NATURAL RESOURCE INVENTORY

Voorhees Township
Camden County, New Jersey

VOORHEES
TOWNSHIP

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INTRODUCTION

This Natural Resource Inventory (NRI) for Voorhees Township has been compiled pursuant to the authorization of the Mayor and Township Committee in order to obtain a Sustainable Jersey Certification.

Sustainable Jersey is a certification program for Municipalities in New Jersey that want to take steps to sustain their quality of life over the long term. The organization is a non-profit that provides tools, training and financial incentives to support and reward communities as they pursue sustainability programs. Certification is achieved by earning 150 points received by completing a list of action items. An NRI is considered to be a priority action as it provides a resource for the land use decision-making process.

Additionally, in accordance with Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.), a municipal Master Plan is required to contain a land use plan element. An NRI is a compilation of basic environmental information that is an essential supplement to a land use plan. This document is therefore intended to be utilized by Voorhees Township Environmental Commission, Planning and Zoning Boards, and Township Committee to aid in the identification of significant natural resources and the evaluation of environmental issues in land use planning.

Maps for this NRI were generated using Geographic Information Systems (GIS) software. A GIS facilitates the linking of digital spatial data that define the location and boundaries of natural and cultural resources to databases that contain information identifying the characteristics of each resource. Data used in this project was obtained from secondary sources including the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Geological Survey (NJGS), the New Jersey Geographic Information Network (NJGIN) the New Jersey Office of State Planning, the Delaware Valley Regional Planning Commission (DVRPC) and the Soil Survey Geographic Database (SSURGO). Most data sets were used as received from the source agencies, but some

were partially modified to include changes that have occurred since the original data was acquired or to include local information.

POPULATION

Voorhees Township comprises an area of approximately 11.6 square miles. The Township population recorded in the 2010 Census was 29,131. Substantial growth was recorded between 1950 and 1990 where the population grew 1,247%, from 1,823 to 24,559. Although population growth has continued since 1990 it has drastically slowed down, recording a 14.5% increase from 1990 and 2000 and a 3.6% increase from 2000 to 2010. (See Table 1 Population Trends) Population increase in Voorhees has been directly related to new residential development.

TABLE 1

POPULATION TRENDS

Year	Population
1900	969
1910	1,174
1920	1,305
1930	1,405
1940	1,450
1950	1,823
1960	3,784
1970	6,214
1980	12,919
1990	24,559
2000	28,126
2010	29,131

CLIMATE

Voorhees Township has a continental climate and is located in the Southwest Zone of New Jersey. Its close proximity to the Delaware Bay adds a maritime influence to the climate. The moderating effect of the water also gives the region the longest growing season in New Jersey. Autumn frosts typically occur approximately four weeks later than in the North and the last spring frosts are about for weeks earlier.

This region receives less precipitation than the Northern and Central Regions and typically has the highest average daily temperatures. Rainfall averages approximately 46.6 inches per year with July averaging the highest amount. Total annual snowfall accumulates at an average of 30 inches. Prevailing winds are from the southwest during the summer months and west to northwest winds throughout the winter season (Office of NJ State Climatologist).

LAND USE

The Delaware Valley Regional Planning Commission (DVRPC) has mapped fourteen different types of land use within Voorhees Township as of 2010. These land use types are interpreted from aerial color infrared photography, and do not reflect changes in land use that have occurred since the data was acquired. Brief definitions of each land use category mapped in Voorhees were provided by DVRPC and are provided in this section. Map units representing wetland areas are described in the Freshwater Wetlands section.

Residential

This map unit includes Single-Family detached units where lot boundaries are evident; Multi-family dwellings including duplexes, apartments, condominiums, etc; Row Homes defined as a series of connected single-family houses forming a continuous group; and Mobile Homes in areas containing a large group of transportable single-family dwellings.

Commercial

This map unit includes land areas that contain structures predominantly used for the sale of products and services. Examples include central business districts, malls, strip malls, shopping centers, hotels and motels and warehousing and distribution centers. All landscaped areas associated with a Commercial area are also included in this category.

Manufacturing

This category includes industrial parks and small-scale manufacturing assembly.

Military

Military includes all military installations, such as bases and camps, armories, air bases, naval bases and air stations, and Coast Guard bases.

Mining

Mining includes any extractive use, principally quarries and sand pits

Parking

This map unit includes parking lots of ten or more spaces associated with any of the other land uses mentioned in this section

Recreation

Recreation areas are those developed for recreational activities. This includes recreational parks and playgrounds including those associated with schools, golf courses, picnic areas, camps, fairgrounds, recreational boat launches, swimming pools, theatres, stadiums and arenas, zoos, amusement parks, and non-military firing ranges.

Agriculture

Agriculture includes land devoted to crops, pastures, orchards, tree farms, or other agricultural uses. Also included are nurseries, greenhouses, sod farms, horse

farms, and cattle, pig, poultry, and dairy farms. The farmstead and associated buildings are included as well.

Transportation

Transportation includes areas devoted to rail, air, marine and highway transportation. Examples include limited-access highways (highways that are at least double lane divided) and their ramps, railroad facilities (stations, roundhouses, and switching yards), airports, and truck and bus terminals. Two lane roads and residential streets are not identified as Transportation. The Transportation category takes priority over any other coexisting land use that may be present (i.e. highways over rivers or utility rights-of-way).

Utility

Utility includes power generation and substations, major transmission lines and towers, water filtration and storage tanks, wastewater treatment, landfills and recycling centers. Reservoirs are identified as Water, not Utility. Transmission lines take priority only over certain coexisting land uses (Agriculture, Vacant, and Wooded) if present.

Vacant

Vacant lands are areas that are not clearly wooded, not agricultural, not developed, not landscaped, or are cleared or unused but not tied to other uses.

Water

Water Areas are rivers, canals, streams, lakes, reservoirs, and ponds that have two definable boundaries. Single line hydrology is not defined. When coexisting with another land use, other than Transportation, the Water land use takes priority.

Wooded

Wooded (forested) areas are regions of continuous canopy or solid tree cover, woodlands, and natural lands. Hedgerows (windrows) and wooded areas associated with residences are not interpreted as Wooded.

STATE DEVELOPMENT AND REDEVELOPMENT PLAN

The New Jersey State Development and Redevelopment Plan (the Plan) was initially adopted in June of 1992. A new State Development and Redevelopment Draft Final Plan was adopted on March 1, 2001.

In 1985, the New Jersey State Legislature adopted the State Planning Act (under N.J.S.A. 52:18A-196 et. seq.). According to the New Jersey Office for Planning Advocacy, the Plan was developed because of the State's need for sound and integrated statewide planning in order to "...conserve its natural resources, revitalize its urban centers, protect the quality of its environment, and provide needed housing and adequate public services at a reasonable cost while promoting beneficial growth, development, and renewal..." (New Jersey Office for Planning Advocacy, 2000). The Plan was designed to establish statewide planning objectives "regarding land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination".

The Resource Planning and Management Structure of the Plan has two basic concepts: Planning Areas and Centers/Environs. Planning Areas are determined by type and intensity of development, proximity to existing developed areas, public and private infrastructure, and environmental resources. Five Planning Areas are defined:

- PA1: Metropolitan Planning Area - Designed to "promote growth, stabilize and revitalize communities, modernize infrastructure, and redesign areas of sprawl".
- PA2: Suburban Planning Area - Designed to "promote much of the statewide growth in centers and redesign areas of sprawl"

- PA3: Fringe Planning Area - Designed to "accommodate growth in centers and keep environs largely open"

- PA4: Rural Planning Area, which includes PA4B, the Rural/Environmentally Sensitive Planning Area - Designed to "promote a viable agricultural industry, protect large contiguous areas of farmland – including those on environmentally sensitive land – and accommodate growth in centers".

