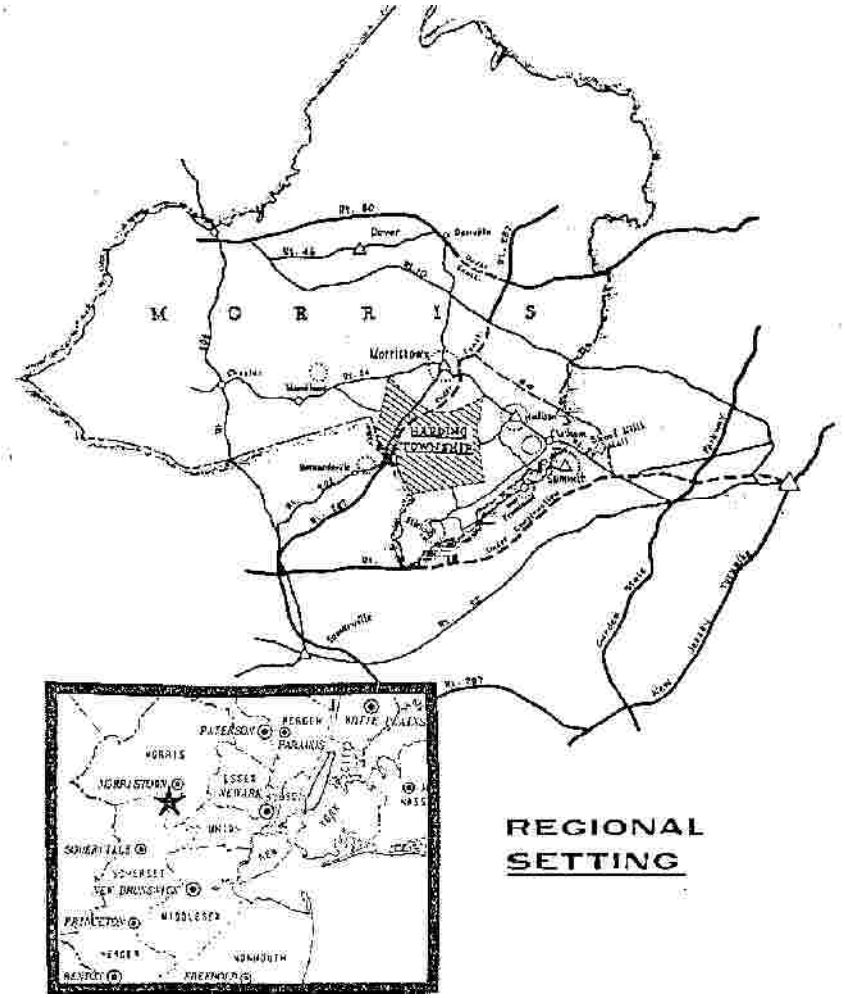
COMMUNITY CHARACTERISTICS

(Adopted February 25, 2008)

This section of the Master Plan includes descriptions of the major environmental and historic features that contribute to Harding's unique rural and historic character. Each individual plan element contains relevant background data such as existing land use, demographic characteristics, infrastructure, and community facilities. The township's high quality water resources, major open space reservations and low density development pattern are the principal reasons for the State Planning Commission's designation of virtually the entire township within Planning Area 5 – the *Environmentally Sensitive* planning area. With abundant historic resources reminiscent of early American settlement patterns, the township's major planning goals are rooted in the objectives of environmental protection and preservation of the predominant low-density rural residential development pattern.



REGIONAL CONTEXT

Harding Township is one of 39 municipalities in Morris County. It is 20.5 square miles in area and is located in the northern portion of the state on the fringe of the New York - northern New Jersey metropolitan area. Harding is located south of Morristown, the county seat for Morris County, and is situated approximately 35 miles west of New York City, 20 miles west of Newark, 40 miles northeast of Trenton and 40 miles east of Phillipsburg and Easton, Pennsylvania.

Situated in the southeastern section of the county, Harding is almost half way between Interstates 80 and 78 and is bisected on its western side by Interstate 287. With a population of 3,180 residents in 2000, the township lies approximately three miles south of the Town of Morristown and is bounded by Morris Township on the north, Chatha ugh on the east, Long Hill Township on the south, Bernardsvil Borough and Bernards and Mendham Townships on the west.

No description of Harding's setting within the region would be complete without the recognition of the extensive land areas which form prominent national and regional (including county and state) preserves, parks and recreation areas. Harding is nestled between the Morristown National Historical Park (Jockey Hollow) to the north, and the Great Swamp National Wildlife Refuge, to the south. Together, these two national open space areas comprise over one-third of the township's land area. In addition, there are numerous other public, quasi public and private preserves and environmental resource areas found within the township.

From a local planning perspective, it is the combination of these significant natural resources that promotes the rural character of the town. By the same token, the rural land use pattern which has guided most development over the years has helped to mitigate potential adverse impacts on such important resources as the Wildlife Refuge, Jockey Hol y streams, water bodies, and wetlands throughout the township. The Master Plan's goals and policies address the need for preservation of these and other valuable natural features; they recognize that through the land use decision-making process, water quality and supplies can be protected. Lying as it does in such a fragile setting, and comprising over 37 percent of the Great Swamp's watershed area, Harding has a unique obligation to balance the objectives of land development with environmental resource protection.

ENVIRONMENTAL RESOURCES INVENTORY [1]

(Adopted October 27, 2003; Reorganized under "Community Characteristics" February 25, 2008)

Introduction

The purpose of an Environmental Resources Inventory (ERI) is to catalog natural and environmental characteristics to provide a factual basis for policy recommendations in the Master Plan that relate to the natural environment. The Harding Township Master Plan has contained an ERI since 1984. Prepared by the Harding Township Environmental Commission, the ERI has evolved since then with periodic amendments and additions. This latest evolution is based firmly upon prior versions inventorying a wide range of natural and environmental resources. The major changes in this amendment are intended to focus on the environmental resources of most importance and significance in Harding: water resources. The maps for this version of the ERI have been recast within a Geographical Information System (GIS), based on a variety of national, state, county, and local data sources. They are referenced in the text and included at the end of the Master Plan.

