

CHAPTER 3
NATURAL RESOURCES PROTECTION PLAN

INTRODUCTION

This chapter inventories and analyzes Franklin’s natural resources (its land, water, and biotic attributes) and its natural and cultural heritage as regards those resources. Implications for planning and policies are woven throughout the text. This will be followed by specific recommendations for protection and restoration strategies and implementation actions.

Franklin Township is currently in the midst of a second “wave” of rapid land use conversion in its three-hundred year history. The first “wave” occurred when the Township was settled by farmers in the early 1700’s: the old growth forests were cleared and the prime agricultural soils they produced were widely plowed and planted to agricultural crops. Over recent decades and now continuing, a second large-scale conversion is occurring as many of those farmlands are being developed into relatively dense residential developments.

These recent changes have major implications for the Township’s natural resources. The complex nature of land and water characteristics significantly influences a wide spectrum of planning issues. Historically, natural capabilities and constraints led Franklin Township’s settlers to the better farming and building locations. Even in the face of accelerating development activity, continued respect for natural resources, particularly those related to soil, water, and woodlands, can result in a pattern of development that is economically viable while posing the least negative impact on the Township’s environment. Emphasis is recommended as much as possible on the restorative and renewable powers of many natural resources, so that the Township can actually improve many of its key environmental and ecological indicators, including watershed health and water quality, woodland cover, and wildlife habitat quantity, health, and variety.

Geologic, topographic, soil, water resource, and biotic resource characteristics are further defined and analyzed to establish the foundation for Township-specific growth management policies, regulatory approaches, and land stewardship practices to be further developed for this Plan. The contents of this Chapter are based on 2004-05 Geographic Information Systems (GIS) analyses of the most recent available data; field observation; and the Inventory of Natural Resources in Franklin’s two prior Comprehensive Plans (1982 and 1991) and Open Space, Environmental Resources, and Recreation Plan (1992).

LAND RESOURCES

Franklin Township is approximately 8,282 acres, or 12.9 square miles in size. Before widespread land clearing by early colonial settlers, and for prior millennia, the Township lands were primarily covered in oak-chestnut-hickory old growth forests. Flatter headwater areas and stream margins included wetlands that filtered and slowly seeped water into local streams. This is Franklin’s “baseline” natural condition, and was the state of the Township for thousands of years. Although this condition may not ever return, it is still useful to understand what Franklin is “by nature” to compare with today’s conditions. Beginning about three hundred years ago, the

forests were cleared and agricultural land uses increasingly dominated the landscape. Since that time all of the woodlands in the Township were cut, though many acres have regrown, much of its wetlands were filled, and much of the original top soil has eroded, according to erosion estimates found in the Chester County Soil Survey (1963, USDA, NRCS).

Today, about 2,246 acres (27.1 percent) of the Township is covered with young to middle-aged woods, and wetland pockets remain scattered across about one percent of the landscape, a fraction of the original wetland acreage (see Table 3-1, *Natural Resource Acreages*, page 3-3). The Township is underlain by approximately 3,464 acres (41.2 percent) of prime agricultural soils (see Map 3-1, *Land Resources*), considered some of the most productive, non-irrigated, farmland soils in the country.

Franklin Township lies entirely within the Piedmont Upland Section of the Piedmont Province of the Appalachian Highlands. The Piedmont is a band of rolling land and underlying geology that stretches from New York to Georgia. The “fall line,” marking the transition from Piedmont to Coastal Plain, is located about 5-10 miles to the southeast of Franklin Township, crossing through northern Delaware at the southern end of the City of Newark, Delaware.

Geology

The characteristics displayed by geologic formations are major determinants of: the slope of the land surface, the soils that form at the surface; the quality and quantity of groundwater supplies; the suitability of certain types of sewage disposal systems; the ease of excavation; and, the soundness of foundations.

The geology of Franklin Township is relatively uniform. It is primarily (96 percent) underlain by Wissahickon schist, a rock type that was once sedimentary shale deposited by wind or water. This shale subsequently recrystallized over millennia under intense heat and/or pressure and hardened into moderately hard schist. The Wissahickon Schist now in Franklin is a moderately hard gray-green rock that has weathered to an estimated depth of 30-50 feet, according to the *Chester County Geology Report*, published by the Chester County Planning Commission (1980). This formation is considered relatively easy to excavate, possessing good groundwater recharge potential, with generally good groundwater yields (between 15 and 130 gallons per minute (gpm), with an average of 75 gpm). Groundwater resources are discussed in more detail in the *Water Resources* section below.

In addition there is a series of six northeast-southwest trending lens-shaped areas composed of mafic gneiss, a coarse-grained hard rock that is weathered to a depth of approximately eight (8) feet. These rock formations appear narrow (perhaps up to a few hundred feet maximum) and from about a half a mile to just over one mile in length. This formation reportedly has limited recharge potential, is difficult to excavate, and offers limited groundwater supplies (approximately 5 to 20 gpm, with an average of 15 gpm). Site-specific testing is particularly recommended for water supply or wastewater disposal in these areas.

A third small but noteworthy geologic feature found in Franklin Township is the set of four granitic diabase dikes that occur in central Franklin Township, primarily in the watershed of the West

Table 3-1. Natural Resource Acreages

<u>Category</u>	<u>Acreage</u>	<u>% of Twp.</u>
Water Resources -		
Streams	See Table 3-2 on pages 3-7, 8 below	
Floodplains	468.5	5.2%
Wetlands	92.8	1.1%
Hydric soils	513.4	6.1%
Headwater areas	4,540.1	54.8%
Land Resources -		
High elevation	450 feet	
Low elevation	190 feet	
Severe slopes (>25%)	293.1	3.5%
Moderate slopes (15-25%)	1,242.9	14.8%
Prime farmland soils	3,463.9	41.2%
Moderately eroded soils	3,408.9	40.5%
Severely eroded soils	2,565.9	30.5%
Biotic Resources -		
Woodlands (84*)	2,246.0	27.1%
By class of woodland		
Class I (10*) –	1,388.9	16.8%
Class II (14*) –	536.0	6.5%
Class III (60*) –	321.1	3.9%
Forest interiors	201.8	2.4%
Wetlands (55*)	92.8	1.1%
Meadows (n/a)	N/A	N/A

* Individual numbers

Branch of the White Clay Creek. These dikes are younger narrow igneous “intrusions” into the older Wissahickon schist. They may vary in width from five to 100 feet, are approximately one mile in length at the surface, and are associated with very low well yields. They likely impede infiltration of surface drainage, which also may literally create a subsurface dam or water blockage, altering the flow of ground water. The linear nature of these dikes makes site-specific testing for adequate water supply and soil percolation/wastewater disposal important in this area. Within the dikes, a range in available water of 0 to 10 gpm is reported, with an average of 5 gpm.