- PA5: Environmentally Sensitive Planning Area, which includes PA5B, the Environmentally Sensitive/Barrier Island Planning Area - Designed to "protect environmental resources – including large areas of open lands and sensitive barrier islands – and accommodate growth in centers".

Centers are defined as central places within planning areas where growth should be either attracted or contained, depending on the unique characteristics and growth opportunities of each center and the characteristics of the surrounding planning area in which it is located.

Environs are "areas outside centers and should be protected from the growth that occurs in centers".

Two State planning areas are designated within Voorhees Township: the Metropolitan Planning Area (PA1), and Suburban Planning Area (PA2). The largest coverage in the Township is the Metropolitan Planning Area. It should be noted that State Planning Areas generally do not coincide with the Township boundaries, but extend into adjacent municipalities. The New Jersey State Development and Redevelopment Plan should be referenced for specific details on how the designated State planning areas may affect various aspects of development within Voorhees Township. A copy of the Plan can

be obtained from the New Jersey Office for Planning Advocacy website at www.nj.gov/state/planning/plan.html.

SANITARY SEWER SERVICE AREAS

This map represents the most current sanitary sewer service areas, as provided by the New Jersey Department of Environmental Protection. The coverage shows the existing sewer service areas for the Township, for various types of existing wastewater management facilities.

The Township is serviced by the Camden County Municipal Utilities Authority (MUA) sewage collection system. Waste water is treated at the Delaware Number 1 Water Pollution Control Facility.

It should be noted that this plan is subject to change based upon Township, Camden County MUA, and NJDEP approved sewer extensions.

HISTORIC SITES

In 1998, Camden County established a trust fund of approximately $2 million for the purpose of preserving open space, recreation, farmland and historic sites within the County. The Camden County Open Space Preservation Trust Fund Advisory Committee was appointed for the purposes of providing guidance regarding implementation of the Trust Fund. Since 2000, a total of forty seven Historic Preservation projects in twelve municipalities have been funded through the program. Voorhees Township includes two sites of historic importance.

Glendale United Methodist Church – The church was constructed in 1855 on land donated by Quaker Alexander Cooper. The original uses of the Greek Revival-style structure included a co-ed public school on the lower level and a Methodist-Episcopal church on the upper level. It survives as the oldest public school in Camden County, but as of 1920, the building has not been used as an educational establishment. The Church was placed on the National Register of Historic Places in 1995. The Township received $25,000 through the Camden County Open Space Preservation Trust Fund for the preservation of this site.

Camden and Atlantic Railroad Historic District- This is railroad right-of-way that passed through the western portion of the Township. The former railroad extended from Pennsauken and Camden to Atlantic City. The railroad officially opened in 1854 and is no longer in use.

GEOLOGY

Physiography

Voorhees Township is located entirely within the Atlantic Coastal Plain physiographic province. The Coastal Plain is characterized by low lying terrain with open stream valleys and broad, gently sloping divides. Topography in the Coastal Plain is a result of the differential erosion of unconsolidated, gently dipping strata of gravel, sand, silt, and clay. Relatively resistant geologic formations erode less rapidly and typically form the higher elevations. The majority of Voorhees is at an elevation of approximately 112 feet, or 34 meters, with the lowest areas along the northwest boundary of the Township at less than 40 feet along the Cooper River. Hills with an elevation in excess of 190 feet are located in the center portion of the Township. The highest points reach approximately 210 feet and are located along the boarder of Camden and Burlington Counties (NAD83).

Stratigraphy

The Atlantic Coastal Plain is mainly composed of strata of clay, silt, sand, and gravel deposited during the Cretaceous and Tertiary geologic time periods. These layers of unconsolidated sediment lie over a basement of much older Precambrian and early Paleozoic crystalline rock (schist and gneiss). The sedimentary formations dip gently toward the southeast (10 to 60 feet per mile), and generally thicken toward the southeast (Kümmel, 1940). In Voorhees Township, it is approximately 1200 feet thick near the southwest portion of the township, near the border of Gibbsboro Borough

Each sedimentary formation of the Coastal Plain consists of a succession of strata of similar or variable characteristics that were deposited over a particular interval of geologic time. The surface outcrop patterns of the formations generally trend from southwest to northeast. On a local scale, formation boundaries typically appear irregular due to their

gentle dip and the effects of topography. Sedimentary strata of the Coastal Plain dip to the southeast, and the formations become successively younger toward the southeast. Brief descriptions of each formation that has exposure within the Township are obtained from Kümmel (1940).

TABLE 2

GEOLOGIC FORMATIONS OF VOORHEES TOWNSHIP

AGE	FORMATION	HYDROGEOLOGIC UNIT	THICKNESS (Feet)
Tertiary (70 mya)	Cohansey Sand	Kirkwood-Cohansey Aquifer System	0-30
	Kirkwood Formation		100
	Vincentown Sand	Vincentown Aquifer	100
	Hornerstown Marl	Confining Unit	30
Upper Cretaceous (70-100 mya)	Navesink Formation	Confining Unit	25-40
	Mount Laurel and Wenonah Sands	Wenonah-Mount Laurel Aquifer	40-80
	Pre-Cambrian/Lower Paleozoic Schist and Gneiss	Bedrock Confining Unit	----

Adapted from Pucci, Gronberg, & Pope (1989)

Mount Laurel Sand and Wenonah Formation (Kmw)

The *Mount Laurel Sand and Wenonah formations* are grouped together into a single unit. The lower section of this unit is the Wenonah, which consists of fine-grained micaceous quartz sand that is conformable to the underlying Marshalltown. The Mount Laurel is the upper section and consists of coarser grained quartz sand that is variably glauconitic. Sediment in both formations was deposited in a near shore marine environment. Combined thickness of the units ranges from 40 to 80 feet. The Mount Laurel sand generally constitutes an aquifer.

Navesink Formation (Kns)

The *Navesink formation* consists of green to black glauconitic quartz sand and clayey sand deposited in a marine environment. The Navesink is conformable to the underlying Mount Laurel sand and the overlying Red Bank sand. Thickness ranges from a maximum of 40 feet to less than 25 feet. The Navesink is a hydrogeologic confining unit.

Hornerstown Marl (Tht)

The *Hornerstown* formation consists of dark green glauconitic sand and clay beds deposited in a marine environment. The Tertiary Age Hornerstown unconformably overlays the Cretaceous Age formations below. Total thickness is up to 30 feet. The Hornerstown is a confining unit.

Vincentown Sand (Tvt)

The *Vincentown* formation contains two facies (zones of distinct composition within the formation). One facies consists of calcareous sand with abundant marine fossils. A second facies consists of glauconitic quartz sand. The calcareous facies is dominant in Camden County. The Vincentown conformably overlies the Hornerstown, and is up to 100 feet thick. The Vincentown can potentially yield moderate quantities of water, but its occurrence in Voorhees is not extensive.

Kirkwood Sand (Tkw)

The *Kirkwood* formation consists of light-colored fine-grained micaceous quartz sand deposited in a near shore marine environment and unconformably overlying the Vincentown sand. Black lignitic clay occurs in some localities at the based of the Kirkwood. Total thickness of the Kirkwood is up to 100 feet. Portions of

the Kirkwood are aquifers, and its occurrence is extensive within the central portion of Voorhees Township.