Water resources are particularly important in Harding s. Its citizens rely primarily upon individual wells for their potable water supply. The township is completely within the recharge area of the Buried Valley Sole Source Aquifer and virtually the entire township's surface waters drain directly into the Great Swamp National Wildlife Refuge. Changes in the quality or quantity of water flowing into the Refuge may substantially impact it and the Passaic River, which flows out of it. In addition, fragile streams of rare quality, among the highest in the state, are the basis for the township's designation as an *environmentally sensitive planning area* in the New Jersey Development and Redevelopment Plan. In a general sense, the high quality water resources found in the township contribute greatly to the township's and region's environmental quality and are significant from a regional and state perspective. They are also important from a national perspective because large portions of the Morristown National Historical Park and the Great Swamp National Wildlife Refuge are located within the township.

Physiography and Geology [2]

The physiography and geology characteristics of an are the basic landforms of the community. Physiography is the study of the physical features of the earth's surface. Over a period of millions of years, two different areas in Harding were created by geologic actions as shown in Figure 1, Bedrock Geology map. The two geologic "provinces," the Appalachian Highlands and the Piedmont Plain (the "lowlands"), are separated by a border fault. The Appalachian Highlands (often referred to as the Reading Prong of the New England Province), located to the west of the present day US Route 202, were created by an uplifting of the earth's crust. The land east of the cracked earth was depressed, forming the Piedmont Plain.

---

[1] This Environmental Resources Inventory, was funded in part by a grant from the New Jersey Department of Environmental Protection, Environmental Services Program.

[2] This section is based on material prepared by Paul S. Boyer, Professor of Geology, Fairleigh Dickinson University, in 1991.

As weathering proceeded, the Plain received deposits of sand, silt and clay, which were intermittently covered by lava sheets from volcanic eruptions. A period of faulting and tilting in the Piedmont exposed the basalt ridges which resulted from volcanic action forming the upland areas of today. In later geologic eras, glacial advances and retreats resulted in a mixture of stratified boulders, pebbles, sand and clay. Mucky soils found in the Great Swamp are also a result of glacial actions and soil deposition.

The upthrown Highlands block has undergone more erosion, so that the rocks exposed on that side are of different composition and age from those j he fault line: they are very ancient Precambrian metamorphic rocks about one billion years old, mainly gneiss. The rocks of the Highlands are quite resistant to erosion, which explains the loftiness of this section of the township. This is the area where radon would be expected to pose the biggest problem, but elevated readings have also been encountered in other parts of the township.

Most of the township lies within the Piedmont Province, which is underlain by three formations, all deposited during the early part of the Jurassic Pe iod (roughly 200 million years ago). The oldest of these is the Towaco Formation, composed of sedimentary rocks: sandstone, siltstone, and red shale. A good exposure of this material may be seen on the west side of Millbrook Road, just north of the intersection with Village Road. Also within the Towaco Formation is a lens of coarse conglomerate that, because of its great elative resistance to erosion, accounts for the hill at the upper end of Anthony Wayne Road.

The layered formations of the Piedmont Plain have been folded upward into a structural dome, so we find the younger formations appearing outward from the area of the Towaco Formation. The next formation in age is the Hook Mountain Basalt. Basalt is an igneous rock resulting from the solidification of a flood of lava. The Hook Mountain Basalt is a sheet about l00 meters thick, but we see only the upturned edge which forms a crescentic ridge sweeping from the Mt. Kemble Lake area eastward to Green Village, thence northward along the west side of Spring Valley Road. A good exposure of the basalt is visible where Lee's Hill Road crosses the ridge southwest of the school. Elsewhere along the ridge one frequently notices in the soil weathered fragments of basalt: very dark rock weathering orange or yellow-brown on the outer surface. Youngest in the township is the Boonton Formation, consisting of red, gray, brown, and black sandstone, siltstone, and shale. The formation weathers readily, so there are no good exposures within the township. The Boonton Formation underlies the low areas beyond the basalt ridge, including the area of the Great Swamp.

In very recent geologic time, our area was subjected to the effects of glaciation. Debris directly deposited by the last great ice sheets is not found in Harding Township, but the periglacial (near-glacial) conditions must have given the region a tundra environment as recently as l0,000 years ago. Moreover, the Second Watchung Mountain acted as a dam, trapping the glacial meltwater as the celebrated Lake Passaic, a cold, desolate lake spiked with icebergs. The Highlands escaped inundation, as did parts of the basalt ridge and the conglomerate-lens area, which formed islands. More than half of the area of the township was flooded and received deposits of lakebed clay and loam which determine the condition of the soils to this day. Many of the current septic and drainage problems today may be blamed directly on Lake Passaic.

Groundwater Resources [3]

Water supplies for Harding Township are derived from both surface and groundwater supplies. However, a majority of residents are wholly dependent upon groundwater wells. Approximately 300 households in Harding are adjacent to water mains. This leaves approximately 900 of the existing 1200 homes (75%) that rely on individual wells for potable water. These same residences are also reliant upon individual subsurface septic systems for wastewater disposal. Almost all of the undeveloped land within Harding is in areas where individual wells and septic systems will be required for potable water supply and wastewater disposal. A recent examination of more than half of the township's well drilling records shows modest yields for residential purposes [more than 85% with yields greater than 10 gallons per minute (gpm)] with considerable variation from site to site (average yield of 22 gpm with a standard deviation of +/- 17 gpm), consistent with the underlying fractured-bedrock nature of the aquifers.