Topography and Landforms

Franklin Township contains four major stream drainages – the West, Middle, and East Branches of the White Clay Creek, and the mainstem of the Big Elk Creek. These streams cross the Township in rough parallels oriented northwest to southeast and divide it into two major types of landforms – stream valleys and uplands. The uplands are generally flatter and the stream valleys steeper. The

Township ranges in elevation from 450 feet above sea level (found in the northwestern part of the Township) to 190 feet above sea level at the southern end of the Township where the Big Elk Creek exits, a difference of 260 feet. This constitutes a fairly considerable drop overall (by comparison, Niagara Falls is a 160 foot drop).

Land slope is a significant factor in determining sensitivity to disturbance and suitability for development. Though all soils are subject to erosion when their vegetative cover is disturbed, disturbance of vegetation on steep slopes especially accelerates runoff and erosion, causing down-gradient sedimentation and water/wetland degradation.

The *Land Resources Map*, Figure 3-1, shows Franklin's moderate (15-25 percent) and severe (> 25 percent) slopes and displays the relatively gentle nature of most of the Township's topography. These slope categories are the same as those used in the Franklin Township Zoning Ordinance (ZO). As noted, steeply sloped areas are concentrated along stream corridors, with flat floodplain areas framing the streams themselves.

The acreages of moderate and steep slopes are, respectively 1,243 acres (14.8 percent) and 293 acres (3.5 percent). The total acreage of all steep slopes is 1,536 acres, slightly less than 20 percent of the Township total.

Concentration of runoff from the installation of impervious surfaces on sloped areas can diminish groundwater recharge. The potential for erosion from earth-moving is heightened on steep slopes, both during and subsequent to the activity, even with substantial erosion control measures. In contrast, the presence of intact vegetation, especially trees, contributes to slope stability and stormwater control. The Township's ZO currently regulates moderate and severe slopes, allowing minimal vegetative disturbance and grading, based on identified and mapped steep slope categories.

Soils

The suitability of a particular soil type is an important determinant in the location of most land use activities, roadways, and public facilities. Another important characteristic is the ability of a soil type to support on-site sewage facilities. The thickness of the soil (i.e., depth to bedrock), drainage characteristics, erosion potential, and slope factor all combine to determine the potential extent of the limitations on septic systems. Where limitations exist, it is important that they are identified and documented as part of a detailed site investigation. For example, the soil's ability to assimilate and mitigate wastewater disposal (either on-site or from an off-site collector) is a central element of the planning process and a primary determinant in locating land uses. Similarly, a soil's suitability for stormwater management is also important. Due to compaction, permeability, and erodability qualities, certain soils are better suited for certain management and/or disposal techniques than others.

Soil formation is an ongoing process, a complex interaction among factors such as weather, underlying geology, vegetative cover, and time. In Franklin, this process occurred over millennia under old growth chestnut-oak-hickory-dominated forests where rainfall, runoff, and evaporation were in a balance such that leaching of soil nutrients is not as severe as in other more southerly areas of the United States. Accordingly, the Township contains a significant amount of productive farm

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soils and as such, agriculture is the historically predominant land use in the Township. When the original forest

vegetation was cleared and plowed as a part of the settlement, soil formation and specifically the creation of prime agricultural soils effectively ceased as a natural process. Historically, over decades of farming use, much of the original top soil then eroded, as noted in the USDA – Natural Resources Conservation Service *Soil Survey for Chester and Delaware Counties* (1963) and depicted in the *Historically Eroded Soils and Impaired Streams Map*, Figure 3-2. According to this source, 3,409 acres (40.5 percent) were moderately eroded and 2,566 (30.5 percent) acres were severely eroded, including many of the prime agricultural soils. The total amount estimated to have undergone significant erosion is 5,975 acres, or about 71 percent of the Township.

Franklin’s soils today include both highly productive prime agricultural soils and soils that are constrained by specific characteristics. Constrained soils include those with a seasonally high water table (hydric soils); alluvial soils that are subject to stream flooding; soils with shallow depth to bedrock or underlain by soft rock; and, soils susceptible to erosion. Hydric and alluvial soils are discussed under the *Water Resources* section of this chapter.

As mentioned above, over forty percent of Franklin Township is underlain by prime farmland soils – 3,464 acres (41.2 percent, or 5.4 square miles). These soils are deep, fertile, nearly level, well drained, generally devoid of stones and rocks, and are the most productive for traditional agricultural crops. This resource, formed over centuries under old growth forested conditions, has historically been a major driver of Franklin’s economy and settlement patterns.

Soils generally are classified into seven “agricultural capability” classes. Prime agricultural soils include the top three of those classes (Classes I, II, III) based on USDA, Natural Resources Conservation Service rankings and “soils of statewide importance” according to Chester County data. According to the USDA, Chester County’s prime agricultural soils are some of the best non-irrigated soils in the country for the production of crops and grasses. Like many other Chester County townships, Franklin has lost agricultural land to non-farm uses, though the rate of loss to development has increased in particular over the past 10 – 15 years. Considerable pressure is being applied by developers interested in purchasing Township farms and other open lands for non-farm purposes. It should also be noted that the soil characteristics that create high agricultural value are also valuable in for other uses (e.g., good drainage is important in road construction and wastewater disposal).

WATERSHED RESOURCES

This section describes a number of important attributes of Franklin’s water and watershed resources; these are shown on Figure 3-3, *Water Resources*. It strives to achieve the policies and management approaches set forth in Chester County’s Water Resource Plan, *Watersheds* (2002). That document should be referred to for more in-depth discussions of the subject matters in this section.