Cohansey Sand (Tch)

The *Cohansey* formation dominantly consists of quartz sand, although it locally may contain thin clay seams (laminae), thicker clay lenses, or lenses of gravel. Cohansey sediments were deposited in a near shore environment, generally disconformably overlying Kirkwood sands. The Cohansey is an important water table aquifer throughout much of the Coastal Plain. Its occurrence in Voorhees Township is restricted to the southern portion of the town.

According to the NJDEP Technical Manual for the Flood Hazard Control Act (FHA) rules, three (3) of these formations (Marshalltown, Navesink, and Kirkwood) may contain iron sulfide minerals (pyrite or marcasite), that if exposed to air for a period of time can produce sulfuric acid. This material can drastically impact new and proposed vegetative cover and cause water pollution. The handling of this material should be done in accordance with the aforementioned NJDEP FHA Manual.

AQUIFERS

Aquifers are saturated geologic formations capable of yielding significant quantities of water under conventional pumping pressures. An unconfined aquifer is a near surface aquifer that has the water table as its upper boundary (also called a water table aquifer). A confined aquifer is a fully saturated unit bounded above and below by relatively impermeable formations called confining units. Aquifers underlying Voorhees Township include the Kirkwood-Cohansey aquifer system, the Mount Laurel - Wenonah aquifer, and a composite confining unit aquifer within the Hornerstown marl and Navesink formations.

The Kirkwood-Cohansey aquifer system is made up of the Kirkwood and Cohansey Formations and spans throughout nearly the entire New Jersey Coastal Plain. The Cohansey Formation is comprised mostly of sand with minor lenses of silt, clay and gravel. The Kirkwood Formation contains both sand and clay beds. According to data from the 938 high-capacity wells constructed throughout the system, the Kirkwood-Cohansey Formation yields measure up to 4500 gallons of water per minute and a mean yield of 400 gallons per minute. Groundwater within this aquifer is typically fresh, acidic, highly corrosive, and low in dissolved solids.

The Mount Laurel-Wenonah aquifer is comprised of glauconitic sand overlying micaceous sand. These formations outcrop across central Voorhees, striking from southwest to northeast. An aquifer rank of "C" is assigned to the Mount Laurel-Wenonah, with an average yield of high capacity wells less than 25 gallons per minute. Water is typically fresh, moderately hard, and alkaline. Iron and manganese levels may be locally elevated. Calcium and magnesium levels decrease with depth (NJDEP, 1996).

The stratigraphic interval including the Navesink formation and Hornerstown marl are mapped as a composite confining unit that outcrops in the southern portion of Voorhees Township. This composite unit locally contains sandy intervals that may be important water table aquifers and are mapped as "composite confining unit aquifers". Aquifer rankings

range from "E" for confining members (average yield of high capacity wells less than 25 gallons per minute) to "B" for more permeable members (average yield of high capacity wells between 250 and 500 gallons per minute). Water quality in the aquifers is generally good, although iron and manganese levels may be locally elevated (NJDEP, 1996).

Groundwater recharge is the transmission of water from the surface to the saturated zone beneath the water table. Areas of high aquifer recharge areas typically correspond to the outcrop occurrence of permeable strata that are hydraulically connected to an aquifer. Potential recharge areas therefore roughly correspond to areas where geologic formations comprising aquifers are exposed at the surface. Actual groundwater recharge is dependent on climate, soil characteristics, slope, vegetative cover, and land use. A method for quantitatively evaluating recharge areas and creating detailed groundwater recharge maps has been proposed by the New Jersey Geological Survey (Charles and Others, 1993).

HYDROLOGY

Major surface hydrologic features within Voorhees Township are presented on the Streams and Lakes Map. A northeast-southwest trending drainage divide within the Coastal Plain is located in the middle of the Township.

Main streams in the north and central portion include the Cooper River and its tributaries. The Cooper River is a major tributary of the Delaware River and forms the north western border of the Township. Several tributaries of the Cooper River are located within the western portion of the Township as well. The headwater of the Cooper River begins south west of the Township in Gibbsboro with its confluence with the Delaware River in the City of Camden. The North Branch of Cooper River has its headwater at the center of the Township along with several tributaries. Woodcrest Creek, a main tributary of the Cooper River, begins in the northern portion of the Township at a small pond. Barton Run, one of three major tributaries to the Southwest Branch Rancocas Creek, runs through the southern portion of the Township. Both the Cooper River and Rancocas Creek are major tributaries of the Delaware River.

The majority of Voorhees Township is part of the Cooper River watershed and the Delaware River drainage basin. Another large portion along the southeast is part of the Rancocas Creek Southwest Branch watershed, while a small portion of the Township along the southwest is part of the Woodbury/ Big Timber/ Newton Creeks Watershed.

All streams within Voorhees Township are classified as FW2-NT by the New Jersey Department of Environmental Protection (NJAC 7:9B; NJDEP, 1998). FW2 is a general surface water classification applied to fresh waters that are not considered to be of exceptional quality, significance, or resource value (i.e., not FW1 waters). NT is the designation for non-trout waters.

The New Jersey Department of Environmental Protection has divided the State into 20 Watershed Management Areas for the purposes of environmental planning and

management. The major drainage systems of Voorhees Township are within Lower Delaware Watershed Management (WMA) Area 18 and the Rancocas Watershed Management Area 19. WMA 18 includes the Cooper River, Big Timber, Mantua, Newton, Oldmans, Pennsauken, Raccoon, and Woodbury Creeks. WMA 19 which includes the North Branch, South Branch, and Mainstream of the Rancocas Creek. (NJDEP, 1996).

Water quality in the State is monitored by the NJDEP. Monitoring stations in the vicinity of Voorhees Township are located on Barton Run at Tuckerton and Christopher Mill Roads in Medford Townships and on Cooper River on Kaighn Avenue in the City of Camden. The most recent monitoring results publicly available were published in 2010 and reflect water quality conditions from 2004 through 2008 (NJDEP, 2010).

Cooper River was assessed as fully supporting industrial water supply. High levels of total dissolved solids were detected therefore making the Cooper River unsuitable for agricultural water supply. Cooper River is limited in its ability to support aquatic life due to elevated levels of Lead, Phosphorus, and Turbidity. Fish consumption is also unsupported due to DDD, DDE and DDT. Unsafe levels of Mercury and PCB were found in fish tissue. Primary Contact Recreation, including swimming, is not supported due to high levels of Fecal Coliform; and the public water supply is not supported due to elevated levels of Arsenic, Lead, Sulfates, Tetrachloroethylene, Total Dissolved Solids, and Trichloroethylene.

Barton Run was assessed as fully supporting agricultural water supply only. It has limited ability to support aquatic life due to elevated levels of dissolved oxygen and pH or the public water supply due to higher levels of arsenic. The inability of Barton Run to support these uses is due to urban runoff, agriculture, and natural sources.

Principal land uses in the Township's watersheds include suburban residential, commercial, and agricultural, with considerable residential and commercial development of former farm and woodland continuing to occur.. Non-point source water quality problems associated with these land uses are related to runoff from acid producing soils, silt loadings,

flooding, septic system leachate, fertilizers/pesticides/herbicides used on residential lawns, and stream bank destabilization. In Voorhees Township, recent sediment loading and flooding due to runoff from active construction sites and existing roadways has resulted in a severe decline in the quality of fish habitat (NJDEP, 2010).

Ponds and lakes within Voorhees Township are generally manmade by excavation or impoundment, and have historically been used for agricultural irrigation or as mill sites. Kirkwood Lake creates a boarder between Voorhees and Lindenwold and is owned by Camden County.