As a result of the township's predominant use of indiv lls for potable water supply and on-site septic systems for wastewater disposal, the township's groundwater resources are potentially at risk for impacts related to subsurface sewage disposal. Of the various constituents present in domestic wastewater, nitrate is the most ty threat to groundwater quality and is typically the component used to evaluate groundwater impacts related to subsurface septic disposal systems. This is due to the fact that nitrate generally occurs naturally at low concentrations; it is relatively stable and mobile in groundwater; and human health concerns and environmental impacts result from excessive nitrate concentrations. The US Environmental Protection Agency has a Primary Maximum Contaminant Limit for nitrate of 10 mg/l (nitrate-nitrogen). Consumption of potable water with concentrations above this level can lead to human health impacts such as methemoglobinemia. Environmental impacts associated with excessive nitrate include accelerated growth of algae in surface water and an associated decrease in oxygen concentrations that can impact stream biota.

One way to evaluate potential nitrate-based groundwater impacts is to perform a nitrate-based carrying capacity analysis. The results of such an analysis would indicate maximum lot densities throughout the township that would be protective of groundwater quality with respect to nitrate impacts from septic systems.

Harding Township's hydrogeology is characterized by three general classes of bedrock aquifer and two regions of surficial aquifer. The bedrock reg derlie the majority of developed and developable land in the township. These bedrock formations are characterized by water flow primarily along fracture lines, resulting in varying well depths and yields throughout the township and generally unpredictable hydraulic interconnection between nearby wells. The formation yields are classified as "C" and "D" within the state system, averaging 101-250 gpm and 25-100 gpm respectively. These classifications are consistent with existing township well performance data. A higher-yielding surficial formation underlies a small area in the northeast portion of the township and a very low-yield surficial formation lies within the Great Swamp National Wildlife Refuge. The majority of surface water runoff from the township runs through the Great Swamp and then through the Passaic River, serving as a water source for communities

[3] This section was prepared by Robert L. Zelley, P.G., Maser Consulting, July 2003.

downstream. Harding is also designated as a recharge region for the Buried Valley Sole Source Aquifer, providing water to nearly 600,000 people in Morris and Essex counties.

Groundwater Hydrology and Aquifer Recharge Areas [4]

An aquifer is a geological formation capable of storing and transmitting water at rates fast enough to supply reasonable amounts of water to wells. rs are classified into two main categories: 1) unconfined or water table aquifers in which relatively permeable materials are present from the bottom of the aquifer to the ground s in which one or more low-porosity layers are present at and above the top of the aquifer. The productivity of an aquifer is a function of the effective porosity (the void space of a consolidated or unconsolidated formation available to fluid flow) and permeability. In consolidated formations (those compacted and made solid), and less commonly in unconsolidated formations, porosity is categorized as primary porosity and secondary porosity. Primary porosity consists of the void spaces between grains and secondary porosity consists of fractures within the formation. Poorly cemented sandstone will exhibit primary porosity via the interstitial spaces between sand grains akin to that of the unconsolidated sands from which it was derived and secondary porosity via fracturing of the formation. Movement of groundwater occurs in response to hydraulic gradients, with flow occurring from areas of high hydraulic head to areas of low hydraulic head.

An aquifer recharge zone is an area through which prec ion infiltrates the ground surface, the underlying soil, and into the deeper subsurface and potential underlying aquifers. Several sources of water loss occur during this journey and include: surface runoff, evapotranspiration, and interflow. Interflow occurs when infiltrating water encounters low permeability deposits upon which it will travel horizontally to a more permeable deposit or possibly be discharged to a spring or stream.

In confined aquifers the recharge zone(s) can be located considerable distances from wells tapping the aquifer. Unconfined aquifers generally have common characteristics associated with recharge areas and are typically located in topographically high locations having a relatively deep water table. As a result of the interaction of groundwater recharge and the differing geologic settings of unconfined versus confined aquifers, the water level in a well completed in an unconfined aquifer will be at the same elevation as that of the water table, whereas in a confined aquifer the water level in a well will have an elevation greater than that of the top of the aquifer (i.e. the bottom of the confining unit). In certain situations, the water level elevation (the piezometric surface) will be higher than the ground surface resulting in a freely flowing well.

Figure 2, Ground Water Recharge map, illustrates the distribution of groundwater recharge throughout Harding Township. These data were calculat l Survey (NJGS) using a technique developed by NJGS to calculate approximate groundwater recharge rates from readily available data.[5] The method is not applicable for areas containing water bodies, wetlands, and hydric soils due to the fact that site specific investigations are usually required to assess whether or not these locations are groundwater recharge zones,

[4] This section was prepared by Robert L. Zelley, P.G., Maser Consulting, July 2003.
[5] NJGS Geological Survey Report GSR-32 A Method for Evaluating Ground-Water-Recharge Areas in New Jersey; Charles, Emmanuel G, et al; 1993.

groundwater discharge zones, or temporally vary between the two. The Great Swamp serves as an example. In periods of low precipitation, as the water table drops, the Swamp tends to act as a recharge area as water slowly filters into the groundwater. The Swamp tends to act in a discharge capacity as the water table rises during per ndant precipitation.

Within Harding Township two broad sources of groundwater are available, namely: bedrock sources and overburden sources that consist of unconsolidated glacial deposits. The productivity of an aquifer is dependent upon the geology, as well as the topographic, climatic, and soil conditions associated with the aquifer. Bedrock groundwater sources underlie the vast majority of developed and developable land in Harding. This is a result of both the geologic history of the area and the protected status of the Great Swamp Natural Wildlife Refuge in the southern portion of the township (also the area of the low permeability glacial deposit overburden).

The bedrock in Harding Township can be divided into three general classifications: Pre-Cambrian crystalline rock (e.g. granite); Jurassic sedimentary rock (e.g. shale and sandstones); and Jurassic basalt. Figure 1, Bedrock Geology map, i lustrates the bedrock geology of the township. Pre-Cambrian formations are found to the northwest of Route 202 and are separated from the other geologic formations in the township by the border fault (Ramapo Fault) that also represents the division between the Highlands Physiographic Province and the Piedmont Physiographic Province. Jurassic sedimentary rock formations and Jurassic igneous rock formations are located to the southeast of the border fault with the basalt being present in the central portion of the township.

1. Pre-Cambrian Rock Formations – Underlie all of the area to the west of the border fault (in the vicinity of Route 202) – over 600 million years old and originally consisted of sedimentary and igneous formations some of which have been metamorphosed over the years by heat and compression.