Water resources, like prime farmland soils, are among Franklin’s most important and most sensitive resources. As high land and the meeting ground for four watersheds, headwater areas and first order streams are prevalent in the Township, and a useful focus for thinking about watershed management. The use of water resources often faces competing interests. Surface water as well as groundwater supplies are used to meet domestic, commercial, and industrial needs. Streams are used to assimilate treated (and sometimes untreated) wastewater. Aquatic life depends on clean water for its survival.

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Streams can provide attractive recreational resources where public access is afforded. In order to sustain

all of these uses, it is important to protect water resources through proper management of the land uses that directly and indirectly affect adjacent and downstream water resources.

The Water Cycle

The water, or hydrologic, cycle consists of the migration of water, whether in a liquid, solid or vapor phase, from the atmosphere to the surface of the Earth and back again. Water falls to Earth as precipitation. Some evaporative losses occur while rain or snow descends, but that which reaches the surface of the earth meets one of several fates.

Precipitation that reaches the land surface either flows over the surface, penetrates the surface, or evaporates. Water flowing over the surface generally starts as broad “sheet flow” and collects in rivulets, which join to create small streams, leading to larger rivers and eventually large water bodies, such as lakes, seas, or oceans.

Infiltrating water is: taken up by plant roots and returned to the atmosphere through transpiration; evaporates from the upper, unsaturated zone of the soil; or infiltrates to the saturated zone, becoming groundwater, and a part of a larger body of underground water called an aquifer. Although much groundwater that is part of the aquifer eventually discharges to a surface water body, the journey may take months, years, decades, or longer. Some groundwater seeps into bedrock aquifers, such as occur on the Wissahickon schist formations of Franklin. Of course, water that returns to the atmosphere will eventually fall back to the Earth.

The Water Budget

The water cycle in a given watershed follows an established average "water budget" developed over long climatic time periods. Using data from over 25 years, the U.S. Geologic Survey determined an average water budget for the neighboring Brandywine Creek watershed should be roughly representative of all the watersheds in Franklin Township.

- Precipitation - 46-47 inches/ year
- Surface runoff - 7-8 in/yr. (approximately 17 percent of the whole)
- Evapo-transpiration - 23-27 in/yr. (approximately 56 percent)
- Groundwater recharge/baseflow - 12-14 in/yr. (approximately 28 percent)

(Note – Since numbers are averaged over many years, they do not add up exactly.)

Overall, slightly more than half of the water that falls to the earth is returned to the skies, some passing through plants first. Only about 17 percent runs off as surface water. However, as a watershed develops and impervious coverage increases, this long-established equilibrium tends to skew - surface runoff tends to increase, causing additional erosion and flooding, and groundwater recharge and the vital baseflow it provides to streams tends to decrease, potentially threatening shallow water supply wells and aquatic communities. With the widespread removal and simplification of vegetation layers, evapo-transpiration rates may decrease as well. This becomes a watershed out of balance, an enormous natural mechanism that cannot simply be re-engineered. Efforts to restore a watershed’s balance usually focus on protecting those high-

quality sub-basins still in a relatively natural state, while in areas slated for development, increasing the amount of groundwater recharge that occurs after a rain and reducing the quantity and rate of surface water run off. Planting more trees, especially along streams, is an important additional watershed “best management practice”.

While it is well known that development can and does degrade surface and ground water resources, it is not so well known where some of the critical thresholds lie and how to manage developing watersheds sustainably. Still, the key goals of a sustainable watershed management program should include:

- Sustain the quality and quantity of ground and surface waters
- Minimize impervious coverage
- Maximize woodland and wetland acreages
- Maintain stream base flow especially during droughts
- Maintain the groundwater table
- Protect existing and future water sources and wells
- Prevent groundwater contamination
- Minimize excessive existing and future flooding, while making room for natural flooding
- Minimize impacts from the land on natural stream system morphology (channel and bank geometry), including from excessive stormwater runoff
- Maintain natural stream channel regimes
- Maintain aquatic communities and their habitats, including wetlands
- Minimize point and non-point source pollution in streams and ponds

Watersheds, Drainage Patterns, and Streams

As previously noted, Franklin contains four major stream drainages – the West, Middle, and East Branches of the White Clay Creek, and the mainstem of the Big Elk Creek. Indian Run is a tributary of the Middle Branch of the White Clay. The headwaters of the Christina River lie in southeastern Franklin Township. Franklin’s surface water resources drain into two major river basins – the Chesapeake (Big Elk Creek) and the Delaware (the White Clay Creek and Christina River).

Table 3-2. Watersheds of Franklin Township

Watershed	Specific Tributary	Franklin Acres	Stream Miles	Water Use Designation/ Status	Other
White Clay	East Branch	626.7	3.3	CWF: Impaired stream*	National Wild & Scenic River
White Clay	West Branch	2,681.6	17.9	TSF-MF	National Wild & Scenic River
White Clay	Middle Branch	1,525.0	9.1	TSF-MF; Impaired stream*	National Wild & Scenic River

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White Clay	Indian Run	135.3	1.1	TSF-MF; Impaired stream*	National Wild & Scenic River
Big Elk	Big Elk	2,963.2	23.7	HQ-TSF-MF	Special Protection Water**
Christina	Christina	479.5	2.7	WWF	Headwater Areas
Christina	East Branch	0.5	0	WWF	

Source – Chester County Water Resources Authority, *Watersheds*, 2002

Water Use Designations –

HQ – High Quality

CWF – Cold Water Fishery

TSF - Trout Stocked Fishery

MF - Migratory Fishery (The migratory fish is the American eel. The American shad and other river herring species may one day migrate into Franklin Township, especially from the Chesapeake Bay up Big Elk Creek.)

WWF – Warm Water Fishery

*Impaired streams are those that do not meet applicable water quality standards. Generally these areas are targeted for remedial actions.

**High Quality streams, which include the East Branch of the Big Elk and its tributaries in Franklin Township, are Special Protection Waters subject to “antidegradation” rules implemented through the Department of Environmental Protection. Generally, these require that “best management practices” (BMPs) be used in new developments. New “point source discharges” of wastewater are generally prohibited unless a developer can demonstrate it has no cost-effective or environmentally sound non-discharge alternative.