FLOOD-PRONE AREAS

Readers of this Natural Resource Inventory are directed to the flood mapping provided by the Federal Emergency Management Agency (found at FEMA.GOV), and through the State of NJ, Department of Environmental Protect, Office of Floodplain Management, at State of NJ, Department of Environmental Protection, Bureau of Dam Safety and Flood Control, PO Box 419, Trenton NJ 08628-0859

FRESHWATER WETLANDS

Wetlands are generally defined as areas that are inundated or saturated by surface or ground waters at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions. The Freshwater Wetlands Map for Voorhees depicts wetlands within the Township as interpreted by the New Jersey Department of Environmental Protection. These wetland areas are classified according to the U.S. Geological Survey Land Use and Land Cover classification system used for Land Use mapping. The wetlands map is intended for use as a planning guide to indicate areas that may potentially contain regulated wetlands. Actual determination of regulated areas is dependent on a field delineation of the wetland boundary.

Freshwater wetlands in Voorhees are commonly associated with stream corridors and broad stream valleys. General wetland types found within the Township include:

Deciduous Wooded Wetlands – This map unit includes closed canopy swamps associated with watercourses and marsh edges, as well as isolated wetlands. The wetlands are dominated by deciduous tree species (>75%) with an average height greater than 20 feet.

Mixed Forest, Deciduous Wetlands – This map unit includes forested swamps of mixed deciduous and coniferous trees with deciduous trees prevalent (>50%), but not dominant (<75%). Average tree height is greater than 20 feet.

Mixed Forest, Coniferous Wetlands – This map unit includes forested swamps of mixed coniferous and deciduous trees with coniferous trees prevalent (>50%), but not dominant (<75%). Average tree height is greater than 20 feet.

Deciduous Shrub/Scrub Wetlands – This map unit includes brush/shrubland swamps with deciduous species less than 20 feet in height predominant (>75%).

Herbaceous Wetlands – This map unit includes non-tidal swamps dominated by non-woody plant species. Typical herbaceous wetlands may be located on open lake edges and floodplains, and in abandoned wet agricultural fields.

Modified Agricultural Wetlands - This map unit includes cultivated lands that are former natural wetlands. These areas generally have hydric soils.

Managed Wetlands – This map unit includes modified former natural wetland areas that are managed for miscellaneous types of agriculture other than cropland and pasture land. Included in this category may be orchards, nurseries, sod and seed farms, cranberry and blueberry farms, live stock feed lots, poultry farms, horse farms, and other specialty farms that have hydric soils.

Disturbed Wetlands – These areas are former natural wetlands that have been disturbed by clearing, filling, or excavating. The soil shows signs of saturation, but typical wetland vegetation is generally not supported.

Wetland Rights-of-Way – These areas are former natural wetlands in rights-of-way. These areas have hydric soils but may not support the typical wetland vegetation found in adjacent unaltered wetlands.

AIR QUALITY

One of the most difficult environmental resources to measure is air quality. Pollution has many sources including industries, vehicles, fires, and dust. The affects of air pollution can be felt far away from its source. Increased public awareness regarding air quality issues led to laws such as the Air Pollution Control Act of 1955 and the Clean Air Act of 1963. The Air Quality Act was later passed in 1967, granting the federal government increased enforcement and led to widespread air quality monitoring and inspections.

The Clean Air Act of 1970 caused major changes in federal government's role in air pollution control. It allowed Federal and State governments to regulate emissions from both stationary and mobile sources. At about the same time the U.S. Environmental Protection Agency (EPA) was created to implement the requirements of the Clean Air Act of 1970.

In New Jersey, the Department of Environmental Protection's Bureau of Air Monitoring has established 43 stations throughout the State. These monitoring stations continually monitor all of some of seven (7) parameters set forth by the EPA in the National Ambient Air Quality Standards (NAAQS). These seven (7) parameters are carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, smoke shade, particulate matter, and meteorological data. There are two (2) types of NAAQ Standards, the primary standard focuses on the effects on human health, and the secondary standard focuses on environmental and property damage.

Voorhees Township is located within Region 8, the Southern Delaware Valley Region. Region 8 includes three monitoring stations: The South Camden station measures Particulate Matter (PM) only, the Ancora State Hospital station measures Carbon Monoxide (CO), Sulfur Dioxide (SO2) and Ozone (O3), and the Clarksboro station measures Sulfur Dioxide and Ozone.

Air Quality Index (AQI) was created by the EPA to specify a region's air quality by measuring the levels of five (5) criteria pollutants: ground level ozone, particulate matter,

carbon monoxide, nitrogen oxides, and sulfur dioxide. The AQI is used to determine the potential human health hazards caused by breathing unhealthy air. The scale used by the AQI measures ranges from 0 to 500 and is divided into six (6) color-coded categories and is shown below.

TABLE 3

AIR QUALITY INDEX

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

(Airnow.gov)

Based on the findings of the most recent report available from the NJDEP, in 2010 the Air Quality Index Summary for Region 8 reported 256 days of good air quality, 89 days of moderate air quality, 19 days of unhealthy air quality for sensitive groups and 1 day of unhealthy air quality.

SOILS

Soil Series

Abbreviated descriptions of the soils series that have been mapped in Voorhees Township are obtained from the Soil Conservation Service of the United States Department of Agriculture soil survey for Camden County (Jablonski & Baumley, 1989).

Atsion Series (AtsA)

The *Atsion Sand* consists of poorly drained soil in depressional areas and on broad flats. A typical profile may include black sand from 0" to 5" deep, light gray sand from 5" to 28" deep, dark reddish brown loamy sand from 28" to 34" deep, and light gray sand from 34" to 60" deep. Atsion Sand has a seasonal high water table between the surface and a depth of 1'. The Atsion series is listed as a Group 2 hydric soil in New Jersey.

Berryland Series (BerAr)

The *Berryland Sand* is a very poorly drained soil formed in sandy glacial fluvial deposits. A typical profile consists of black sand that is about 8'" thick and has a high content of organic matter. The layers below include loose, gray or brown sand from 8" to 19" deep, dark-brown loamy sand from 19" to 24", and loose, yellowish-brown sand from 24"-42". The seasonal high water table is within a depth of 6 inches. The Berryland Series is listed as a Group 2 hydric soil in New Jersey

Buddtown Series

The *Buddtown series* is made up of moderately well drained soils found in knolls, flats and depressions. A profile will include 0" to 9" of brown fine sandy loam, 9"-12" of light yellowish brown very fine sandy loam, 12"-34" of yellowish brown loam,

and 34"-80" of light yellowish brown to pale olive loamy course sand and coarse sand. Depth to the seasonal high water table ranges from 18 to 42 inches. The Buddtown Series is listed as a Group 2 hydric soil in New Jersey

Deptford Series

The *Deptford series* is a somewhat poorly drained soil found in flats, depressions and knolls. The typical profile includes 0" to 8" of dark gray very fine sandy loam, 8" to 12" of brownish yellow very fine sandy loam, 12" to 22" of light yellowish brown loam, 22" to 46" o flight gray very fine sandy loam and 46" to 50" of light gray fine sandy loam. The Deptford series is listed as a Group 2 hydric soil in New Jersey.

Colemantown Series (CoeAs)

The *Colemantown loam* is a poorly drained soil found in depressional areas and on broad flats. A typical profile may include very dark brown loam from 0" to 9" deep, mottled dark greenish-gray clay loam from 9" to 36" deep, and mottled dark greenish-gray stratified sandy clay loam to sandy clay from 36" to 60" deep. The seasonal high water table is generally perched and between the surface and 1' deep. The Colemantown series is listed as a Group 1 hydric soil in New Jersey, and nearly always displays hydric conditions.