2. Jurassic Rock Formations – Underlie the remainder of the township and consist of sandstones, shales, and basalt. These formations are younger than the Pre-Cambrian formations and typically occur as alternating beds of various sandstone, siltstone, mudstone, and shale. Uplift in the western Highlands resulted in a depressed basin and heavy rains resulted in the deposition of eroded sediments here that became the sedimentary Jurassic formations. Regionall three lava flows resulted from volcanic activity during the Jurassic period that interrupted the deposition of sedimentary formations and created the Jurassic basalt formations (e.g. Hook Mountain Basalt). Subsequent tilting and weathering of these formations has eroded them, leaving the more resistant basalt present in the form of ridges now known as the First, Second, and Third Watchung Mountains, with the Third Watchung Mountain being a broken ridge comprised of Towaco Mountain, Mt. Kemble, and Long Hill.

Figure 3, Glacial Deposits map, illustrates the distribution of glacial deposits in and around Harding Township. The glacial deposits were predominantly deposited during the Wisconsinan Age and are located in the southern third of the towns in the northeast corner of the township. In general, the bulk of these unconsolidated sediments, and in particular the lake bottom deposits in the area of the Great Swamp National Wildlife Refuge, are too fine-grained to yield significant quantities of groundwater to wells. However, they do serve as a large reservoir that stores groundwater from recharge and can slowly release it to the underlying and adjacent bedrock during periods of time when the underlying water table is depressed.

The New Jersey Geological Survey (NJGS) developed an aquifer ranking system in order to compare the typical water supply productivities of the various formations within the state. The

aquifer rank classes range from A (> 500 gpm) to E (< 25 gpm). It should be noted that these yields are for high productivity wells that may have been favorably sited and also may have boreholes exceeding the 6-inch diameter typically used in a domestic well. The bedrock geologic formations within Harding Township can be ranked in order of decreasing potential yields as: 1) Jurassic sedimentary formations – Rank C: 101 to 250 gpm, and 2) Pre-Cambrian and Jurassic basalt formations – Rank D: 25 to 100 gpm. A very small portion of the township (the area to the north of Woodland Avenue) lies within a productive overburden region, comprised of Wisconsinan Aged Deltaic and Lacustrine Fan deposits having an Aquifer Rank of B: 251 to 500 gpm.

In general, the primary porosity of the Pre-Cambrian formations is near zero. The storage and movement of water in these formations is the result of secondary porosity. Recharge to the Pre-Cambrian formations generally occurs through overlying soils and surficial deposits. Groundwater is typically present under water table conditions (unconfined) in these formations. However, local confined conditions may occur both in low-lying areas where overlain by low permeability sediments and in situations where a poorly interconnected fracture system is recharged at an elevation higher than that of the well intersecting the fractures. As is typical of the consolidated formations of New Jersey, fracture size and density in the Pre-Cambrian formations decreases considerably below a depth of approximately 300 feet due to the increasing pressure exerted by the overlying rock and overburden. As such, the yield of a well completed in these formations generally will not increase significantly below this depth. Due to the fact that water flow and storage is a result of secondary porosity in these formations, well yields can be significantly improved by siting wells at locations near fault zones where fracture size and density is typically greater than that of the surrounding formation. Fracture trace and lineament analyses can be performed relatively inexpensively to identify locations where several fractures intersect.

Similar to the Pre-Cambrian formations, the Jurassic sedimentary and basalt formations within Harding Township have near-zero primary porosities. Secondary porosity is responsible for the bulk of water movement and storage in these formations. Groundwater is typically present under water table conditions in these formations. As with the Pre-Cambrian formations, local artesian conditions may occur both in low lying areas where ove lain by low permeability sediments and in situations where a poorly interconnected fracture system is recharged at a higher elevation than that of the well intersecting the fractures.

The Wisconsinan Aged Deltaic and Lacustrine Fan deposits located in the northeastern corner of the township have the highest potential for large groundwater yields. The Southeast Morris County Municipal Utilities Authority's McCabe Well taps this source from a depth of approximately 200 feet and is located approximately 1, 0 feet northeast of the intersection of Woodland Avenue and the township boundary with Morris Unfortunately, this resource underlies only a small fraction of Harding Township.

Buried Valley Aquifer [6]

Southeastern Morris County is underlain by the "Buried Valley Aquifer," formally known as the "Buried Valley Aquifer in southeastern Morris and western Essex counties." On January 15, 1979, the City of East Orange and the Passaic River Coalition of Basking Ridge petitioned the Administrator of the U.S. Department of Environmental Protection to declare the Buried Valley Aquifer System a "sole source aquifer" under the provisions of the 1974 Safe Drinking Water Act. In 1980 the Administrator determined that the system is a sole or principal drinking water source which "if contaminated would create a significant hazard to public health." Figure 4, Buried Valley Sole Source Aquifer map, illustrates the location of the Buried Valley Aquifer with respect to northeastern New Jersey and the location of Harding Township within the aquifer. All of Harding is located within the recharge zone of the Buried Valley Aquifer.

As a result of this designation, no project undertaken in the area may receive federal financial assistance if the EPA Administrator determines that such a project may contaminate the aquifer through a recharge zone so as to endanger public health. A commitment for assistance may be made, however, authorized by another provision of the law, to plan or design the project to assure that the aquifer will not be contaminated.

The Buried Valley Aquifer is based on political boundaries, not hydrogeologic boundaries. There is a misconception that it represents a single aquifer when, in reality, there are multiple aquifers, not necessarily interconnected, within this political boundary. In fact, the boundaries of the Buried Valley Aquifer overlap with the Northwest New Jersey sole source aquifer and the Rockaway River sole source aquifer.

Topography

The northwestern part of Harding (generally west of Route 202), located within the Appalachian Highlands, has a typical elevation roughly between 500 to 700 feet above sea level. The valleys have eroded to between 200 to 300 feet below the tops of the ridges. The remainder of the township, in the Piedmont Plain, is characterized by elevations of approximately 160 to 500 feet with rolling plains and swampy areas.