Groundwater and Aquifers

Groundwater is fresh water found in pore spaces, cracks and fissures in bedrock and below the soil surface. An aquifer is an interconnected underground layer of groundwater that may occur over several geologic strata and may be tapped by people for their use. Not only are most residents of Franklin Township dependent on groundwater for their domestic uses (see further discussion under Chapter 10, *Utilities and Water Supply Plan*, but also, according to scientists, approximately 2/3 of stream flow in the non-carbonate rocks of Chester County, including Wissahickon schist, is derived from groundwater discharge. The amount of groundwater available in an area is related to its geology. In Franklin, where Wissahickon schist is the predominant formation present, available groundwater pump rates vary considerably, from minimal outputs to about 350 gallons per minute, an excellent rate.

Because this region is subject to drought, groundwater levels may vary. It is critically important to replenish groundwater supplies from surface recharge and protect the aquifer’s water quality. Groundwater recharge may be built into new developments in four major ways –

- Require recharge of stormwater for at least the 2-year storm;
- Recharge treated wastewater into the ground, either through a drip or spray field;
- Limit allowable impervious coverage to 10-20 percent total, and,

- Restore forest, wetland, and meadow areas in protected open spaces.

Water Quality

Under the federal Clean Water Act, the United States Environmental Protection Agency (EPA) and Pennsylvania Department of Environmental Protection (DEP) have developed water quality regulations designed to protect the physical, chemical, and biological integrity of streams in the U.S. and Pennsylvania. Specifically, DEP has established a classification system for protected water uses or types. As mentioned above, Big Elk Creek and its tributaries are designated High Quality (HQ) streams. Much of the White Clay Creek, including the Middle and East Branches and their tributaries in Franklin, are classified as impaired or polluted streams. These streams both have municipal wastewater discharges placed into them upstream from Franklin Township (West Grove discharges into the Middle Branch and Avondale discharges into the East Branch). Impaired streams are potentially eligible for federal and state improvement programs and grants designed to help meet water quality standards. For example, there are special federal funds available to help landowners plant trees along White Clay Creek stream corridors and improve water quality (through PL-566). There is also an effort underway to implement a variety of water quality improvements through the Christina Basin Task Force and a grant they received through the EPA.

Land uses in a watershed directly impacts streams and water quality. A particularly important aspect of many Township streams is their “first-order” status, and where applicable, the extent and composition of the contributing watershed (i.e., a “headwaters” watershed). (Refer to the next section of this Chapter for discussion of the values of these resources.)

Headwater Areas/ First-Order Streams

A first-order stream begins at the location where channelized flow occurs as a result of runoff, melting, springs, or groundwater discharge (“base flow”). These streams are important for many reasons including that they carry the majority of the system’s base flow in any watershed to its downstream waterways, contributing significantly to both water quality and quantity in any given stream. Second-order streams are formed at the confluence of two first-order streams, while a third-order stream is created at the influence of two second-order streams, and so on.

Headwaters are those land areas that drain directly into first-order streams, the smallest tributaries of the larger stream system. First-order streams are significant beyond their size in the overall hydrologic regime. Given their importance to both water quality and quantity and in the context of relatively low flow individually, first-order streams are disproportionately vulnerable to sedimentation and other degradation. The regularity of flow from headwaters areas is essential to the health of first-order streams and the wildlife on which they depend, particularly during periods of low flow. Thus, the headwaters watershed to these first-order streams is extremely sensitive to introduction of impervious surfaces, improper grading, discharge of pollutants, or poor agricultural practices. Maintenance or restoration of forested headwaters, particularly in close proximity to first-order streams, is especially important given the ability of wooded areas to: slow and filter flows; control erosion and sedimentation; provide shade and water temperature regulation; and supply wildlife food and cover. Because they are sometimes closely associated with cold water seeps and springs, first-order streams can serve as refuge areas for wild trout populations.

As shown on Map 3-2, *Watershed Resources*, over half of Franklin's land area is comprised of headwaters. These are particularly extensive in the central upland areas of the Township. Specifically, headwaters comprise about 4,540 acres, or 54.8 percent of the Township's land area. Route 896 travels along headwater uplands, and the Village of Kemblesville is located in a headwater area.

Wetlands

Wetlands are defined as those areas where the soils are saturated for a significant part of the year, where plants typical of saturated soils occur, and where hydrologic conditions provide evidence of surface ponding, flooding, or flow. In Franklin Township, these areas are typically found along streams, where they are often narrow and linear in shape, or in upland depressions in headwater areas, where they may broaden out. In Franklin, these wetlands were identified by the National Wetlands Inventory (NWI) based on aerial photography. There are currently 55 known individual wetlands in Franklin Township, totaling about 93 acres (1.1 percent of the Township). Franklin's largest remaining wetland area is along the West Branch of White Clay Creek, and is about 24 acres in size. Two other wetlands are greater than 6 acres in size, and five more are greater than two acres. It is likely that additional wetlands exist in the Township that went undetected during the NWI inventory, many of which are probably located within hydric soil and floodplain areas (see discussion on hydric soils below).

Wetlands are a key component of watershed management, positively impacting both water quality and quantity issues through regulating different aspects of water on the landscape. By filtering water, they slow it down, allowing sediments to fall to the bottom and allowing plants to uptake nutrients, improving water quality. By storing water during flooding events, they reduce flood damages and moderate high flows. They are sometimes referred to as the "kidneys" of a watershed. Wetlands, like streams, are greatly benefited by vegetated buffers so as not to be overwhelmed by off-site influences. Wetlands' central importance to natural diversity is discussed under the Biotic Resources section of this chapter.

Franklin undoubtedly once supported a far greater acreage of wetlands, however, as many were probably converted with drainage tiles to farm fields and dug out into ponds. Research has determined that slightly more than half (50 percent) of Pennsylvania's wetlands have been filled or otherwise converted to non-wetlands since the 1700's, mostly due to intensive agricultural uses. In Franklin, probably well more than half and as much as 80 percent of the original wetland acreage has been so converted. This indicates a great opportunity to strategically restore some of these wet acres, especially during the course of new development.

Hydric Soils

Hydric soils are found in upland depressions and along the fringes of floodplains, generally within or adjacent to wetlands. More than simply an indicator of wetland conditions, they often indicate former wetland locations.

They exhibit shallow depth to water table and, occasionally, display standing water. These soils often correlate to headwater areas that include springs, seeps and marshes at the uppermost terminus

of stream corridors. Subsurface water, seeping through hydric soils, supplies groundwater to the surface water system. This subsurface water source forms the base flow in streams and defines a baseline for stream water quality. The native vegetation of these soils, according to the Chester County Soil Survey, was generally wet woodlands, chiefly dominated by red maple.

There are 513 acres of hydric soils in Franklin (6.1 percent of the Township). Hydric soil units between 5 and 10 acres in size occur along many headwater streams, while others parallel larger streams for sometimes over one mile. The largest hydric soil unit is approximately 61 acres located along the West Branch of White Clay Creek.

Floodplains

Floodplains are identified in part by the boundary of the area subject to flooding resulting from a storm event occurring with a frequency of once every 100 years, as delineated by the Federal Emergency Management Agency (FEMA). Areas of the Township in all its watersheds, and especially along Doe Run, are subject to periodic flooding (water rising over the stream banks) or wet conditions and have been identified by FEMA as 100-year floodplains.

During storm events (whether 100-year or more frequent), floodplains serve to absorb and slow flood waters, and take up water-borne pollutants and flood-carried sediments. Where maintained in a relatively natural state, these areas also help limit potential for erosion, downstream sedimentation, non-point-source pollution, and obstruction or alteration of the floodway. As with headwaters, maintenance or establishment of stable, wooded vegetative cover in floodplain areas can help maintain both stream water quality as well as control flooding.

Alluvial soils are soils that have been eroded, transported, and deposited by floodwaters over time; they generally indicate potential for flooding. These soils are typically consistent with the boundaries of the 100-year floodplain. Generally, floodplains are not suitable for residential or commercial use, although flood proofing and engineering are often permitted to allow limited expansion of uses already existing within the floodplain. Floodplains can be used for active recreational purposes, and also make excellent passive open spaces. As defined by FEMA mapping, 100-year floodplains represent 468 acres, or about 5.2 percent of Franklin Township.

BIOLOGICAL RESOURCES

As shown on Figure 3-4, *Biological Resources Map*, Franklin's biotic resources consist primarily of wetlands, woodlands, and several rare species sites, including habitat for the federally-threatened and state-endangered bog turtle. To date, no native meadow grasslands have been identified in Franklin Township.

There are no known wildlife surveys that have been conducted within Franklin Township, though it should be noted that the entire southern boundary of the Township is adjacent to the 5,613-acre Fair Hill Natural Resource Management Area located in Cecil County, Maryland, and that the

1,500-acre White Clay Creek State Preserve lies approximately one-half mile to the east, in neighboring London Britain Township. These two large preserves undoubtedly act as “source areas” for wildlife that use Franklin Township lands, and the major stream corridors – the three branches of the White Clay Creek and the Big Elk Creek – make excellent natural conduits or corridors.

Greenway corridors and the wildlife that may use them are discussed more below.

In addition to inventorying and discussing these biotic resources, a key concept Franklin Township should keep in mind is that of resource restoration, which particularly applies to biotic resources, and secondarily to watershed resources. Of these, restoring forests along stream corridors, often called riparian buffers, is perhaps the single most important natural resource management objective.

Wetlands

In addition to their water resources values, wetlands have significant biological value as they provide rich wildlife habitat. These values include the plants and the animals they provide with food and cover, as well as nesting and breeding sites. While a wide range of animal species utilize wetlands, certain amphibian, reptile, and bird species are wetland specialists. There are several varieties of natural wetlands. They are sometimes forested, but are also at times dominated by native shrubs or graminoid (grass-like) plants and wildflowers.

Wetlands are also important storage areas for both surface and groundwater resources, filtering pollutants, and releasing waters to maintain critical flows (e.g., for fisheries, water supply wells), acting as the “kidneys” of the Township. Given these ecological and public health values, wetlands are regulated by the Pennsylvania Department of Environmental Protection, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers. In essence, no development activity may occur within a wetland area without a permit. The permitting process requires investigation of alternatives, and may require mitigation.

Bog turtles, a federally-threatened species, occur in groundwater-fed wetlands, and are discussed under the rare species section more below.

Woodlands

Wooded areas are highly significant for their environmental, social, and economic functions and values. Not only are these lands a vital link in watershed management, but, since most of the northern Piedmont was wooded prior to colonization and settlement, woodlands are the defining characteristic habitat type of this region. Woodlands are the best type of land cover for watershed management since trees absorb large amounts of water through their roots which is stored in the stem and leaves and released as evapo-transpiration. Stands of trees also provide natural erosion and flood control by decreasing the speed and amount of stormwater runoff. They are especially valuable along streams (as riparian buffers), on steep slopes, and in headwater areas. Most native plants and animals are adapted to life in or near woodlands. Many beneficial species (e.g., pollinators), soil organisms, and natural predators (e.g., insect-eating birds) live and breed in such

areas. Woodlands also have aesthetic and commercial values [e.g., recreation (passive and active), logging, etc.].

Trees function as natural barriers by reducing the unwelcome impact of noise and of strong winds and wind-transported substances (e.g., dust, snow) and by screening unsightly areas. They also function to reduce temperature extremes and moderate evaporation, acting as the “lungs” of the Township.

There are 84 individual woodlands greater than one-quarter acre in size in Franklin (these are defined using roads as the primary fragmenting feature that divides one woodlands from another), with a total acreage of 2,246 acres or 27.1 percent of the Township. Much of Franklin's woodland areas are located on hydric soils, steep slopes, and floodplains – areas that could not be easily farmed.

Woodland Classes

Woodlands are by no means of equal value. They vary in size, age, quality, and in the biological/ecological functions they perform. In order to assign relative importance to the Township's individual woodlands, a woodland classification system was developed that utilizes Geographic Information System (GIS) mapped data for Franklin Township. Under this system, the presence of a more or less significant amount of these values, combined with ecological values such as extent of forested interior (discussed below), watershed values such as stabilizing steep slopes, headwater areas, and streams, and threat of development, all contributed to the classification of Franklin's woodlands. Franklin's woodlands were compared according to all these attributes, as depicted in the accompanying spreadsheet.

Class I forests are the most important from the standpoint of functions provided and are worthy of a higher level of protection than other woodlands. There are ten (10) Class I woodlands totaling 1,389 acres. Class II woodlands also provide significant ecological services and perform important watershed functions, but not as much as Class I woodlands. There are fourteen (14) Class II woodlands totaling 536 acres. All other woodlands in Franklin (60, totaling 321 acres) are included in Class III, as shown on Figure 3-4, *Biological Resources*. A spreadsheet illustrating the woodland classification calculations may be found as Appendix A.

Forest Interiors

Forested interiors are ‘deep woods’ areas which lie beyond many of the influences that degrade a forest from the outside – light, wind, noise, and non-native species. These interiors are measured at 300 feet from any outer edge. In other words, forested interiors are the “hole” in a “donut” with a 300-foot wide edge. Figure 3-5, *Woodland Classification*, shows the extent of the typically large and mature woodlands that contain forested interiors. Given the ecology of these areas, they are likely to support a considerable variety of native vegetation and wildlife species. Certain species of forest plants and wildlife depend specifically on the unique conditions of a healthy forest ecosystem. Many species of songbirds, for example, are specifically adapted to forest-interior conditions and will not nest elsewhere. Similarly, numerous species of spring ephemeral wildflowers and other rare and unusual species will only bloom on the rich, moist soils of the forest floor. There are only about 202 acres of forested interiors in Franklin, representing 2.4 percent of the Township.

Forested Slopes

Forested slopes occur where steep slopes, both moderate and severe (15-25 percent, >25 percent), and woodland coincide. Here woodlands perform the vital function of protecting against erosion, which steep slopes are prone to.

Forested Headwaters

As previously described, headwaters areas are the watersheds for first-order streams, the smallest tributaries within a watershed and are the most sensitive resources to grading and other land disturbances. Forest areas directly adjacent to a stream (a wooded riparian buffer, also previously detailed) are also very important for high quality streams. Accordingly, forested headwaters are particularly valuable to maintaining and protecting the quality and quantity of first-order streams.

Forested Riparian Buffers

Forests along streams represent the combination of two of the Township's most important resources. Forested streams are also called forested riparian buffers. These areas are transitional between the flowing waters of streams and rivers, and upland areas. Protecting these land areas is widely recognized as one of the most important ways to protect a stream's overall health. Given that Chester County's watersheds evolved under primarily forested conditions, riparian buffers function best when they are forested. Wooded stream buffers: cool water temperature; provide wildlife habitat in the form of food, water, and shelter; supply important nutrients from leaves; contribute woody debris to regulate stream flow and to create resting spots; and, filter runoff from surrounding lands through their roots and vegetative growth underlying the trees. Culturally, riparian forests make excellent flood control areas, recreational corridors, and are highly scenic.

Although the presence and relative amount of forested riparian buffers was one factor that went into the analysis resulting in the woodland classification, riparian buffers are important enough to warrant Township-wide analysis as a natural resource. To accomplish this analysis, Figure 3-6, *Forested Riparian Buffers Map*, and a spreadsheet were created identifying lands with riparian buffer gaps, areas where few to no trees occur within 100 feet of either side of a stream. They indicate that 212 parcels occur where there are riparian gaps greater than one-quarter acre. On five of these parcels the gap is greater than ten acres, and on nineteen that gap is greater than five acres.

A total of 1,403 acres occur as riparian lands (lands within 100' of streams) within the Township. Of these, 52 percent, or 726 acres, are fully buffered; 22 percent, or 313 acres, are partially buffered, and 26 percent, or 365 acres, are without forested buffers. These "gap" lands should be highlighted for future reforestation.

Wildlife and Rare Species

As discussed above, there are no known general wildlife population surveys from Franklin Township. Nevertheless, with two large habitat areas in close proximity (Fair Hill Natural Resource Management Area and White Clay Creek State Preserve), it is likely that Franklin serves as extension habitat for many species that use those larger areas. Adjacent wooded stream corridors are especially likely to conduct wildlife from these larger "source" areas.

There are several different kinds of "target species" that are of more ecological concern to support or restore to Franklin Township. The presences of these species indicate overall good habitat conditions for their particular habitat.

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- Endangered, threatened, and rare species, discussed below;
- Riparian species, including beaver, mink, river otter, Cooper's and red-shouldered

- hawks;
- Habitat-restricted species, for example, forest interior habitat species, especially birds, reptiles, and amphibians;
- Wide-ranging mammals, which make excellent greenway target species, potentially including bobcat, river otter, and gray fox.
- Migratory fishes, such as American shad, mentioned above.

A different set of target species are the non-native and invasive ones, including both plant and animal species. Based on township botanical surveys from other Chester County townships, non-native plants generally total about *one-third* of a township's plant species. A township the size of Franklin may be expected to support approximately 600 – 800 plant species, so some 200- 300 plants are not native to the area. Of these, at least several dozen are invasive. This means that they did not evolve in the area, and were introduced at some point whether intentionally (such as multi-flora rose) or accidentally (such as garlic mustard and Japanese stilt grass). Invasive plants are a serious ecological threat to a township's natural areas and require extensive efforts and eternal vigilance to minimize, much less eradicate.

Franklin Township contains five known rare species locations. Information about rare species is closely guarded, as poaching and trespassing can jeopardize the continued survival of rare species. While not all of the rare species identities are known, it is known that Franklin supports at least two rare orchid species and one rare sedge species, known in Chester County only from this one site. One of the orchid populations is considered “one of the best populations of the plant in Chester County and possibly in eastern Pennsylvania,” according to *The Chester County Natural Areas Inventory*, 1994, updated in 2000.

The federally threatened bog turtle is also known to reside in Franklin Township. Bog turtle habitat is quite specialized: the turtle needs almost treeless seepage meadows where ground water typically sheet flows over a relatively flat, mucky surface. The vegetation consists of a variety of sedges and grasses, with some of the sedges being tussock-forming. Less commonly, the vegetation can be sphagnum moss. Shrubs can occur within the habitat and are more common on habitat edges. Shrub pedestals often serve as over-wintering sites. Tree cover is generally detrimental, since nests need full sunlight in order for the eggs to hatch. Tree cover also reduces basking opportunities. Home ranges of individual bog turtles are small – often well less than two acres - consistent with the generally small sizes of the wetlands they inhabit, although great variation has been seen among individual animals. However, individual turtles have been noted to move long distances between habitats, sometimes crossing barriers or moving through dry upland habitats

More broadly, both the White Clay and Big Elk Creek watersheds contain numerous remaining bog turtle sites. A planning process is underway to identify potential larger scale “recovery areas” for the turtle that would protect clusters of turtles in relative proximity to each other, and try to create safe travel ways for them to interact with each other. Parts of Franklin Township may make a good choice for such a recovery area.

NATURAL RESOURCE RESTORATION

The restoration of biological and watershed resources has been a major development in resource

management philosophy and practice over the last fifteen years or so. Many resources are not static but dynamic, changing over time. They can and do change in quantity and quality, and people, through their decisions and actions or inactions, make a difference in how that occurs.

Renewable resources are those which inherently renew or regenerate themselves over a relatively short time span. Most biological resources are renewable on one time span or another.

An example is a woodland where trees, if allowed to grow, will, form a canopy on their own and a new woodland will exist. *Restorable resources* are those which human intervention can assist in the process of renewing or re-establishing themselves even if once damaged or degraded. The human action generally takes advantage of the inherent renewability of the resource in the process. An example is a wetland which may have been drained by a field tile in the 1800's. If the field tile is removed, barring other changes in hydrology, the wetland is likely to become wet again. People can further the process of wetland restoration by replanting wetland plants into the restored wetland. Gradually, that wetland will begin to perform some of the same watershed functions and provide some of the same benefits it did before.

Ten biological and water resources are identified here as renewable and restorable (see Table 3-3, below). This has involved the discovery, invention, and application of ecosystem restoration principles, which generally follow natural laws and processes like ecosystem succession.

Using these principles, it is possible to restore high-functioning mature, diverse, and healthy forest, wetland, stream, and meadow ecosystems. These systems can perform more functions useful to humans, including managing stormwater and improving water quality. It is also possible to restore certain rare and disappearing plant and animal species. It is theoretically possible to restore species that once occurred in an area but now no longer do. It is possible to restore a living fabric of woodlands in a network of stream and cross-country corridors, and attract and retain new species of plants and animals into these habitats.

Table 3-3. Renewable and Restorable Resources

Watershed Resources

1. Streams (habitat, water quality, and water quantity)
2. Wetlands
3. Floodplains
4. Aquifers (through groundwater recharge)
5. Headwater Areas

Biological Resources

1. Woodlands
2. Meadows
3. Wetlands
4. Natural Areas/ Rare Species
5. Wildlife diversity
6. Streams

*Soils, such as prime agricultural soils, are renewable too, but only over very long time periods

Part of Franklin Township's approach to resource conservation should thus take full advantage of this relatively new approach to natural resource management, sometimes called *ecological restoration*. This approach sometimes requires taking a long-term view to achieving resource conservation and management goals however, as, for example, restoring water quality in the White Clay Creek or restoring an old growth forest can take over 100 years. Nevertheless, some resources can take a relatively short time to restore, such as a meadow or a wetland, as described above. This long-term view is supported by the fact that much of the landscape of Franklin Township is protected from further development, and is therefore relatively stable. Here a new stage begins where landowner education and participation becomes more important, as do Township and other government incentives which foster such active participation.

Through relying on the inherent renewability of many natural resources and carefully applying the arts and techniques of ecological restoration, natural elements of the landscape will slowly but surely return to more vibrant health and vigor, supplying local residents with more wildlife, water quality, natural scenic beauty, and other ecosystem services.

LANDSCAPE NETWORKS – CORRIDORS AND GREENWAYS

One of the primary opportunities in undertaking a mapping exercise where layers of data are collected and then overlapped with one another is to ascertain what patterns emerge. Such patterns suggest a way to move from a lower to a higher organizational level – in the case of natural resources from an individual site to an integrated system of sites, a *network* where the whole is greater than the sum of its parts. When designed well, these networks promote the broader environmental health and public welfare of the area in question. They are also well-designed when they are multi-purpose in nature, benefiting watershed and biodiversity resources certainly, but also steep slopes, farmland, scenic, recreational, and historic resources. In Franklin Township, the natural resource patterns are present to make a strong case for proposing an interconnected network of corridors based primarily on stream corridors and woodlands.

This type of planning follows recent thinking in resource management and open space planning, as in the growing popularity of “greenways” for example. Across the United States numerous federal agencies, states, counties, regions, non-governmental organizations, and others have promoted open space corridor plans. The State of Delaware has developed a conceptual greenways plan, and in June 2001, the Commonwealth of Pennsylvania published *Pennsylvania’s Greenways: An Action Plan for Creating Connections*. This new effort led by the Department of Conservation and Natural Resources (DCNR) targets the creation of a statewide network of greenways in Pennsylvania, with the goal of establishing a local greenway *in every community* by 2020. The Plan strategy for achieving the statewide network depends on the development of greenway plans for each of the 67 counties. DCNR guidelines for county greenway planning were finalized in 2002.

Chester County has already developed a greenways plan, though it is not known by that name. All three County policy plans of its Comprehensive Plan – *Landscapes; Linking Landscapes;* and *Watersheds* – promote the establishment of landscape-level natural corridors, including both stream- and woodland-based corridors. For Franklin Township, the County has suggested

protecting lands along all three major stream corridors in *Landscapes*; establishing sound riparian buffers along all streams in *Watersheds*; and developing a cross-country east-west woodland corridor in *Linking*

Landscapes. Most of these corridors would continue into adjacent jurisdictions, ultimately requiring a regional approach to implement these concepts. See especially Chapter 13 of *Linking Landscapes* for more information on greenways as wildlife corridors.

Franklin's stream corridors and woodlands represent a resource-rich overlap area that already forms natural resource networks. Most of the Township's wetlands, floodplains, hydric soils, and many steep and very steep slopes, Class I and Class II woodlands, and headwater areas are contained in these areas. The confluence of so many environmentally sensitive features along the streams is by "natural design." Figure 3-7, *Greenways*, was produced by analyzing these confluences of natural resources and joining them together into one natural resource network. The corridors widen where the woodlands are larger, sometimes growing into a larger woodland that serves as an "anchor point" or "node" for the larger system.

Redundancy is intentionally built into the proposal, so that if one corridor is blocked by a new development or substantially degraded by logging, another may be used in its place. Roadways can also be an obstacle to smooth wildlife movement, but special wildlife crossing design techniques can mitigate their impact.

While this system probably functions, though imperfectly, today, it is far from completely implemented. Certain "greenway opportunity areas," or gaps, were identified that will need to be reforested as much as possible to improve the system.

RECOMMENDATIONS

1) Headwater areas –

Maintain and restore water balances within individual headwater areas. Protect headwater areas from development impacts such as impervious coverage wherever possible. Restore headwater areas to natural conditions, generally emphasizing forested wetlands, on public lands and other open spaces where possible. Strategies include –

- 1) Reforest headwater areas, especially along streams, on public lands and with willing landowners. The Conservation Reserve Enhancement Program (CREP) is one program that can provide funding for this.
- 2) Make headwater areas one priority for open space designation within a development proposal, and for riparian reforestation efforts (see next item below).
- 3) Where new development does occur in headwater areas, limit impervious coverage percentages to no more than 10% for residential and 20% for commercial developments. Review and revise municipal ordinances to reduce any unnecessary requirements for impervious cover for proposed land development projects (such as by reducing cartway and roadway widths, reducing building setbacks for shorter driveways, and so on).
- 4) Where existing development occurs within headwater areas, and especially within the Kemblesville area, identify opportunities to provide retrofitted stormwater management. Pursue funding to implement, for example, through a DEP Growing Greener grant.

2) Riparian buffers –

Promote protection and restoration of 100-foot wide forested riparian buffers, as measured from each stream bank, through the zoning and subdivision ordinances. Limit development encroachment into these buffers, especially closer to a stream. Require reforestation of unforested stream corridors at the time of development approval, through the conditional use process for example.

Using the riparian forested buffer map and landowner spreadsheet developed through this Comprehensive Plan, identify priority landowners for riparian restoration outreach and education purposes. Work with landowners on a voluntary basis to promote the reforestation of riparian buffers through private land stewardship efforts, including through the CREP program (see #1 above). Support similar efforts of conservation organizations such as the White Clay Creek Wild & Scenic Management Committee. Work with the Chester County Conservation District, the White Clay Committee, Stroud Water Research Center and others to educate landowners concerning the importance of forested stream corridors to the Township's water quality and wildlife habitat.

3) Stormwater management –

Utilize stormwater/best management practices within Township regulatory ordinances based, at a minimum, on the Commonwealth Department of Environmental Management's BMP standards and the model stormwater ordinance of the Chester County Water Resources Authority. Require consideration of stormwater recharge and water quality objectives and standards early in the development approval process (i.e., at time of sketch plan) when the development design can be oriented to utilize natural-based, non-structural measures for intercepting run-off at the source, significantly reducing site run-off volumes (at least to the two-year storm), peak rates, and achieving water quality standards by preventing stream pollution and sedimentation. Consider requiring higher recharge standards for headwater areas.

4) Hydric soils –

Avoid excessive new development within hydric soils where possible by establishing limits to disturbance of hydric soil units. Promote the restoration of hydric soils by requiring drain tile identification, disabling, and removal during the land development approval process.

5) Woodlands –

Implement ordinance provisions based on the woodland classification approach and map adopted as a part of this Plan through adopting natural resource language definitions, development-related disturbance limits of 10-25%, tree replacement standards, and timber harvesting limits as part of the Zoning Ordinance. Provide increased protection to forest interiors and higher classes of woodlands. Increase tree replacement requirements while making them more flexible, including allowing for higher numbers of smaller trees and for off-site tree replacement, especially to reforest riparian buffers and implement greenways. Regulate commercial timber harvesting using the woodlands classification system. Minimize destructive "high-grading" forestry practices by requiring retention of a minimum amount of higher value trees.

6) Greenways corridors –

Adopt the greenways plan proposed here through the Zoning Ordinance, possibly as an overlay district. Ensure as much as possible that new development occurs outside of greenway corridors, for example by subjecting developments that include greenways to the conditional use process. Require that the open space set aside through the development process is designed to implement a greenway corridor. Also, applicable bulk, area, and design standards should be modified as part of the conditional use process.

Where applicable and where not undertaken voluntarily by the affected landowner(s), as condition(s) of conditional use approval, the Board of Supervisors may require establishment of formal conservation easements and/or public trail easements, in order to permanently secure the benefits of the greenway corridor subject to application.

In the context of an application for approval of a conditional use, subdivision or land development plan, special exception, variance, or building permit, the Township should consider requiring reforestation within designated greenway corridors. A landscape plan should accompany the application and adequately illustrate proposed reforestation plans, including a list of native trees and shrubs to be provided, and defining the long-term management provisions. All plantings should be established prior to final occupancy permit approval.

Alteration of natural ridgelines within any designated greenway corridor through grading or earthmoving should be avoided or, if not feasible, should be minimized to the greatest extent feasible.

Promote continuance of the adopted greenway corridor network based on existing and future developments on adjoining properties. Review and revise as necessary open space design guidelines, or provide other incentives, to ensure the protection and enhancement of these greenway corridors through a development site.

Where greenway corridors are already a part of protected lands, work with landowners on a voluntary basis, as with the reforestation of riparian buffers, to promote sensitive management of the corridors.

7) Natural areas restoration –

Implement natural area (woodland, wetland, stream, and meadow) protection and restoration on Township-controlled and Homeowner Association-owned (HOA) lands (see page 9-11, *Recommendations* for Chapter 9, also). Natural areas on these lands should have management/restoration plans developed for them where they do not already exist. Mechanisms and techniques for funding natural area restoration should be explored.

Consider forming a Franklin Township Environmental Advisory Committee (EAC) that takes on the mission of natural area restoration at appropriate sites throughout the Township. The EAC could promote landowner education concerning natural resource and natural area (woodland, wetland, stream, and meadow) protection and restoration. The EAC and Open Space Committees should work with the White Clay Wild & Scenic Watershed Management Committee to prepare a Franklin Township Natural Areas Survey. The EAC should write

articles for the Township newsletter and hold public informational meetings at least once per year; promote voluntary management measures; become familiar with federal farm cost-share programs like CREP, CRP, WHIP, and so on, that may provide funding for local landowners to better manage their lands.

Significant open space areas should be protected through conservation easements wherever possible. New developments should be required to develop and implement Open Space Management Plans that promote natural areas restoration as much as practicable, including removal of key invasive species, and replanting native species in key areas. Natural areas should be buffered with sensitive land uses wherever possible.