Evesboro Series (EveB, EveE, EvewB, EvfmB)

The *Evesboro sand* is an excessively drained soil on divided and side slopes. A typical profile of the Evesboro series may include decomposed organic matter and grayish brown sand from 0" to 4" deep, yellowish brown sand from 4" to 9" deep, yellowish brown sand subsoil from 9" to 34" deep, and yellowish brown sand

substratum from 34" to 60" deep. The seasonal high water table is greater than 6' deep. The Evesboro series is not on the New Jersey hydric soils list.

Fluvaquents (FmgAT, FmhAT)

Fluvaquents are comprised of poorly drained sands and loams found in flood plains. A typical profile may include 0" to 5" of very dark grayish brown loam, 5"-12" of dark gray silt loam, 12" to 18" of grayish brown sandy clay loam, 18" to 24" of dark yellowish brown sandy clay loam and 24" to 50" of light brownish gray sandy loam.

Freehold Series (FRWD, FrmA, FrmB, FrpkB)

The *Freehold* series consists of well-drained soils on divides and side slopes. A typical profile of the Freehold series may include dark yellowish brown loamy sand to sandy loam plow layer from 0" to 9" deep, dark brown sandy loam and sandy clay loam from 9" to 25" deep, brown sandy loam from 25" to 35" deep, and yellowish-brown loamy sand from 35" to 70" deep. The seasonal high water table is greater than 6' deep. The Freehold series is not on the New Jersey hydric soils list.

Holmdel Series (HodA)

The *Holmdel* sandy loam is a moderately well to somewhat poorly drained soil in depressional areas and on low divides. A typical profile has a 10" thick dark grayish brown sandy loam surface layer, yellowish brown sandy loam from 10" to 20" deep, mottled yellowish brown sandy clay loam from 20" to 38" deep, and a mottled yellowish brown and light olive brown sand and sandy loam substratum from 38" to a depth of 60" or more. The depth to the seasonal high water table is between 1.5' to 4.0'. Holmdel soils are not on the New Jersey hydric soils list.

Jade Run Series (JdrA, JduA)

The *Jade Run loam* consists of poorly drained soil found on flats. The profile typically includes 0" to 11" of very dark grayish brown fine sandy loam, 11" to 19" of grayish brown very find sandy loam, 19" to 35" of light brownish gray very fine sandy loam, 35" to 52" of light gray very fine sandy loam, and 52" to 80" of light gray to pale olive sand. The seasonal high water table falls within a depth of 12 inches.

Kresson Series (KrdA)

The *Kresson sandy loam* includes somewhat poorly drained soils found in flats and depressions. Typically, the soil profile consists of 0"to 6" of very dark grayish brown fine sandy loam, 6" to 18" of olive clay, 18" to 33" of dark greenish gray clay, 33" to 41" of dark grayish green clay, and 41" to 80" of olive and light yellowish brown stratified sandy loam and sandy clay loam. Depth to the seasonal high water table ranges between 12 and 18 inches.

Lakehurst Series (LakB, LamB, LanB)

The *Lakehurst sand* is a moderately well-drained to somewhat poorly-drained soil found in flats and knolls. A typical profile may include gray sand from 0" to 4" deep, light gray sand from 4" to 10" deep, brown loamy sand from 10" to 13" deep, mottled brownish yellow sand from 13" to 24" deep, mottled pale brown sand from 24" to 36" deep, and mottled light brownish gray sand substratum from 36" to 60" deep. This series has a depth to seasonal high water table ranging from 1.5' to 3.5'. The Lakehurst sand is not on the New Jersey hydric soils list.

Lakewood Series (LasB, LasC, LatB, LatC)

The *Lakewood series* is comprised of excessively drained soils found in flats and knolls. The typical profile includes 0" to 3" of grayish brown sand, 3" to 11" of light brownish gray sand, 11" to 13" of brown loamy sand, 13" to 30" of yellowish brown sand, 30" to 46" of brownish yellow sand and 48" to 80" of very pale brown sand. This series has a depth to seasonal high water table at more than 72 inches.

Pits Sand and Gravel (PT)

This unit consists of disturbed areas that have historically been excavated for sand and gravel. Soils in these areas are typically sandy with varying amounts of gravel and fragments of iron cemented sandstone. The properties and characteristics of this map unit vary from location to location, and onsite investigation is generally required to determine suitability for an intended use.

Psamments (PssA)

Psamments are from human altered areas where thick sandy fill has been placed on a poorly drained soil. The profile consists of 0" to 12" of mixed mineral and organic material and the lower portion consists of clean coarse sand. Below the sandy fill is a poorly drained soil.

Shrewsbury Series (ShsA)

Shrewsbury loam is a poorly drained soil type. Typically the profile consists of 0" to 10" of dark gray fine sandy loam, 10" to 14" of gray fine sandy loam, 14" to 24" of mixed gray, light olive gray, greenish gray, light gray, and dark gray sandy clay loam, 24" to 32" of greenish gray sandy clay loam, and 32" to 60" of alternating strata of olive gray loamy sand, fine sandy loam, and white sand. Depth to seasonal high water table falls within 12 inches.

Westphalia Series (WedB, WedC, WeeB, WeeD, WefB)

The *Westphalia series* is comprised of well drained soils found in knolls and hills. A typical profile includes 0" to 6" of dark yellowish brown fine sandy loam, 6" to 15" of yellowish brown fine sandy loam, 15" to 30 " of brownish yellow loamy fine sand and 30" to 80" of pale yellow and light yellowish brown fine and stratified fine sand and loamy fine sand. Depth to the seasonal high water table falls at more than 72 inches.

Woodstown Series (WokA)

The *Woodstown sandy loam* is a moderately well drained soil in depressions, knolls, and drainageways. The profile typically is comprised of 0" to 8" of dark grayish brown sandy loam, 8" to 26" yellowish brown sandy loam, 26" to 30" of light yellowish brown sandy clay loam, 30" to 36" of light yellowish brown sandy loam, and 36" to 80" of very pale brown, strong brown, and light gray loamy sand. It has a seasonal high water table at a depth of 18 to 42 inches.

Other soil types within Voorhees Township include the *Jade Run-Weeksville Urban land complex* and the *Marlton-Kresson-Urban land complex*. These types of soils have been heavily disturbed by construction and human activity.

TABLE 4

SELECTED SOIL PROPERITES

MAP UNIT	SOIL SERIES	SLOPE %	DEPTH TO SHWT (in)	DRAINAGE CLASS	FLOODING FREQUENCY	SURFICIAL PERMEABILITY (in/hr)	HYDROLOGIC GROUP	SURFACE EROSION POTENTIAL K-FACTOR
AtsA	Atsion sand	0-2	0-12	Poorly Drained	None	6-12	C/D	0.17
BerAr	Berryland sand	0-2	0-6	Very Poorly Drained	Rare	6-20	B/D	.10
CoeAs	Colemantown loam	0-2	0-12	Poorly Drained	Occasionally	0.2-2	C/D	.43
EveB	Evesboro sand	2-5	>6.0	Excessively Drained	None	6-20	A	.17
EveE		15-25						
EvewB								
EvfmB		0-5						
FmgAt	Fluvaquents	0-3	<18	Poorly Drained	Frequent	0.6-2	B/D	.32
FmhAt								
FrmA	Freehold fine sandy loam	0-2	>60	Well Drained	None	0.6-6	B	.24 (approximate value)
FrmB	Freehold fine sandy loam	2-5						
FrpkB	Freehold Downer	0-5						
HodA	Holmdel Sandy Loam	0-2	1.5-4	Moderately Well Drained	None	0.6-6.0	A	.28
JdrA	Jade Run fine sandy loam	0-2	<12	Poorly Drained	None	2-6	B/D	.32
JduA	Urban Land Complex							
KrdA	Kresson sandy loam	0-2	12-18	Somewhat Poorly Drained	None	0.6-6	C	.32
LakB	Lakehurst sand	0-5	18-42	Moderately Well Drained	None	6-20	A	.10
LamB	Lakehurst fine sand	0-5						
LasB	Lakewood sand	0-5	>72	Excessively Drained	None	6-20	A	.15
LasC		5-10						
LatB	Lakewood fine sand	0-5						
LatC		5-10						
PHG	Pits, sand, & gravel	Properties Variable						
PssA	Psamments	Properties Variable						
ShsA	Shrewsberry sandy loam	0-2		Poorly Drained	None	0.6-6	C/D	.32
WedB	Westphalia loamy fine sand	2-5	>72	Well Drained	None	0.2-6	B	.37
WedC		5-10						