Figure 5, Topography map, shows the outline of Harding Township overlaid on the USGS topographic map of the area. Elevations within the township range from approximately 740 feet above sea level on Sugar Loaf Hill in Morristown National Historical Park (Jockey Hollow) to a low of approximately 225 feet in the Great Swamp National Wildlife Refuge. Although the more steeply sloping areas of the township are generally found west and north of Route 202 and are contained within Jockey Hollow and further to the north, Lewis Morris Park, there are substantial areas to the south and west of Route 202 which contain slopes of 15 percent to 25 percent.

Another area of steeply sloping land is found around Mt. Kemble Lake. Here, slopes of 15 percent to 25 percent predominate, with three ridge lines of stronger slopes over 25 percent.

[6] This section was prepared by Robert L. Zelley, P.G., Maser Consulting, July 2003.

Aside from the above areas, there are sporadic sites which contain slopes ranging from 15 percent to 25 percent and above, but these areas are not expansive. The bulk of the township east of Route 202 is gently to moderately sloping and is comprised of gently rolling open and wooded land areas, ranging from 250 feet to 450 feet in elevation. The Great Swamp in the southern third of the township is nearly level.

Steeply sloping terrain can have both positive and negative implications on water resources. On the positive side, such terrain is often associated with fast moving (oxygenating) and highly shaded (cool) streams, conditions that promote high water quality. On the negative side, such areas are more prone to severe soil erosion when the land is cleared or disturbed. Areas in excess of 25% slopes are highly prone to soil erosion with potentially substantial impacts on surface water quality.

Soils [7]

Planning decisions should be made based upon an understanding of the basic capacity of the land to "carry" development. This is reflected in part by soils types, but also in terms of topography, vegetation, watercourses, etc. Soils are formed as a result of the interaction of:

1. Parent Material - The unconsolidated mass in which soils form. In Morris County soils formed in glacial till, glacial outwash, recent stream alluvium, organic material and rock material weathered in place.
2. Climate - In Morris County, average annual precipitation of approximately 44 inches and average annual temperature of 49° F.
3. Plant and Animal Life - Delivering organic matter to the soil and bringing nutrients from lower layers to upper layers of the soil.
4. Topography - The slope of the land - influencing rates of runoff, drainage, erosion, and seepage.
5. Time - The long period required to form soils from the parent material.

The soils found in Harding Township form a fundamental basis for the area's environmental sensitivity. The predominant types are the result of soils formed in:

1. Organic deposits, glacial lake sediment or glacial outwashes such as the Riverhead, Carlisle, and Parsippany soils.
2. Old glacial deposits or material weathered from bedrock such as the Neshaminy, Penn, Reaville, Califon, Cokesbury, Parker, and Edneyville soils.

Generally, the township can be characterized by four major areas:

1. The southern third of the township (Great Swamp) is th y Parsippany, Carlisle, and Pompton soils, although the Loantaka Res nd Great Brook areas are also formed of these soils which are basically organic deposits.
2. The central portion of the township is crossed by an expansive band of Neshaminy and Ellington soils which are fairly well drained soils.
3. The north-central part of the township, east of Route 202, is largely composed of Penn, Parsippany, and Pattenburg soils with scattered areas of Reaville soils.

[7] The information for this section was derived from the Soil Survey of Morris Co., NJ, US Dept. of Agriculture Soil Conservation Service, 1976.

4. The northwestern part of the township west of Route 20 ve areas of Edneyville, Califon, and Parker-Edneyville soils. Much of this area is steeply sloping, and the northernmost portion is the site of Morristown National Historical Park and Lewis Morris Park.

The United States Department of Agriculture Soil Conservation Service prepared a Soil Survey of Morris County in 1976. The survey contains extensive data concerning the soils found in the township and provides detailed mapping of the various soils - such areas shown on the soil maps are referred to as "mapping units." A mapping unit is similar to a soil "phase," which is a component of a soil series - or soils, which have like profiles. Soils within a "series" often vary in their surface layers or slope, stoniness, or other features, which may have an impact on our ability to use the land. Soil series are divided into "phases" to reflect such differences and to enable mapping each soil phase (or mapping unit) based upon some of these differing characteristics. The specificity of the mapping and soil descriptions is therefore enhanced to reflect multiple land characteristics.

The Soil Survey contains extensive information related to the suitability of soils types to support various types of human uses. Soil characteristics determine, in part, the suitability of a site or area for a variety of uses such as agricultural, building foundations, septic tank absorption, streets and parking areas, landscaping and recreation areas. Also, and of increasing importance today, soil characteristics determine an area's drainage capability, aquifer recharge potential, and erosion hazard. Of particular importance to planning decisions in Harding Township is the classification of soils in terms of their limitations in connection with septic systems because the township largely depends upon such systems.

Figure 6, Soil Limitations for Septic Systems map, generally classifies soils in the township based upon their limitations to support septic systems. The soils in the northwestern part of the township and in a band through the center of the township (running east to west) have the fewest limitations (i.e. slight) for septic systems. More common however, in the northern and southern parts of the township, are soils that have moderate to severe limitations for septic systems. A table at the end of this section lists specific soils particular to Harding with their properties.

Wetlands

In general, wetlands are transitional areas between we l-drained, rarely flooded uplands and permanently flooded deep waters, lakes, rivers, and streams. Wetlands typically are found in upland depressions or along waterways where they are subject to periodic flooding. However, they are sometimes located on slope areas where they are fed by groundwater seepage. The preservation of wetlands is critical to the protection of the environmental resources that are the most fragile and important in the township: water resources.

There are a variety of definitions of wetlands, but the definition adopted by the New Jersey Department of Environmental Protection (DEP) in the New Jersey Freshwater Wetlands Protection Act and which was originally established under Section 404 of the Clean Water Act is as follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a

prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (EPA, 40 CFR 230.3 and CE, 33 CFR 328.3)

This definition includes three criteria, which determine if an area is a wetland: hydrology, vegetation, and soils. Wetland areas must have a suff ient exposure to water to produce saturated soil conditions (i.e., hydric soils) and to support a predominance of wetlands plant species (i.e., hydrophytic vegetation). Some wetlands, such as marshes, are obvious, but others such as forested wetlands, are much less distinct.

