LANDUSE & LANDCOVER

Human interaction with the natural landscape determines the ecological health of the watershed; it also contributes to the character and identity of the region. While the watershed is predominately comprised of public land, each landowner contributes to the watershed health and identity. As one of Pennsylvania's most heavily stocked and naturally productive coldwater fisheries, Kettle Creek also attracts visitors from across the state, who value its rich angling opportunities and its historic, rural character. This chapter discusses both the public and private management of various landuse types found throughout the watershed.

Introduction

Landuse, or the way in which people use and depend upon natural resources, is simply a relationship between people and the landscape. It sculpts the character of the places in which we live and it also has profound impacts on the natural resources upon which we depend. Kettle Creek exemplifies this intimate relationship. Historically, its timber and coal supported a thriving industrial watershed economy. Agriculture, throughout the northern watershed and along the main stem valley, allowed people to live directly off of the land. Today, the rural, forested watershed is cherished for vast expanses of contiguous forest, thriving coldwater fisheries and recreational opportunities. Whether it is remnants of the watershed's industrial heritage or its thriving present day forest, all of these characteristics make Kettle Creek a unique place to live and visit. On a larger scale these characteristics contribute collectively to the character and identity of both Kettle Creek and the north central Pennsylvania region.

Just as landuse defines character, it also carries the potential to impact the natural areas around it and, in turn, the people who depend upon these natural resources. For instance, infrastructure that facilitates access to the watershed, such as roads and utilities, becomes a source of sediment and nutrient problems to the streams. This in turn affects both adjacent and downstream stream water quality. Fish and other wildlife that depend upon these clean waters also are affected. Yet as extensively as landuse affects the natural landscape, it also affects the people who drink that water and fish in those streams.

As long as people continue to live in and visit the watershed, the landscape will continue to change. Identification and conservation - by the residents of Kettle Creek - of the lands that are most valued by the community is the first step towards conserving the cherished Kettle Creek watershed identity as it is today.

Classification of Landuse Types

A categorization of landuse type by ownership could help to identify potential partners in the implementation of conservation measures. Forested lands are predominately state owned and managed by the Bureau of Forestry. Natural and sensitive lands, including wetlands, springs and seeps, span across private and public boundaries throughout the watershed and thus become a management issue for a host of stakeholders. Privately owned residential and agricultural lands are regulated by the municipalities. Each of these landuse types and its associated issues is broadly outlined below. This chapter will provide a framework for the inventory and assessment of high value lands in the watershed. While management recommendations are outlined at the end of this chapter, it is left to the Kettle Creek watershed residents and the association to prioritize conservation measures based upon what elements are most important to them.

Kettle Creek is 92% public land that is managed and supervised by the Commonwealth of Pennsylvania. Included within the watershed are four state forests and two state parks.

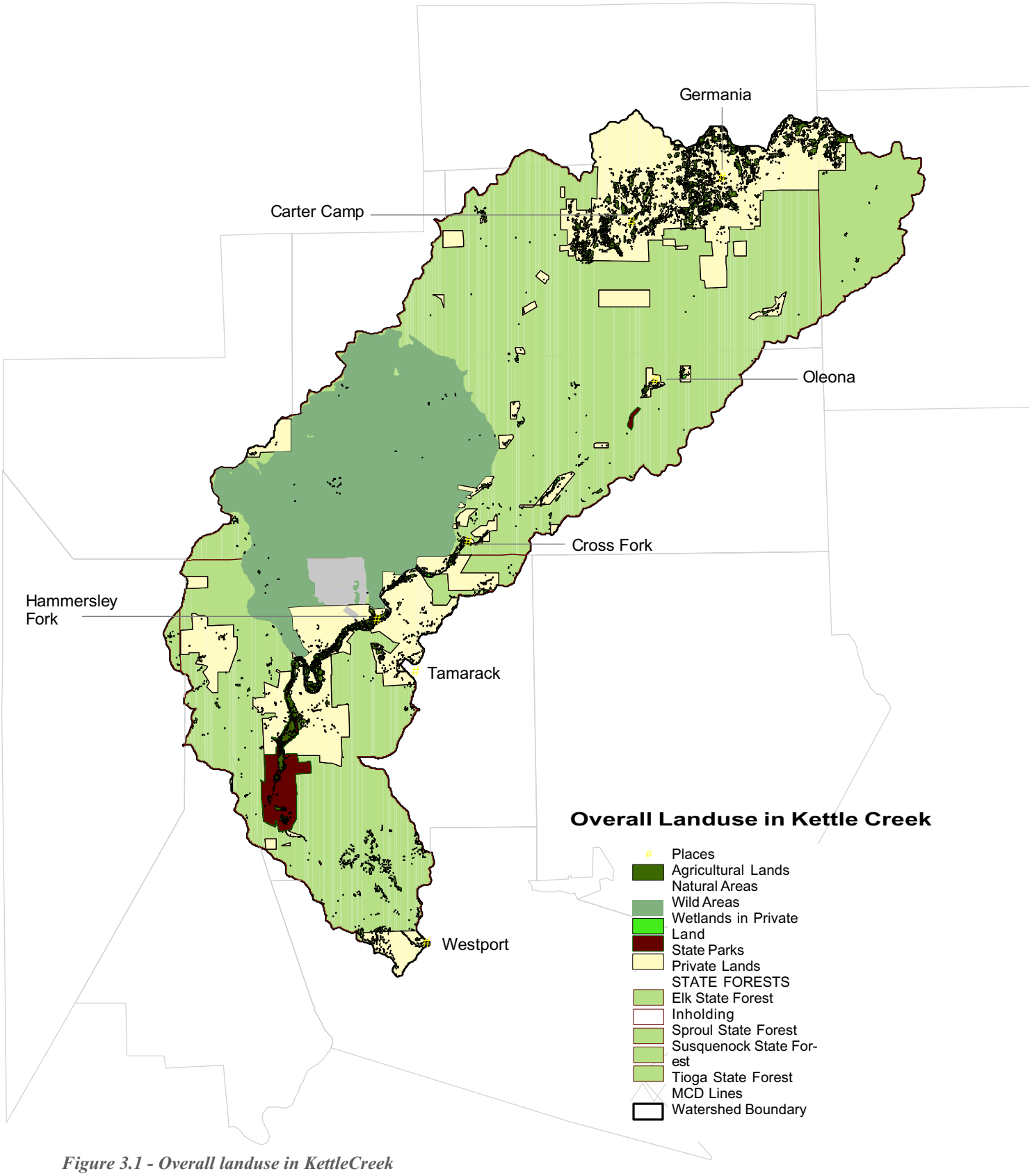


Figure 3.1 - Overall landuse in KettleCreek

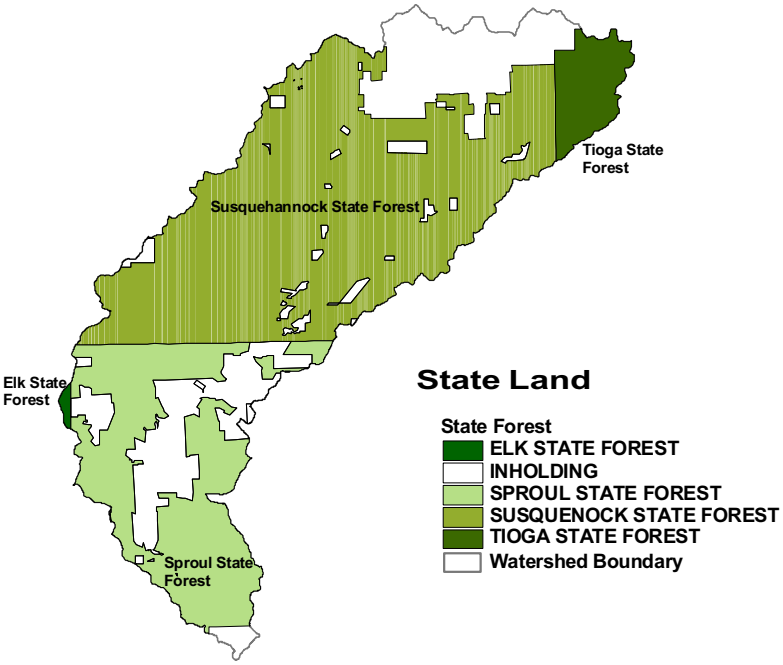


Figure 3.2 - Commercial timber lands within the state forests bring in revenue to the DCNR and the local municipalities.

