SECTION 2

2. LAND RESOURCES

This section provides an overview of major land use issues and resources in the watershed.

2.1 GEOLOGY

The Buffalo Creek Watershed lies within the Pittsburgh Low Plateau Section of the Allegheny Plateau Region (Hughes 1933). The Pittsburgh Low Plateau is considered a true plateau and is primarily composed of clastic shale bedrock and speckled with highly variable regions of sandstone, siltstone, coal and limestone (Briggs 1999). The bedrock is primarily from the Conemaugh and Allegheny groups typical of the Pennsylvanian and Permian bedrock systems that formed approximately 300 million years ago. Sandstone from both bedrock groups is good water bearing material, however, groundwater output is variable over the watershed region. Often the sandstone rapidly transitions into shale, thereby greatly limiting groundwater output. Within the Allegheny bedrock group is the main bituminous coal field, which also contains interspersed shallow gas and oil fields throughout. Areas rich in these resources are found primarily in the northern section of the watershed.

Like all sections within the Allegheny Plateau region, the bedrock of the Pittsburgh Low Plateau underwent lift and dissection. However, unlike most sections of the Allegheny Plateau Region to the east of the Pittsburgh Low Plateau, folds are of low amplitude and the strata are nearly horizontal. Consequently, upland areas within the Pittsburgh Low Plateau Section are horizontal plateaus (Briggs 1999). Folds in the strata are generally parallel in nature, running in a southwest-northeast direction and increasing in amplitude and frequency to the northeast across the region forming a repeating anticline ridge/syncline valley pattern (Hughes 1933, Beardsly *et al.* 1999, Briggs 1999). Consequently, the general topography of the watershed is variable, containing plateaus, valleys, ridges, mixed features and rocks. Ridge-top elevation is typically uniform at approximately 1,350 feet (some higher elevations reach up to 1,500 feet) with a gross relief of approximately 550 feet to the valley floors.

The principal strata exposed within the watershed are depositional and include the lower portion of the Conemaugh series, all of the Allegheny series and the upper portion of the Pottsville series (Armstrong Conservation District 2006). As discussed in the Western Armstrong Watershed Assessment (Armstrong Conservation District 2006), a series of weak folds crosses the watershed with a northeast to southwest strike and plunge. Five named fold axes cross the watershed, including the Amity Anticline, Boggsville Syncline, McMurray Syncline, Kellersburg Anticline, and Bradys Bend Syncline.

The economically important limestone and coal outcrops in the watershed are associated with the Kellersburg Syncline. This structure extends across the watershed from southeast of Saxonburg to north of Cowansville. The Vanport Limestone outcrops from West Winfield and northward, and is often exposed in thick beds at the elevation of Buffalo Creek. Extensive underground and surface mining operations have been carried out all along the axis of the Kellersburg Anticline for the Vanport Limestone (Armstrong Conservation District 2006). The principal coal seams within the watershed include the Upper and Lower Freeport coals, and the Upper Middle and Lower Kittanning coals. These coals are strip mined in the upper portions of the watershed, and extensive deep mines formerly operated in the vicinity of Freeport.

The Pittsburgh Low Plateau, including the Buffalo Creek watershed, is situated directly southeast of the Glaciated Pittsburgh Plateau Section of the Allegheny Plateau Region.

Although identical in nearly all respects, the effects of the Pleistocene glaciation have come to distinguish one region from another. The Glaciated Pittsburgh Plateau has little vertical relief and rock outcrops are extremely rare as a result of being covered by up to 300 feet of glacial till (Briggs 1999). Conversely, the Pittsburgh Low Plateau is highly dissected with substantial relief.

Near Anthony's Bridge

Buffalo Creek near Winfield Junction

SIDEBAR:

Topographic descriptions from the 1883 History of Butler County (Waterman, Watkins, and Co. 1883).

Description of Donegal Township: *The surface of the county is very rolling and uneven, and no sooner does the traveler mount one elevation than a second is presented to view, and so on over the whole township, and, to use a metaphor, the surface is like the billows of the surging ocean.*

Description of Winfield Township: *It would be difficult to find more picturesque bits of rural landscapes than can be seen along Rough Run, a stream which crosses the northern part of this township and flows eastward into Armstrong County. The valley of this water course is deeply graven, and its rocky banks rise abruptly, culminating in hilltops back of which stretch tracts of level country….The silvery stream, encompassed by bluffs which seem to attain almost to the dimensions of mountains, threads its winding way around rocky barriers and dashes over its stony bed with musical murmur, or glides noiselessly in smooth shallows. Close to you a wild ravine from the southward comes down and merges itself with the deeper valley of the creek.*

Despite being directly spared from the Pleistocene glaciation, the unglaciated Pittsburgh Low Plateau was significantly impacted by the glacial retreat that occurred to the northwest. Prior to the glacial advance, the drainage within the Pittsburgh Low Plateau flowed primarily to the northwest into the Lake Erie basin. The subsequent glacial advance and retreat drastically altered this pattern of water flow. Of these changes in drainage patterns, the most significant to the Buffalo Creek Watershed was the rerouting of the Allegheny River. Prior to the glacial period of the Pleistocene the Allegheny River flowed north. After the glacial retreat the Allegheny River was rerouted and flowed in a southerly direction into the Ohio River drainage basin. Buffalo Creek and its tributaries exist in their current configuration due to the shift in drainage patterns caused by the glacial impacts north of the Pittsburgh Low Plateau Section of the Allegheny Plateau Region.

Drainage patterns within the Buffalo Creek Watershed and the Pittsburgh Low Plateau are primarily dendritic. Dendritic drainage patterns typically resemble a tree and branch pattern. These patterns evolve in regions containing a mostly homogenous bedrock layer such as the Pittsburgh Low Plateau. Homogenous bedrock over an entire drainage or watershed area promotes dendritic drainage patterns by creating a vast area with equal weathering potential leading to a directionally random pattern of tributaries with an overall branching tree-like pattern.

2.2 SOILS

Three major soils orders occur in Pennsylvania: inceptisols, ultisols, and alfisols. Soils within the watershed are limited to the alfisols (Miller 1995). The alfisols are widely distributed in Pennsylvania and are the most productive agricultural soils in the state. Alfisols are typified by a yellowish–brown A-horizon, which is indicative of mineral leaching. Most of these soils have a depth of 20 to 40 inches over bedrock. The typical texture is loam to silt loam.

Nearly all of the Buffalo Creek Watershed is covered by a single group of soils characterized by Smith (1989) as, "*moderately to very deep soils primarily formed in residual material.*" The soils are weathered from shale, the predominant component of the watershed bedrock, in addition to sandstone and siltstone. Overall soil characteristics for the watershed are quite variable. The soils within the watershed exhibit a wide range of depths and drainage characteristics. In addition, the soils are highly variable with regards to topographic associations. Certain soil types exist primarily on sloped aspects, others primarily on flat areas, while others are less particular and exist over a broad range of topographical locations. Soils in this latter group are typically equally suited for either sustaining woodlands or agricultural cultivation (although this is highly dependent upon aspect). For example, post-agricultural abandonment, reforestation has typically occurred over most of the watershed, except in areas further converted by industry, development, natural resource acquisition, etc.

SIDEBAR:

County Soil Surveys.

Differences and Similarities Explained: *Differences in nomenclature regarding soil series and associations between counties does not necessarily reflect differences in soil properties. Soil surveys are highly variable as a function of publication year and the soil scientist performing the survey. Comparing soils between counties is best accomplished by comparing the physical descriptions of each soil series or association as listed in Table 2-1 and 2-2. In general, both Armstrong and Butler County have a large diversity of soil types based upon aspect, slope, and location within the watershed, however, there is generally little difference in the types of soils found in similar physical and topographic locations between counties.*

Eleven soil associations consisting of 30 soil series have been characterized within the watershed (Smith 1989, Martin 1977) as identified in Tables 2-1 and 2-2. Both the Hazelton-Gilpin-Wharton and Weikert-Gilpin soil association units are primarily found directly along Buffalo Creek and any major tributaries within the watershed. Both units are composed of well to moderately-well drained soils. Both units are typically found in steep areas with deep soils, however, the Hazelton-Gilpin-Wharton unit can also be found on shallow level areas. The Hazelton-Gilpin-Wharton unit is weathered primarily from sandstone and siltstone, while the Weikert-Gilpin unit is weathered from interspersed sandstone, siltstone and shale. Both soil units lend themselves well to agriculture uses, however, much of the watershed area containing these soils consists of steep slopes that are not capable of being farmed. These areas are primarily wooded, or were once wooded and are in the process of being naturally reforested.

TABLE 2-1
SOIL ASSOCIATIONS

Soil Association	Description
Hazelton-Cookport-Buchanan	Nearly level to steep, deep and very deep, well drained and moderately well drained soils formed in material weathered dominantly from sandstone.
Hazelton-Gilpin-Wharton	Nearly level to steep, moderately deep and deep, well drained and moderately well drained soils formed in material weathered dominantly from sandstone and siltstone.
Gilpin-Wharton	Gently sloping to very steep, moderately deep and deep, well drained and moderately well drained soils formed in material dominantly from siltstone and shale.
Cavode-Wharton-Gilpin	Gently sloping to steep, deep and moderately deep, somewhat poorly drained to well drained soils formed in material weathered dominantly from shale
Tilsit-Brinkerton-Gilpin	Nearly level to moderately steep, moderately deep to very deep, well drained to poorly drained soils formed in material weathered dominantly from shale and siltstone
Udorthents-Wharton-Hazelton	Gently sloping to very steep, very deep and deep, excessively drained to moderately well drained soil formed during strip mining and in material weathered from sandstone, siltstone, and shale
Hazelton-Buchanan-Gilpin	Gently sloping to very steep, moderately deep to very deep, well drained and moderately well drained, dominantly very stony soils formed in material weathered from sandstone, siltstone, and shale
Weikert-Gilpin	Well drained, shallow and moderately deep, steep and very steep soils on uplands
Gilpin-Weikert-Ernest	Well drained and moderately well drained, shallow to deep, gently sloping to moderately steep soils on benches, ridges, and hillsides
Rayne-Ernest-Hazelton	Well drained and moderately well drained, deep, gently sloping to moderately steep soils in low-lying areas on ridgetops, and on hillsides
Wharton-Rayne-Cavode	Well drained to somewhat poorly drained, deep, nearly level to moderately steep soils on ridges, benches, and hillsides

Source: Martin 1977, Smith 1989.

West Franklin Township

Table 2-2
SOIL SERIES DESCRIPTIONS

Soil Series	Description
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults, deep, well drained, gently sloping and sloping soils on terraces, formed from loamy alluvium derived from sandstone, siltstone, and shale
Andover	Fine-loamy mixed mesic Typic Fluvaquents, very deep and poorly drained, on foot slopes and benches, depressions and lowlands throughout all but the extreme northwest part of the watershed. Formed from colluvium from acid gray and brown sandstone interbedded with shale and siltstone.
Arents	Shallow to very deep moderately well drained to somewhat excessively well drained soils in excavated and filled areas on ridgetops, sideslopes, benches and floodplains throughout the watershed.
Atkins	Fine-loamy, mixed, acid, Typic Fluvaquents, very deep and poorly drained on flood plains throughout the watershed, formed in alluvium from acid sandstone siltstone, and shale.
Brinkerton	Fine-silty, mixed, mesic Typic Fluvaquents, deep and poorly drained on lowlands, depressions, and benches throughout all but the extreme northwest part of the watershed, formed in colluvium from acid gray and brown shale and sandstone.
Buchanan	Fine-loamy, mixed, mesic Aquic Fragiudults, very deep moderately well drained on foot slopes, benches, depressions, and lowlands throughout all but the extreme northwest part of the watershed, formed in colluvium from acid brown and gray sandstone interbedded with shale and siltstone.
Caneada	Fine, illitic, mesic Aeric Ochraqulfs, very deep somewhat poorly drained on lowlands, foot slopes, terraces, and dissected benches in valleys along Slippery Rock Creek and Muddy Creek and their tributaries, in areas along Connoquenessing Creek and Brush Creek, formed from silts and clays deposited in glacial lakes and slackwater stream deposits.
Cavode	Clayey, mixed, mesic Aeric Ochraqualts, deep, somewhat poorly drained, gently sloping to moderately steep soils on uplands and ridgetops, benches and some foot slopes, formed from acid clay shale with some thin siltstone
Clymer	Fine-loamy, mixed, mesic Typic Hapludults, deep and well drained on broad ridgetops in all but the extreme northwest of the watershed, formed from weathered acid sandstone interbedded with siltstone and shale.
Cookport	Fine-loamy, mixed, mesic Aquic Fragiudults, deep and moderately well drained on ridgetops and side slopes in all but the extreme northwest corner of the watershed, formed from weathered acid gray and brown sandstone interbedded with siltstone and shale.
Dumps, Industrial	Nearly level to very steep areas consisting of slag, sludge, and other waste materials mainly from factories that produce steel, chemicals, and glass
Dumps, Mine	Nearly level to very steep areas consisting of an accumulation of waste material from coal mining
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults, deep, moderately well drained, nearly level to moderately steep form from colluvial material weather from acid gray shale, siltstone, and some fine sandstone
Fluvaquents	Deep, poorly drained and very poorly drained soils on a few floodplains in the northern half of the watershed, formed form alluvium form acid sandstone, siltstone, and shale
Gilpin	Fine-loamy, mixed mesic Typic Hapludults, moderately deep, well drained gently sloping to very steep soils on uplands, formed from acid shale, siltstone, and fine grained sandstone

TABLE 2.2 (Continued)

Soil Series	Description
Hazelton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts, deep, well drained gently sloping to moderately steep soils on uplands, formed from acid gray and brown sandstone
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents, deep, poorly drained, nearly level soils on flood plains form from alluvium derived from shale, siltstone, sandstone, and some limestone
Monongahela	Fine-loamy, mesic Typic Fragidults, very deep and moderately well drained on terraces mainly along the Connoquenessing and Brush Creeks, formed from alluvium from shale, siltstone, and sandstone
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts, deep and moderately well drained on flood plains along major waterways, formed form alluvium from sandstone, shale, and siltstone
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts, deep well drained nearly level soils on flood plains formed from alluvium derived from shale, siltstone, and sandstone
Rainsboro	Fine-silty, mixed, mesic, Typic Fragiudulfs, deep, moderately well drained nearly level to sloping soils on rolling stream terraces, formed in loess and underlying loamy sediment that commonly grades to sandy or gravelly material
Rayne	Fine-loamy, mixed, mesic, Typic Hapludults, deep, well drained gently sloping to moderately steep soils on uplands formed in material weathered from interbedded shale, siltstone, and some fine grained sandstone, mainly on ridgetops and hillsides
Steff	Fine-silty, mixed, mesic, Fluvaquentic Dystrochrepts, deep, moderately well drained nearly level soils on flood plains. Formed in alluvium derived from shale, siltstone, and sandstone
Strip Mine	Sandstone, boulders, and fractured shale, and some soil material that has been disturbed by mining operations
Tilsit	Fine-silty, mixed, mesic Typic Fragidults, deep and moderately well drained on ridgetops mainly in the southern half of the watershed, formed from residuum of weathered siltstone interbedded with shale and fine grained sandstone
Udorthents	Deep, moderately well drained to excessively drained soils on ridgetops, side slopes, benches, lowlands, and flood plains, formed from the mixing of soils and bedrock during strip mining for coal and limestone
Upshur	Fine, mixed, mesic, Typic Hapludalfs, deep well drained gently sloping to steep soils on uplands formed from material that weathered from neutral or alkaline red clay shale
Urban Land	Nearly level or gently sloping areas, on stream terraces or flood plains and some in uplands, in larger towns where structures make identification of soils difficult
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts, shallow, well drained gently sloping to steep soils on uplands formed from material weathered from interbedded shale, siltstone, and fine grained sandstone.
Wharton	Calyey, mixed, mesic, Aquic Hapludults, deep, moderately well drained gently sloping to moderately steep soils on uplands, formed from material weathered from acid clay shale interbedded with siltstone.

Source: Martin 1977, Smith 1989.

Most of the upland areas within the watershed consist of the Gilpin-Wharton, Hazelton-Cookport-Buchanan, and Gilpin-Weikert-Ernest, and Wharton-Rayne-Cavode soil association units (see Table 2-1 for details). Nearly all of these soils can be used for agriculture and will generally support forests. Similar to the soil units running directly along Buffalo Creek and the major tributaries, agricultural use of the areas characterized by these soil units is primarily limited due to steep slopes, however some flat areas are also unusable due to limited rooting zones that are rocky and highly drought prone. Figure 2-1 shows the major soil series within the watershed as summarized in Table 2-2.

Among the soil units in the watershed, a number of specific soils are considered indicative of potential prime farmland as designated by the United States Department of Agriculture (USDA) (Martin 1977, Smith 1989). Prime farmland is defined by Smith (1989) as, "the land best suited to produce food, feed, forage, fiber, and oilseed crops." These areas must have an appropriate precipitation regime, growing season, and soil characteristics necessary to consistently produce high crop yields using conventionally accepted farming methods. The most prevalent prime-farmland designated soils within the Buffalo Creek watershed are Wharton silt loams (0-8 percent slopes), Gilpin silt loam (3-8 percent slopes) and Rayne silt loam (3-8 percent slopes). All of these listed soils, in addition to other less abundant prime-farmland designated soils, are scattered throughout the watershed area. Areas considered prime farmland are also typically highly attractive to other types of land development, specifically if adjacent to growing urban population centers. Obtaining USDA prime farmland designations for qualifying lands can aid in the conservation and protection of these areas. A prime farmland designation aids to manage and direct development with the interest of maintaining the integrity of the designated prime farmland.

Other soils requiring special consideration within the watershed are areas that have been impacted by strip mining activities. Strip mining drastically alters the soil environment both physically and chemically long after mining is complete. These areas (1) are often unstable and prone to land slides, (2) experience high levels of erosion, (3) negatively effect water quality due to increased silt and chemical inputs, and (4) are often devoid of vegetation and wildlife if not properly restored. Although appearing physically localized, the negative impacts of an abandoned strip mine can have far reaching effects within the watershed in terms of water quality, ultimately determining the overall physical ecological health of the watershed. Mitigating and limiting the negative impacts of abandoned strip mines is essential to the preservation and conservation of the physical, chemical, and ecological watershed attributes.

In much the same way that abandoned strip mines are often considered the bane of a watershed, areas containing hydric soils can act as a watershed's savior. Hydric soils are strong indicators of potential wetland habitat. Wetlands provide numerous beneficial functions. Hydrologically, wetlands act to store ground water, maintain surface water, and aid in flood and storm protection by acting as natural "sponges", minimizing erosion and washout. Biogeochemically, wetlands provide numerous valued services such as carbon sequestration, nutrient retention, and natural nonpoint source pollution mitigation (i.e., natural acid mine drainage mitigation) (Mitsch and Gosselink 2007). In addition to wetland plants, these areas also provide important habitat for a large number of birds, mammals, fish, amphibians, and reptiles not commonly found in more upland areas. Within the Buffalo Creek Watershed, the Brinkerton soil series (subgroup: Typic Fragiaqualfs) is considered a hydric soil within Pennsylvania (National Resource Conservation Service 2007, Smith 1989, Martin 1977). Areas containing this soil series and subgroup, if functioning as wetland, are very important in maintaining and/or improving water quality throughout the watershed.

2.3 LAND USE

Land use in the watershed was quantified utilizing land use data from the Pennsylvania Land Cover Data Set compiled by the U.S. Geological Survey (1990). These data were compiled from Landsat satellite imagery circa 1992. Figure 2-2 shows land use in the watershed.

As shown in Table 2-3, forest (63.0 percent) and agricultural land (34.2 percent) dominate the watershed as a whole. However, the percentage of these uses varies among subwatersheds, with the Lower Buffalo Creek and Little Buffalo Creek Watersheds having the highest percentage of urban land uses. These areas are located largely in Butler County, which is one of only two counties in the region to experience positive population growth during the 1990s.

2.4 OWNERSHIP

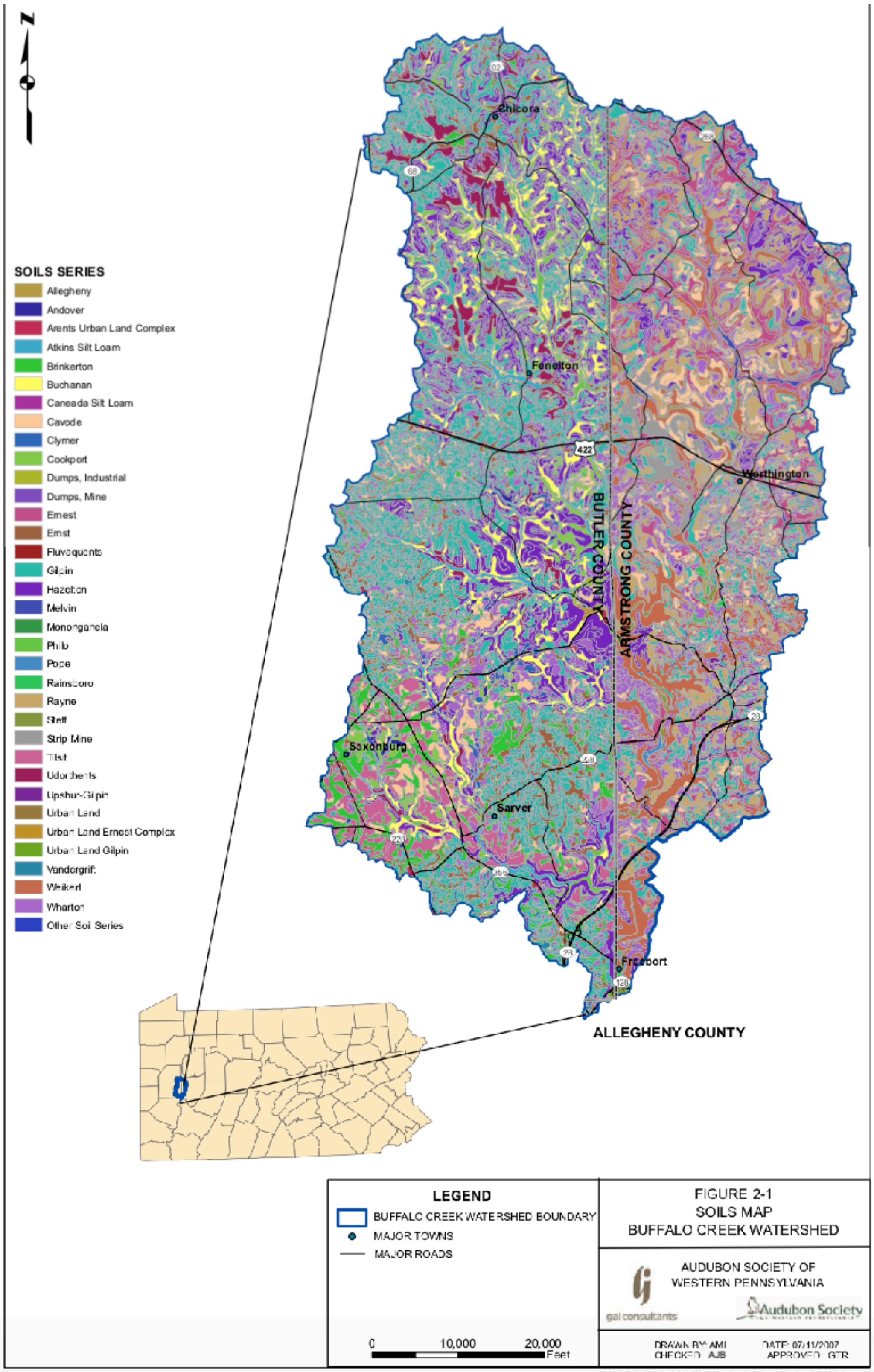
The majority of land in the watershed is privately owned. Public lands in the watershed include state game lands (1,079.0 acres), county parks (6.0 acres), and township/community parks (46.2 acres, excluding the Butler-Freeport Trail). Cumulatively, these areas represent approximately one percent of the watershed. These areas are discussed in further detail in Section 5.

2.5 AGRICULTURAL RESOURCES

Agriculture is one of Pennsylvania's most important industries. In 2001, the total value of farm production in the state exceeded $4.5 billion, and agriculture provided more than 84,300 jobs. At that time, the state had more than 59,000 farms, comprising 7.7 million acres.

Agriculture has suffered substantial declines in recent decades (Figure 2-3). In 1959, there were 100,051 farms occupying 11.9 million acres in the state. By 1980, these had declined to 61,000 farms occupying about 9 million acres (Pennsylvania State University 2007). There are various reasons for these declines. In some areas, demand for urban development has caused land prices to rise to the point that it is more profitable to sell land for development than to continue its agricultural use. In addition, as farming methods have become more productive, less land is needed to produce the same product. When productivity increases faster than demand, fewer productive acres are needed and farmlands are converted to other uses. In Butler County, the total number of farms decreased by 55 percent and agricultural area decreased by 59 percent between 1959 and 2001 (Pennsylvania State University 2007). The trend is even worse in Armstrong County, where the total number of farms decreased by 57 percent and agricultural area decreased by 73 percent.

Rassau Farm, Sarver


N
SOILS SERIES
Allegheny
Andover
Arents Urban Land Complex
Atkins Silt Loam
Brinkerton
Buchanan
Caneada Silt Loam
Cavode
Clymer
Cookport
Dumps, Industrial
Dumps, Mine
Ernest
Ernst
Fluvaquents
Gilpin
Hazleton
Melvin
Monongahela
Philo
Pope
Rainsboro
Rayne
Steff
Strip Mine
Tilsit
Udorthents
Upshur-Gilpin
Urban Land
Urban Land Ernest Complex
Urban Land Gilpin
Vandergrift
Weikert
Wharton
Other Soil Series
Chicora
Fenelton
Worthington
Saxonburg
Sarver
Freeport
BUTLER COUNTY
ARMSTRONG COUNTY
ALLEGHENY COUNTY
422
LEGEND
BUFFALO CREEK WATERSHED BOUNDARY
MAJOR TOWNS
MAJOR ROADS
0
10,000
20,000
Feet
FIGURE 2-1
SOILS MAP
BUFFALO CREEK WATERSHED
AUDUBON SOCIETY OF
WESTERN PENNSYLVANIA
gai consultants
Audubon Society
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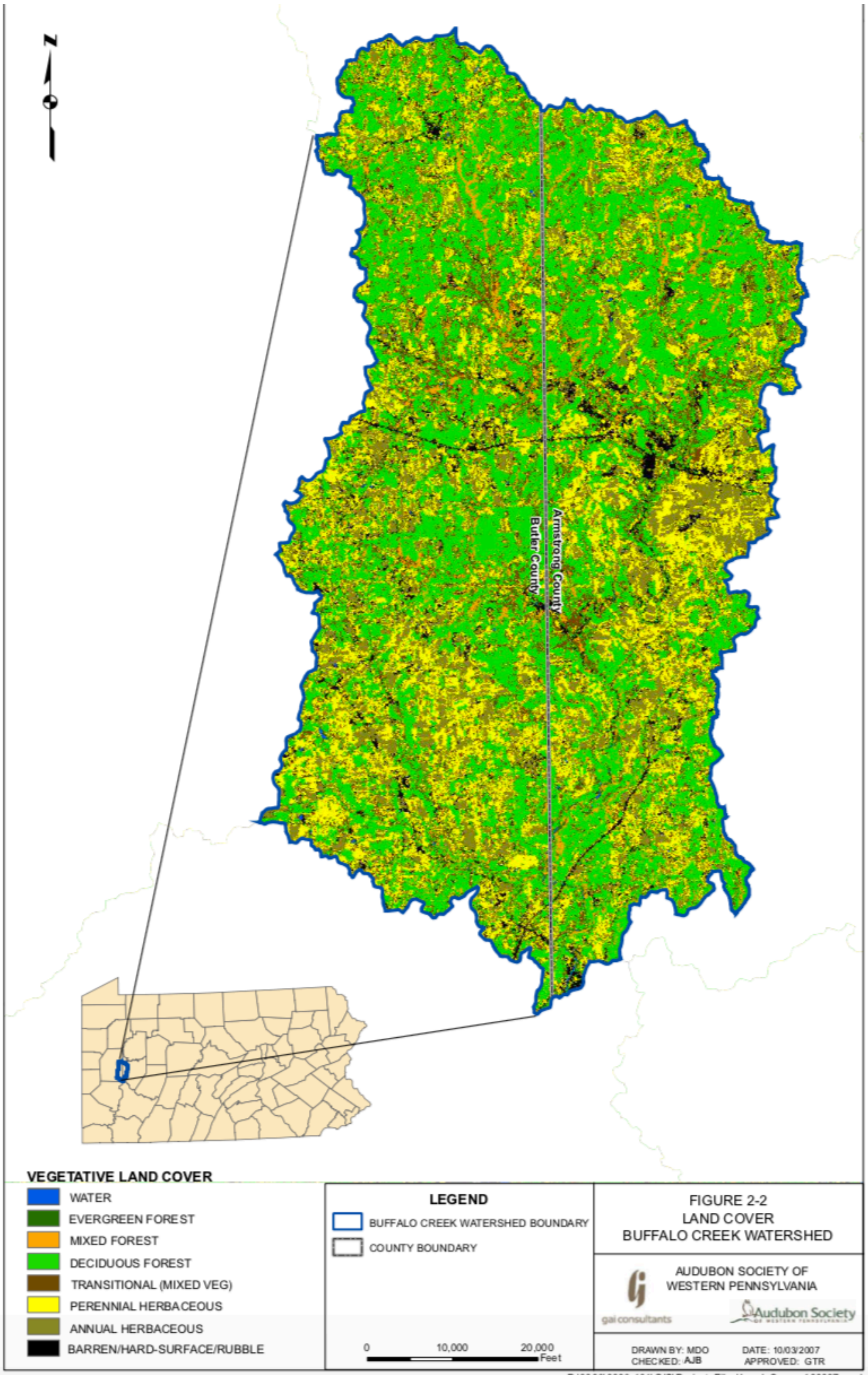

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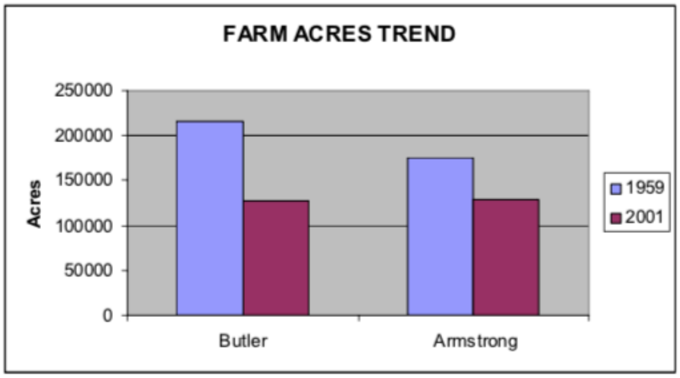
Figure 2-3
AGRICULTURAL TRENDS



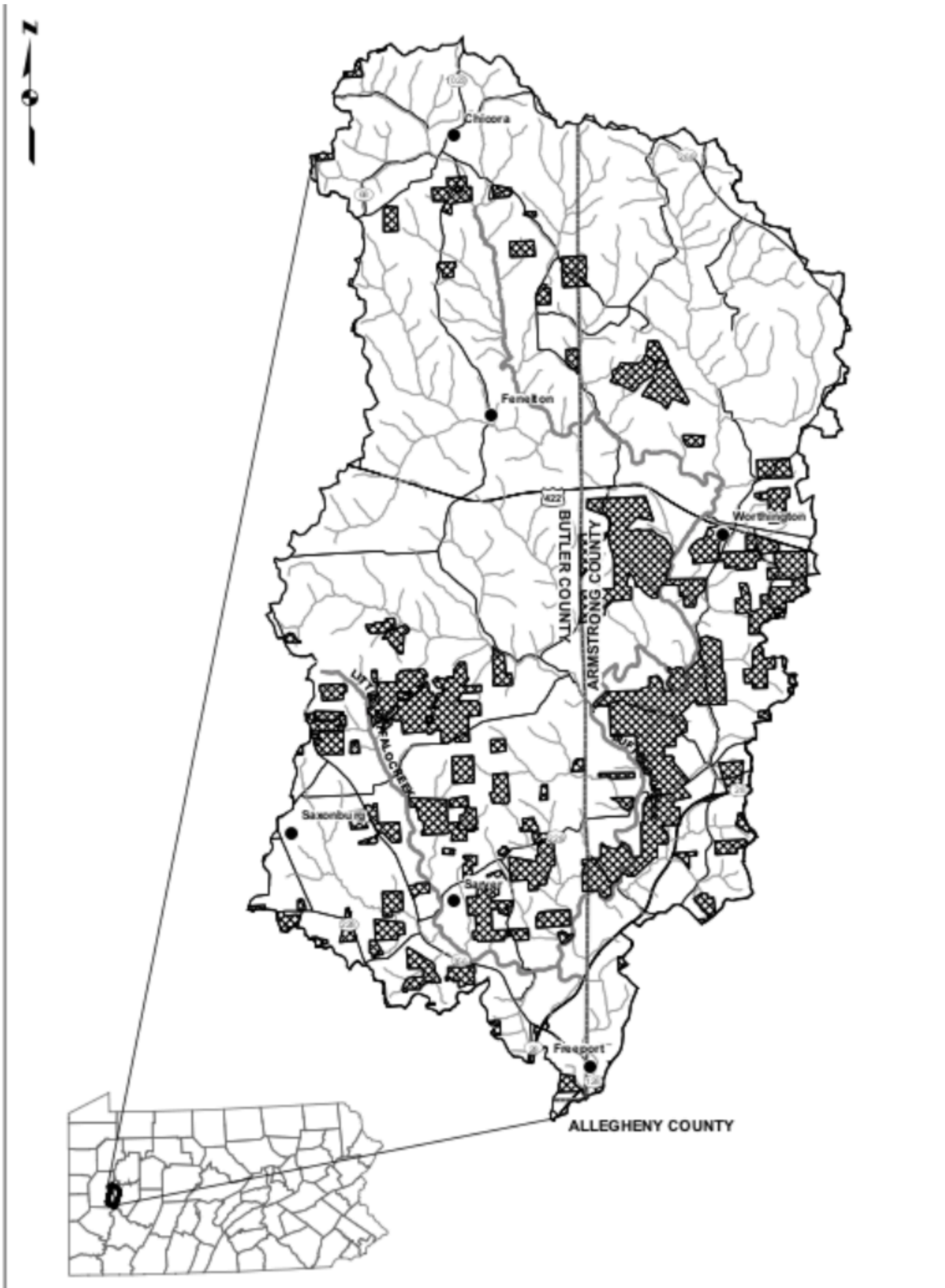
Source: Pennsylvania State University 2007.

The agricultural census does not track what uses former farmlands are converted to. However, it appears that in the southern portion of the watershed, many acres of farmland have been developed for residential use. In the northern areas, residential development has also occurred, although in a number of locations former farmland has been allowed to revert to forest.

In response to these pressures, the Commonwealth has enacted several programs to further the conservation of agricultural lands. These efforts are administered the Pennsylvania Department of Agriculture's Bureau of Farmland Preservation. State administered programs include Agricultural Security Areas (ASAs), agricultural easements, and the Clean and Green Program.

ASAs provide participating farmers with additional levels of protection from local ordinances affecting operations and nuisance complaints, and also provide for review of farmland condemnation actions by state and local government agencies. These protections are intended to promote more permanent and viable farming operations over the long-term by strengthening the farming community's sense of security in land use and the right to farm. Participation in the program is voluntary. ASAs are created by local municipalities in cooperation with individual landowners. There are presently 14,354.4 acres of ASAs within the watershed. The locations of ASAs in the watershed are shown on Figure 2-4. Table 2-4 identifies the extent of ASAs in the watershed by municipality.

Pennsylvania's Agricultural Conservation Easement Purchase Program was developed to help slow the loss of prime farmland to non-agricultural uses. The program enables state, county and local governments to purchase conservation easements (sometimes called development rights) from owners of quality farmland. By selling an easement, the farmer gains capital that can be used to reduce debt load or expand operations, thus helping to pass on farms to the next generation. Counties participating in the program have appointed agricultural land preservation boards with a state board created to oversee this program. All three counties in the watershed participate in this program. The state board is responsible for distribution of



LEGEND	FIGURE 2-4 AGRICULTURAL SECURITY AREAS BUFFALO CREEK WATERSHED
BUFFALO CREEK WATERSHED BOUNDARY	Audubon Society of Western Pennsylvania
MAJOR TOWNS	
MAJOR STREAMS	
MAJOR ROADS	
AGRICULTURE SECURITY AREA	
0 10,000 20,000 Feet	DRAWN BY: AML DATE: 07/10/2007 CHECKED: AJB APPROVED: GTR

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Table 2-4
AGRICULTURAL SECURITY AREAS

Municipality	ASA Acres	Municipality	ASA Acres
Allegheny County			
Harrison Township	0.0		
Armstrong County			
Bradys Bend Township	0.0	South Buffalo Township	1,876.4
East Franklin Township	65.0	Sugarcreek Township	65.8
Freeport Borough	0.0	West Franklin Township	3,869.1
North Buffalo Township	2,006.9	Worthington Borough	39.5
Butler County			
Buffalo Township	1,880.5	Fairview Township	58.1
Chicora Borough	0.0	Jefferson Township	479.5
Clearfield Township	20.9	Oakland Township	36.2
Clinton Township	159.1	Saxonburg Borough	0.0
Concord Township	0.0	Summit Township	0.0
Donegal Township	761.8	Winfield Township	3,035.6

Source: GAI 2007.

state funds, approval and monitoring of county programs and specific easement purchases. In Butler County, as of March 2003, the conservation easement program had enrolled 21 farms, comprising 2,729 acres. In Armstrong County, there were no enrollments in this program.

The Pennsylvania Department of Agriculture recognizes Pennsylvania families who have been farming the same land for 100 and 200 years through the Century and Bicentennial Farm Programs. A number of farms in the watershed, such as the Rassau Farm in Buffalo Township, have been recognized by this program.

2.6 FOREST RESOURCES

Nearly two-thirds of the land within the Buffalo Creek watershed is forested. Historically, nearly all of the forested area within the watershed was logged either for timber and/or agriculture. Consequently, current forested areas are almost all second growth stands. Data from Butler and Armstrong Counties indicate that these forest resources currently have a large local economic impact. Based upon the 1997 USDA Census of Agriculture, there are over 20,000 private owners of forested land and almost 40 wood-product related businesses in Butler and Armstrong Counties. These industries employ over 500 individuals in Butler and Armstrong Counties with a combined annual economic contribution of approximately 35 million dollars.

The vast majority of forest resources within the watershed are privately managed and have traditionally operated under diameter-limited harvests. With diameter-limited harvest methods, trees over a specific diameter are removed without consideration of species, age, quality, or vigor. The trees that remain after harvest are intended to restock the area with seedlings as well as serve as future crop trees. Under current conditions, most forest stands in the watershed consist of a variety of species of trees of similar age that have greatly differing diameters. These diameter variations exist because of the growth characteristics of individual species as well as competition among individual trees; the smaller trees are not necessarily younger trees.

Forest landowners often use diameter-limited harvests in the belief that some form of selective cutting is the least disruptive way to harvest timber. However, when timber is harvested using this method, those species with growth characteristics leading to larger diameters, as well as the more vigorous and healthy individuals, are removed and trees with lower growth potential are retained. Over the long term, this leads to loss of species diversity within the stand and lower economic productivity as species with higher growth potential are eliminated. Diameter-limited harvest may yield the highest immediate income, but at the cost of reduced future timber values, biodiversity, and overall environmental degradation. Thus, diameter-limited methods are neither sustainable or conservation oriented.

Careful management utilizing sound forestry practices that provide for the future by considering species composition, stand density, growth potential, site characteristics, and other parameters such as habitat quality is essential for the economic sustainability and ecological integrity of the watershed's forests. By working with a professional forester, landowners can ensure that these factors are considered prior to harvesting timber.

The PA DCNR Bureau of Forestry has assigned a service forester to each county to aid private land owners and organizations in responsible and sustainable forest management practices, restoration projects, forest stewardship and education.

The PA DCNR Bureau of Forestry offers assistance to municipalities regarding planning for stewardship, conservation, and wise use of forests and other related natural resources. The Bureau employs experts in forestland conservation practices that will provide sound, impartial advice to communities wishing to conserve and enhance their natural resources and maximize the myriad benefits they provide. The Bureau also provides advice to municipalities on various forms of green space and green infrastructure, including the planting and care of trees in developed or developing areas.

The Forest Stewardship Program is a federal and state partnership that assists landowners in the completion of plans focusing on sustainable management of the forest and its related natural resources. The intention of the program is to provide sound management and continuing care for Pennsylvania's private forest resources into the future. Limited cost share funding is currently available to offset the cost of preparing a Forest Stewardship Plan. Plans must be written by approved plan writers. Information on this opportunity can be obtained at the nearest Bureau of Forestry field office.

For a detailed physical description of the forest resources within the Buffalo Creek Watershed please see Section 5.

2.7 MINING AND MINERAL RESOURCES

Mining and mineral extraction have historically been significant in the economic development of the watershed (see Section 6). Oil fields in the northern portion of the watershed were developed as part of the world's first oil boom in the 1870s. Coal has been extracted at various locations throughout the watershed, and limestone and sandstone mining are also substantial industries in some locations. Figure 2-5 shows the distribution of mineral resources in the watershed.

There are several active underground coal mining operations in the watershed. The Clementine Mine operates in South Buffalo Township, although the mine portal is located outside of the watershed near Clinton. The Clementine 2 mine has also been permitted. The

Long Run Mine in West Franklin Township was recently permitted for an approximately 3,500-acre area. A number of closed and/or abandoned coal mines exist throughout the watershed. Strip mining for coal has and is occurring in those portions of the watershed generally north of the community of Shadyside Village. In the 1970s, approximately 5.4 percent of Armstrong County had been stripped, and between 2 and 5 percent of Butler County.

Underground mining of the Vanport limestone is presently conducted by M&M Minerals in Worthington and Winfield Lime and Stone Company in West Winfield. Surface mining operations are conducted by M&M Minerals, McRea Mining, and Allegheny Mineral Corporation. Products of these operations include crushed stone, agricultural lime, and cement. Substantial areas are permitted for future surface mining of limestone in the Worthington area. Butler County is the second largest producer of lime in Pennsylvania (Miller 1995). A number of abandoned underground limestone mines occur in the upper portions of the watershed, generally from West Winfield and north. Several of these abandoned mines have been put to adaptive reuse by several industries. One of these mines is now used for mushroom production by Creekside Mushrooms southwest of Worthington. Another located at West Winfield is used for underground document storage.

SIDEBAR:

The iron industry as described in the 1883 *History of Butler County*:

A furnace, long known as Winfield Furnace, for the manufacture of iron from native ore, was established in 1847 by William Spear. The ruins of it are still standing on Rough Run, near the eastern line of the township (Winfield Township). *It was a charcoal furnace, and consisted of a stone stack thirty-three feet high and about twenty feet square at the base. Abundance of ore and limestone are found in the immediate vicinity. Spear carried on the business eight or ten years. Then it was conducted by the Winfield Coal and Iron Company, and later, by William Stewart. The furnace went out of blast about 1864. When doing its best, it produced twenty-five to forty tons of iron per week. The work was first started with a blast generated by water power, but this not being a success, steam was introduced and used.*

Sandstone quarrying was once extensive in the lower portions of the watershed. This material was used for building material and glass production. There are now few active sand or gravel quarries in the watershed. M&M Minerals produces some sandstone near Worthington.

An active clay mine is located north of Freeport. This material is used for manufacture of refractory bricks. Iron production was one of the earliest industries in the watershed.

As noted previously, oil production in the northern portion of the watershed was part of the world's first great oil boom in the 1870's. Oil and gas production continues to occur throughout the northern portion of the watershed. Gas well exploration and development has increased substantially in 2006 and 2007 as a result of increased prices and demand for natural gas.

SIDEBAR:

The 1883 History of Butler County states this concerning the oil boom:

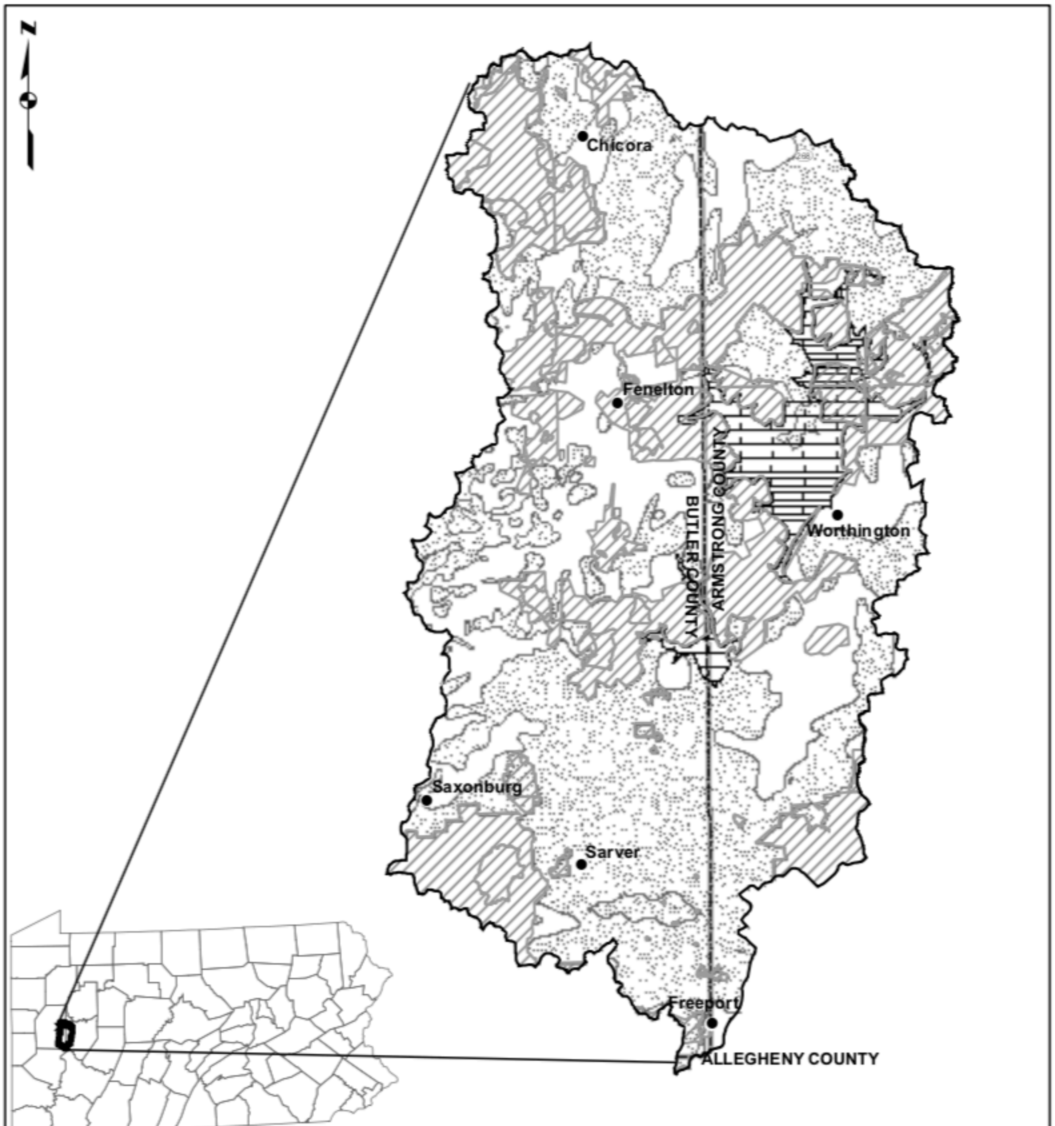
As fast as pioneer operations revealed the extension of the (oil) belt to the southward, the territory added was made the scene of operations, and hundreds of wells were put down. By 1875, the country from Parker to a point several miles south of Millerstown (Chicora) fairly bristled with derricks, and a torrent of wealth flowed into the hands of producers and land-owners…. The area of the developed territory in Butler County is about 25,000 acres. According to the most trustworthy statistics, the total production in the county has, up to January 1, 1882, amounted to the enormous quantity of 33,750,000 barrels, more than one-sixth of the total production in Pennsylvania from 1859 to 1882, which was 186,502,798 barrels. A large amount of this was sold at $4 per barrel and some for only 40 cents. It has been estimated that the development of the Butler oil region has brought in an immigration which has increased by 10,000 the population of the county, and it has added untold millions to its wealth."

2.8 CRITICAL AREAS

Critical areas include those locations with conditions that create potential natural hazards or limitations to development or land uses. Within the Buffalo Creek Watershed these include areas of steep slopes and floodplains.

Steep slopes of 25 percent or more occur throughout the watershed, but typically occur along the major stream valleys. These steep slopes are particularly susceptible to landsliding and erosion problems, and their frequent location near streams make these problems of particular concern. While most of these areas are presently vegetated and undeveloped, increasing urban development, inadequate stormwater controls, and timbering practices have the potential to create future problems. Approximately 7,641 acres in the watershed have slopes of 25 percent or more. These areas are shown on Figure 2-6.

Floodplains of varying size occur along all streams. As discussed in Section 3, flooding in the Buffalo Creek Watershed is typically the result of abnormally high rainfall rather than other factors. Major storm events have caused the most widespread damage, although sudden thunderstorms as well as prolonged rain events over localized areas can have devastating effects on small watersheds, particularly in urban areas with extensive impervious surfaces and inadequate stormwater controls.



LEGEND

- BUFFALO CREEK WATERSHED BOUNDARY
- MAJOR TOWNS
- COAL MINED AREAS
- LIMESTONE
- OIL AND GAS FIELDS

0 7,500 15,000 Feet

FIGURE 2-5
MINERAL RESOURCES
BUFFALO CREEK WATERSHED

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gai consultants

Audubon Society of Western Pennsylvania

DRAWN BY: AML DATE: 07/11/2007
CHECKED: AJB APPROVED: GTR

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2.9 LANDFILLS

There are no active landfills in the watershed. There are five closed landfills in the watershed according to the Pennsylvania Department of Environmental Protection (PaDEP) (2007). These include the Hranica Landfill in Buffalo Township, Penn Dixie Industries Landfill in West Winfield, the Donegal Landfill in Donegal Township, and two unnamed landfills in Buffalo and North Buffalo Townships.

2.10 HAZARDOUS AREAS

The Superfund program, administered by the U.S. Environmental Protection Agency (EPA) is the federal government's program to clean up uncontrolled hazardous waste sites. A Superfund site is defined as any land in the United States that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup because it poses a risk to human health and/or the environment. Under this program, abandoned, accidentally spilled, or illegally dumped hazardous waste that pose a current or future threat to human health or the environment are cleaned up. At the core of the Superfund program is a system of identification and prioritization that allows the most dangerous sites and releases to be addressed within the confines of limited Federal funding and human resources. Sites identified as meeting these criteria are placed on the National Priorities List (NPL). All sites where releases or potential releases have been reported are listed in the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS).

One site within the watershed has been listed on the NPL. This is the 14-acre Hranica Landfill in Buffalo Township. This privately owned landfill operated from 1966 to 1974 and received both municipal and hazardous wastes. By 1981, the site contained over 19,200 drums and other larger vessels of waste composed of solvents, paint pigments, and metal sludges. Metals in soils were the primary concern. The ground water and soil were contaminated with heavy metals and volatile organic compounds (VOCs) from the former site operations. Surface water was also contaminated with VOCs. In addition to the above contaminants, the soil and surface water also were contaminated with polychlorinated biphenyls (PCBs) and phenols. Remedial action on the site began in June 1993 and was completed in September 1993. The site is now completely fenced and a five-acre soil cover was placed on the former disposal area and the adjoining hillside. The EPA deleted this site from the NPL on September 18, 1997 in response to this remediation effort.

The Pennsylvania Hazardous Sites Cleanup Act (HSCA) provides the PaDEP with the funding and the authority to conduct cleanup actions at sites where hazardous substances have been released. HSCA also provides PaDEP with enforcement authorities to force the persons who are responsible for releases of hazardous substances to conduct cleanup actions or to repay public funds spent on a PaDEP funded cleanup action. HSCA funds are also used to pay the state share of costs of cleanup actions at Pennsylvania sites in the Federal Superfund Program. One HSCA site is located in the watershed. This is the Delta Chem site in Worthington. An HSCA Remedial Response was completed at this site in 2002, and HSCA Operation & Maintenance was completed in 2005.

The Resource Conservation and Recovery Act (RCRA) is the federal law that creates the framework for the proper management of hazardous and non-hazardous solid waste.

RCRA focuses only on active and future facilities; abandoned or historical sites are managed under CERCLA. RCRA is administered by the EPA. Any facility that generates, treats, stores, disposes of, transports, or offers for transportation any hazardous waste must have an EPA identification number. Approximately 53 RCRA sites are located in the watershed. These are identified in Appendix A.

Illegal dumping of household and construction wastes is often a problem in rural areas. The dumping of deer carcasses along roadsides and in pull-off areas along Buffalo Creek is an increasingly serious problem. PA Cleanways recently completed a survey of illegal dumpsites in Butler County (PA Cleanways 2007). This survey found 16 sites in Clinton Township, 11 in Buffalo, nine in Jefferson, seven in Penn, five in Winfield, four each in Clearfield and Summit, two in Fairview, and one in Concord. A copy of PA Cleanways survey report is included in Appendix B.

2.11 BROWNFIELDS

Brownfields are abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contaminations. Typically these types of sites are located in or adjacent to urban areas, although occasionally sites may be in rural locations. Access to infrastructure such as water and sewerage is typically a necessary component in the redevelopment potential of a brownfield site. There are no brownfield sites located within the Buffalo Creek Watershed.

Farmlands near Worthington

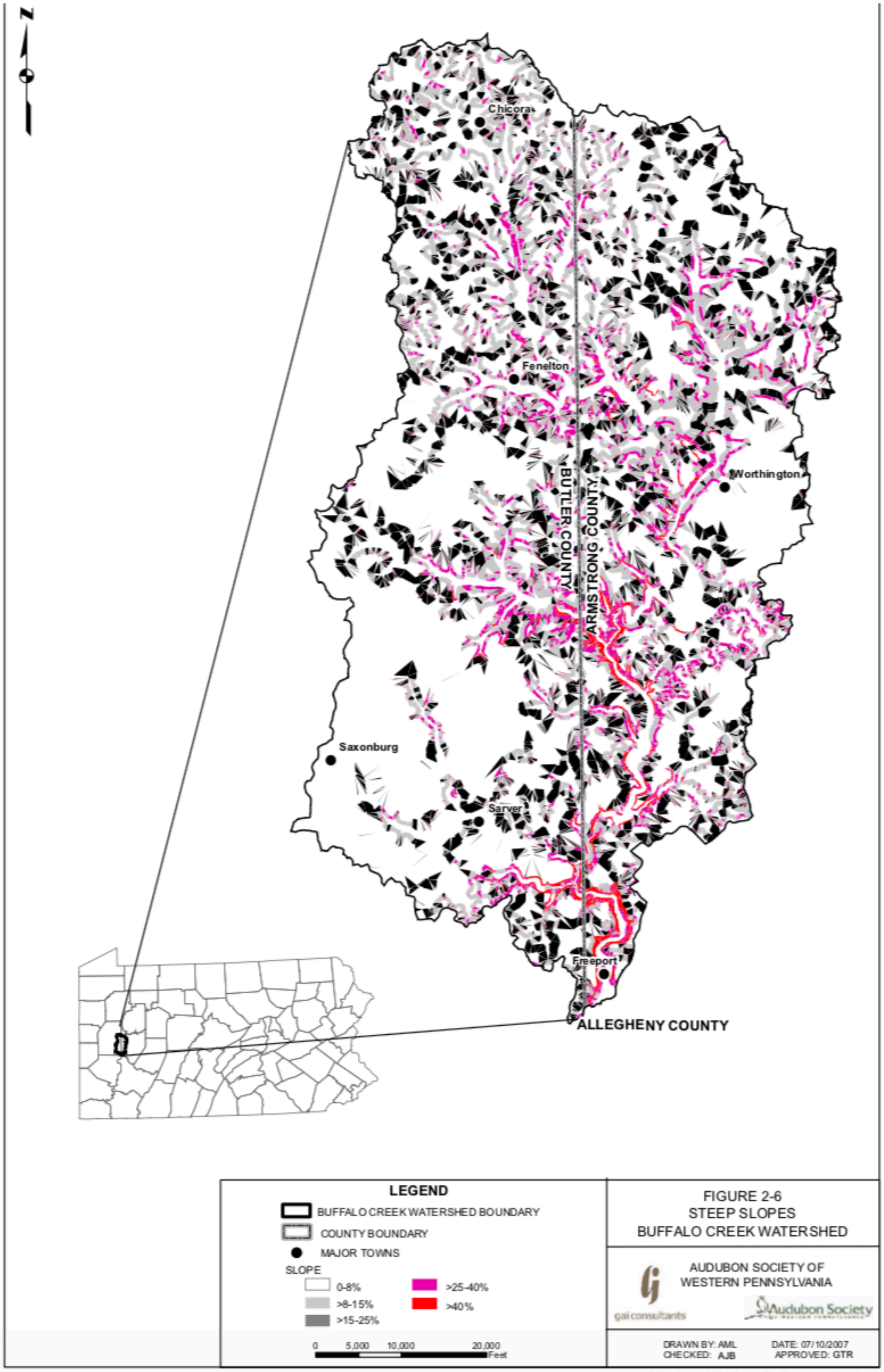

FIGURE 2-6
STEEP SLOPES
BUFFALO CREEK WATERSHED

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APPROVED: GTR

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