In the past, wetlands were once considered nuisance areas which should be drained and converted to "productive" upland. However, they are now appreciated for their positive role in the natural ecosystem. Unfortunately, as development of upland areas continues, increasing pressure is placed on wetland areas for their development potential. The benefits of wetlands to nature and man are briefly summarized below.

Flood Control - Wetlands reduce the flood potential of waterways by detaining storm water in natural depressions and dissipating flood waters which overflow river banks. In addition, the flood energy can be reduced by wetland trees and plants in a flood plain area. Urban flood damages and erosion are thereby reduced.

Aquifer Recharge - Wetlands are often important areas for the recharge of groundwater aquifers. Because wetlands detain storm water, the opportunity for infiltration into aquifers is greater than in upland areas. Water entering wetlands also serves to maintain base flow in adjoining streams. Since aquifers (and rivers) serve as sources of drinking water, protection of wetlands related to aquifers is vitally important.

Erosion Control - Wetland plants can often reduce stream bank erosion due to the stabilizing nature of the root systems and reduction of current velocity. Maintenance of wetland vegetation or specific planting schemes is recommended to protect stream banks from erosion.

Water Quality Improvement - Wetlands can greatly improve the quality of waterways by removing and retaining nutrients, processing chemical and organic wastes and reducing sediment loads. Because wetlands naturally are found between uplands and open water, they intercept runoff from the land and filter contaminants. The wetlands' ability to cleanse the water is an important consideration as we try to improve the quality of our streams and rivers, an important resource in Harding Township.

Recreation/Aesthetics Open Space - Many active and passive recreation activities take place in wetlands, including environmental education. Wetlands are aesthetically appealing to many people, even from a distance, and they can provide scarce open space in urbanized areas.

Wildlife Habitat - Wetlands are required by many types of animals and plants for survival. More than one-third of the nation's endangered and threatened species depend on wetlands. While a primary home to some animals (such as the wood duck, muskrat, and beaver), wetlands provide food, water or cover to many additional species. Fres and coastal marshes serve as important spawning and nursery grounds. Almost all of our important sport fishes spawn in the open water or emergent portions of wetlands. Wetlands also serve as critical nesting and resting areas for migratory waterfowl. Protection of wetland resources can have significant positive impacts on wildlife habitat maintenance and enhancement as well as helping to lessen potential damage and costs to the public from flooding and degradation of sources of drinking water.

In New Jersey, wetlands are regulated by the Army Corps of Engineers and the New Jersey Department of Environmental Protection (DEP) through the New Jersey Freshwater Wetlands Protection Act. The Act prohibits disturbance of wetlands in New Jersey without a permit from DEP and describes the very limited circumstances under which permits may be granted. As part of the Act, the freshwater wetlands of New Jersey are divided into three categories:

1. Wetlands of exceptional resource value are those which discharge into trout production waters or their tributaries or which serve as habitat for threatened or endangered species.
2. Wetlands of ordinary value do not exhibit the characteristics of "exceptional value" wetlands and are isolated wetlands that are more than 50 percent surrounded by development and less than 5,000 square feet in size. Also included in this category are drainage ditches, swales, and detention facilities.
3. Wetlands of intermediate resource value are those not defined as exceptional or ordinary.

The Freshwater Wetlands Protection Act also established transition areas (or buffer zones) between wetlands and uplands. Wetland areas of exceptional resource value will require transition areas of 150 feet and those of intermediate resource value will require transition areas of 50 feet. To instill flexibility for site planning purposes, the DEP rules provide the opportunity to average the transition area on a particular site under certain circumstances.

The Army Corps of Engineers (COE) retains jurisdiction over wetlands in New Jersey through Section 404 of the Clean Water Act. However, because DEP's Statewide General Permit program duplicates the COE's Nationwide Permit program, the COE only retains jurisdiction over permitting in the following circumstances: impacts to tidal waters and their tributaries; impacts to wetlands that are hydrologically connected to tidal waters and their tributaries; impacts to wetlands greater than one acre; and violations of wetland regulations that occurred prior to enactment of New Jersey's Freshwater Wetlands Protection Act.

The Freshwater Wetlands Protection Act specifically supersedes all existing county and municipal wetlands regulations and prohibits new regulations. As a result, the role of municipalities in protection of wetland areas is to support DEP in its enforcement of the Act. The Act invites input to DEP from local governments and the public, and it requires notification of adjacent landowners, local governments, and the general public by applicants for wetlands permits. Otherwise, municipalities are permitted to regulate activities in other critical areas to enhance natural resource protection.

Figure 7, Wetlands map, shows the probable locations of various general categories of wetlands in Harding Township. It was produced from information provided by the New Jersey Department of Environmental Protection based upon photo-interpretation of 1995/97 photos. The Wetlands map should be used only for planning purposes; site-specific applications require a detailed delineation of the wetlands boundary. Such delineation requires extensive field investigation and careful documentation of the site's soils, vegetation, and hydrology.

Drainage Basins

Out of Harding's total of 13,108 acres, 12,793 acres lie within the drainage basin of the Passaic River. This can be broken down into five sub-basins, defined by waters flowing into the five largest waterways in the township: Loantaka Brook, Great Brook, Primrose Brook, Black Brook and the Passaic River. Figure 8, Drainage Basins map, displays these areas. Over 97 percent of Harding's land area drains into the Great Swamp. A small area, comprised of about 300 acres in the northwesterly corner of the township, lies within the headwaters of the Whippany River drainage basin and is not directly tributary to either the Great Swamp or the Passaic River. All but the aforementioned 300 acres within Harding Township lies within the Great Swamp basin and approximately 36 percent of the basin itself is comprised of lands within Harding.