WeeB WeeD	Wesphalia fine sandy loam	2-5 10-15	>72	Well Drained	None	0.2-6	B	.37

NOTES:

1. SHWT is apparent seasonal high water table; a '+' sign indicates a water table above the surface of the soil.

2. Urban land complexes are undifferentiated areas of soil and urban land (impermeable surfaces). Properties for urban land vary greatly from site to site.

Soil Properties

The Soil Survey of Camden County, New Jersey (1961) contains information on soil properties, characteristics, and limitations pertaining to agriculture, woodland management, recreation, wildlife habitat, site development, sanitary facilities, construction materials, water management, engineering, and hydrology. A table of selected properties for the soil types occurring in Voorhees Township is included in this document.

Texture

Textural classes are defined by the relative proportion of sand, silt, and clay particles in a soil mass. Sand includes soil particles ranging in size from 2mm to 0.05mm; silt particles range from 0.05mm to 0.002mm; clay particles are smaller than 0.002mm (U.S.D.A. System of Soil Textural Classification). The sand size fraction may be subdivided into very coarse, coarse, medium, fine, and very fine sand. Gravel includes particles greater than 2mm.

Slope

Slope is the inclination of the land surface from the horizontal. The slope between two points on the land surface is thus the difference in elevation divided by the horizontal distance between the points, which may be expressed as a percentage. Moderate to severe limitations on site development are generally associated with slopes in excess of 10% (slope classes D and E).

Seasonal High Water Table

The water table is the surface below which a soil is saturated. The elevation of this surface varies spatially and with time, and is usually highest in the winter and early spring. A perched water table occurs where a saturated zone overlies an

unsaturated zone, usually due to the presence of a low permeability layer impeding the vertical movement of ground water. Moderate limitations on site development are generally associated with a depth to the seasonal high water table less than 4 feet; severe limitations exist for groundwater shallower than 1 foot below the land surface. A Depth to Water Table Map for Voorhees Township is included in this document.

Drainage Class

Drainage is the removal of excess surface and subsurface water. The Soil Conservation Service defines seven classes of natural soil drainage (Jablonski & Baumley, 1989).

Excessively Drained: Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep.

Somewhat Excessively Drained: Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff.

Well Drained: Water is removed from the soil readily, but not rapidly. Well drained soils are commonly medium textured.

Moderately Well Drained: Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short

time during the growing season. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat Poorly Drained: Water is removed slowly enough that the soil is wet for significant periods during the growing season. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly Drained: Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very Poorly Drained: Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Very poorly drained soils are commonly level or depressed and are frequently ponded.

Flooding

Flooding is the temporary covering of the soil surface by flowing water due to overflowing streams or runoff from adjacent slopes. The Soil Conservation Service has estimates of the frequency, duration, and probable period of occurrence of flooding for each soil series. There are five categories for flooding frequency:

None	Flooding is not probable;
Rare	Flooding is unlikely but possible under unusual weather conditions (near 0 to 5 percent chance of flooding in any year);
Occasional	Flooding occurs infrequently under normal weather conditions (5 to 50 percent chance of flooding in any year);
Common	This term is used when classification as occasional or frequent does not affect interpretations;
Frequent	Flooding occurs often under normal weather conditions (more than a 50 percent chance of flooding in any year).

Soil survey information on flooding is based on the physical characteristics and typical landscape position of a soil series. The Federal Emergency Management Association (FEMA) has more detailed information available as part of the National Flood Insurance Program. FEMA delineated flood zones are based on detailed topographic surveys and hydraulic engineering calculations. A Flood-Prone Areas Map for Voorhees Township is included in this document.

Permeability

Permeability is the property that characterizes a soils ability to transmit water or air. The permeability of a particular soil is dependent on the size, shape, and structural arrangement of the soil particles. Soil Survey estimates of permeability are reported as the number of inches per hour that water moves vertically downward through saturated soil. The following terms are used to describe permeability in soil descriptions:

Very Slow	< 0.06 in/hr
Slow	0.06-0.2 in/hr

Moderately Slow	0.2-0.6 in/hr
Moderate	0.6-2.0 in/hr
Moderately Rapid	2.0-6.0 in/hr
Rapid	6.0-20 in/hr
Very Rapid	> 20 in/hr

Surficial permeability refers to water movement through the surface of an undisturbed soil profile. The Soil Survey of Camden County contains permeability estimates for additional horizons in the profile of each soil type. Soil permeability can be a critical parameter in the design of septic system disposal fields and certain types of drainage systems. Soil survey estimates of permeability are typically used as a planning guide to identify areas of potentially permeable soils. Actual permeability is generally assessed by onsite investigation and evaluation or laboratory testing.

Hydrologic Group

Soil series are assigned to one of four hydrologic groups according to the estimated stormwater runoff that would occur during long-duration storms. The groupings assume a soil to be unvegetated, and are determined by the rate at which a soil intakes water when thoroughly wet.

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two groups, the first grouping refers to runoff when the soil is drained (relatively low water table) and the second grouping refers to runoff when the soil is undrained (relatively high water table). Hydrologic soil groupings are used to estimate runoff in stormwater management design.

Erosion Potential

Soil erosion is the removal of soil material from the land surface by the action of rainfall and surface runoff. The K-factor is used to indicate the susceptibility of a soil to sheet and rill erosion (sheet erosion is the removal of a layer of soil material;

rill erosion is the removal of soil in a network of shallow, steep-sided channels). Estimates of the K-factor are primarily based on the percentage of silt, sand, and organic matter in a soil. Values of K range from 0.05 to 0.69, with higher values indicating a greater susceptibility to sheet and rill erosion by water.

PRIME FARMLAND

The Prime Farmland Map for Voorhees Township is based on data provided by the Natural Resource Conservation Service (NRCS). Prime farmland is generally defined by the U.S. Department of Agriculture as land with the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while employing conventional farming methods. This mapping therefore identifies the location and extent of the most suitable land for producing crops. Prime farmland will typically meet the following criteria (Jablonski & Baumley, 1989):

- adequate and dependable moisture supply;
- favorable temperature and length of growing season;
- soils have acceptable levels of acidity or alkalinity;
- soils have few or no rocks;
- soils are permeable to water and air;
- soils are not excessively erodible;
- land is not saturated with water for long periods and does not flood frequently during the growing season or is protected from flooding;
- slope is mainly 0 to 6 percent.

In addition, land classified as prime farmland is either in active agricultural production or is available for that use. Areas of water or urban or built-up land are generally not identified as prime farmland. The NRCS (formerly the SCS, Soil Conservation Service) mapping does not reflect some relatively recent changes from agricultural to non-agricultural land use that have occurred since the mapping was completed. Some areas shown as prime farmland in Voorhees Township therefore overlap with developed residential or commercial land and would not be currently classified as prime farmland.

Lands that meet the criteria for prime farmland are generally gently sloping with well to moderately well drained, sandy loam and loamy sand soils. In Voorhees Township, prime farmland generally corresponds to Atsion, Berryland, Buddtown, Freehold, Holmdel, Jade Run, Kresson, Westphalia and Woodstown soils in areas of agricultural land use.

Please note that the parcel data used on the GIS map is more current that Prime Farmland data available at the time of preparation.

DEPTH TO WATER TABLE

The depth to water table map has been complied from data provided in the Camden County Soil Survey. The ranges presented show the depths predicted for the seasonal high water table, usually at its peak between January and late April. This information can be used to identify limitations for the construction of individual subsurface sewage disposal systems, building foundations, subsurface utility line installations, agriculture, and stormwater management basins.

FORESTS

There are four different types of forest coverage mapped in the Township: coniferous forest, coniferous/deciduous forest, deciduous forest, and deciduous/coniferous forest. Of these four forest types, the deciduous forest is by far the most abundant.

Coniferous forest exists mostly in the southern portion of the Township, near the Gibbsboro border. Three small areas containing a stand of coniferous/deciduous forest is identified within the central portion of the municipality

Deciduous forests within the upland portions of Voorhees commonly include the following species:

Dominant Trees

White Oak	(Quercus alba)
Red Oak	(Quercus rubrum)
Black Locust	(Robinia psuedoacacia)
Scarlet Oak	(Quercus coccinea)
Black Oak	(Quercus velutina)
Tulip	(Liriodendron tulipifera)
American Beech	(Fagus grandifolia)
Chestnut Oak	(Quercus prinus)

Non-Dominant Trees

Shagbark Hickory	(Carya ovata)
Pignut Hickory	(Carya glabra)
Black Birch	(Betula lenta)
White Ash	(Fraxinus americana)
Red Cedar	(Juniperus virginiana)
Black Cherry	(Prunus serotina)
American Holly	(Ilex opaca)
White Mulberry	(Morus alba)
Sugar Maple	(Acer saccharum)
Flowering Dogwood	(Cornus florida)

Tree-of-Heaven	(Ailanthus altissima)
Black Walnut	(Juglans nigra)

The following tree species commonly occur in deciduous forests within the lowland portions of the Township:

Dominant Trees

Red Maple	(Acer rubrum)
Silver Maple	(Acer saccharinum)
Pin Oak	(Quercus palustris)
Gray Birch	(Betula populifolia)
Sweetgum	(Liquidambar styraciflua)
Blackgum	(Nyssa sylvatica)

Non-Dominant Trees

Green Ash	(Fraxinus pennsylvatica)
River Birch	(Betula nigra)
Box Elder	(Acer negundo)
American Hornbeam	(Carpinus caroliniana)
Sweetbay Magnolia	(Magnolia virginiana)
American Sycamore	(Platanus occidentalis)
Black Willow	(Salix nigra)

Within the limited areas identified as coniferous forest, the overall dominant conifer is Pitch Pine (Pinus rigida). Minor occurrences of White Pine (Pinus strobus) can also be expected, but these are most likely introduced by man. The coniferous-forested areas in the Township exist as small clusters in the southern section of the Township.

The G.I.S. coverage also includes mixed coniferous/deciduous forest and deciduous/coniferous forest types within the Township. Woodlands mapped as coniferous/deciduous forest are dominated by coniferous trees, and woodlands mapped as deciduous/coniferous forest are dominated by deciduous trees.

This G.I.S. mapping is a general assessment of the Township's woodlands, and is intended for overall planning purposes. A site-specific assessment of forest types typically requires an onsite inspection and evaluation.

RARE SPECIES AND NATURAL COMMUNITIES

This map coverage has been provided by the N.J. Department of Environmental Protection Landscape Project Data.

The term rare has been utilized by the Natural Lands Management Office to include both endangered and threatened plant and animal species, and species that could potentially become endangered or threatened if the population continues a downward trend. Also included within this coverage are natural communities.

Voorhees Township includes a number of State listed endangered species along the south eastern portion of the municipality. These species include:

Timber Rattlesnake
Barred Owl
Northern Goshawk
Northern Pine Snake
Brown Thrasher
Allegheny River Cruiser

APPENDIX I

WILDLIFE

WILDLIFE

Lists of the mammals, birds, reptiles, amphibians, and fish common to western Camden County were adapted from State checklists generated by the New Jersey Division of Fish and Wildlife. Wildlife habitats found within Voorhees include openland habitat (cropland, pasture, meadows, and scrub-shrub terrain), woodland habitat (deciduous and coniferous forests), and wetland habitat (marshes, swamps, and other shallow water areas). These generalized habitat types are typically intermingled with each other and with the increasing suburban environment in the Township. Relatively larger parcels of wildlife habitat in Voorhees generally coincide with the cropland, forest, and wetland areas shown on the land use map.

Endangered species are defined as those whose prospects for survival within the State are in immediate danger due to one or many factors including habitat loss, over exploitation, predation, competition, or disease. An endangered species requires immediate assistance or extinction will probably follow. Species listed as threatened may become endangered if conditions surrounding the species begin to or continue to deteriorate. The potential for a particular rare species to be present in the Township is dependent on the presence of suitable habitat. Identification of suitable habitat generally requires a field evaluation by an experienced wildlife biologist.

MAMMALS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
Oppossum	Didelphis marsupialis	Red Squirrel	Tamiasciurus hudsonicus
Smokey Shrew	Sorex fumeus	Southern Flying Squirrel	Glaucomys volans
Short-tailed Shrew	Blarina brevicauda	Beaver	Castor candensis
Least Shrew	Crytotis parva	White-footed Mouse	Peromyscus leucopus
Eastern Mole	Scalopus aquaticus	Red-backed Vole	Clethrionomys gapperi
Star-nosed Mole	Condylura cristata	Meadow Vole	Microtus pennsylvanicus
Little Brown Bat	Myotis lucifugus	Pine Vole	Microtus pinetorum
Keen Myotis	Myotis septentrionalis	Muskrat	Ondatra zibethicus
Small-footed Myotis	Myotis leibii	Southern Bog Lemming	Synaptomys cooperi
Silver-haired Bat	Lasionycteris noctivagans	Brown Rat	Rattus norvegicus
Eastern Pipistrel	Pipistrellus subflavus	House mouse	Mus musculus
Big Brown Bat	Eptesicus fuscus	Meadow Jumping Mouse	Zapus hudsonius
Red Bat	Lasiurus borealis	Red Fox	Vulpes vulpes
Hoary Bat	Lasiurus cinereus	Gray Fox	Urocyon cinereoargenteus
Eastern Cottontail	Sylvilagus floridanus	Raccoon	Procyon lotor
New England Cottontail	Sylvilagus transitionalis	Long-tailed Weasel	Mustela frenata
European Hare	Lepus capensis	Mink	Mustela vison
Eastern Chipmunk	Tamias striatus	Striped Skunk	Mephitis mephitis
Woodchuck	Marmota monax	River Otter	Lutra canadensis
Gray Squirrel	Sciurus carolinensis	White-tailed Deer	Odocoileus virginianus

REPTILES OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Common Snapping Turtle	Chelydra s. serpentina
Stinkpot	Sternotherus odoratus
Eastern Mud Turtle	Kinosternon s. subrubrum
Spotted Turtle	Clemmys guttata
Eastern Box Turtle	Terrapene c. carolina
N. Diamondback Terrapin	Malaclemys t. terrapin
Red-eared Turtle	Pseudemys scripta elegans
Eastern Painted Turtle	Chrysemys p. picta
Northern Fence Lizard	Sceloporus undulates hyacinthinus
Five-lined Skink	Eumeces fasciatus
Northern Water Snake	Nerodia s. sipedon
Northern Brown Snake	Storeria d. dekayi
Northern Red-bellied Snake	Storeria o. occipitomaculata

COMMON NAME	SCIENTIFIC NAME
Eastern Garter Snake	Thamnophis s. sirtalis
Eastern Ribbon Snake	Thamnophis s. sauritus
Eastern Smooth Earth Snake	Virginia v. valeriae
Eastern Hognose Snake	Heterodon platyrhinos
Northern Ringneck Snake	Diadophis punctatus edwardsi
Eastern Worm Snake	Carphophis a. amoenus
Northern Black Racer	Coluber c. constrictor
Rough Green Snake	Opheodrys aestivus
Corn Snake	Elaphe g. guttata
Black Rat Snake	Elaphe o. obsolete
Northern Pine Snake	Pituophis m. melanoleucus
Eastern King Snake	Lampropeltis g. getulus
Eastern Milk Snake	Lampropeltis t. triangulum
Northern Scarlet Snake	Cemophora coccinea copei
Timber Rattlesnake	Crotalus h. horridus

AMPHIBIANS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Marbled Salamander	Ambystoma opacum
Spotted Salamander	Ambystoma maculatum
Eastern Tiger Salamander	Ambystoma t. tigrinum
Red-spotted Newt	Notophthalmus v. viridescens
Northern Dusky Salamander	Desmognathus f. fuscus
Red-backed Salamander	Plethodon c. cinereus
Four-toed Salamander	Hemidactylium scutatum
Northern Red Salamander	Pseudotriton r. ruber
Eastern Mud Salamander	Pseudotriton m. montanus
Northern Two-lined Salamander	Eurycea b. bislineata
Eastern Spadefoot Toad	Scaphiopus h. holbrookii
Fowler's Toad	Bufo woodhousii fowleri
Northern Cricket Frog	Acris c. crepitans
Northern Spring Peeper	Hyla c. crucifer
Pine Barrens Treefrog	Hyla andersonii
Northern Gray Treefrog	Hyla versicolor
New Jersey Chorus Frog	Pseudacris triseriata kalmi
Bullfrog	Rana catesbeiana
Carpenter Frog	Rana virgatipes
Green Frog	Rana clamitans melanota
Wood Frog	Rana sylvatica
Pickerel Frog	Rana palustris
Northern Leopard Frog	Rana pipiens

BIRDS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
American Bittern	Botaurus lentiginosos
Red-Winged Blackbird	Agelaius phoeniceus
Northern Bobwhite	Colinus virginianus
Indigo Bunting	Passerina cyanea
Northern Cardinal	Cardinalis cardinalis
Catbird	Dumetella carolinensis
Black-Capped Chicadee	Parus atricapillus
Carolina Chicadee	Parus carolinensis
Brown-Headed Cowbird	Molothrus ater
American Crow	Corvus brachyrhynchos
Mourning Dove	Zenaida macroura
American Black Duck	Anas rubripes
Mallard	Anas platyrhynchos
Wood Duck	Aix sponsa
Northern Common Flicker	Colaptes auratus
Great Crested Flycatcher	Myiarchus crinitus
Olive-Sided Flycatcher	Contopus borealis
American Goldfinch	Carduelis tristis
Boat-tailed Grackle	Quiscalus major
Common Grackle	Quiscalus quiscula
Evening Grosbeak	Hesperiphona vespertinus
Rose-breasted Grosbeak	Pheucticus ludovicianus
Great Black-backed Gull	Larus marinus

BIRDS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Herring Gull	Larus argentatus
Osprey	Pandion haliaetus
Ovenbird	Seiurus aurocapillus
Eastern Screech Owl	Otus asio
Barred Owl	Strix varia
Great Horned Owl	Bubo virginianus
Ring-Necked Pheasant	Phasianus colchicus
Eastern Phoebe	Sayornis phoebe
American Redstart	Setophaga ruticilla
American Robin	Turdus migratorius
Spotted Sandpiper	Actitis macularia
Yellow-Bellied Sapsucker	Sphyrapicus varius
Snowy Egret	Egretta thula
Song Sparrow	Melospiza melodia
Starling	Sturnus vulgaris
Barn Swallow	Hirundo rustica
Cliff Swallow	Hirundo pyrrhonota
Tree Swallow	Tachycineta bicolor
Chimney Swift	Chaetura pelagica
Scarlet Tanager	Piranga olivacea
Brown Thrasher	Toxostoma rufum
Wood Thrush	Hylocichla mustelina
Tufted Titmouse	Parus bicolor
Rufous-Sided Towhee	Pipilo erythrophthalmus

BIRDS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Red-eyed Vireo	Vireo olivaceus
Laughing Gull	Larus atricilla
Ruffed Grouse	Bonasa umbellus
Red-shouldered Hawk	Buteo lineatus
Red-tailed Hawk	Buteo jamaicensis
American Kestrel	Falco sparverius
Green-backed Heron	Butorides striatus
Great Blue Heron	Ardea herodias
Ruby-throated Hummingbird	Archilochus colubris
Blue Jay	Cyanocitta cristata
Dark-eyed Junco	Junco hyemalis
Killdeer	Charadrius vociferus
Eastern Kingbird	Tyrannus tyrannus
Belted Kingfisher	Ceryle alcyon
White-breasted Nuthatch	Sitta carolinensis
Northern Oriole	Icterus galbula
Yellow-throated Vireo	Vireo flavifrons
Turkey Vulture	Cathartes aura
Black and White Warbler	Miniotilta varia
Black-throated Blue Warbler	Dendroica caerulescens
Blue-winged Warbler	Vermivora pinus
Yellow-throated Warbler	Dendroica dominica
Cedar Waxwing	Bombycilla cedrorum
American Woodcock	Philohela minor

BIRDS OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Downy Woodpecker	Picoides pubescens
Hairy Woodpecker	Picoides villosus
Red-bellied Woodpecker	Melanerpes carolinus
Eastern Wood Pewee	Contopus virens
Carolina Wren	Thryothorus ludovicianus
House Wren	Troglogytes aedon
Canada Goose	Branta Canadensis
Eastern Bluebird	Sialia sialis
Northern Mockingbird	Mimus polyglottos
Yellow-Rumped Warbler	Dendroica coronata
White-Throated Sparrow	Zonotrichia albicollis
House Sparrow	Passer domesticus
House Finch	Carpodacus mexicanus
Rock Dove	Columba livia
Sharp-Shinned Hawk	Accipiter striatus
Purple Martin	Progne subis

FISH OF CAMDEN COUNTY

COMMON NAME	SCIENTIFIC NAME
Largemouth bass	Micropterus salmoides
Chain pickerel	Esox niger
Grass pickerel	Esox spp.
Bluegill sunfish	Lepomis macrochirus
Pumpkinseed sunfish	Lepomis gibbosus
Bluespotted sunfish	Enneacanthus gloriosus
Redbreast sunfish	Lepomis auritus
Golden shiner	Notemigonus crysoleucas
Brown bullhead	Ictalurus nebulosus
Black crappie	Pomoxis nigromaculatus
White sucker	Catostomus commersoni
Creek chubsucker	Erimyzon oblongus
Fallfish	Semotilus corporalis
Johnny darter	Etheostoma nigrum
Mudminnow	Umbra pygmaea
American eel	Anguilla rostrata
Brown trout	Salmo trutta
Carp	Cyprinus carpio

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