

V.
BIOLOGICAL
RESOURCES



V. BIOLOGICAL RESOURCES

A. Introduction

In 1681, King Charles II of England gave William Penn a charter to a territory of almost 48,000 square miles (30 million acres) to repay a debt owed to Penn's father. "*The soil is good, air serene and sweet from the cedar, pine and sassafras, with wild myrtle of great fragrance*" wrote Penn in an early description of Penn's Woods. Pennsylvania was largely forest (though the Lenni Lenape burned and actively farmed some of the land) upon Penn's arrival, and he recommended, "...*care to be taken to leave one acre of trees for every five acres cleared.*" Philadelphia, built strategically on the banks of the Delaware River near its convergence with the Schuylkill River, rapidly developed into the dominant city of both Pennsylvania and the new American nation in part because of the religious tolerance, strong market economy and comprehensive planning for the City. The metropolitan population of Philadelphia quickly outgrew the original city boundaries and numerous villages sprang up around its periphery. Connected to the villages was a regional network of farms and plantations, which supplied the agricultural resources that supported the growing population and economy (Source: Fairmount Park Natural Lands Restoration Master Plan, 1999).

The natural physical characteristics of the Darby Creek Watershed region have been important features in shaping its population centers and overall population density. Its geographic location, natural resources, soil and climate influenced the development of industry, agriculture, and commerce. The floodplain, the land adjacent to the stream channel, as a naturally level surface, typically developed into the principal route of transportation for horses, carriages, automobiles, and railroads.

The intense historic development within the Watershed impacted and displaced much of the original natural ecological landscape in eastern Delaware County. The absence of sound land use planning through much of its history has often resulted in poor land development that adversely impacted the Watershed. In the Twentieth Century, several significant waves of migration of people out of the City and into the suburbs substantially increased the population in the townships and boroughs located within the Watershed, particularly in the eastern region. Through much of these growth spurts, the townships and boroughs in the Watershed did not have comprehensive planning or specific land use controls that may have mitigated the adverse effects of the rapid pace and limited control on the rampant residential, commercial and industrial development. While each of these types of development are important, the way in which specific sites are developed can be beneficial or detrimental to the Watershed. Unfortunately, the results of decades of insensitive development are evident in the present-day general quality of the land, water, and natural resources of the Watershed.

In contrast, several important initiatives have preserved portions of the Watershed. In 1855, partially as an effort to protect the City's water supply, a group of civic leaders established Fairmount Park. The foresight of these leaders, and sustained efforts of many people for over a century, has given the current residents of the Cobbs Creek Watershed an invaluable woodland



resource with recreational features within walking distance of densely developed urban areas. (Source: Fairmount Park Natural Lands Restoration Master Plan, 1999).

**Land Use Categories, Developed compared to Undeveloped Uses
(DVRPC, 1995)**

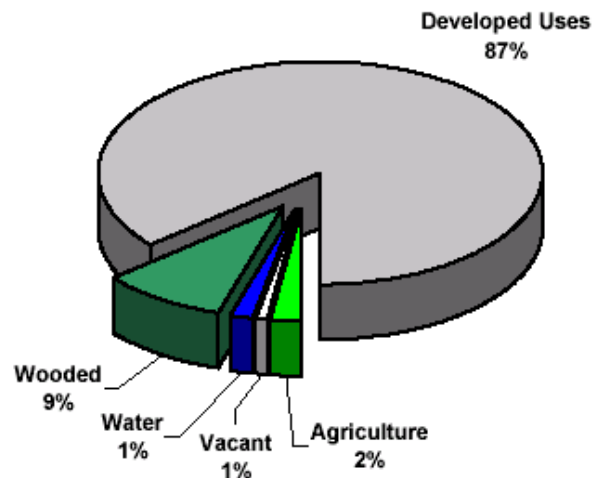


Figure V-1 Summary Land Use Within the Darby Creek Watershed (DVRPC, 1995)

Undeveloped land (agriculture, wooded, vacant and water) in the entire Watershed totals a mere thirteen percent (13%) of the Watershed’s land area, while the remaining eighty-seven percent (87%) of land area has been developed (Source: DVRPC, 1995). Figure V-1 illustrates the land cover types identified within the Watershed. The remaining wooded area within the watershed encompasses only seven square miles, and distinctly follows the valley of the main stems of Darby and Cobbs Creeks (Figure V-2). Some of the tributaries in the lower portion of the Watershed (Stony Creek, Muckinipattis Creek, and Hermesprota Creek) lack natural wooded greenways and have only small remnants of wooded islands between much larger expanses of residential, commercial, and industrial land uses.