In the southern portion of the township, the Great Swamp and the immediate upslope areas comprise a total of 4,460 acres. Great Brook is the principal drainage way within Harding Township's portion of the Great Swamp and is the discharge waterway for the Swamp where it merges with the Passaic River. Great Brook enters the Great Swamp in the southeast portion of the township. Its headwaters are located in Morristown to the north and it traverses Morris Township before entering Harding Township. Not including any part of the Great Swamp, the drainage area of the Great Brook basin within Harding 3,560 acres.

Included within Great Brook Basin area is Silver Brook drainage basin comprised of 1,230 acres within the township. Silver Brook, a tributary stream to Great Brook, drains the north central portion of the township and extends into Morris Township to the north. Both Silver Brook and the entire reach of Great Brook are classified as non-trout waters by the DEP. Also included within Great Brook Basin are Silver Lake and Pine Brook.

To the east of Great Brook, Loantaka Brook, a stream tributary to Great Swamp, enters Harding Township from Morris Township and after a short distance leaves Harding and enters Chatham Township. Loantaka Brook, also a non-trout stream, drains approximately 510 acres of Harding Township and its entire reach within Harding Township located within the Loantaka Reservation, a county park. Loantaka Brook is the receiving water for the Woodland Avenue Sewage Treatment Plant located upstream in Morris Township.

Slightly south and west of Great Brook basin is Mill Brook and Mill Brook drainage basin comprising a total of 280 acres. Mill Brook's headwaters are located within the New Vernon area. Mill Brook parallels Millbrook Road and crosses Pleasantville Road before it enters the Great Swamp. Mill Brook is classified as a non-trout stream.

To the west of Great Brook and its drainage basin is Primrose Brook and Primrose Brook drainage basin. Primrose, which has its headwaters for the most part within Harding Township and is directly tributary to the Great Swamp, drains an area of 3,100 acres. Included within Primrose Brook drainage basin is Mt. Kemble Lake and its tributary drainage area of 510 acres. Mt. Kemble Lake is a recreation lake for a private community in the township. In accordance with the Surface Water Quality Standards adopted by the DEP Division of Water Resources, the Primrose Brook is categorized as a fresh water 2 category 1 trout production stream above Lee's

Hill Road and a non-trout stream below Lee's Hill Road. The fact that a portion of Primrose is in the "trout production" category indicates its exist gh quality.

It is important to note that all waterways are designated category 1 waters as soon as they enter the Great Swamp National Wildlife Refuge. Not directly tributary to the Great Swamp, the Passaic River, a freshwater 2 trout production stream above Route 202 and a non-trout stream below Route 202, drains 930 acres of the extreme western portion of the township.

Floodways and Flood Hazard Areas

Along its eastern border, Morris County contains a chain of low-lying lands that function as a giant sponge. One of the largest links in this chain, lying almost wholly within Harding Township, is the Great Swamp National Wildlife Refuge, its feeder streams, and their associated floodplains and wetlands. These floodplain and wetland areas, when properly managed, have the capacity to absorb huge quantities of rain and flood waters. A substantial amount of this absorbed moisture is returned to the water table. The is released slowly to the rivers, and returned to the atmosphere, thus completing the natural cycle. As in most natural systems, the operative potential of a floodplain can easily be disrupted. Soil conditions combined with the slope areas, make floodplain planning essential to the retention of the present ecological balance in Harding Township. Floodplain and storm water management have become increasingly recognized as an essential element in the community planning process and are now required as part of the Municipal Land Use Law.

Figure 9, Flood-prone Areas map, shows flood-prone areas in the township. It is based upon information provided by the Federal Emergency Management Agency in September 1996. Flood-prone areas are generally defined as having a one percent chance of flooding each year. Flood hazard areas were initially delineated by the Township Engineer in partial fulfillment of the National Flood Insurance Act of 1968 and accepted by the US Department of Housing and Urban Development in 1974. Revised flood hazard areas were adopted in 1976, in March 1982 and September 1996. The current Flood Insurance Rate Maps were adopted December 2001[8]. Designated flood hazard areas for 100-year floods are located along Silver Brook and Great Brook in the north-central portion of the township, Loantaka Brook in the northeastern corner of the township, Primrose Brook and the Passaic River in the southwestern portion of the township and the Great Swamp National Wildlife Refuge area in the southern portion of the township. Copies of the current official Federal Flood Insurance Rate maps are on file with the Township Clerk.

There are state regulations in place which, together with township ordinances, ensure that development in and along the delineated floodways and flood fringe areas does not encroach on these sensitive areas and that the lowest floor elevat including basement) of residential structures is built one foot above the level of potential flooding (as mapped by FEMA). The township's Flood Damage Prevention Ordinance defines the following:

[8] Figure 9, Flood-prone Areas, displays areas based upon the 1996 FEMA mapping which was the most recent GIS data available when the figures for this ERI were developed.

Floodway - The Floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than two-tenths (0.2) of one (l) foot.
Flood Fringe Area - The area between the floodway and the boundary of the l00-year flood. The "flood fringe area" is synonymous with the term "flood way fringe" as used in the Flood Insurance Study.
Flood Hazard Area - The floodway and the flood fringe area as determined y the New Jersey Department of Environmental Protection pursuant to New Jersey Flood Hazard Control Act, NJSA 58:16A-50 et seq.

Approximately 4,653 acres, amounting to about 35 percent of the township, are located within flood hazard areas of various streams and rivers. The predominant flood hazard area is within the Great Swamp National Wildlife Refuge. The Passaic River, Primrose Brook, Great Brook, Silver Brook, and Loantaka Brook have delineated flood hazard areas.

Annually, Harding Township and its residents are impacted by the flooding of these waterways. Great Brook, as it traverses the Great Swamp, floods Long Hill Road almost on an annual basis, requiring the road to be closed. Once every four to five years, Lee's Hill Road and Baileys Mill Road are closed due to flooding along Primrose Brook. In addition, Woodland Road is closed on a four- to five-year frequency due to flooding along Great Brook. Properties immediately adjacent to the Great Swamp along Woodland Road, Meyersville Road, and Miller Road are partially flooded annually due to a back up of flood waters from the Wilderness Area of the Great Swamp National Wildlife Refuge.

Vegetation

The great diversity of land use and vegetative cover in Harding Township is graphically illustrated in Figure 10, Vegetative Cover map. It is based upon 2002 information from the Landscape Project, a NJDEP Division of Fish and Wildli ize vegetative cover throughout the state to a single standard. Diverse ecosystems are known to be more resilient to environmental disturbance than are ecosystems characterized by one or two dominant species. The maintenance of a wide spectrum of vegetative types helps to ensure the perpetuation of native wildlife species. Extensive areas of natural vegetation contribute to the general environmental quality of the entire township.

Lush vegetation and aquatic plants extract and utilize common air and water pollutants and large stands of mature woodland help to moderate the local c imate by breaking the force of winds and trapping heat re-radiated from the earth's surface at night. The scenic value of naturally diverse vegetation makes the township an aesthetically pleasing place. Seven categories have been used to characterize the township's vegetation:

1. Open Water
2. Emergent/Scrub-Shrub
3. Wetland Forest
4. Grassland
5. Forest
6. Suburban Wooded
7. Dense Residential/Commercial

Open Water habitats include lakes and ponds, but, as mapped, do not include streams and rivers. The vegetation in open water habitats includes numerous algal species and macrophytes such as pondweed, water lilies, and tape grass. These species adapted to deeper water that is not suitable habitat for emergent species.

Emergent/Scrub-Shrub lands are one of the most valuable yet least appreciated kinds of communities. These lands are among the most productive ecosystems in the world. They improve water quality by filtering suspended solids and utilizing nutrients to support plant growth. These areas play an important role in reducing flood peaks a recharging groundwater supplies. Plants common in emergent areas include rushes, sedges, reed grass, cattails, iris, and mallow. Scrub-shrub vegetation includes spicebush, silky and red osier dogwood, red raspberry, multiflora rose, and swamp azalea.

Wetland Forests generally have seasonally high water tables and so support species tolerant of moist conditions. Trees in these woodlands include re ple, green ash, pin oak, swamp white oak, and sweet gum.

Grasslands consist of cultivated and fallow fields. Some abandoned fields are in various stages of succession, which involves a natural transition from field to forest. Vegetation in these areas includes perennial grasses, goldenrod, milkweed, asters, numerous wildflower species, black raspberry, Allegheny blackberry, multiflora rose.

Forests are located on well-drained soils. Some upland forests are dominated by a species such as oak or hickory and others are composed of mixed species, where no one species is more prevalent than any other. Trees in these areas commonly include red and white oak, red cedar, Norway spruce, shagbark hickory, black cherry, and flowering dogwood.

Suburban Wooded lands are areas of upland forest in which the density of housing is sufficient to disturb the natural community. The same vegetational species found in upland forests are present in suburban woodlands.

Dense Residential/Commercial areas provide very little habitat value. Constant disturbance in these areas changes and often eliminates the natural communities that were originally present. Perennial grasses and ornamental trees and shrubs make up most of the vegetation in these areas.

Although Harding is not known principally for its agricultural qualities, there are a number of working farms located in the township. Some properties are pasture lands and/or hay fields, with a few devoted to horses or sheep; others contain apple orchards, tree farms and to a lesser extent, croplands. There are a handful of working farms including Fawn Hill Farm, Red Gate Farm, Walling Farm, Frelinghuysen, a portion of Hartley Farms, and Wightman Farms, which also operates a business on Route 202. In addition to agricultural activities, there are a number of active boarding stables in Harding including Hilltop Stables and Floradale Farm.

It is important to maintain a variety of vegetation for aesthetic, educational, and ecological reasons. Some kinds of vegetation, however, are more valuable than others due to their role in protecting other environmental resources and their wildlife habitat potential. Sensitive planning should encourage the development of the least useful areas.

Invasive Plants

"Exotic" species have been introduced into Harding either by accident or intentionally from other parts of the world. Because they have few, if any, natural diseases or insects to contain them in this location, they compete aggressively for space and nutrients and often form dense stands or thickets that crowd out native vegetation. This causes a loss of plant biodiversity. The degree of biodiversity is a general indicator of an ecosystem's health. Wildlife that depend on displaced native species for food are also affected. Most invasives flourish in disturbed habitats. The following are invasive exotic species in Morris County[9].

Trees

Acer platanoides	Norway maple
Ailanthus altissima	Tree of heaven
Paulownia tomentosa	Princess tree
Prunus avium	Bird cherry, wild cherry
Robinia pseudoacacia	Black locust

Shrubs

Berberis thunbergii	Japanese barberry
Eleagnus umbellata	Autumn olive
Euonymus alata	Burning bush, winged euonymus
Ligustrum obtusifolium	Border privet
Lonicera tatarica	Tartarian honeysuckle
Rosa multiflora	Multiflora rose
Rubus phoenicolasius	Wineberry
Viburnum sieboldii	Siebold's viburnum

Vines

Ampelopsis brevipedunculata	Porcelainberry
Celastrus orbiculatus	Oriental bittersweet, Asiatic bittersweet
Hedera helix	English ivy
Lonicera japonica	Japanese honeysuckle
Vitis spp.	Grapevine*
Wisteria floribunda	Wisteria

* Some grapevine species are native.

Annuals, Biennials and Perennials

Alliaria petiolata	Garlic mustard
Artemisia vulgaris	Mugwort
Coronilla varia	Crown vetch
Fallopia japonica	Japanese knotweed, Mexican bamboo
Lythrum salicaria	Purple loosestrife
Phragmites australis	Common reed
Vinca minor	Periwinkle, myrtle, vinca

Grasses

Microstegium vimineum Japanese stiltgrass, basket or wire grass

[9] Table was a handout at the May 2003 "Morris County's Green Table" Program, sponsored by the Morris County Park Commission.

Wildlife Habitats

The vegetative communities that exist across the township form a complex pattern. This pattern is shown on Figure 10, Vegetative Cover map. