, the maintenance of water quality and quantity provides both ecological and economic benefits.

Existing Conditions

Malvern Borough primarily relies on public water and sewer systems. It does not draw water from its streams or deposit treated wastewater into its streams. Therefore, surface water quality issues are not the highest priority concern within the Borough's boundaries. However, the Borough is largely composed of the headwaters that drain into the surrounding watersheds. Thus there is the potential that pollution generated in Malvern would impact highly populated downstream communities. Furthermore the watersheds in and around Malvern Borough are now, or will likely be, the subject of a number of water resources initiatives, some of which are mandated. These initiatives include:

- **Impaired Streams** – The Federal Clean Water Act of 1977, as amended, requires states to maintain a list of all impaired waters. "Impaired waters" refers to waters that do not meet a state's use designations even after pollution controls, as required by law, are put into place. The impaired waters list includes the reason for impairment, which may be non-point sources (e.g. agricultural runoff) or point sources (e.g. industrial or sewage discharges).

According to PADEP mapping of impaired waters⁴, the West Branch of Warren Run and East Branch of Crum Creek were designated as "not meeting standards." Massacre Run and Ruth Run were designated as "meeting standards." Warren Run has not been given a designation, but recent field visits at that time observed trash and dumped material along the stream suggesting it may also be impaired.

- **Total Maximum Daily Load (TMDL)** – The state must determine the conditions that would return impaired streams to a point that meets water quality standards. As a part of this effort, PADEP determines the amount of pollutants the stream is capable of receiving while still maintaining the water quality standards. A TMDL is calculated for each stream to determine what quantity (or loading) of pollutants can be assimilated by the stream without impairing the designated use. Pollutants that need to be addressed and the "allocation" responsibility for reducing pollutants to an acceptable level are then distributed among the pollutants sources and a TMDL plan(s) is developed to address individual or groups of pollutants. Once a plan(s) is in place, the stream is

⁴ PADEP website eMapPA

removed from the impaired stream list. There is a TMDL for streams in the Valley Creek Watershed portion of the Borough.⁵

- **Act 167 Stormwater Management Planning** – In 1978, Pennsylvania adopted PA Act 167, the Stormwater Management Act, to provide for the regulation of land and water use for flood control and stormwater management purposes. Act 167 called for the eventual completion of stormwater management plan for all watersheds within the state. Act 167 planning for Valley Creek and Crum Creek Watershed is discussed above.
- **Municipal Separate Storm Sewer Systems (MS4)** – Stormwater runoff is often transported to MS4s and ultimately discharged into streams without treatment. The Clean Water Act National Pollutant Discharge Elimination System (NPDES) Stormwater Program was designed to prevent pollutants from being carried into water bodies by stormwater runoff. NPDES stormwater permit regulations apply to operators of MS4s in urbanized areas. The Borough has been designated by PADEP as requiring a MS4 permit.
- **Chapter 93 Water Quality Use Designations** - Pennsylvania complied with the Federal Water Pollution Control Act of 1972 by establishing water quality standards in PA Code Chapter 93, "Water Quality Standards," of the PADEP's Protection's Rules and Regulations. Chapter 93 identifies existing and designated water uses (e.g. trout stocking, irrigation or potable water supply) for each stream in the state. Chapter 93 also provides specific water quality criteria standards, such as pH, alkalinity or bacteria levels, that are necessary to protect water uses.

Crum Creek and streams in its basin have Chapter 93 designated protected uses of Cold Water Fish (CWF) and Migratory Fish (MF).⁶ Valley Creek and its basin have Cold Water Fish (CWF) and Migratory Fish (MF) as designated Chapter 93 protected uses.⁷

- **Chapter 93 Specially Protected Waters** – Chapter 93 lists waters [waterways] with outstanding ecological or recreation value as either "Exceptional Value (EV)" or "High Quality (HQ)." EV waters must be protected to maintain their existing quality, and can include waters in parks and natural areas or waters used as an unfiltered potable water supply. HQ waters are excellent quality waters that must be protected, but the water quality can be lowered for necessary social and economic development if all existing uses of the stream are protected.

The entire Valley Creek Watershed (including West Branch Warren Run and Warren Run) is designated as Exceptional Value (EV) water. The West Branch of Crum Creek portion of the Crum Creek Watershed is also designated as EV water. The remainder of the Crum Creek Watershed (including East Branch of the Crum Creek, Massacre Run, and Ruth Run) is designated as High Quality (HQ) water.

- **Waters Supporting Trout** – Because trout prefer water cooler than 70 degrees Fahrenheit and are sensitive to pollution, the PA Fish and Boat Commission (FBC) has compiled a "Listing of Surveyed Streams having Verified Trout Reproduction." Only sections of streams are listed, not the entire stream. As of June 2011, Little Valley Creek, a tributary of the Valley Creek, mouth to its headwaters, is included on the Listing from its headwaters downstream to its mouth.
- **Forested Riparian Buffers** – A forested riparian buffer is an area of trees, usually accompanied by shrubs and other vegetation, adjacent to a body of water that is managed to maintain the integrity of the stream channels and shorelines. The benefits of forested riparian

⁵ PADEP website EMapPA

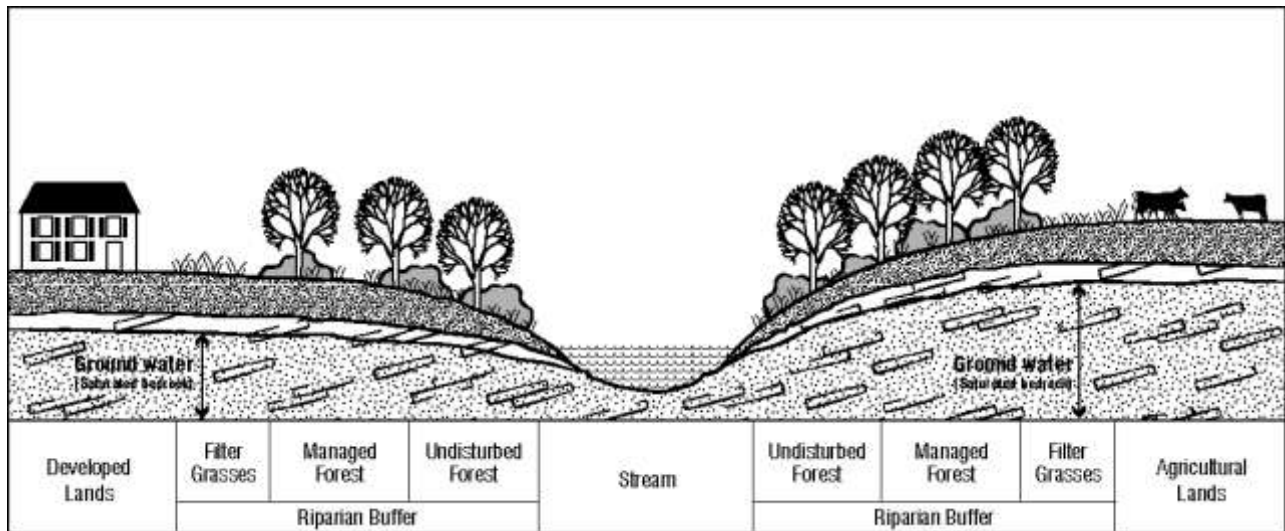
⁶ Per Pa Code Ch 93 Drainage List G as mostly recently amended April 2010

⁷ Per Pa Code Ch 93 Drainage List F as mostly recently amended Sept. 2011

buffers include: prevention of erosion and sedimentation, filtration of nutrients and other chemicals, and the protection of water quality. Forested buffers also provide wildlife habitat, reduce ambient temperatures, and serve as windbreaks.

Aerial photography (Map 12-2) shows that there are forested land areas along most stream segments in/near the Borough. There are a few un-forested (mowed lawn area) segments along Massacre Run at the entrance to Malvern Prep School, and the areas near the pond at Tidewater along the East Branch of Crum Creek. Both of these areas are open land and appear to be well-suited to be reforested, or returned to un-mowed meadow conditions. Figure 12-4 illustrates the characteristics of a forested riparian buffer.

Figure 12-4: Forested Riparian Buffer



Note: The structure of a forested riparian buffer can be divided into three parts: the undisturbed forest, managed forest, and filter (grasses) zone.

Planning and Protection Efforts

- ***Zoning Ordinance (ZO) and Subdivision and Land Development Ordinance (SLDO) Regulations*** – The following provisions address surface water quality and quantity:

⇒ **ZO Article XXII, Section 2201** includes stormwater management standards, riparian buffer standards, and floodplain regulations which serve to protect surface waters. Standards for the protection of steep slopes, woodlands, wetlands, and wetland margins provide further protection for water quality.

As well, the 2009 Borough Revitalization Plan includes a recommendation for a storm sewer study (see Appendix D).

Planning Implications

The Borough straddles two watersheds that have both been the subject of regional watershed planning efforts. Given the current larger scale regulatory environment and the pace of development and redevelopment in the region surrounding the Borough, it is likely that there will be more initiatives in terms of surface water planning. The Borough has addressed surface water planning. However, with the constantly expanding and evolving initiatives regarding surface water planning, the Borough may need to periodically review and revise its ordinances in the future.

GROUNDWATER QUANTITY AND QUALITY

Overview

Groundwater is the water located underground that saturates the spaces between particles of sand, gravel, silt, and clay, or that fills the crevices or fractures in rocks. Groundwater may exist near the land surface or it may occur at depths of up to several hundred feet. The underground rock units in which the groundwater occurs are called “aquifers.” Aquifers are major sources of drinking water as well as for agricultural, commercial, and other purposes.

The Delaware River Basin Commission (DRBC) established Groundwater Protected Areas (GWPA) within the Delaware River Basin. A GWPA is regulated by the DRBC to prevent depletion of groundwater and to protect the interests and rights of lawful users of the water source, as well as to balance and reconcile alternative and conflicting uses of limited water resources in the region.

The regulations require detailed hydrogeologic studies, pump test analyses, and evaluation of potential impacts on adjacent wells for withdrawals that exceed 10,000 gallons per day based on an average 30-day use.

The regulations also set a two-tiered system of water withdrawal limits:

- The **first tier** serves as a warning that a subbasin is "potentially stressed." In potentially stressed subbasins, applicants for new or expanded groundwater withdrawals are now required to implement one or more programs to mitigate adverse impacts of additional groundwater withdrawals. Acceptable programs include: conjunctive use of groundwater and surface water, expanded water conservation programs, programs to control groundwater infiltration and artificial recharge and spray irrigation.
- The **second tier** serves as the maximum withdrawal limit. Under the regulations, groundwater withdrawals cannot exceed that limit.

Existing Conditions

Malvern Borough is located within a DRBC Groundwater Protected Area. Lowered water tables in the Protected Area have reduced flows in some streams. This reduction in baseflows affects downstream water uses, negatively impacts aquatic life, and can reduce the capacity of waterways in the region to assimilate pollutants. Within the Protected Area, the DRBC requires permits for any groundwater withdrawal that averages more than 10,000 gallons per day during a calendar month.

Currently, Aqua Pennsylvania provides all water to the Borough. Historically, Malvern Borough's water supply was withdrawn from municipal wells that tapped into a geologic fracture which transverses the southern portion of the Malvern Prep and St. Joseph's Retreat properties. Geologic fractures are important since they are indicators of underground water supplies. In general, the Borough is underlain by geological formations which have good water bearing characteristics. There are currently no known groundwater contamination issues in the Borough.

The general features of Malvern's groundwater are as follows:

- **Aquifer Well Yields** - The geological formations which underlay Malvern Borough (Octoraro Phyllite and Wissahickon Schist) have a median yield of 20 gallons/minute with highest yields in fractured layers.
- **Groundwater Quality** - As part of the research conducted for *Watersheds, the Integrated Water Resources Plan for Chester County, PA and Its Watersheds*, available information on groundwater quality was collected to identify locations of groundwater quality problems within the county. At that time, there were no known groundwater problems identified within Malvern Borough or the immediate vicinity of its borders. There are no known groundwater contamination issues that affect the Borough.
- **Groundwater Quantity** - Groundwater balance information shows the stress that water consumption may be putting on aquifers and stream baseflows. Baseflow refers to the portion of stream flow derived from groundwater. Table 12-5 shows the most currently available data on estimated baseflow for all of the Upper Crum Creek and Valley Creek Subbasin (not just the parts of those basins in the Borough). Groundwater balances total the volume of water withdrawn from and recharged to the aquifers by users. In Chester County overall, groundwater contributes a significant portion of the water supply and about 60 percent of the total annual flow of streams.

Table 12-5 indicates, in millions of gallons per year, how much groundwater it takes to keep streams flowing in the 25-year low baseflow. In other words, if that amount of water were removed during the 25-year low baseflow, the streams in the subbasin would be dry. The third column in the table shows the estimated amount of groundwater withdrawn in 1998, which was determined in part by evaluating the number of wells and the population in the sub-basin. The volume recharged shown in the fourth column, indicates the replenishment of groundwater through infiltration of rainfall and other surface waters sources. The net volume withdrawn from the groundwater is the difference between the withdrawal and recharge. The final column indicates the percentage of the baseflow that is withdrawn each year in the subbasin.

Table 12-5: Estimated 1998 Groundwater Balances in and surrounding Malvern

Sub-Basin	Annual Baseflow* (mil gal/year)	1998 Groundwater Withdrawals (mil gal/year)			Net Withdrawal as % of Baseflow*
		Volume Withdrawn	Volume Recharged	Net Volume Withdrawn	
Upper Crum Creek	1,728	116	91	25	<1%
Valley Creek	2,489	681	794	-113	-5%

Source: *Watersheds*, CCWRA, 2002. Note: *1 in 25 year annual baseflow equals the amount of water needed to keep streams flowing in a 25 year low baseflow. These baseflows are used by DRBC for establishing withdrawal limits.

- **Projected Future Water Demand** – According to projections presented in *Watersheds*, the additional water needed for Malvern Borough by the year 2020 is 150,510 gallons per day, all of which would come from public systems. Thus no additional water would be needed from individual residential wells. (Also see Chapter 10 for a discussion about water needs/service).

Planning and Protection Efforts

Within the Borough's municipal planning documents and regulations, there are no provisions that specifically target groundwater quality and quantity, such as a withdrawal ordinance. However, the existing surface water protection standards directly and indirectly provide protection for groundwater

because surface waters are hydrologically linked to the groundwater. These surface water provisions are discussed above under Surface Water Quantity and Quality.

Planning Implications

Because the Borough uses public water, groundwater concerns are mostly limited to maintaining the natural water balance. The Borough currently addresses groundwater issues in a number of ordinances that focus on water quality as a whole, which is appropriate given that groundwater and surface water are parts of one interacting system. Because initiatives that address watershed wide surface water issues also address groundwater, the Borough may need to expand its groundwater ordinances in the future.

SUMMARY OF CURRENT WATER RESOURCE PROTECTION STANDARDS

Table 12-6: Malvern Borough Water Resource Protection Standards

Protected Resource	Current Protection Standards*
Watersheds, Headwaters, and Streams	<ul style="list-style-type: none"> Streams and watersheds are addressed in a number of ordinances. Zoning includes stormwater management standards, riparian buffer standards, and floodplain regulations.
Floodplains	<ul style="list-style-type: none"> Zoning Ordinance regulates activities in the 100-year floodplain. SLDO requires FEMA floodplains be addressed as part of the Existing Resources and Site Analysis Plan submission.
Surface Water Quantity and Quality	<ul style="list-style-type: none"> Water quality and quantity is addressed in a number of ordinances and regulations. Zoning includes stormwater management standards, riparian buffer standards, and floodplain regulations which serve to protect surface waters.
Groundwater Quality and Quantity	<ul style="list-style-type: none"> Groundwater quality and quantity not specifically addressed.

Source: Malvern Zoning Ordinance, 2003 and Subdivision and Land Development Ordinance, 2006.

* this provides a general overview of regulations.

WATER RESOURCES PLANNING RECOMMENDATIONS

The Borough's streams, floodplains, and wetlands are largely located within riparian corridors, which are largely undeveloped. Malvern Prep, Randolph Woods, and St. Joseph's Retreat properties contain most of these riparian corridors. Borough ordinances regarding riparian corridors should be reviewed to ensure that they are practical given the long-term development and preservation plans of these private landowners. The Borough also contains headwaters which flow into two watersheds that are both the focus of regional planning. Therefore, the Borough's ordinances should accommodate regional water resource planning efforts as a way to be a good neighbor to its nearby downstream communities, avoid potential lawsuits, and also to pursue stream corridor and floodplain restoration grants.

Watersheds, Headwaters, and Streams

12.27 Work with surrounding municipalities on projects that will improve the overall health of the Valley Creek and Crum Creek watersheds and protection of headwater areas.

Such projects could include creating naturalized swales. Target the first order streams for establishing forested riparian buffer networks. When development is proposed in headwater areas, particular attention should be paid to preventing negative impacts such as erosion and sedimentation of streams and pre-treating water discharged from stormwater facilities. Such a multi-municipal approach could be attractive to grant funding programs, but would also require regional cooperation.

Floodplains

12.28 Continue the policy of not allowing structures or disturbance within the 100-year floodplain.

This policy can be continued in zoning and floodplain regulations. Maintaining floodplains in their natural state reduces flood hazards and preserves their value as greenways and wildlife habitat. (Note: Recommendations for vegetated or forested riparian buffers used for floodplain restoration are under Surface Water Quantity and Quality, since riparian buffers are primarily established as a means for improving surface water quality and slowing stormwater runoff.)

Surface Water Quantity and Quality

12.29 Encourage restoration of impaired streams as a priority for surface water protection.

This effort can be achieved through the restoration and maintenance of riparian buffers, the continued implementation of the Borough's stormwater management policies, and coordination with regional watershed protection efforts.

12.30 Reduce stormwater runoff from impervious surfaces.

Periodically review the maximum impervious surface allowances, parking requirements, street, and sidewalk and curb requirements, and other zoning ordinance and SLDO standards to determine if they unnecessarily increase impervious surfaces and whether revisions are needed.

12.31 Encourage the planting, restoration, and maintenance of riparian buffers.

As noted in *Watersheds*, the scientific consensus is that riparian buffers should be a minimum of 100 feet wide to provide the ideal stream protection benefit. *Watersheds* notes that when there is insufficient land to accommodate such a buffer, a buffer with an average width of 75 may be acceptable. Given that the Borough has limited areas suitable for the ideal buffer width, a buffer standard that is unique to the Borough and legally defensible should be considered in zoning. The Borough could include educational informational materials about the importance of riparian buffers and their restoration and maintenance as a voluntary property owner initiative.

12.32 Promote public awareness about efforts to improve surface water quality and to control stormwater runoff.

This effort can include public cooperation in reducing common surface water pollutants such as lawn pesticides and pet waste, and the value of planting trees and native plants. Initiatives such as rain barrels and rain gardens should also be promoted.

12.33 Support completion of the Act 167 Crum Creek Watershed Plan and the implementation of the Act 167 Plans for Valley Creek and Crum Creek watersheds.

Implementation could include additional studies, initiatives, or restoration projects that result from the Act 167 plans.

Groundwater Quantity and Quality**12.34 Promote groundwater recharge in new construction, redevelopment, and through the upgrading of existing infrastructure.**

Existing and emerging technologies that promote the groundwater recharge of stormwater runoff, or if applicable, treated wastewater should be encouraged, or as a next step could be required via stormwater management and SLDO provisions. Such techniques can include landscaping and the planting and management of vegetation.

12.35 Promote efforts to reduce and mitigate groundwater contamination.

Such efforts could include requiring the pre-treatment of stormwater discharge for stormwater facilities where the contamination of groundwater may be more likely. Another effort could be the monitoring of “pumping” schedules for the few remaining on-lot sewage systems in the Borough to prevent malfunctions that could contaminate groundwater.

INTEGRATED NATURAL RESOURCES PLANNING

Natural resources make up an interconnected system which, taken as a whole, forms the natural environment. Plants and animals rely on soil and water bodies which are ultimately formed by the interaction of the climate and the underlying geology. Currently, there are a number of initiatives and programs that pursue improving the natural environment and human quality-of-life by taking a more holistic “systems” approach to natural resources planning. These efforts tend to be regional in scope, and focus not on just one natural resource, but rather on related natural resources. Many of these programs are funded through grants. There is value in addressing these programs in a comprehensive plan as a way to formally document Borough understanding and support for them.

EXISTING PROGRAMS AND INITIATIVES

The following programs and initiatives are actively ongoing in or could be pursued by the Borough:

- ***Watersheds: An Integrated Water Resources Management Plan for Chester County, Pennsylvania and Its Watersheds***, adopted by the Chester County Commissioners on September 17, 2002, is the water resources element of the county’s comprehensive plan. *Watersheds* provides scientifically-sound goals, objectives, and strategies for accommodating

existing land uses and planned growth while maintaining the County's water resources. Most importantly for the Borough, *Watersheds* includes numerous implementation strategies for municipalities to more effectively protect and manage their water resources while accommodating planned growth and redevelopment.

- **TreeVitalize** is a public-private partnership to help restore tree cover, educate citizens about planting trees, and build capacity among local governments to understand, protect and restore their urban trees. This program has been active in southeastern Pennsylvania since 2004 and was expanded to a statewide program in 2009. The program involves a combination of trees available for planting, technical assistance, education, and funding to support tree planting in neighborhoods (street and park trees) and along streams (forest buffers). Under this program grants can be offered to communities to plant trees, or plant material can be provided directly. The program also fosters discussion and regional dialogue and collaboration around broader policies and best practices that affect tree cover in the region.
- **Regional Act 537 Plan for Valley Forge Sewer Authority**, completed in November 2006, notes that almost all of Malvern Borough is served by public sewers. Although this plan provides alternatives for wastewater disposal, it does not address how wastewater disposal will impact the "water balance," which is discussed above under Water Resources.
- **Water Resource Planning** – There are a number of ongoing water quality-related initiatives that are regional in context. These are described above under Water Quantity and Quality, and include Total Maximum Daily Load (TMDL) planning, Act 167 stormwater management planning, and Municipal Separate Storm Sewer Systems (MS4) planning.

INTEGRATED NATURAL RESOURCES PLANNING RECOMMENDATIONS

12.36 Consider establishing an Environmental Advisory Council (EAC).

An EAC can assist the Borough Planning Commission with environmental reviews of proposed plans and can also provide input as requested on environmental problems, resource protection and mapping, and possible uses of natural open space. The Pennsylvania Environmental Council has a publication available entitled *The EAC Handbook: A Guide for Pennsylvania's Municipal Environmental Advisory Councils*, (2004) that can be consulted for further information on establishing and using an EAC.

12.37 Encourage consistency with the primary recommendations of *Watersheds*. These are as follows:

- Consider the implications of watershed resources within municipal decision-making (such as stormwater runoff, groundwater recharge, flooding, water quality, aquatic living resources, water-based recreational and cultural resources and opportunities).
- Review municipal ordinances and, where appropriate, eliminate requirements that unnecessarily create stormwater or other impacts to watershed resources.
- Revise municipal comprehensive plans and municipal ordinances to incorporate *Watersheds* strategies.

- Encourage landowners, operators, and developers to implement conservation development designs, best management practices, and other relevant *Watersheds* strategies in land use and land management activities.
- Apply relevant *Watersheds* strategies to management of lands and facilities owned, leased or operated by the municipality and in projects funded by the municipality.
- Participate in multi-municipal and integrated water resources planning efforts to address regional needs and problems.
- Utilize available opportunities to expand public education and awareness regarding watershed stewardship.

12.38 Educate residents and businesses about the importance of natural resource protection.

Information on the benefits of riparian buffers, woodland management, control of non-native plant species, use of native plants, and the impact of pesticide and fertilizer use on streams and soils can be provided through the Borough newsletter and website. Also, keeping residents informed about the resource protection requirements in Borough ordinances may help them to better understand their own obligations for resource protection and reduce the need for enforcement actions.

12.39 Balance the protection of natural resources with property owner's rights.

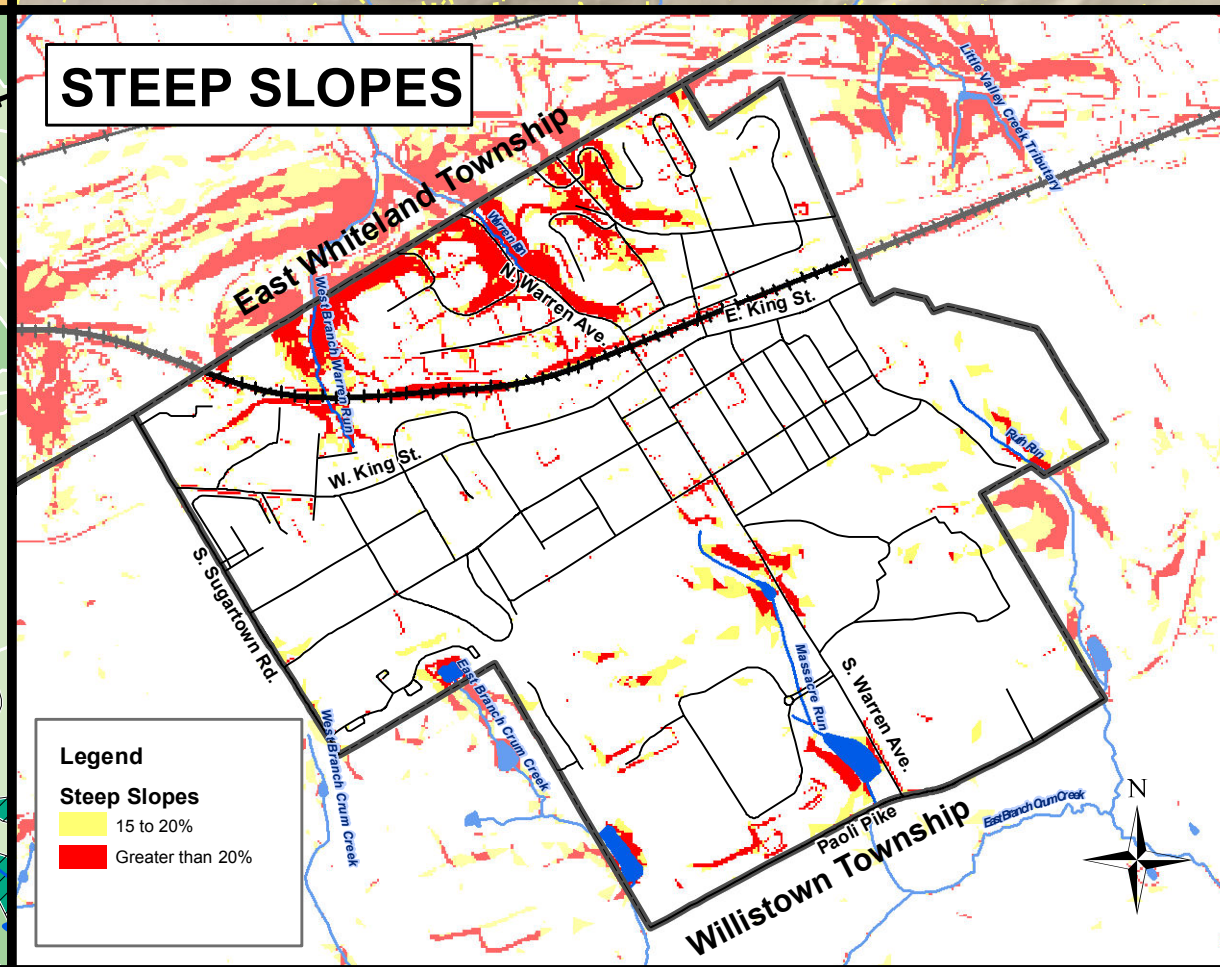
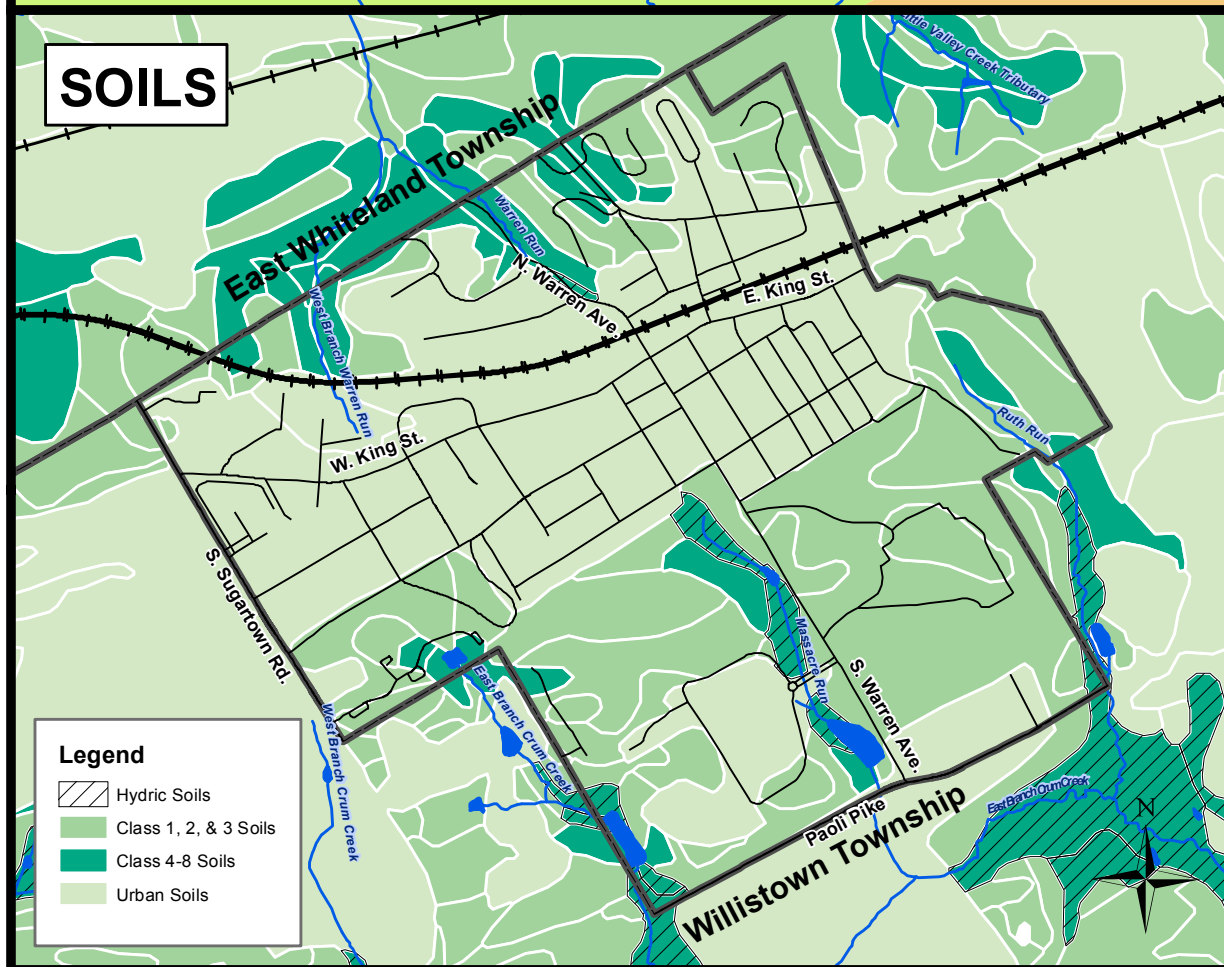
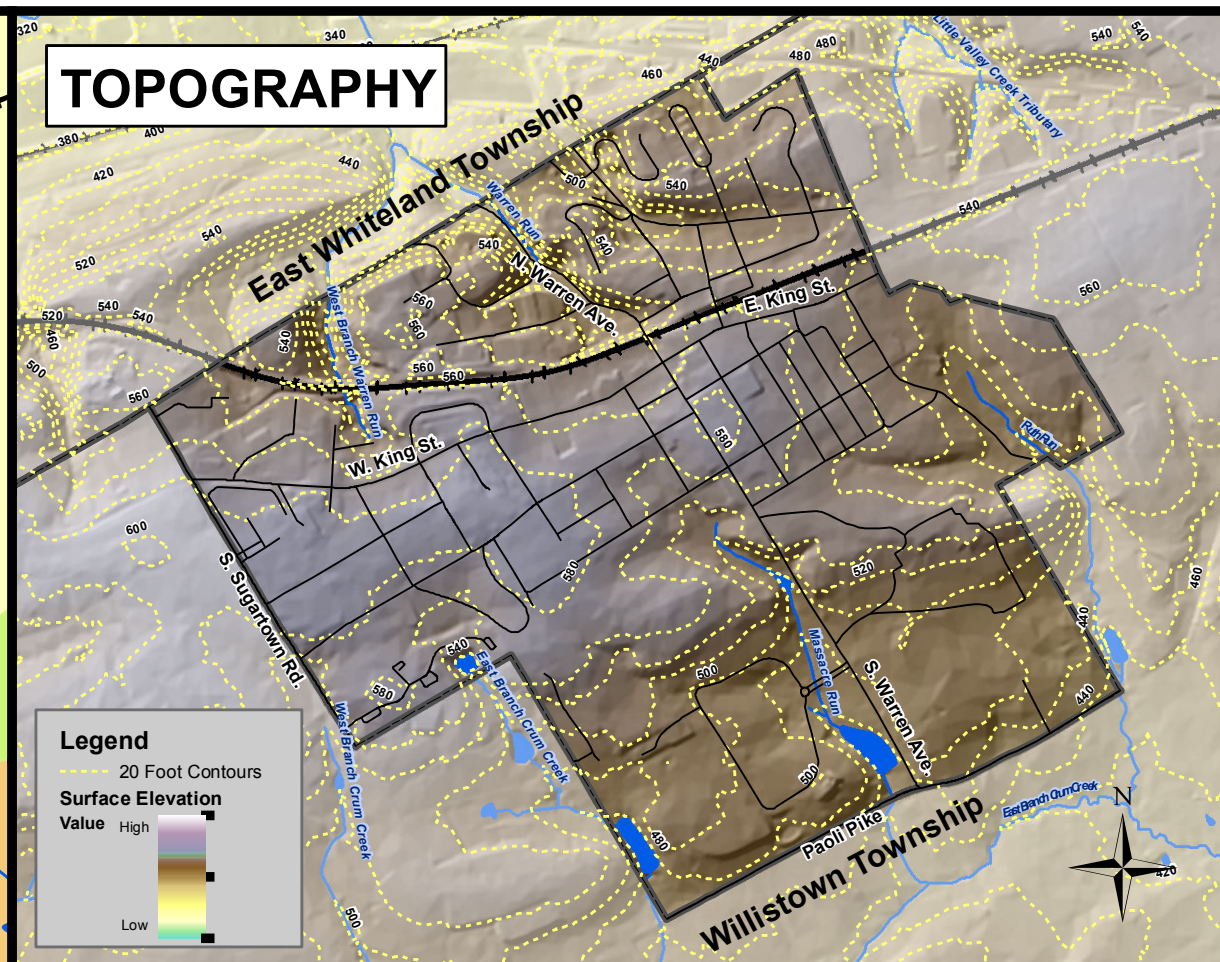
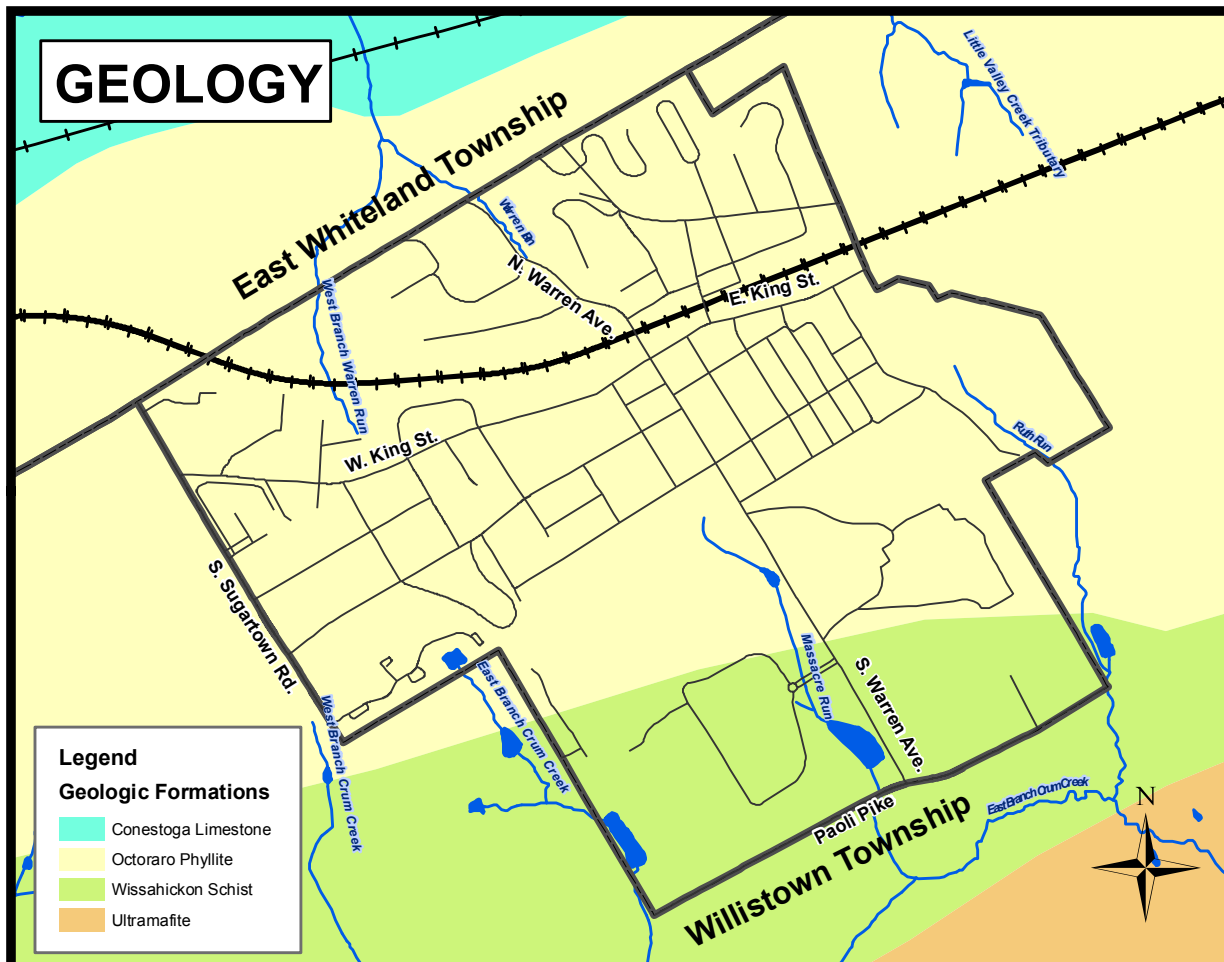
The Borough recognizes that the desire to protect natural resources must be balanced with the rights of its residents and property owners. It is not the intent to prevent residents from enjoying and using their property as legally permitted. The implementation of the recommended resource protection measures will stay within the limits of what has been established as legally acceptable.

12.40 Require that Act 537 Sewage Facilities Plans are only deemed in compliance with the Borough Comprehensive Plan if the 537 Plans evaluate potential impacts to watershed water balances.

The Borough should include this as part of Borough administrative procedure. Such an evaluation would involve estimating how much potable water (for drinking and other uses) is withdrawn from groundwater and water bodies in a watershed as compared with the total volume of water recharged back into the aquifers by users, including water deposited back into the ground, which is treated wastewater discharged back into the watershed, e.g. through spray or drip irrigation.

12.41 Support regional efforts to improve, restore, and maintain conditions within headwaters, Exceptional Value (EV) waters, and High Quality (HQ) waters.

Such support would be useful in assisting government and civic groups who wish to pursue funding for water resource improvement projects.



Map 12-1 Natural Resources: Land Resources Malvern Borough Comprehensive Plan

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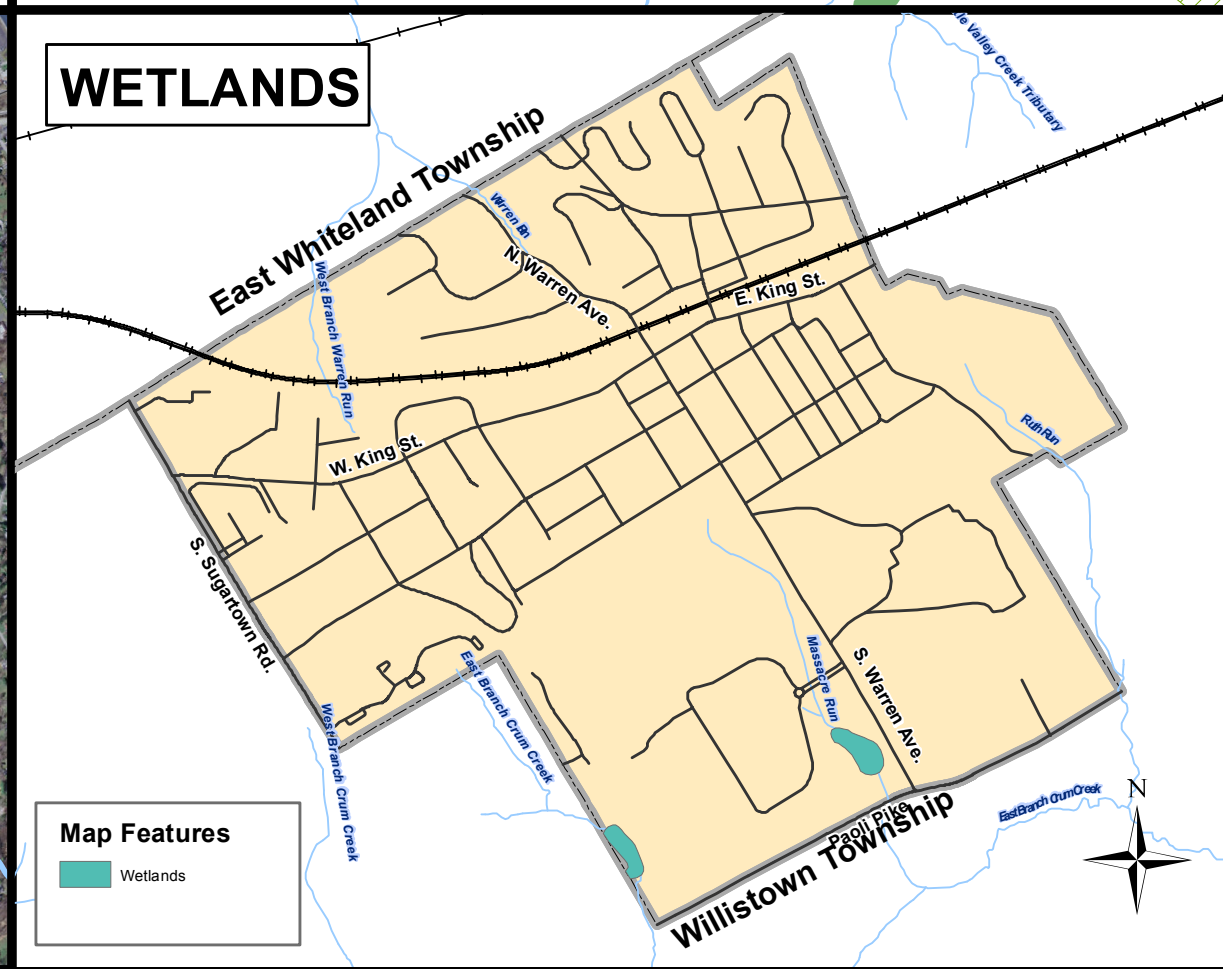
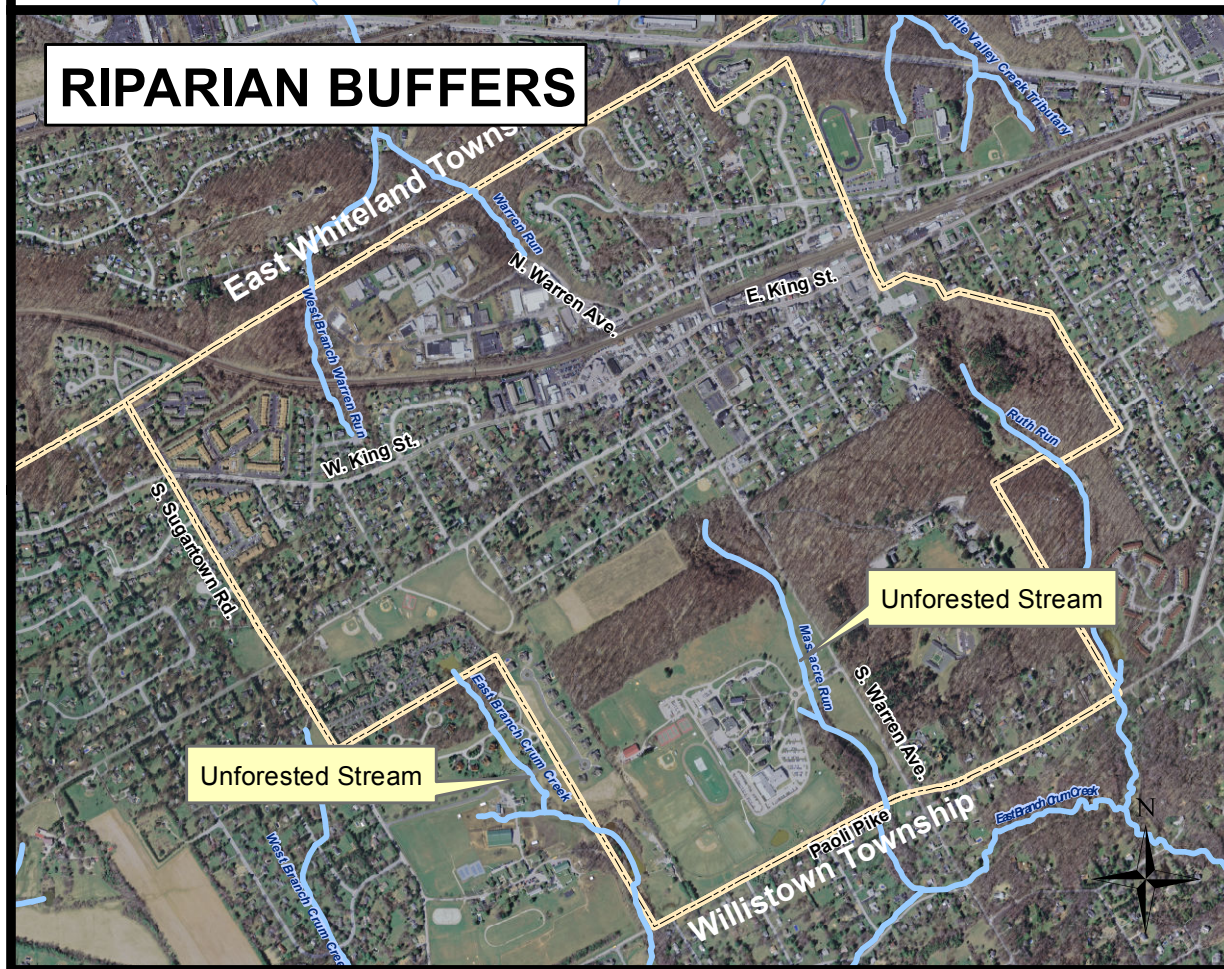
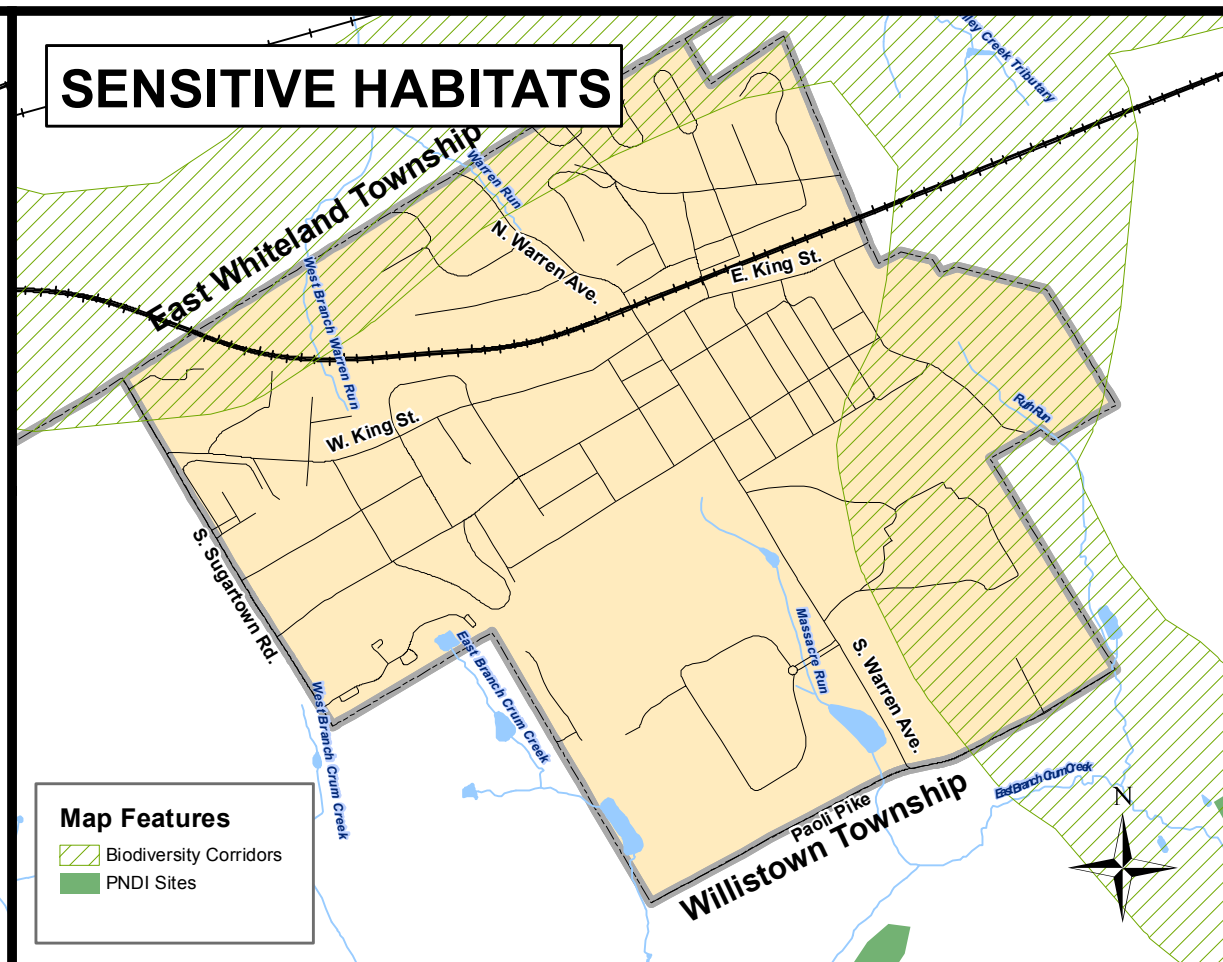
Base Features

- Municipalities
- Streams & Ponds
- Roads
- Railroad

0 900 1,800 3,600 Feet

December 2011

Data Source: Geology- USGS, 1996; Soils- SSURGO & CCPC, 2007; 20 ft Contours- CCPC, 2000; Slope- CCPC, 2004; Municipal Borders, Parcels, Roads, Railroads, Streams- Chester County Bureau of Land Records, 1997/2006 as amended; Roads- Chester County DCIS/GIS, 2000/2006 as amended.



Map 12-2 Natural Resources: Biotic

Malvern Borough Comprehensive Plan

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Base Features

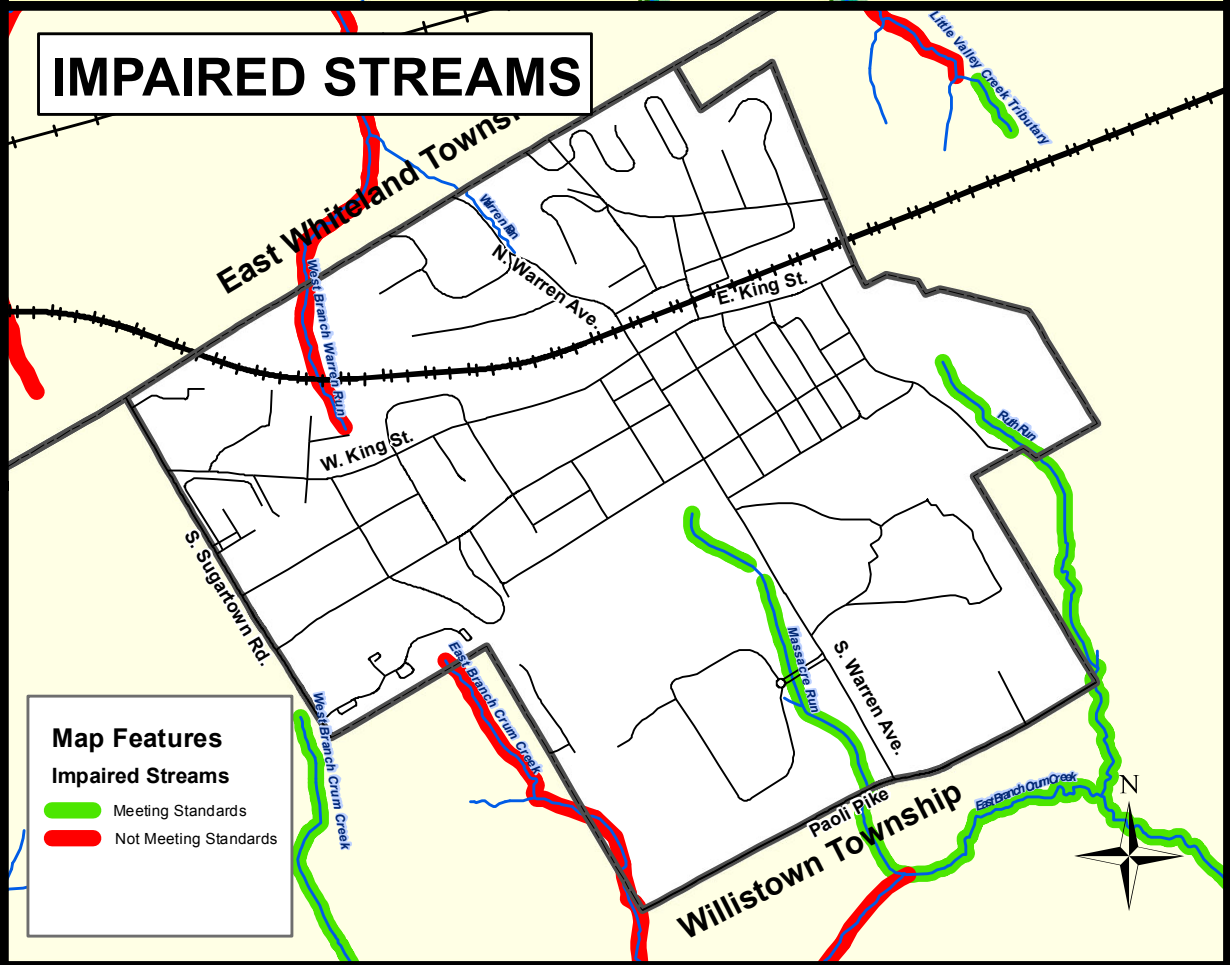
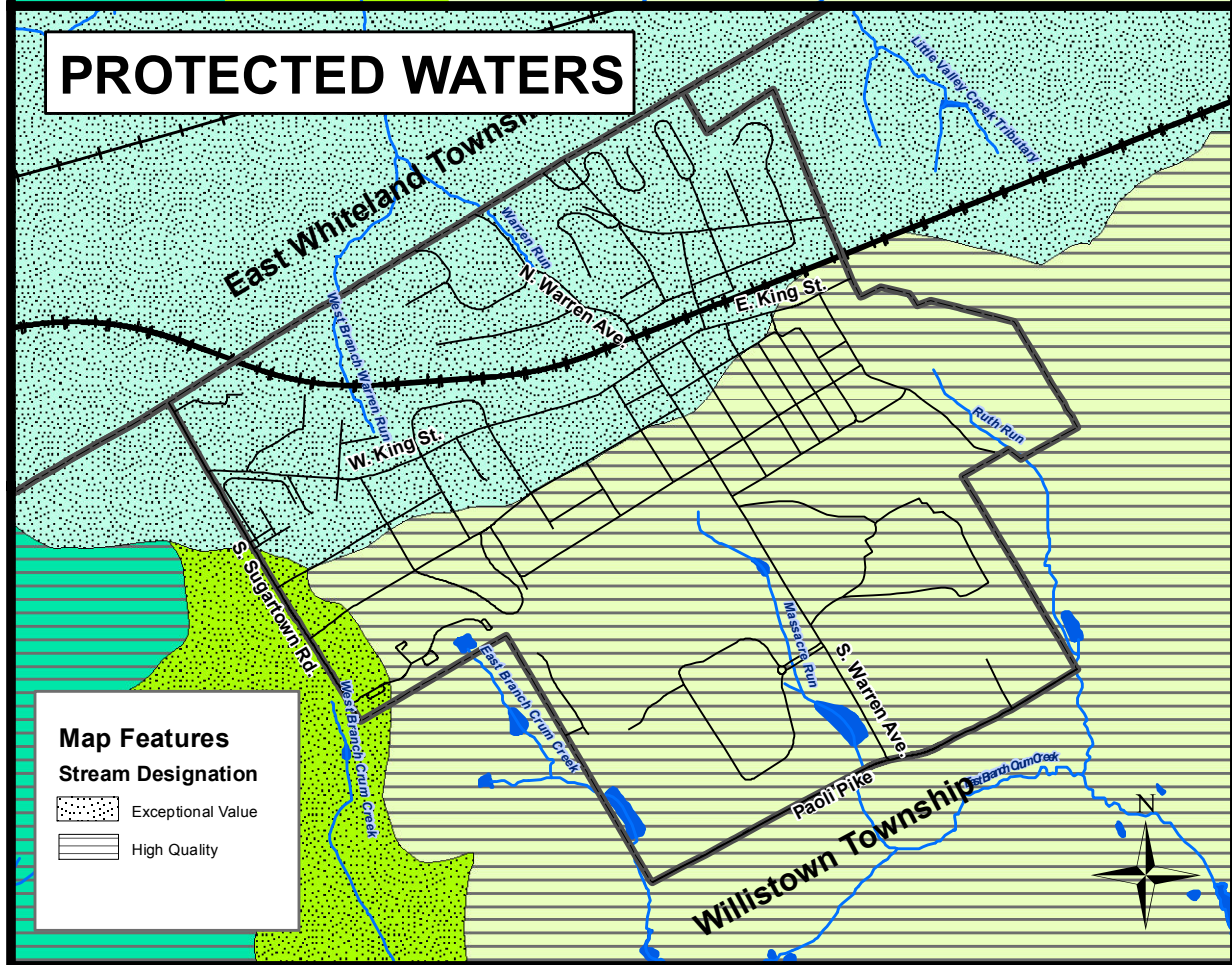
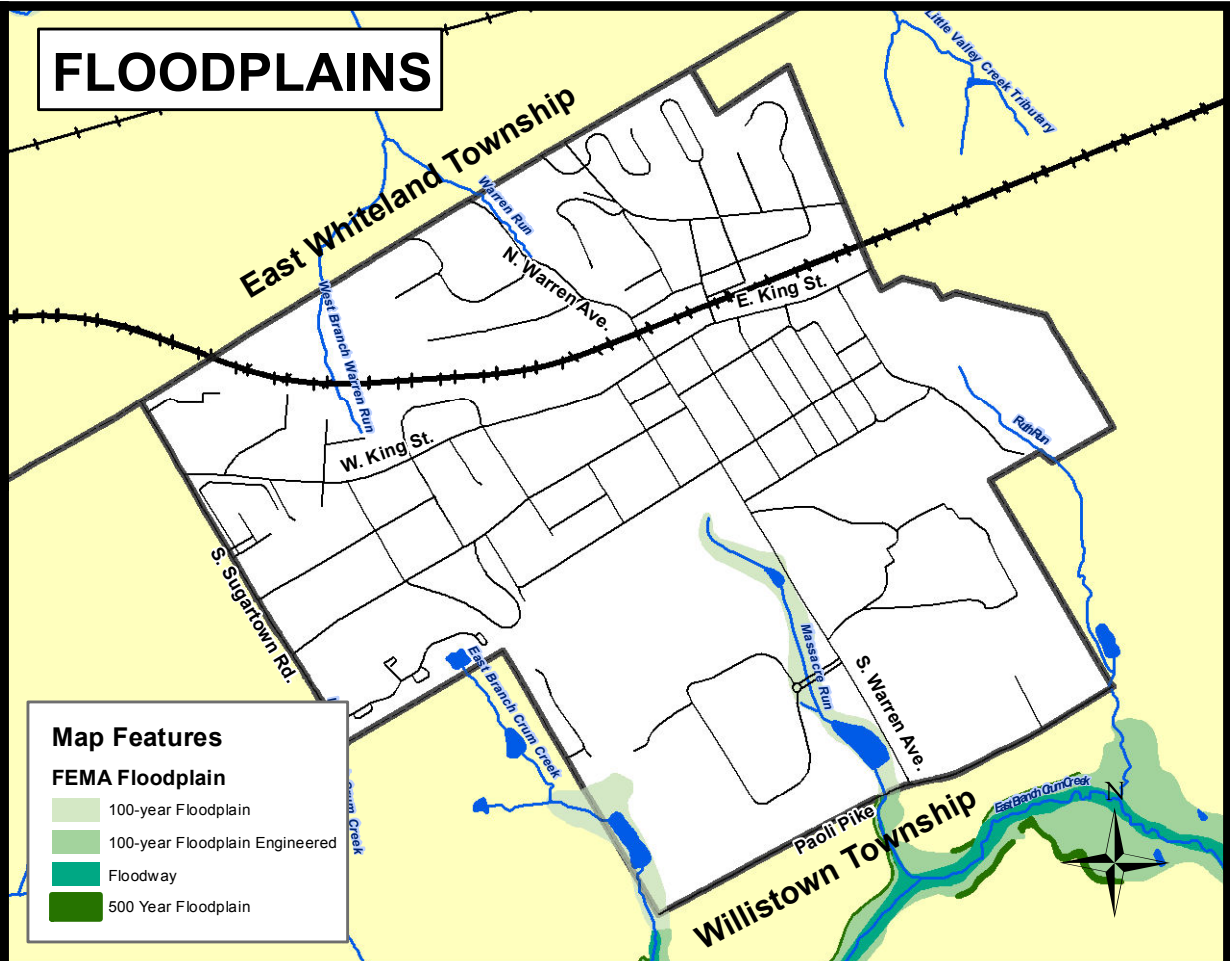
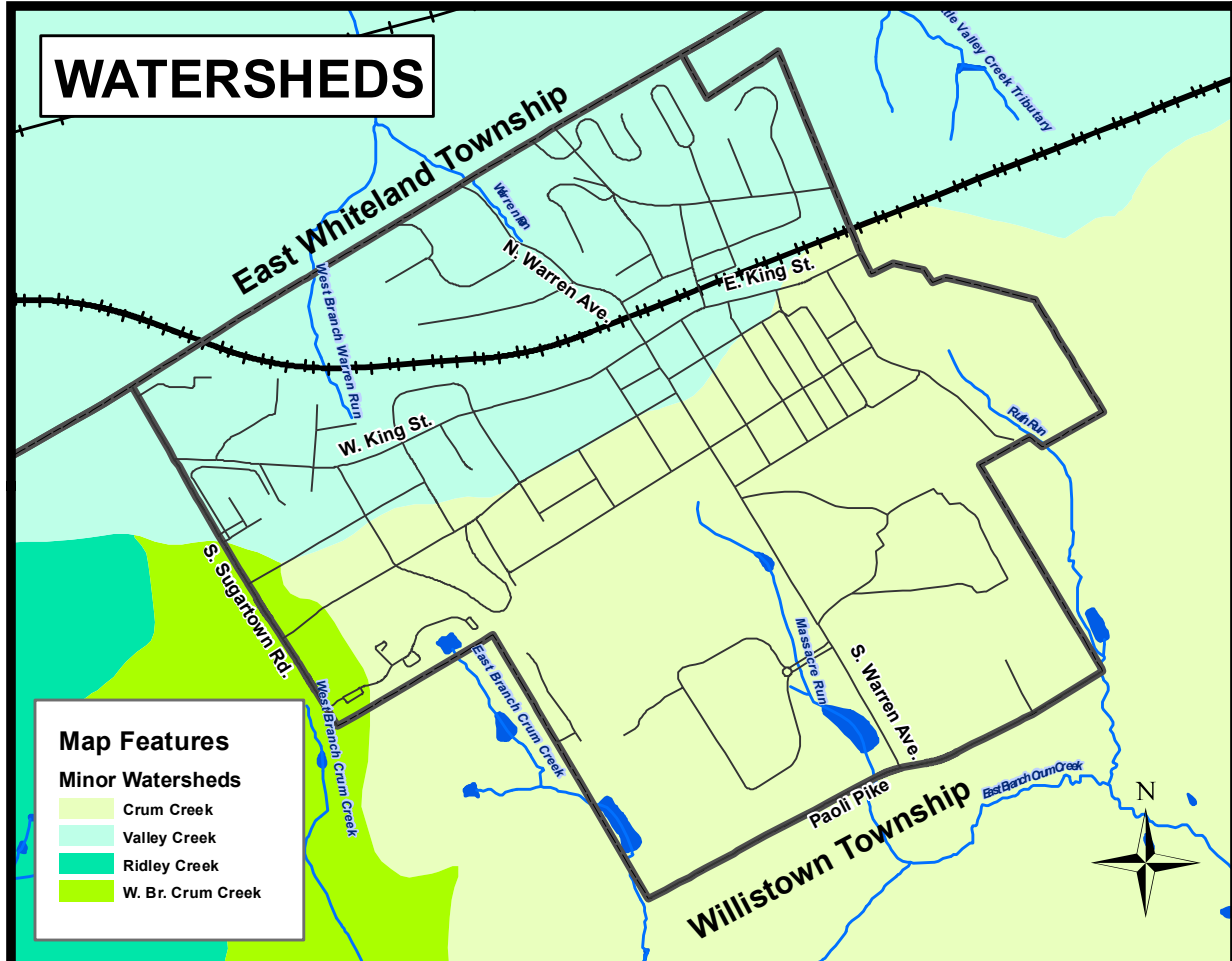
- Municipal Border
- Streams & Ponds
- Roads
- Railroad Lines

EDC

0 900 1,800 3,600 Feet

December 2011

Data Source: CCPC, 2011.



Map 12-3

Natural Resources:

Water Resources

Malvern Borough

Comprehensive Plan

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Base Features

- Municipalities
- Streams & Ponds
- Roads
- Railroad

Map 12-3

December 2011

Data Source: CCPC, 2011