All state forest lands are managed by the DCNR under a state forest management plan. This comprehensive plan, revisited every 5 years, prescribes forest stewardship principles for the management of cutting, natural areas, historical areas, sensitive areas and recreational areas. The 2001-2005 plan is currently being revised.

Public Lands

STATE OWNED
LANDS

State Forest Land

Elk, Sproul, Susquehannock and Tioga state forests make up approximately 92% of the watershed. The forests offer not only abundant hardwood timber, fish and game, and a rich history but also comprise some of the largest expanses of contiguous forest in the state. These tracts of contiguous forest provide viable wildlife corridors and support a uniquely diverse plant and animal habitat. (For more information on Wildlife see page 147). These large expanses of forest also maintain the exceptional value waters of Kettle Creek and its tributaries. The dense forest floor absorbs and filters nutrients and sediment emanating from adjacent roads and development. It also absorbs excess storm water, moderating flow and flood events in the stream.

State forest lands are designated and managed by the DCNR Bureau of Forestry under a State Forest Management Plan. Commercial timberlands, generally areas with high value timber stands, are managed for sustainable cutting and provide revenue to both the state and the local municipalities. Noncommercial lands are often economically unsuitable for cutting and are typically managed as environmentally sensitive areas (See Figure 3.3 - State forest timber stands).

Commercial Timber

State Forest commercial timberlands are dominant in Potter County, particularly around Kettle Creek's mainstem and the tributaries and mainstem of Cross Fork. They are managed for sustainable timber production. In addition the State Forest Management Plan prescribes the careful management of environmentally sensitive areas, including erosion-prone steep slopes (greater than 20%), ridgelines, headwaters and rock outcroppings, to moderate both the economic costs and the environmental impact of cutting in these areas. (For a discussion of headwaters see page 110).

The state forests generate economic resources for both the state and municipalities. While revenue from timber harvesting supports the

Forested areas in the watershed are predominately composed of Northern Hardwood tree species (approximately 50%); other species include Mixed Oak (Quercus sp. 29%) Red Maple (Acer rubrum 4%), Aspen (Populus sp.) and Gray Birch (Betula populifolia 3%), Coniferous Plantations of Virginia Pine (Pinus virginiana) and other conifers 1%), White Pine (Pinus strobus) and Hemlock (Tsuga canadensis 1%).

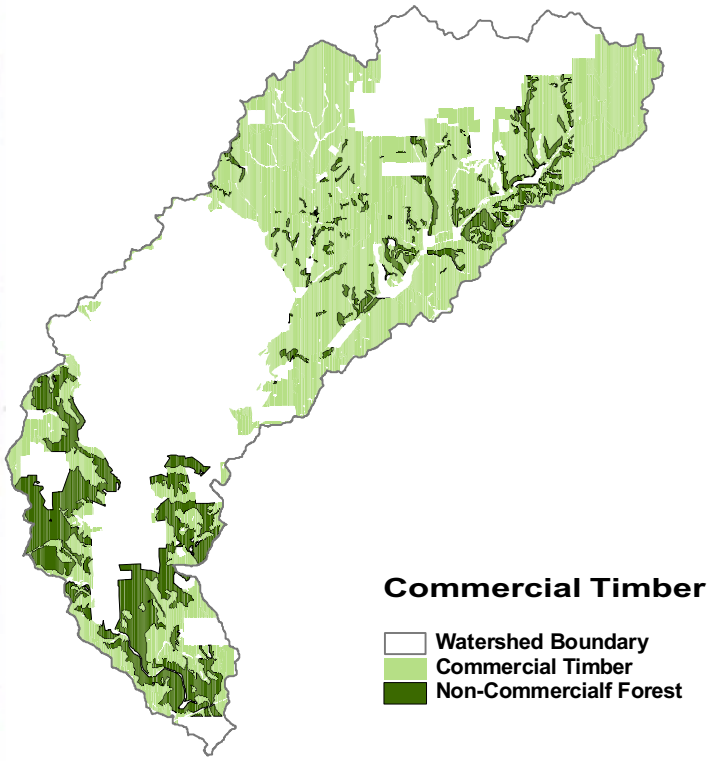


Figure 3.3 - Commercial timber lands within the state forests provide revenue to the DCNR and the local municipalities.

Bureau of Forestry, municipalities also benefit from in lieu taxes. The 2001 - 2005 State Forest Management Plan draft further proposes an increase in revenue allotted to the municipalities. Support of this plan could provide additional revenue to the townships, bringing with it the opportunity to implement municipal improvement projects.

Non-Commercial Timber

Noncommercial state forest timber areas are generally found in rugged terrain that presents a financial barrier to timber harvesting in areas with relatively low value timber stands. These areas are widely dispersed throughout the watershed although a large percentage falls generally in the southern part of the watershed (See Figure 3.3).

Lack of development within noncommercial forest lands provides the opportunity to link to adjacent tracts of forest. These links, would create tracts of contiguous forest corridors

State forest lands offer rich & diverse wildlife habitat and enhance the visual quality of the watershed.

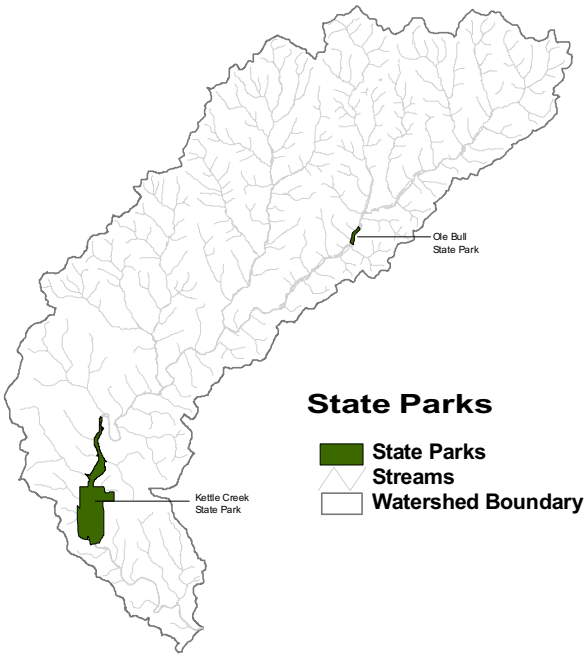
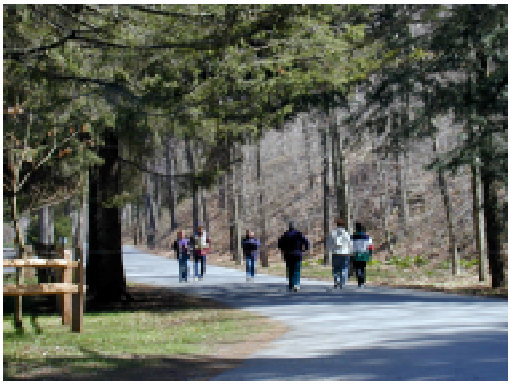


Figure 3.4 - Two state parks along the mainstem of Kettle Creek draw visitors from across the state each year.



People participating in outdoor activities at Ole Bull State Park

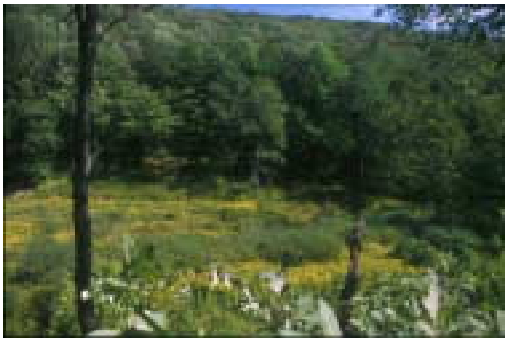
State Parks offer opportunities for both outdoor recreation and environmental, historical and cultural education and interpretation.

which would thus enhance the potential for wildlife diversity. These areas could further foster forest connectivity with the riparian streamside forests; in turn this would provide valuable wildlife corridors promoting greater species diversity in the watershed.

State Parks

There are two state parks in the Kettle Creek watershed that offer opportunities for many outdoor recreational activities (See Figure 3.4). Kettle Creek State Park rests on 1,793 acres in the lower branch of Kettle Creek in western Clinton County (See figure 3.4). Ole Bull State Park, situated along the Kettle Creek Valley in Potter County, is 125 acres. The state parks, while relatively small in area, play a large role in the watershed identity. Both parks offer abundant recreational opportunities (For more information on Recreation and State Parks see page 75). They also seek to provide environmental, historical and cultural education and interpretation. They attract a wealth of visitors to the watershed and contribute to the income provided by local businesses.

The parks strive to promote a strong land stewardship ethic through the conservation of the area's natural, historic, scenic, aesthetic and cultural heritage. The management of natural resources within the state parks is focused on recreation and scenic value. Fishing and hunting are regulated by the PA Fish and Boat Commission (PA FBC), the PA Game Commission and the DCNR.



Inherently beautiful natural areas provide rich and diverse wildlife habitat.

Wildlife & Natural Areas

Natural and sensitive areas include wetlands, floodplains, forested areas and other areas that are particularly vulnerable to landuse impacts. Hammersley Natural and Wild Areas, located in the subwatersheds of Hammersley Fork and Trout Run, are two such designated areas. Natural areas not only enrich the landscape through the provision of habitat for an abundance of plant and animal species, but also perform key ecological processes such as floodwater storage and nutrient filtration. Connectivity between these ecosystems enables habitat diversity.

Natural Areas

Natural areas within Kettle Creek have a unique opportunity to survive and thrive. The rural, largely undeveloped landscape provides the opportunity for a diverse plant and animal habitat. A distinctive geography, situated at the junction of the five physiographic provinces, at the edge of the glaciated and unglaciated sections of the state and between the northern hardwood-conifer forest communities of northern Pennsylvania and the mesic (or moderately moist) central forest communities to the south and west, fosters a greater diversity of unique plant and animal communities.

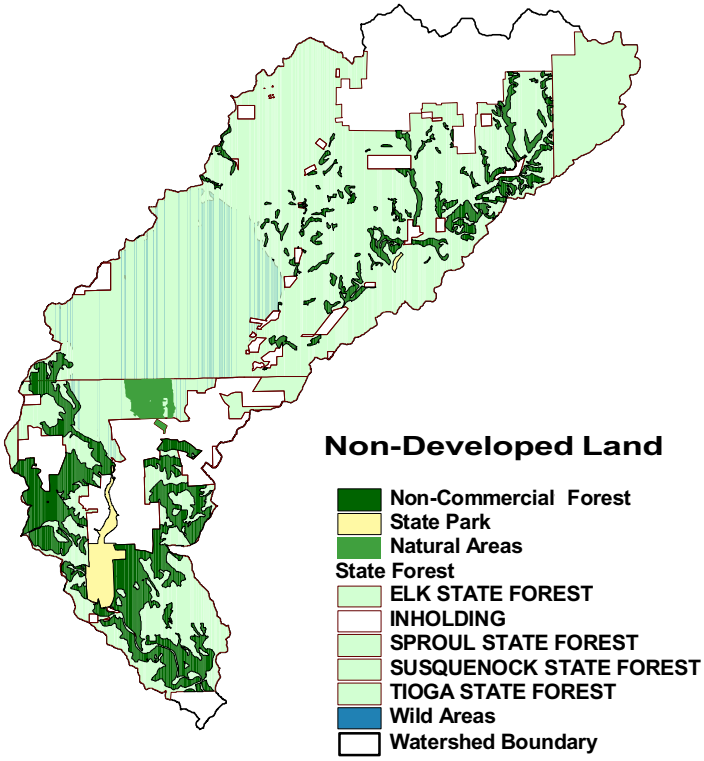


Figure 3.5 - Non-developed land occupies 92% of the total watershed area covering many natural and sensitive areas in Kettle Creek watershed.

PA Natural Diversity Index

A significant inventory of natural areas in Kettle Creek is available for Clinton County through Pennsylvania Natural Diversity Index (PNDI) developed separately by various counties. (See figure 3.6 - designated conservation areas in Kettle Creek) The PNDI is equivalent to the national Natural Heritage Inventory (NHI) program that seeks to recognize, document and understand species biodiversity at state, national and global levels. PNDI was established in 1982 to document not only rare and endangered species, as well as historic areas across the state. It is conducted through partnerships between The Nature Conservancy (TNC), the Bureau of For-

NATURAL & SENSITIVE AREAS

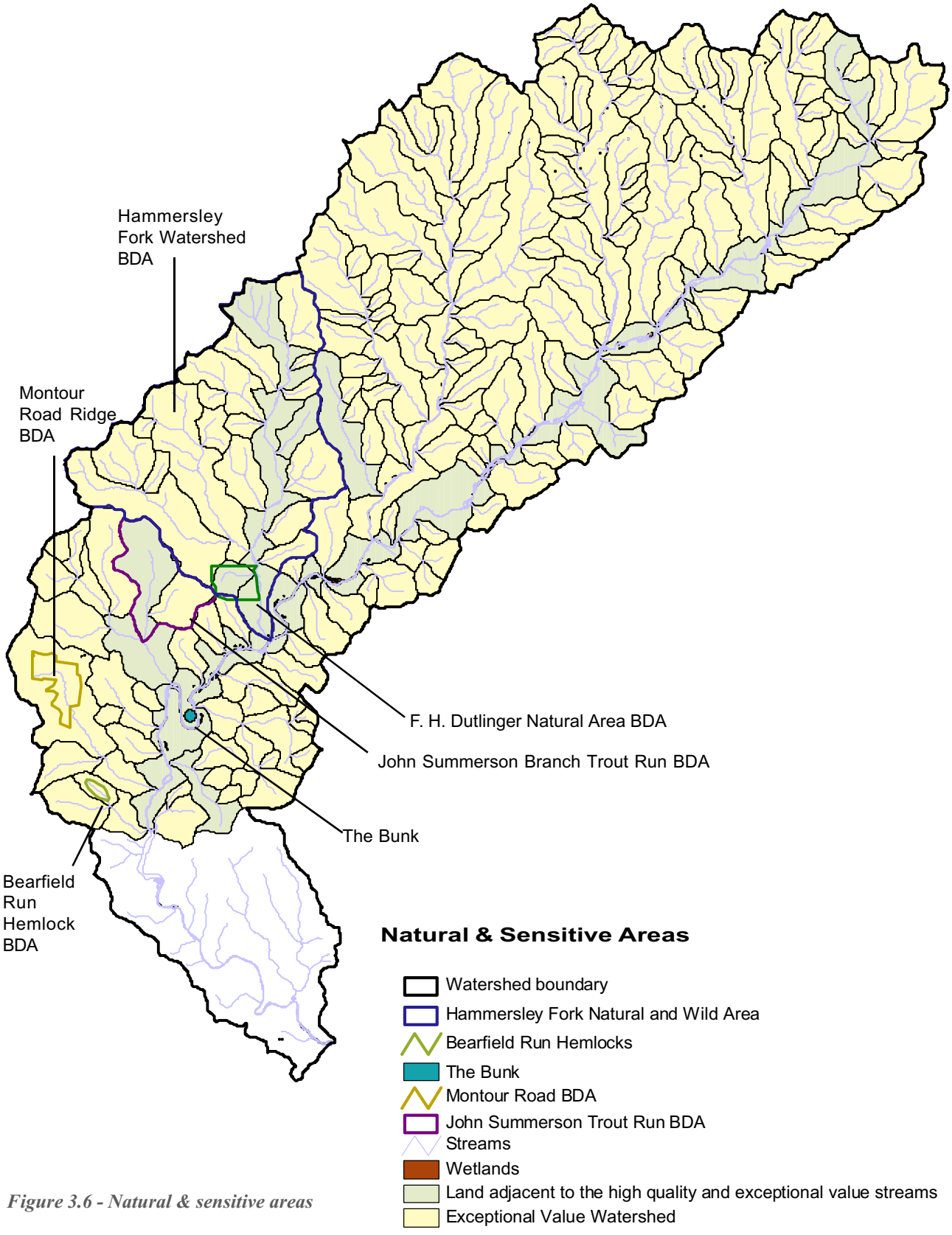


Figure 3.6 - Natural & sensitive areas

estry and the Western Pennsylvania Conservancy. Specifically in Clinton County, the inventory is a joint effort between the Pennsylvania Department of Community Affairs, the Clinton County Planning Commission, and the Western Pennsylvania Conservancy. The PNDI only assesses and ranks high quality, sizable natural communities. It includes pristine natural areas are those areas that are ecologically disturbed. In addition, it considers present conditions as well as potential future conditions for conservation management.

Following the Clinton County PNDI designations, specific areas within the watershed could be managed as sensitive areas (For more information on PNDI designations- see Appendix D, pg 286). These designated lands are a mixture of farmland, federal flood protection land, state parks, state forests, villages and residential lands. They are designated at the larger scale to connect significant natural heritage areas within the watershed. Much of land around Hicks Hollow, above the Alvin Bush dam through Hammersley Fork, is a designated PNDI conservation area. Hammersley Fork and Trout Run, tributaries that provide 1/6 of Kettle Creek's flow, are classified as "exceptional value". These areas support thriving populations of fresh water mollusks, brook trout, king fishers, osprey, bald eagles and other animals that depend upon moderate to large freshwater riverine systems.

PNDI DESIGNATED AREAS

The PNDI designated areas by municipality are listed below. (For more information on the PNDI program, see the Appendix G, page 309).

East Keating Township:

The Montour Road Ridge Biological Diversity Areas (BDA)

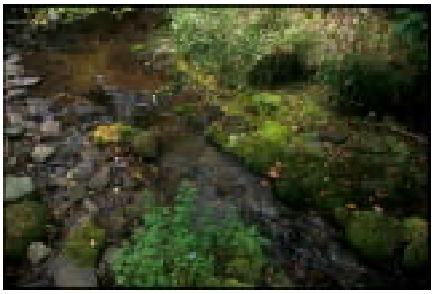
Historically, Kettle Creek has been heavily impacted by agriculture, logging and mining of coal and natural gas. This resource extraction dramatically changed the composition and structure of the watershed's biological communities. The southern portion of the watershed along Two-Mile Run is a prime example of a stream so affected by mining that few species can survive in the area. Some communities, such as those in the Hammersley Fork Natural Area, remain vibrant and should be protected.

Situated in the Hammersley Fork Quadrangle, Montour Road Ridge is a likely site for a species of special concern and its primary food source.

Leidy Township

Bearfield Run Hemlocks BDA

Located within the Hammersley Fork Quadrangle, Bearfield Run is a PNDI high significance area. On the northeastern slope of the ridge separating the right and left forks of Bearfield Run, is an exemplary old growth Northern Conifer Forest dominated by eastern hemlock. Designated as Bearfield Run BDA, this 30+ acre area shows traces of early logging and selective cutting that ended around 1904 with the closing of the last Bearfield Hollow logging camp. Presently Bearfield Run supports a thriving old growth forest of hemlock (*Tsuga canadensis*), yellow birch (*Betula lenta*), sugar maple (*Acer saccharum*) and



Natural areas are visible in every part of the watershed and lend it a unique character and identity. These areas should be protected for their visual and natural qualities.

PNDI designated sensitive areas often are classified by the presence of rare and endangered species. However, identification of these species or their exact locations is never revealed for their protection.

Beech (*Fagus sp.*). A newly widened access road that runs along the lower boundary of the area fragments the otherwise connected forest. This road, if relocated before it became a part of a larger trail system, could encourage greater connectivity within the site.

F. H. Dutlinger Natural Area (BDA)

The Dutlinger Natural Area lies within the Hammersley Fork Quadrangle in the proposed Hammersley Wild Area. Classified as exceptional significance, it is situated adjacent to and west of the flood plain where Hammersley Fork meets Kettle Creek; it includes all of Beech Bottom Hollow watershed. The Natural Area is an example of a PNDI designated area that is managed by the Bureau of Forestry. Dutlinger Natural Area is home to approximately 35 acres of Northern Conifer forest types dominated by old growth eastern hemlock in addition to a northern conifer swamp. It also houses old growth hardwood species including yellow and black birch (*Betula alleghaniensis* and *Betula lenta*), american beech (*Fagus grandifolia*) and sugar maple. The lower valley and slopes of Beech Bottom Hollow support a Mesic Central forest type dominated by beech, maple (*Acer sp.*), white oak (*Quercus alba*), white ash (*Fraxinus americana*) and cucumber magnolia (*Magnolia acuminata*).

John Summerson Branch Trout Run Watershed (BDA)

Located in the Hammersley Fork Quadrangle, the John Summerson Branch Trout Run watershed is classified as exceptional significance. It

has two unique wetland communities: a Broadleaf Conifer Swamp and a Mixed Graminiod Marsh. Although the wetland area shows little evidence of recent disturbance, the area immediately adjacent to the north reveals a history of logging. Scattered old growth white pine stumps from the early logging days and hardwood stumps from subsequent cuttings cover an open area that is now colonized by young woodland growth such as quaking aspen (*Populus tremuloides*) and white birch (*Betula papyrifera*). Sedimentation accelerated by early logging has attributed to significant changes in wildlife species composition and stream and wetland morphology.

Spicewood Saddle Wetland BDA

Located in the Hammersley Fork Quadrangle, Spicewood Saddle Wetland is classified as high significance because of a small natural pool that rests on the saddle at the top of the Spiceood Run watershed. A diversity of grasses, sedges and aquatic mosses flourish within this minimally disturbed wetland. It also supports a plant in the Lily family that is a primary food source for an animal of special concern in Pennsylvania.

Hammersley Fork Watershed BDA

Situated in the Hammersley Fork Quadrangle, the Hammersley Fork watershed, classified as exceptional significance, is a PNDI Biological Diversity Area. Hammersley Fork, a high gradient stream, is also classified as exceptional value by the PA DEP. Its expansive floodplains support rare forest communities.

Natural Geologic Site

Several miles above the Alvin Bush Dam, Kettle Creek makes two 180-degree turns before continuing south. It is probable that the oxbow formed at this site will eventually create an oxbow lake at the junction of the bottom parts of the loop. Known as the “Bunk”, this area is recognized as a natural geologic site. (Geyers and Bolles 1979 & 1987).

NOYES TOWNSHIP MANAGED AREAS

Sproul State Forest, Susquehannock State Forest, Hammersley wild Area, F. H. Dutlinger Natural Area, Kettle Creek State Park, Elk State Forest

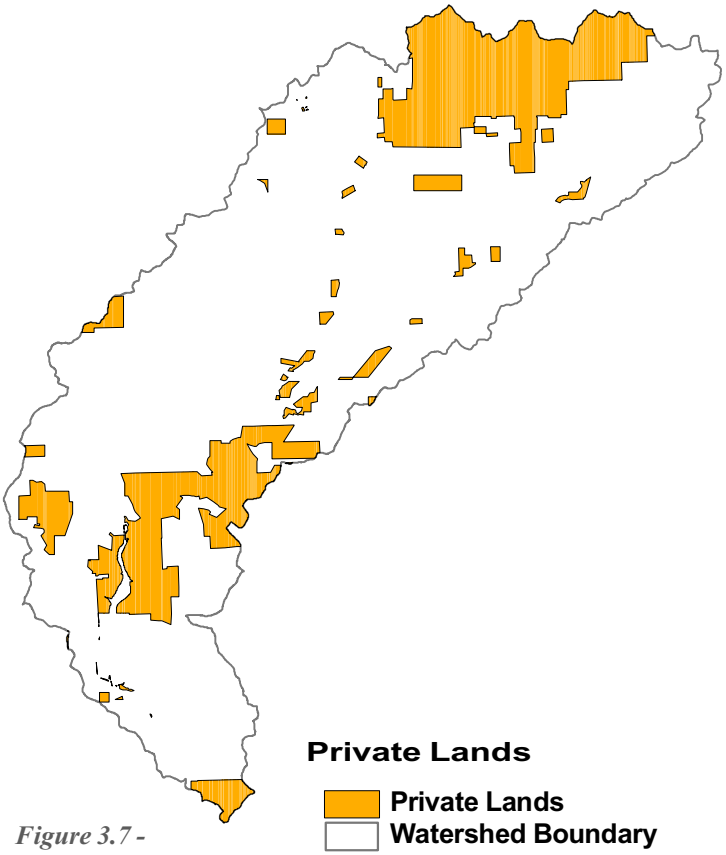


Figure 3.7 - While only 8% of the watershed is private land, these lands are located in ecologically critical areas such as headwaters and floodplains.

PRIVATE LANDS

Introduction

The sparsely populated, rural and agricultural landscape of Kettle Creek is highly valued by residents. Rural residential and agricultural lands make up a large portion of the private lands in the watershed. They furthermore contribute to the local and regional watershed character and identity. As suburban sprawl has consumed much of the open space in other watersheds, Kettle Creek has held on to its rural values. Today, in light of rising market values of land, the watershed has an even greater opportunity through the use of future landuse planning.

Private lands also have an impact on the integrity of the waters and wildlife habitat in the watershed. While only a small percentage of the watershed is privately owned (less than 10%), the majority of this private land is situated on environmentally sensitive areas such as floodplains, wetlands and headwaters. These areas provide habitat for a host of plant and animal species in addition to maintaining the high quality streams that support the thriving fisheries of Kettle Creek. These ecosystems also tend to be the most sensitive to disturbance. Managing the potential for future development or redevelopment of private lands today could serve an important role in not only maintaining the rural, agricultural character of the watershed, but also conserving the high quality waters and wildlife habitat for perpetuity.

Private Residential Lands

Rural villages of Kettle Creek watershed include Westport, Cross Fork, Oleona, Carter Camp and Germania (See Figure 3.1). Residential areas are commonly clustered around a small town center that houses a post office, fire hall, community store, local restaurant and hotel; single-family homes are common and generally house 2 people (Census Bureau 1990). Limited infrastructure such as paved roads or municipal water, power or sewage exists within the watershed.

The rural watershed village communities of Kettle Creek are closely knit. Residents know each other in these towns and congregate around the local stores, bars and community buildings. These villages foster a strong sense of community rare in other places. Homes, which date back to the beginning of the twentieth century in some cases, carry their own unique history.

Yet, just as rural development contributes positively to the character of the watershed, as discussed earlier, it also has an impact on its natural resources. Development, particularly along the floodplains, limits the amount of riparian vegetation available to filter sediment and nutrients from runoff. Infrastructure such

The local Germania store: Rural commercial development contributes to the overall character of the watershed.

A local residence in Cross Fork.

as roads, and sewage utilities create sources of sediment and nutrients to the streams (For more information on dirt and gravel roads see page 178). It is up to the community to decide how important their water quality is to them. And in Kettle Creek, the opportunity exists to carefully manage the future development, and redevelopment of private lands, in a way that ensures high water quality.

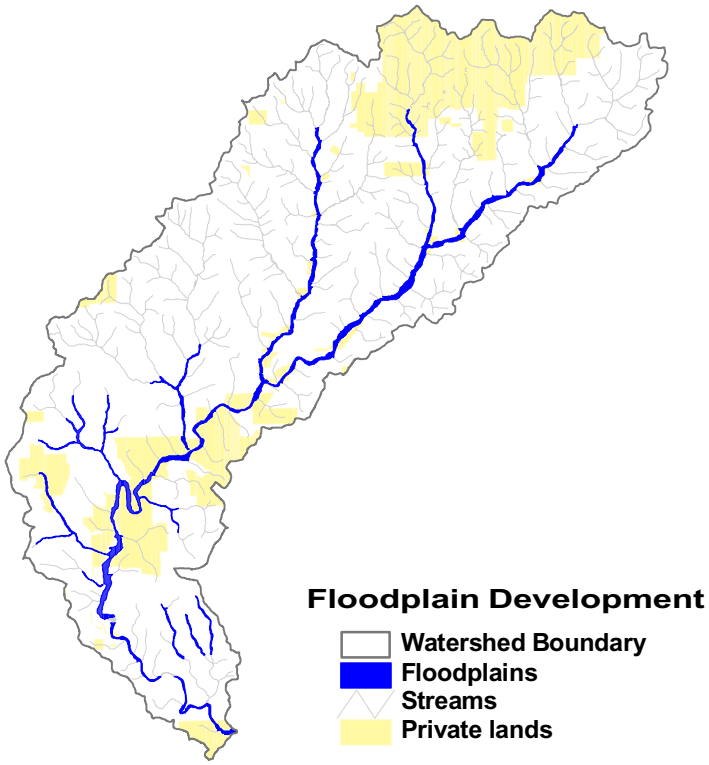


Figure 3.8 - A majority of private lands are located within the floodplain and are developed for residential and agricultural uses. This arrangement creates potential for damaging flood events.

Floodplain Development

Floodplain development is common throughout the watershed. While private residential land amounts to less than 8 percent of the total landcover in Kettle Creek, a majority of this private land is within the floodplain.

Historically in Kettle Creek, and throughout the country, floodplains have been developed for residential and agricultural use. Low-gradient topography in riparian floodplains facilitates transportation networks and building construction; a readily available water supply in addition to direct visual access to the stream has invited many to call the floodplains their home. Yet this development is vulnerable to flood damage and furthermore creates a greater potential for damaging flood events.

A picturesque view of the agricultural landscape in Potter County

Pennsylvania, specifically the north central region, is known for rolling hills and vast open fields of grains and vegetables; it is a state devoted to agriculture. However, today, commercialized, large-scale farming is out-competing smaller scale, family-owned farms. While agricultural lands are quickly declining, the market values for these lands is on the rise (Agricultural Census 1996). Smaller scale farmers are often economically driven to sell their land to developers.

Flood plains serve as an extension to a stream channel bed. During times of high stream flows, they accommodate and retain channel overflow. Vegetation roots in riparian forested areas retain soil along the stream banks limiting bank erosion and stream sedimentation. Wetlands along the stream corridor have an even greater capacity to retain and absorb excess stream flows and stormwater runoff. Development in these areas can disrupt these natural water filtration and retention processes and in turn can lead to degraded water quality and stream corridor habitat over time. Development can also have profound impacts on the overall morphology, or shape, of the stream (For more on stream morphology, see page 6)

Dirt and gravel roads, particularly those located in close proximity to the stream corridor, deliver a tremendous amount of sediment to the streams and wetlands (For a discussion of dirt and gravel roads see page 178). This results in wide, shallow streams that are vulnerable to thermal warming (For more information on thermal conditions in the watershed see page 158). Local residences and camps, while maintaining a low impact to the watershed now, if rebuilt, could infringe further into the floodplain and cause further erosion and sedimentation throughout the watershed.

Development also can increase the occurrence of flooding and the frequency of high, intense stream flows. Impervious surfaces such as paved roads - or those surfaces that do not have the ability to absorb water - limit the amount of stormwater that can infiltrate the ground; in addition they increase the speed in which water flows off into streams resulting in high velocity, short duration stream flows. This in turn leads to sporadic flooding and increased erosion and sedimentation. (To learn about stormwater, see page 177).

Private Agricultural Areas

Through time, Pennsylvania has been known for its agricultural landscapes. Portions of Kettle Creek were once agriculturally productive. Through the years, rugged topography has limited the economic viability of agriculture. Today, agricultural lands in Kettle Creek, approximately 456 acres, makeup about only 0.3% of the entire watershed area but comprise about 15% of the total private lands.

This 15% of the total private lands contributes significantly to the agricultural character and identity of both Kettle Creek and the north Central Pennsylvania region. Agricultural lands maintain available open space yet agricultural lands are declining across the watershed and the state. Smaller scale agricultural production can no longer compete with large, industrialized production. (For further information on agriculture and economy, see page 67). As farmers struggle to produce, market land values of these highly developable, flat areas are increasing. The result is farmland that is sold to commercial developers, or in some cases, such as the Poconos, resort development.

Roughly 4% of the population resides on smaller-scale farms. Common crops include corn, seed and a variety of grains such as wheat and oats.

The Farmland Preservation Program, and Agricultural Security Areas are two programs that respond to this problem of declining agricultural character. For a discussion of these programs, see page 262 in the landuse recommendations.

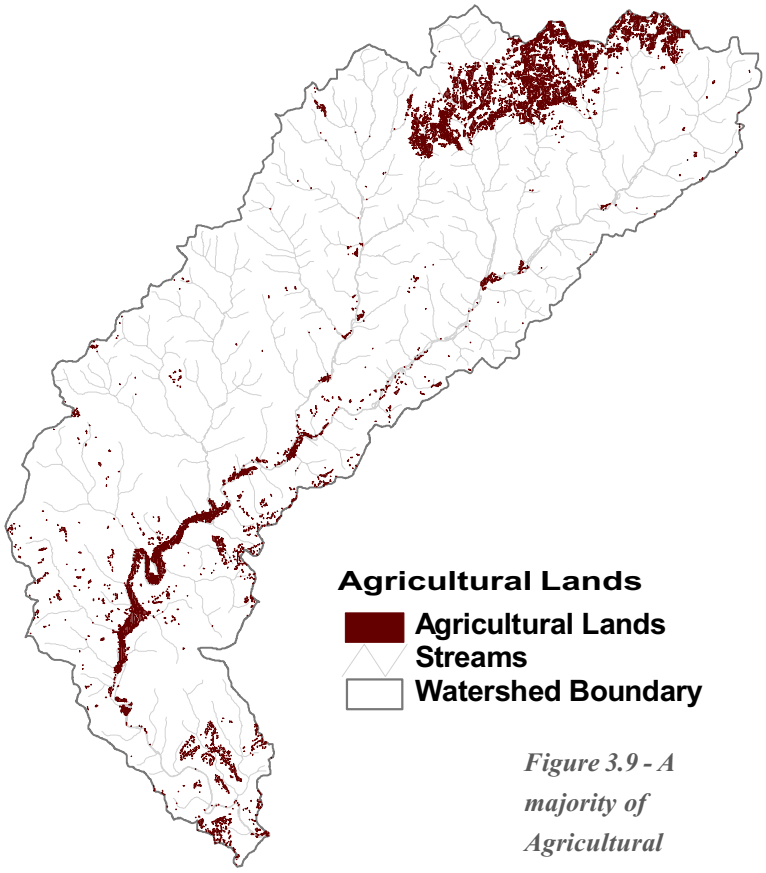


Figure 3.9 - A majority of Agricultural areas are located in the headwaters and some are also distributed along the main stem Kettle Creek.

While the majority of this land lies in the headwaters around Little Kettle Creek, Germania Branch and Sliders Branch, some is also concentrated along the mainstem of Kettle Creek and along Hammersley Fork. Much of this land is farmed for corn, oats, potatoes, hay & alfalfa and livestock (For more information on agricuture and economy see page 67).

In addition to the loss of agricultural character, a majority of the agricultural lands lie in the headwaters of Kettle Creek. As agricultural production continue to decline and the market values continue to rise, these lands carry a strong potential to be developed. These trends, combined with limited landuse protection in the northern portion of the watershed leave the headwaters of Kettle Creek vul-

The northern headwaters of Kettle Creek. The open, relatively flat rolling character of agricultural lands make them prime for development. As land market values continue to rise in these areas, the conservation of these lands, could preserve the agricultural character and identity of this area. It could also protect the integrity of this sensitive headwaters system.

nerable to industrial, residential or commercial development.

The Impact of Headwaters Development

Headwaters provide cool, clean water to a stream network. Germania Branch is an example of a headwater stream that feeds the mainstem of Kettle Creek. Kettle Creek, in turn, is a headwaters watershed of the Susquehanna River basin that ultimately flows into the Chesapeake Bay. The ecological integrity of headwaters is critical, as stream impacts in these areas will inevitably affect water quality in the subsequent tributaries downstream.

The geological context of headwater streams in addition to their function make them perhaps the most sensitive areas within the watershed stream network. Headwaters are often located in areas with shallow ground water supplies that feed water to the streams. This shallow water supply has a high potential of exposure to pollutants such as nutrients from fertilizers or livestock wastes. The low flow of water in headwater tributaries leaves them susceptible to the smallest amounts of pollution. In headwaters areas, there is a high probability of wetlands that are easily impacted by adjacent landuse. (For more on wetlands, see page 112).

The Potential For Future Development

While development pressures today are limited in the watershed, an impending increase in land value within Kettle Creek (For more information on land value see page 67) suggests a strong potential for future development - particularly in the northern portion of the watershed. Limited landuse protection further encourages commercial, residential or industrial development if sold or rebuilt. Finally, a turnover in resident population could invite new landowners with intent to rebuild or redevelop their newly acquired land.

Future development could bring with it additional roads and utility lines, impervious surfaces and other infrastructure that would infringe upon the high quality wildlife habitat and waterways within the watershed. The careful management of this development could serve to maintain the high quality watershed. (See recommendations, page 254 for a discussion of right of ways and development).

What elements in Kettle Creek are important? Is it the industrial history? The streams and abundant fishing opportunities? The rural architecture and character? Or perhaps the abundance of forest and natural areas? This decision concerning the prioritization of land conservation is left to the people and the municipalities within Kettle. Anticipating and planning for potential future development and redevelopment can effectively conserve the

natural, rural landscape that Kettle Creek is today. Landuse planning can furthermore empower a community to decide what types of development occurs in their watershed.

Municipal collaboration could allow for the successful implementation of landuse planning at the watershed level. While county comprehensive plans often seek to promote valuable land stewardship principles, these principles hold little weight without the implementation of landuse planning practices at the township level. (For more information on township authority, see page 57). While county comprehensive plans might seek to moderate future development, township and county officials must collaborate to implement this at the township level. The KCWA could become a discussion forum for this dialogue surrounding watershed wide issues and objectives. As a non-regulatory group, the association could facilitate the establishment of inter-township development guidelines that would protect the existing natural and cultural resources that are cherished in the watershed; these guidelines in turn could encourage positive growth to occur in suitable areas.

GOALS: LANDUSE

LU 1.1 Identify and prioritize high value agricultural lands for conservation.

LU 1.2 Develop and encourage the use of Best Management Practices (BMPs) on Agricultural Production lands to minimize impacts on adjacent natural resources.

LU 2.1 Monitor growth and development in the watershed.

LU 2.2 Encourage positive future residential and commercial development that not only maintains the rural architectural identity of the watershed but which also follows sustainable 'BMP' development.

LU 2.3 Encourage development in environmentally suitable areas (site suitability) and cluster new development around existing infrastructure.

LU 3.2 Designate and protect high value areas. Encourage the protection of these areas through large buffers and the promotion of natural areas or recreational open spaces.

LU 2.5 Encourage coordination between the county comprehensive plan and the township zoning ordinances.

Emergent wetlands have developed upstream of the splash dam on the upper main stem of Kettle Creek

Wetlands

Overview of Wetlands

Wetlands bring many images to mind including cattail dominated marshes, beaver ponds, and flooded timber. These places are obvious wetlands. The less obvious wetlands are the seeps and springs on hillsides or vegetated side channels away from the mainstem of a stream. All of those places are wetlands and they have similar features, such as wet soils and plants adapted to live in wet conditions. Wetlands also need a source of water such as precipitation, stream flooding, groundwater or a combination of the three.

WETLANDS

Wetlands are legally defined in the United States as:

Those areas that are saturated or inundated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (ACOE 1987 Delineation Manual).

A technical definition is used to classify wetlands, but it boils down to three parameters. They are the presence of plants adapted to wet soil conditions (hydrophytes), hydric soils (or soils that have a high capacity to hold water) and a source of water. Wetland soils are unique because they often fluctuate between conditions with or without oxygen. The fluctuation has an effect on plant assemblages.

Hydric soils are wet or saturated during the growing season with anaerobic conditions in the root zone (Wetland Soils 2001).

Wetlands are often referred to as marshes, wet meadows, shallow ponds, swamps and bogs (PADEP Fact Sheet). Wetlands provide many functions to the watershed including habitat for wildlife, cold water discharge to the streams, and water purification. The vegetation in wetlands is capable of collecting sediments and nutrients from upland sources. The nutrients become plant food and the sediments become wetland soils. Wetlands do have a pollution threshold and once exceeded, wetlands can be degraded or destroyed, as such, wetlands need to be protected. Regulations exist to protect wetlands and their functions. Several agencies including the PADEP and the United States Environmental Protection Agency (EPA) have developed rules and procedures to define and protect wetlands.

Historical Wetland Use

Historically, humans have viewed wetlands as an ecosystem with little value or function. The soils were too wet to support agriculture without hydrologic manipulation. Travel was difficult in wetlands because the soils would

not support wheeled vehicles and the standing water was often too shallow to float a boat that could carry significant cargo. Wetlands also were the haunts of mythical swamp things and mud monsters. The solution to the unproductive land "problems" was to fill, drain, or dredge a wetland so that it provided a practical anthropocentric use.

Agriculture has been the predominate force in wetland loss. The Swamplands Act (1849-1860) granted wetlands to citizens if these areas were drained for agricultural or mosquito control. The USDA inventories from 1906, 1922, 1940, and 1953 indicate that an average of 30.25 million ha (74.7 million acres) could be drained for agricultural production. Wetland losses attributed to agriculture began to decline in the 1960s. However, the newest threat to wetlands is urban development. Wetlands drained for agricultural use have the potential to be restored; however wetlands lost to urban development seldom have that same potential.

The estimated wetland acreage for the contiguous US in the late 1700s. was 89 million ha. Current estimates suggest that there are approximately 42 million ha remaining, a computed loss of 53% (Mitsch and Gosselink 1993). The federal government under the first Bush administration, circa 1990, to protect the remaining wetlands adopted a "no-net-loss" policy. No-net-loss refers both to size and function of wetlands

NWI Wetlands

The National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service produces information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats. NWI mapping initiated in 1986 using aerial photographs to demarcated wetlands which are transferred onto topographic quad sheets or digital files. Wetland scientists recognize that NWI maps do not identify a large portion of wetlands due to aerial identification methods. Wetlands that are under a tree canopy are often missed when developing NWI maps (Cole, personal communication). A wetland prediction model was developed to identify potential wetlands missed by the NWI maps by using local geology, slope, and proximity to streams.

This is a palustrine emergent wetland near Cross Fork representing plant diversity typical of wetland communities.

The wetlands potential map was ground verified in the upper portion of the watershed near Carter Camp, Dry Hollow/Leetonia Road, and Sliders branch. The pixels representing very high probability on the map were within 50 meters of wetlands occurring on ground. The model predicts an additional 472 acres of wetlands not identified by NWI inventories (814 acres) resulting in a 58% potential increase in wetland acreage (1286 acres) in the watershed. The potential acreage was calculated from the number of pixels from the Wetlands Potential map having a very high value. Each pixel is 900 m^2, during field checking some wetlands were found to be less than 900 m^2 meaning the model could overestimate the potential wetland acreage.

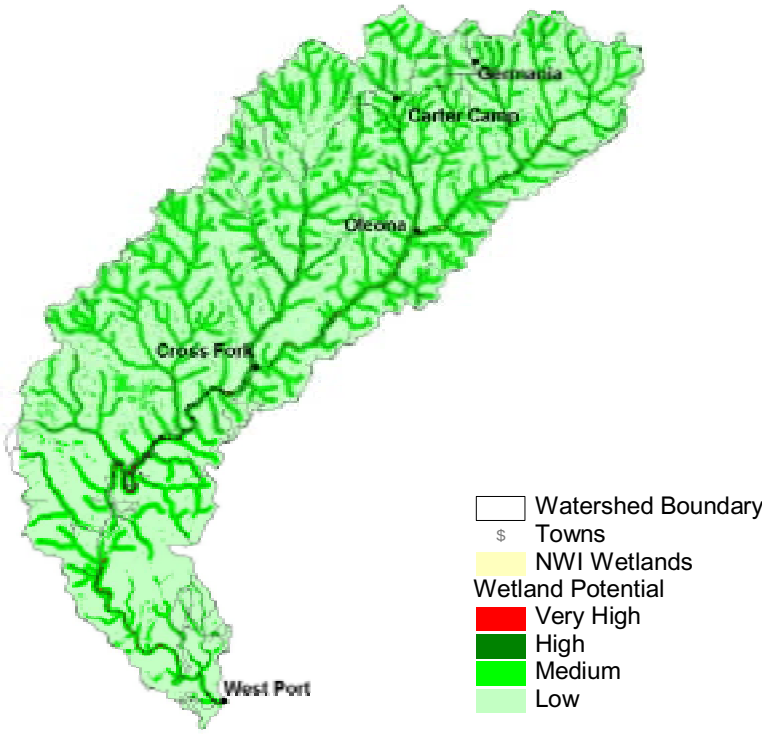


Figure 3.10 - The figure shows the high wetland potential along the main stem.

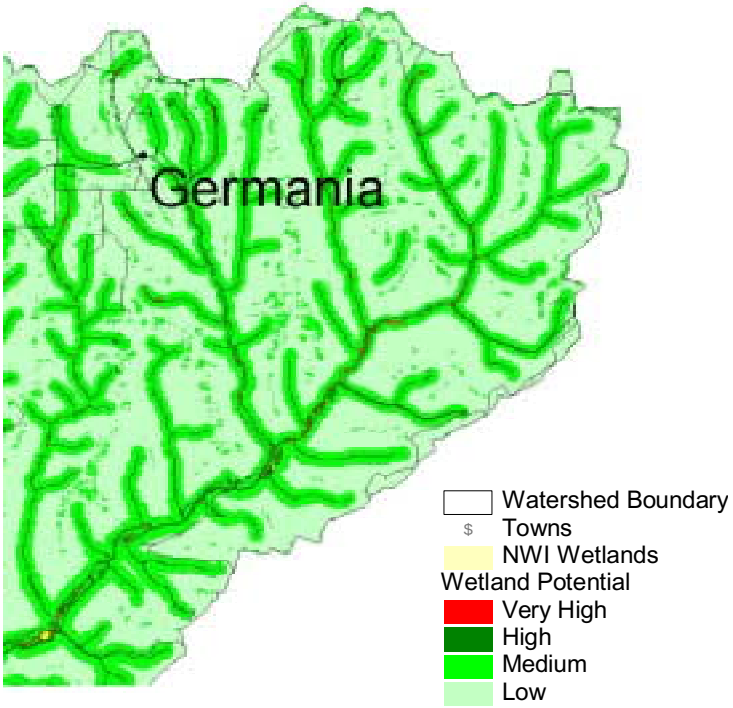


Figure 3.11 - The red pixels show the areas of highest wetland probability in the upper watershed.

Extensive ground verification is needed to validate percentage of wetlands contained in each pixel to more accurately estimate the potential wetland acreage. The model is an indicator of potential wetland resources. Because wetlands are important to water quality, it is important to consider the potential impact to water quality if broad scale landuse changes occur that impact wetlands. The streams in the upper watershed are classified as riverine wetlands by the Cowardin classification system. The streams were not included in the calculation because they have already been identified by NWI and USGS maps. The images on the following page are a watershed view and an enlarged view of the Wetland Potential map. Notice the red pixels (very high potential) in the Germania view are located adjacent to NWI wetlands denoted by yellow pixels. The high potential areas are also located adjacent to tributaries similar to NWI wetland locations in the lower watershed. (For more information on Wetland Potential Model see appendix, page 293)

Kettle Creek Wetlands

The wetlands found in the Kettle Creek watershed have been impacted by draining for agriculture, filling for road or railroad construction, and flooding when the Alvin Bush Dam was constructed. Stream channel manipulation often decreases flooding, but it also deprives riparian wetlands of flood water. Most of the wetlands identified by the National Wetland Inventory (NWI) are found adjacent to the main stem of Kettle Creek and its major tributaries. The NWI maps have been used to inventory the wetlands in the watershed and the following paragraphs will discuss the results.

The digital NWI maps have demarcated 816 acres of wetlands in the watershed. NWI maps identify wetlands based on a hierarchy starting with a general hydrologic regime i.e., rivers, lakes, or marshes (Cowardin et al. 1979). The

hierarchy then classifies wetlands by vegetation, and then physical characteristics of the plants or system type. A typical Cowardin classified wetland is a Palustrine Emergent (PEM) wetland or a freshwater marsh. The NWI maps identify three types of wetland systems in Kettle Creek watershed: palustrine (marsh), riverine (stream) and lacustrine (lake).

Palustrine Wetlands

Palustrine Emergent (PEM) wetlands are generally covered with herbaceous plants with small areas of standing water and a soft muddy soil surface. An observer would often be able to walk across this type of wetland, but might sink in the mud as they crossed. These types of wetlands are often found around seeps and springs and low spots in fields. These types of wetlands can be found above Cross Forks on the western side of the stream with cattails as a good indicator. Palustrine wetlands cover 299 acres in the watershed (See Figure 3.12). The palustrine wetlands break out into four categories emergent (113 acres), scrub/shrub (55 acres), forested (88 acres), and unconsolidated (43 acres). Most of the palustrine wetlands in the watershed are found on the floodplain of the main stem of Kettle Creek. The wetlands are closely associated with the stream because the source of water is the over bank flooding of the stream. The floodplain is also flat which results in poor drainage and the development of wetlands. Beavers are prevalent in the watershed and construct dams on abandoned stream channels and on tributaries that flow across the floodplain. The beavers create wetland complexes that persist after beavers abandon the dams.

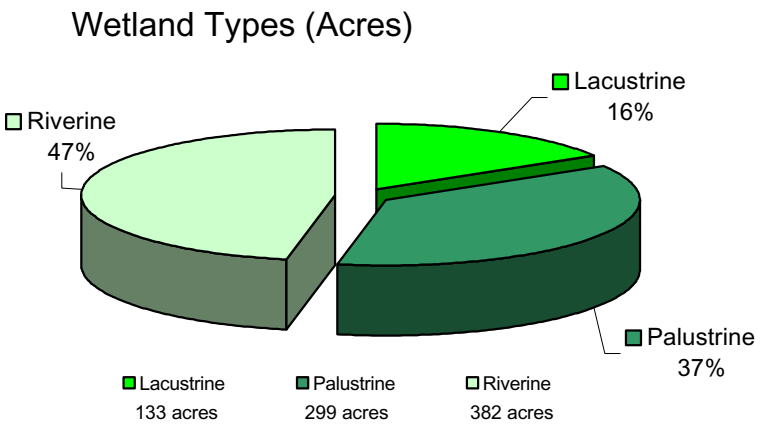


Figure 3.12 - Distribution of major wetland types in the watershed. Riverine wetlands are the major component because all streams in the watershed are considered wetlands.

Palustrine emergent / openwater wetland (PEM/POW) near Carter Camp created by a beaver dam. This site was ground verified using the wetland probability model and found to have very high potential of wetland occurrence.

Lacustrine wetland at the confluence of Kettle Creek mainstem and the Kettle Creek Lake. Lacustrine wetlands remove nutrients from the water, provide fish habitat, and stabilize sediments.

EXCEPTIONAL

VALUE WETLANDS

EV wetlands definition EV wetlands are those associated with habitat for threatened and endangered species, EV and wild trout streams, wild and scenic rivers, state designated wild or natural areas, and public or private water supplies. See the wetlands appendix on page 289 for more detailed information.

A functioning riverine wetland

Lacustrine Wetlands

The second largest wetland category is lacustrine with 133 acres. The Kettle Creek lake is considered a wetland because portions of it are shallow enough to support aquatic vegetation and the soils are saturated. However, area with water depths greater than 6 feet (2 meters) do not support rooted aquatic vegetation and are therefore not considered wetlands. The inlet of the reservoir does have a thriving wetland community. The water lillies and cattails are examples of hydrophytes.

Riverine Wetlands

Riverine wetlands are the most prevalent type in the watershed, covering 383 acres. The figure is misleading because the entire stream channel on the mainstem is considered wetlands. The stream does have saturated soils and a source of water but the majority of the flowing sections of the streams are not vegetated. Unconsolidated wetlands are abandoned stream channels and large gravel bars.

Exceptional Value Wetlands

The wetlands occurring above the Alvin Bush Dam are considered exceptional value (EV) wetlands because the streams in that part of the watershed have been classified EV. (For more information on EV streams see appendix pa. 287) . Wetlands with the EV designation are more protected because of the association with the EV stream. EV wetlands maintain the exceptional value of the adjacent streams by providing habitat for baitfish and macroinvertebrates, removing sediments, removing excess nutrients, and mitigating flood flows.

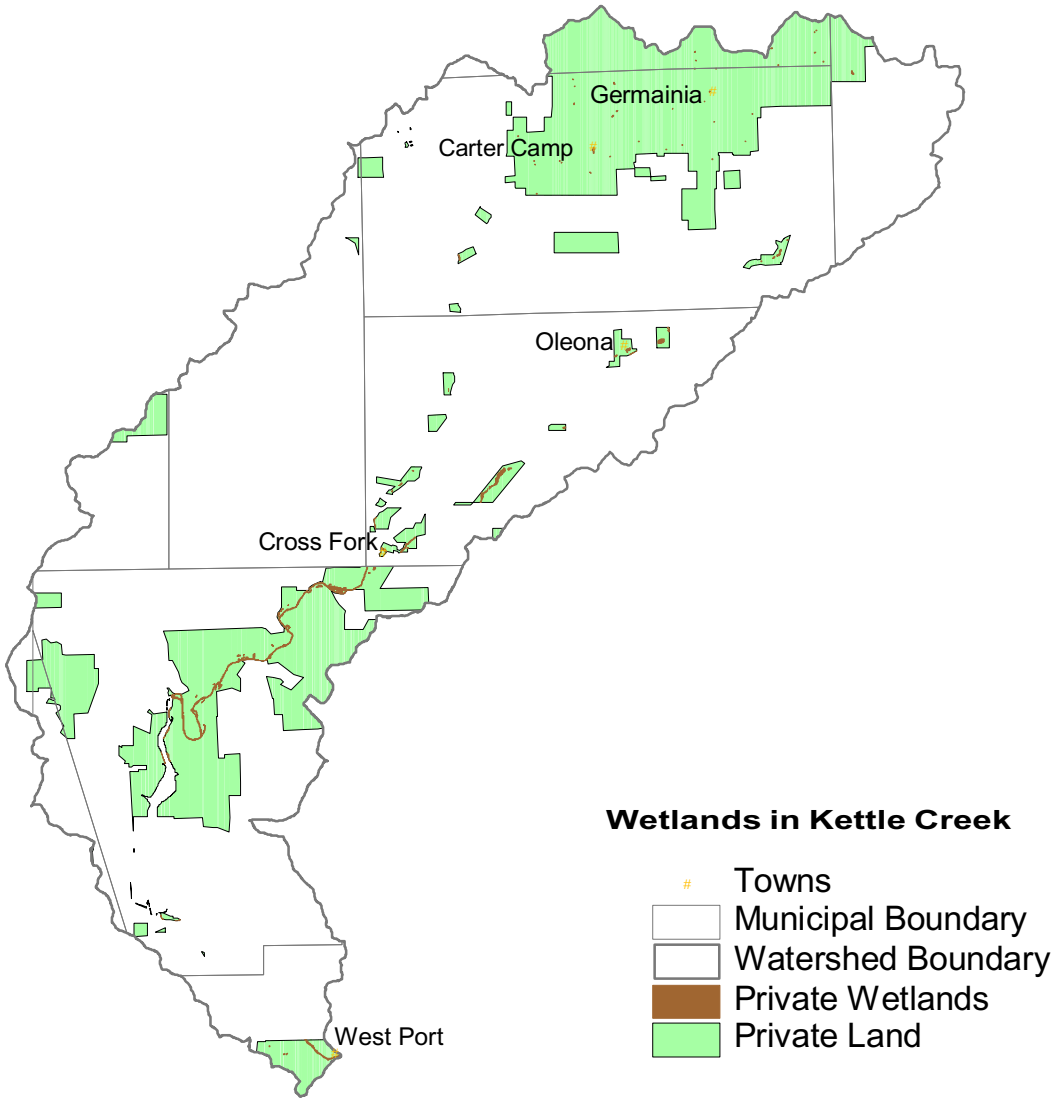


Figure 3.13 - Wetlands in Kettle Creek

Private Wetlands

The final issue regarding wetlands is the prevalence of wetlands in private ownership. Thirty-seven percent (or 297 acres) of the wetlands within the watershed are located on private lands. Wetlands found on public property are considered to be protected. Historically, privately owned wetlands are at a higher risk of degradation. Currently, the wetlands on private land are being protected and conserved and landowners are commended for these actions. Land-use policies and education activities addressing wetlands are two of the best tools available to conserve wetlands located on private lands. Private landowners can preserve and protect wetlands by not filing or draining wet areas and buffering wetland areas when developing a site. A 25 foot (8 meter) vegetated buffer would significantly protect a wetland from small to moderate disturbances on a site. Refer to the Private Wetlands map, green tinted areas are privately owned proper-

GOALS: WETLANDS

WQ 4.1 Identify wetland resource in the watershed WQ 4.2 Protect wetland resources in the watershed

WQ 5.2 Preserve and protect surface water.

LU 3.1 Educate local residents, municipal officials and business representatives about the value of wetlands.

ties and the brown shapes with in those areas are wetlands. Privately owned property makes up 8 % of the watershed, but 20 % (1410 acres) of the private property in located on the floodplain where most wetlands occur.

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