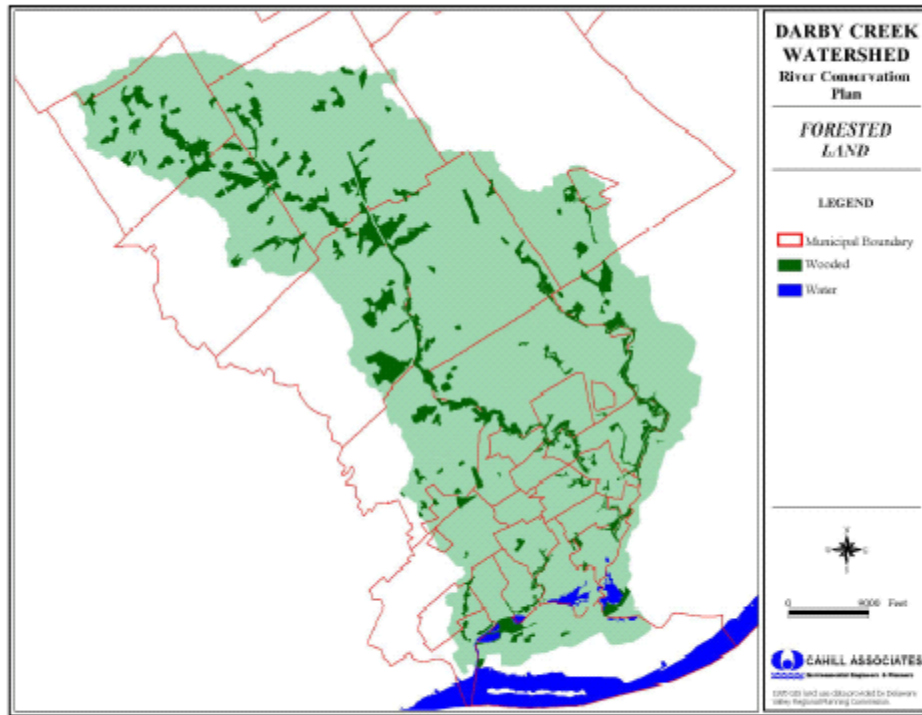


Figure V-2 Forested area within the watershed (DVRPC, 1995 land use data)

The greenway that currently exists along the stream valleys in the Watershed is its primary natural resource, although it survives as a very fragmented resource. Natural resources that occur in a patchy pattern provide only a limited natural habitat. As a result, the ecological systems within those patches generally have reduced species diversity and increased rates of species extinction, and are commonly invaded by non-native species. A Watershed-wide goal should be the preservation of the existing greenway, and it should be supplemented and restored wherever possible to connect and link the natural environmental features of the Watershed. Section VII takes this linkage discussion a step further and describes the vision of a Darby Creek Greenway that will link the remaining natural resources of the Watershed with the existing cultural, historical, and recreational resources.

B. Endangered Species at the Federal Level and Commonwealth Level

The Federal Endangered Species Act (“*ESA*”), adopted in 1973, has been the primary legislative effort to protect plant and animal species that are in danger of extinction. The purpose of the *ESA* is to conserve the remaining individuals of a listed species and develop a plan for the recovery of that species and the ecosystems upon which it depends for survival. Under the *ESA*, a species may be listed as “endangered” when it is in danger of extinction throughout all or a significant portion of its range; or “threatened”, when a species is likely to become endangered within the near future. All plant and animal species (except pest insects) are eligible for listing. The process by which a species is listed is quite complex but is the only legal means of long-term



protection for that species. Seventeen (17) species on the federal list characterized as “endangered” or “threatened” (Table V-1, Nov. 1, 2001) are known to inhabit parts of Pennsylvania.

Table V-1 Federally listed species in Pennsylvania (USFWS Threatened and Endangered Species System, 11/01/01)

ANIMALS		
Status	Common Name	Scientific Name
E	Plover, piping	<i>Charadrius melodus</i>
E	bat, Indiana	<i>Myotis sodalis</i>
E	clubshell	<i>Pleurobema clava</i>
T	eagle, bald	<i>Haliaeetus leucocephalus</i>
T	lynx, Canada	<i>Lynx canadensis</i>
E	mucket, pink (pearlymussel)	<i>Lampsilis abrupta</i>
E	pearlymussel, cracking	<i>Hemistena lata</i>
E	pigtoe, rough	<i>Pleurobema plenum</i>
E	pimpleback, orangefoot (pearlymusse)	<i>Plethobasus cooperianus</i>
E	puma (=cougar), eastern	<i>Puma (=Felis) concolor cougar</i>
E	riffleshell, northern	<i>Epioblasma torulosa rangiana</i>
E	ring pink (mussel)	<i>Obovaria retusa</i>
T	turtle, bog (=Muhlenberg)	<i>Clemmys muhlenbergii</i>
E	wedgemussel, dwarf	<i>Alasmidonta heterodon</i>
PLANTS		
E	bulrush, Northeastern	<i>Scirpus ancistrochaetus</i>
T	pogonia, small whorled	<i>Isotria medeoloides</i>
T	spiraea, Virginia	<i>Spiraea virginiana</i>

Further protection of listed species is achieved through a Federal partnership with the Commonwealth. In Pennsylvania, the responsibility for protecting Pennsylvania’s vulnerable species (plants and animals that are endangered or threatened in Pennsylvania but that are not listed on the ESA) lies with three separate state agencies. The Bureau of Forestry within the Department of Conservation and Natural Resources (“**DCNR**”, <http://www.dcnr.state.pa.us/wrcf/contents.htm>) is responsible for protecting listed plant species. The Pennsylvania Game Commission (“**PGC**”, http://sites.state.pa.us/PA_Exec/PGC/endangered/) is responsible for protecting birds and mammals and the Pennsylvania Fish and Boat Commission (“**FBC**”, http://sites.state.pa.us/PA_Exec/Fish_Boat/etspecis.htm) is responsible for protecting fish, reptiles, and amphibians. DCNR hosts a web site (<http://www.dcnr.state.pa.us/wrcf/contents.htm>) that describes Pennsylvania-listed species, their native habitat, and provides maps of historic and present distributions for some of those species. A total of sixty-seven (67) species are listed as threatened or endangered in Pennsylvania (Table V-2). One species - the passenger pigeon – is listed as *extinct* statewide, though historically it migrated throughout the Darby Creek Watershed region. According to DCNR’s records, there are ten birds, two fish, two reptiles, one amphibian, and two plants (eight endangered and nine threatened) that have inhabited the Watershed.



Table V-2 Pennsylvania listed species from PADCNr, PAGC, PAFBC; 11-01-01

Status	Common Name	Status	Common Name
BIRDS AND MAMMELS		FISH	
T	American Bittern *	T	Atlantic sturgeon *
E	Bald Eagle	T	Bluebreast darter
E	Black Tern	T	Burbot
E	Delmarva Fox Squirrel	T	Channel darter
T	Eastern Woodrat	E	Eastern sand darter
T	Great Egret *	T	Gilt darter
E	Indiana bat	E	Gravel chub
E	King Rail *	E	Lake sturgeon
T	Least Bittern *	E	Longhead darter
E	Least Shrew	E	Longnose sucker
E	Loggerhead Shrike	T	Mountain brook lamprey
E	Osprey *	T	Mountain madtom
E	Peregrine Falcon *	E	Northern brook lamprey
T	Sedge Wren *	T	Northern madtom
E	Short-Eared Owl *	T	Ohio lamprey
T	Small-Footed Myotis	E	Shortnose sturgeon *
T	Upland Sandpiper *	E	Spotted darter
T	West Virginia Water Shrew	E	Tippecanoe darter
T	Yellow-Bellied Flycatcher		
T	Yellow Crowned Night Heron *	REPTILES	
PLANTS		E	Bog turtle *
T	Box Huckleberry	E	Kirtland's snake
E	Canby's Mountain-lover	E	Massasauga rattlesnake
E	Eared False-Foxglove	T	Red-bellied turtle *
E	Glade Spurge	T	Rough green snake
E	Hispid Gromwell	AMPHIBIANS	
E	Jacob's Ladder	E	Coastal plain leopard frog *
T	Jeweled Shooting-Star	E	Eastern mud salamander
E	Large-Flowered Marshillia	T	Green salamander
E	Northeastern Bulrush	E	New Jersey chorus frog
T	Serpentine Aster *	MUSSELS	
T	Shale-Barren Evening Primrose	E	Clubshell
T	Showy Lady's Slipper	E	Northern riffleshell
E	Small Whorled Pogonia		
E	Spreading Globeflower		
E	Swamp Pink		
E	Tall Larkspur		
E	Variable Sedge *		
E	White Monkshood		

* Historically or presently found in study area

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C. Pennsylvania Natural Diversity Inventory

The Pennsylvania Natural Diversity Inventory (“*PNDI*”, <http://www.dcnr.state.pa.us/forestry/pndi/pndiweb.htm>) was established in 1980 as a cooperative project with DCNR Bureau of Forestry, The Nature Conservancy (<http://nature.org/>), and the Western Pennsylvania Conservancy (<http://www.paconserve.org/>). PNDI partners collect and maintain data, and conduct inventories to describe and identify Pennsylvania’s endangered, threatened and rare species. In addition to plant and animal species, PNDI maintains a list of the most outstanding examples of Pennsylvania’s natural communities and geologic features (“*Critical Sites*” or “*Priority Areas*”). After surveying the ecological resources of a county and identifying the outstanding species and areas, each site is ranked from 1 to 5 (1 being the highest priority) in order to prioritize conservation of these areas. The goal of the



PNDI program is “...to provide accurate and accessible ecological information needed for conservation, development planning, and natural resource management.”

In line with the goals of these various agencies, countywide reports are published to document the results of their inventories. In the Darby Creek Watershed, Chester, Montgomery, and Delaware Counties have PNDI reports available from the respective county planning departments on the species of concern. No inventory exists for the City of Philadelphia; however, the Fairmount Park Commission is actively developing an inventory of the species within Philadelphia’s urban parks.

Table V-3 PNDI / TNC Priority Sites within the Darby Creek Watershed

PRIORITY	SITE NAME	HABITAT
1	TINICUM MACROSITE	FRESHWATER INTERTIDAL MARSH
2	DARBY CREEK MOUTH MUDFLAT	FRESHWATER INTERTIDAL MARSH
3	COBBS CREEK SITE	TULIPTREE-BEECH-MAPLE FOREST
4	HVERFORD STATE HOSPITAL	OLD FIELD/DISTURBED FOREST
5	COBBS CREEK HVERFORD SITE	COASTAL PLAIN FOREST
6	WESTINGHOUSE VILLAGE	FRESHWATER INTERTIDAL MARSH AND COASTAL PLAIN FOREST
7	LEEDOM ESTATES	FRESHWATER TIDAL MARSH

The Nature Conservancy (“*TNC*”) provided an updated list of species of concern in the Darby Creek Watershed (Table V-3) and GIS datasets identifying the location of PNDI priority sites in the watershed (Figure V-3 and Table V-4). The species list and the priority area map contain the current ecological information maintained and monitored by the PNDI partners.

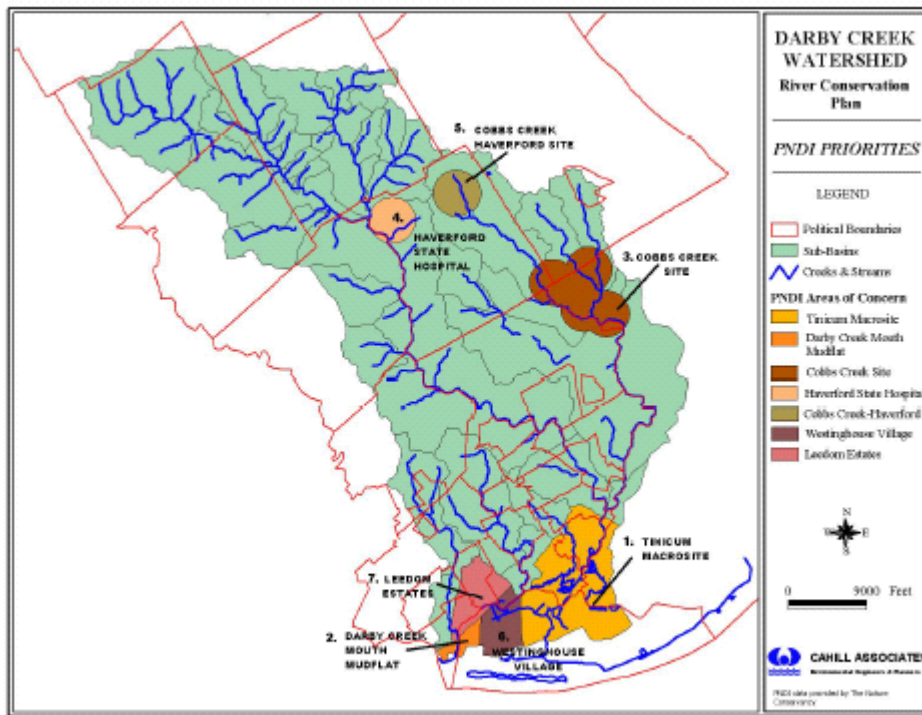


Figure V-3 PNDI Priority Areas within the Darby Creek Watershed (TNC)

The information and maps presented both here and in the PNDI reports should be used by municipalities as a guide for planning development and redevelopment within their jurisdictions, as well as a supplement to municipal open space plans.



Table V-4 PNDI / TNC Species and Habitats of Concern in the Darby Creek Watershed

Species and Ecological Communities Tracked by PNDI within the Darby Creek Watershed			
SCIENTIFIC NAME	COMMON NAME	STATE RANK	STATE STATUS
FRESHWATER INTERTIDAL MARSH	FRESHWATER INTERTIDAL MARSH	S1	
POANES VIATOR ZIZANIAE	BROAD-WINGED SKIPPER	S1	
INCISALIA IRUS	FROSTED ELFIN	S2	
LYCAENA HYLLUS	BRONZE COPPER	S2	
CISTOTHORUS PALUSTRIS	MARSH WREN	S2S3B	
NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON	S2S3B	
EUPHYES CONSPICUUS	BLACK DASH	S3	
RALLUS LIMICOLA	VIRGINIA RAIL	S3B	
TYTO ALBA	BARN-OWL	S3B S3N	
CIRCUS CYANEUS	NORTHERN HARRIER	S3B S4N	
PONTIA PROTODICE	CHECKERED WHITE	SH	
KINOSTERNON SUBRUBRUM	EASTERN MUD TURTLE	SH	
PANOQUINA PANOQUIN	SALT-MARSH SKIPPER	SH	
ATRYTONE AROGOS AROGOS	AROGOS SKIPPER	SX	
DRYOPTERIS CLINTONIANA	CLINTON'S WOOD FERN	S2	N
HETERANTHERA MULTIFLORA	MULTIFLOWERED MUD-PLANTAIN	S1	PE
ECHINOCHLOA WALTERI	WALTER'S BARNYARD-GRASS	S1	PE
ELEOCHARIS PARVULA	LITTLE-SPIKE SPIKE-RUSH	S1	PE
ELEPHANTOPUS CAROLINIANUS	ELEPHANT'S FOOT	S1	PE
LYONIA MARIANA	STAGGER-BUSH	S1	PE
QUERCUS FALCATA	SOUTHERN RED OAK	S1	PE
VERNONIA GLAUCA	TAWNY IRONWEED	S1	PE
ELEOCHARIS OBTUSA VAR PEASEI	WRIGHTS SPIKE RUSH	S1	PE
BOTAURUS LENTIGINOSUS	AMERICAN BITTERN	S1B	PE
RALLUS ELEGANS	KING RAIL	S1B	PE
CASMERODIUS ALBUS	GREAT EGRET	S1B	PE
IXOBRYCHUS EXILIS	LEAST BITTERN	S1B	PE
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON	S1B	PE
ASIO FLAMMEUS	SHORT-EARED OWL	S1B,S3N	PE
QUERCUS PHELLOS	WILLOW OAK	S2	PE
RANA SPHENOCEPHALA	COASTAL PLAIN LEOPARD FROG	S2	PE
SAGITTARIA SUBULATA	SUBULATE ARROWHEAD	S3	PR
AMARANTHUS CANNABINUS	WATERHEMP RAGWEED	S3	PR
SCHOENOPLECTUS FLUVIATILIS	RIVER BULLRUSH	S3	PR
ZIZANIA AQUATICA	INDIAN WILD RICE	S3	PR
BIDENS BIDENTOIDES	SWAMP BEGGAR-TICKS	S1	PT
ELLISIA NYCTELEA	ELLISIA	S2	PT
PSEUDEMYS RUBRIVENTRIS	REDBELLY TURTLE	S2	PT
SPIRANTHES TUBEROSA	LITTLE LADIES'-TRESSES	S1	TU
TRADESCANTIA OHIENSIS	OHIO SPIDERWORT	S1	TU
EUPATORIUM ROTUNDIFOLIUM	A EUPATORIUM	S3	TU

John Heinz National Wildlife Refuge at Tincum

John Heinz National Wildlife Refuge at Tincum (Tincum Macrosite on Figure V-3) and Little Tincum Island are ranked #1 and #2 respectively, as critical sites for maintaining biological diversity in the Watershed by the *Delaware County Natural Areas Inventory* (Source: TNC, 1992). Currently, both sites are under federal protection within the Refuge system. Although Tincum Island lies just outside of the Watershed, in the Delaware River, it is part of Tincum Marsh (the “*Marsh*”), which is the largest Freshwater Tidal Marsh natural community in Pennsylvania. The Marsh is located in the Heinz Refuge (Figure V-4) and within the Watershed. The Wildlife Refuge is important nesting habitat for wide variety of migratory and resident birds. Appendix D contains a detailed species list of the mammals, birds, reptiles, amphibians, and plants that are known to inhabit the Heinz Refuge.



Figure V-4 The "Impoundment" at the John Heinz National Wildlife Refuge at Tinicum

According to the 1992 *Delaware County Natural Areas Inventory*, eleven animal species and three plant species of special concern have been documented as residing within the Heinz Refuge. Three state listed rare inter-tidal plant species are also known within the Marsh. The Refuge's native plant community is threatened by purple loosestrife and common reed (*Phragmites*) encroachment. These two highly aggressive plants currently are found growing throughout the Marsh. Several bird species listed as rare at the state level use the Marsh area and impoundment for general and nesting habitat. A state-listed endangered animal species is also known to inhabit the Heinz Refuge. Although the Refuge is under USFWS protection, upstream activities are threatening the health and integrity of the Marsh's fauna and flora. Water pollution, in the form of sewage effluent, plastic debris, and contaminated storm water runoff is a significant threat to this important resource and its biologic diversity (Source: TNC, 1992).

Cobbs Creek Park, City of Philadelphia

The Cobbs Creek Site (Figure V-5), is listed as the third priority area by the PNDI partners, and is noted for a number of plant and animal species of special concern, as well as areas of significant natural vegetation communities. The Pennsylvania endangered plant species *Elephantopus carolinianus* (elephant's foot) inhabits Cobbs Creek Park (Figure V-6 below, From David Smith's "Delaware Wildflowers" web site, <http://www.delawarewildflowers.org/>).



Figure V-5 The Cobbs Creek Park in Philadelphia, (photo provided by NLREEP)

Cobbs Creek Park is a valuable wildlife corridor and recreational greenway in the midst of a highly urbanized environment. Though many areas of the park were logged for timber to support the growing population in the 18th and 19th Centuries, the forest within Cobbs Creek Park has been disturbed little since then and is now a moderately mature forest. A variety of habitats can be found in Cobbs Creek Park, including wetlands, floodplains, disturbed streambanks and riparian zones, and small, fragmented woods. Non-native species like Norway maple, Japanese honeysuckle, wild rose, garlic mustard, and Japanese knotweed threaten the natural diversity of flora found in the Park. Human disturbance has had negative affects on the surrounding areas of dense forest, where abuse by all-terrain vehicles and the dumping of waste, including large appliances and stolen vehicles impair the natural environment (Source: Cobbs Creek Park Master Plan, 1999). Natural Lands Restoration and Environmental Education Program (“*NLREEP*”) staff and volunteers are currently implementing an urban ecological restoration plan to restore the natural landscape within Cobbs Creek Park.

Haverford State Hospital, Haverford Township

The Haverford State Hospital property (PNDI/TNC Priority #4) encompasses the headwaters of a couple of first-order tributaries to the main stem of Darby Creek (Figure V-7). This site was listed as a PNDI priority for conservation based on the hydrologic value of this large mostly undeveloped tract of undeveloped open space. Current plans for the 212-acre site include the development of the site for residential homes with a variety of municipal recreation facilities (Figure V-8).



Figure V-7 The Haverford State Hospital Area according to 2000 DVRPC Aerials

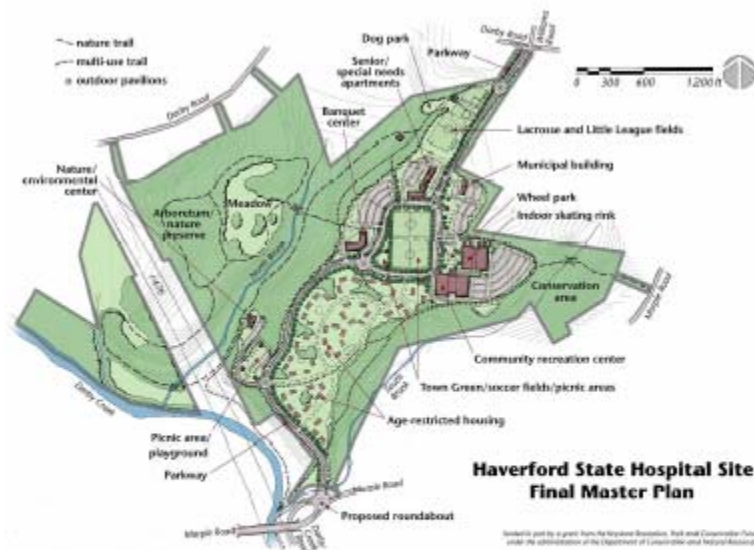


Figure V-8 Haverford State Hospital Site Final Master Plan, (www.pahouse.com/vitali/haverford)

D. Local Species Interaction

All forms of life evolve in close interaction with their immediate environment. Native plant and animal species co-evolved under a variety of local pressures to fit the conditions of their environment. Native plants have built-in capacities to handle a certain level of environmental stress and for meeting the nutrient requirements of native wildlife. However, when a new non-



native species is introduced it can have disastrous impacts on native flora and fauna that have no defenses against such invaders. Non-native species (also known as introduced species, invasive species, exotics, or aliens) cause substantial harm to existing ecosystems, second only to habitat destruction and fragmentation. Introduced into an environment in which they did not evolve, exotic species usually have fewer predators or diseases and thus their populations tend to grow uncontrolled by local biological factors. Invasive species are considered as a factor contributing to the endangered or threatened status of forty-two percent (42%) of animals and plants on the U.S. Federal endangered species list, according to USFWS.

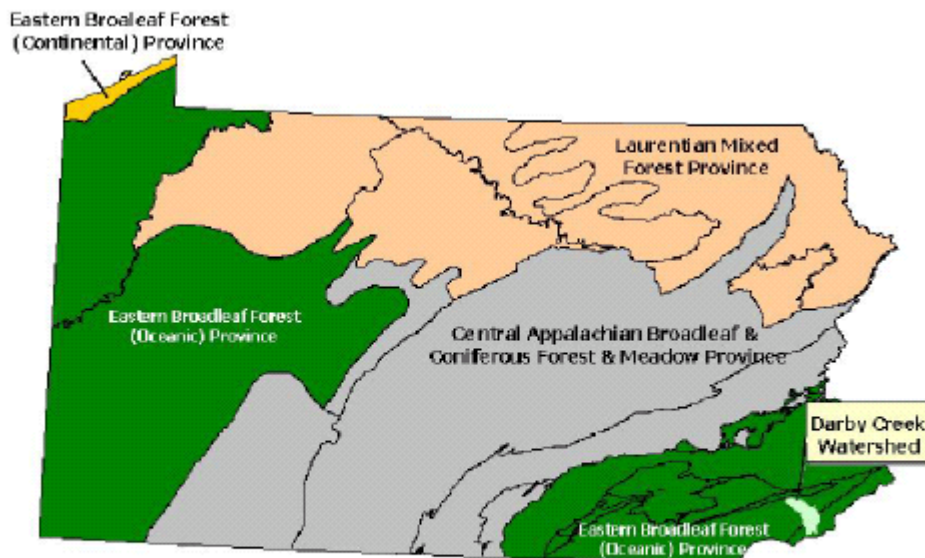


Figure V-9 The Darby Creek Watershed is located within the Eastern Broadleaf Oceanic Forest Ecoregion

The Darby Creek Watershed is situated in the *Eastern Broadleaf Coastal Forest Ecological Province* (Figure V-9). Historically this area was characterized as an oak-chestnut forest, named for the dominant native tree species the American chestnut (*Castanea dentata*). Up until the early 1900's, the chestnut was a major tree co-dominating forests in the region, reaching over one hundred (100) feet in height and occasionally numbering more than any other tree species. Ecologically and commercially, this species was important throughout much of Eastern North America. But by 1940, three and a half billion American chestnuts perished from blight, a Chinese fungus brought into America accidentally on a shipment of Asian nursery stock. The lethal fungus spread rapidly throughout the eastern forests, dispersed by wind, rain, birds and other animals, resulting in one of the worst ecological disasters in North American history. The chestnut (Figure V-10) is now considered biologically extinct throughout the region. Chestnut blight is but one example of the potentially catastrophic impact that an introduced species can have on a previously healthy ecosystem. This is not the only devastating event associated with the introduction of non-native plant species.



Figure V-10 The American chestnut tree was once common in Eastern North America

Vegetation and Flora – Native and Introduced

The Pennsylvania Flora Project, initiated by the Morris Arboretum of the University of Pennsylvania provides an online database of plant species found in Pennsylvania, searchable by many attributes, including native/introduced, federal/state status, growth habit, wetland status, or federal/state noxious weed status (<http://www.upenn.edu/paflora/index.htm>). Other than the American chestnut (*Castanea dentata*), the only tree species listed as extirpated in Pennsylvania is the Atlantic white cedar. The Atlantic white cedar is a wetland species that formerly occupied the freshwater tidal swamps in Pennsylvania's coastal plain region. The dramatic decline of the once common Atlantic white cedar is attributed to harvesting without replanting, hydrologic alteration through filling of wetlands and cutting off tidal flow from its habitat. The American elm (*Ulmus americana*) population is on the verge of becoming the next tree species listed as extirpated because it has been severely impacted by the introduction of Dutch elm disease (www.na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm).

The eco-region within which the majority of the Watershed lies is predominately Appalachian mixed-oak forests. Appalachian mixed-oak forests are characterized by a predominance of white oak (*Quercus alba*), black oak (*Q. velutina*) and northern red oak (*Q. rubra*) trees. A wide variety of other deciduous or evergreen trees that are native to Pennsylvania also are found within the Watershed (elm, sycamore, pin oak, red maple, sugar maple, silver maple, white ash, American beech, river birch, black birch, sassafras, black cherry, tulip tree, shagbark hickory, black walnut, eastern hemlock, pitch pine, sweetgum, etc. Introduced species that are known throughout the Watershed include Norway maple, blue spruce, white spruce, Austrian pine, scotch pine, horse chestnut, tree-of-heaven, princess tree, silktree mimosa, weeping willow, arborvitae, Japanese maple, etc. Many of these trees were planted originally as residential landscape plants and have escaped and proliferated. A portion of the Watershed lies within the Coastal Plain Forest eco-region. Most of the Watershed's land within this region has been heavily developed, with the exception of the John Heinz NWR at Tinicum. The forest species within this eco-region are better adapted to living in a saturated soil environment. The native tree species that would predominant the Coastal Plain region, if it were undisturbed, would include; red maple, black gum, sweet gum, pitch pine, Atlantic white cedar, pin oak, green ash,



black willow, willow oak, southern red oak. There is little if any of the Coastal Plain forest left in the Watershed.

Some typical native shrubs that occur in the Watershed include witch hazel, rhododendron, mountain laurel, Viburnum, dogwood, elderberry, and spicebush. Non-native shrubs that have invaded the shrub layer include, bush honeysuckle, wild rose, privet, burning bush, and Russian olive. Native vines found in the Watershed include bittersweet, poison ivy, grape, and Virginia creeper. Non-native vines include Japanese honeysuckle, Asiatic bittersweet, and wisteria. Within the watershed, there are several invasive plant species that have become (or are becoming) a substantial problem for the local ecosystem, they include common reed (*Phragmites*), purple loosestrife, Japanese knotweed, Asiatic bittersweet, English ivy, Pachysandra, and kudzu.

Some common native wildflowers that occur within the Watershed include jack-in-the-pulpit, May apple, dogtooth violet, spring beauty, phlox, purple coneflower, eastern columbine, brown-eyed susan, speedwell, and milkweeds.



Figure V-11 Kudzu vine over a stream bank on the Little Darby Creek in Radnor Township

Many cultivated flower species used in landscapes have escaped and are causing substantial harm by replacing the native species. Common reed has taken over most of the freshwater marshes in the Watershed, out-competing the diverse native species. Kudzu, a high-climbing perennial vine from eastern Asia, is an extreme example of a highly invasive exotic vine. Kudzu is abundant throughout the southeastern United States and is encroaching northward. Kudzu grows on roadsides and railroad embankments, in vacant lots, in timberlands, and fields, engulfing killing all the native vegetation in its path. Figure V-11 shows an area within the Darby Creek Watershed where kudzu has invaded the landscape. Over-browsing by an uncontrolled deer population within the Watershed has also increased the problem of invasive plants. Deer (Figure V-12) have adapted to consuming only native plant species, leaving the non-native/exotic species untouched. There are no natural predators for deer in the Watershed so their population has been growing uncontrolled by predators to a density greater than the



ecosystem can support. Removal of invasive shrubs, vines, and wildflowers on public land should be implemented immediately in accordance with the goals of this Plan (see Section VII) and educational efforts should be undertaken to alert the public to assist with efforts to control the adverse effect of these invasive flora on private property.



Figure V-12 White-tailed deer (Odocoileus virginianus) is a common sight in urban watersheds

Wildlife

Inherently connected to the flora within the mixed-oak forest is the associated fauna. A healthy vegetative community includes an assemblage of plants and animals coexisting and interacting. There is little if any formal documentation regarding the type and distribution of the Watershed's wildlife species. Some sources of information are available for wildlife, including:

- species checklists and observations at Heinz Refuge;
- species lists from birding clubs such as the Audubon Society, and
- existing fauna inventory from the Cobbs Creek Master Plan.

Presumptions can be made, regarding what wildlife species occur in the Watershed, but more information needs to be compiled in order to accurately characterize the Watershed's wildlife. In urban settings like those that predominate much of the Watershed, most of the remaining mammalian wildlife species are nocturnal and are therefore not easy to observe.

Mammals

White-tailed deer, chipmunk, woodchuck (groundhog), opossum, skunk, red fox, eastern cottontail, raccoon, flying squirrel, bat, muskrat, eastern mole, rat, field mouse, and the ubiquitous gray squirrel are common mammalian species that occur throughout the Watershed. These species are known throughout the rest of the state. The Watershed lacks species diversity as a direct result of the elimination of habitat. Few animals, other than those listed above, are able to co-exist with the level of human activity within most of the Watershed.

Birds

Of the world's 9,700 bird species, almost 4,300 occur in the Americas. Of most concern to scientists is that 353 of these are classified as threatened with extinction, and many more are suffering from long-term population declines. Pennsylvania harbors a significant portion of the world breeding population for many forest bird species as well as over-wintering and migration



habitat. Local organizations, including the Pennsylvania Audubon Society, Valley Forge Audubon Society, Birding Club of Delaware County, and others are promoting conservation, education, and habitat restoration for bird species within the Watershed area. Habitat loss and fragmentation are the most serious threats facing populations of birds across America and locally within the Darby Creek Watershed. Unless the continued rapid destruction and degradation of habitat can be slowed, populations of many birds may decline to dangerously low levels.

The John Heinz NWR is the premiere birding spot in the watershed, especially during migration season. Appendix D provides a list of bird species seen at the Refuge. This list represents the official Refuge “check-list” for visitors; about half of the species listed are migrants or accidentals, while the remainder are known to nest on or near the refuge. The Important Bird Area (“*IBA*”) Program (managed by the National Audubon Society http://www.audubon.org/bird/iba/state_coords.html and coordinated through state offices) is a worldwide effort to identify and protect outstanding habitats for birds and is pivotal to a continent-wide bird conservation strategy. Pennsylvania was the first state to develop an IBA program in the United States. Based on strict scientific criteria, a group of scientific advisors (known as the Ornithological Technical Committee) selected 73 Important Bird Areas encompassing over one million acres of public and private lands within the state. The John Heinz NWR at Tinicum is the only IBA in the Darby Creek Watershed. This important birding area contains migratory staging areas, winter-feeding and roost areas, and prime breeding areas for over 280 species of songbirds, wading birds, and other species. The technical committee, on an ongoing basis, selects additional IBA sites in Pennsylvania. Future work of the IBA program will include the development of volunteer bird monitoring efforts, public education, conservation and management plans, and identification of additional IBAs. Important Birding Areas are a PADCNR conservation priority, and funding is available to help plan or acquire potential areas.

E. Cobbs Creek Biological Assessment

The Philadelphia Water Department, the Academy of Natural Sciences, and the PADEP, have been developing a biological database to assess the aquatic integrity of Cobbs Creek. The database includes data collected from macroinvertebrate, ichthyic fauna, and habitat evaluations at locations in the Cobbs Creek and Darby Creek Watersheds. Appendix E contains location maps and data tables from the evaluations. See <http://www.darby-cobbs.org/>, the Partnership website for more information.

Fish (ichthyic faunal) Sampling: There are three sample stations on Cobbs Creek, one on Naylor’s Run, and one on West Branch Indian Creek. In general, sampling results show that fish abundance (number), richness (number of taxa) and species diversity (variety) varied greatly among the five locations (see Appendix E). Though results indicate a relatively diverse community, four of the dominant species were classified as pollution tolerant. In fact, pollution tolerant or moderately tolerant fish assemblages dominated all five sites. No sampling sites “...contained individuals classified as pollution intolerant, indicating the probability of episodic periods of impaired water quality or habitat degradation.”



Benthic (macroinvertebrate) Sampling: Seven sites were chosen for the benthic sampling, where EPA Rapid Bioassessment Protocols III and PADEP Modified Rapid Biological Assessments were performed. After completion of the total biological scoring criteria, each site was compared to a site-specific control/regional reference station in an attempt to create a baseline for monitoring trends in benthic community structure. Based on the percent comparison to reference score, each site was classified. Six sampling sites were scored moderately impaired and one site received a severely impaired score. Results from all seven sampling locations indicate a moderately high pollution tolerant benthic community.

Aquatic Habitat Assessment: Habitat assessments were completed at the seven benthic-sampling sites using 12 different habitat parameters so that each site could be graded. Five out of seven sampling sites were partially supporting when compared to reference stations. Only one site received a habitat assessment scored as comparable to the reference and one site was scored as Supporting (see Appendix E).

F. DCVA Biomonitoring Project

DCVA received USEPA funding for a stream biomonitoring program in 1996. Benthic macroinvertebrate samples were collected at five sample locations on Darby Creek. USEPA staff assisted in the identification of the benthos and population metrics that were calculated to assess the health of the creek. Population metrics decreased downstream, indicating decreasing water quality and increasing habitat degradation. No significant water quality sampling programs followed the 1996 program. DCVA recently resumed (summer 2001) benthic monitoring at a single Darby Creek site, and hopes to continue sampling in the future.

G. Outstanding or Unique Features

Indian Rock Park, Springfield Township

The park is a steeply wooded slope above Darby Creek, noted for its mature canopy trees. The woodland provides significant habitat for wildlife, recreational opportunity (hiking, fishing, and rock climbing) as well as providing protection in the Creek. Indian Rock is located in Upper Darby Township across the creek from Indian Rock Park, and other significant rock outcroppings occur along the hiking trails in the area (Figure V-13).



Figure V-13 Outcropping of rock along the banks of the Darby Creek

Ithan Creek Wetland, Radnor Township

This area was identified by the PNDI as an area of local significance. The wetland is bordered by the Blue Route, Bryn Mawr Avenue, Ithan Creek, and a residential neighborhood. It offers wildlife habitat and local landscape diversity and water quantity benefits.

Jenkins Arboretum, Radnor Township

Provides multiple benefits to the Watershed. Jenkins Arboretum was developed as a public garden in 1976. Its woodland ecosystem, large pond, and stream preserve the diverse plantings of native trees, wildflowers, ferns and over 1,000 varieties of azaleas and rhododendrons.

Chanticleer, Radnor Township

Chanticleer is a 30-acre pleasure garden, which includes thousands of spring bulbs, orchards with flowering trees, and native wildflowers blooming in the woods. It is open to the public and a modest fee is charged for access.

Villanova Arboretum, Radnor Township

The campus of Villanova University has contributed to conservation in the Watershed for over 150 years. It includes rolling hills, 1,500 trees, and some historic flora including 35,000 daffodils.

H. Issues, Threats, Opportunities

The primary threat to the remaining biological and ecological resources in the Watershed is habitat fragmentation resulting from development. The bits of isolated protected land, be it a township or county park, or open space are scattered throughout the landscape. Open space generally follows the stream valleys in the Watershed. These isolated areas are vulnerable to invasion by non-native species and reduction of biological diversity. With careful planning and

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coordination of existing and future conservation activities, the Watershed's stakeholders can develop a greenway, which will protect and preserve important biological resources.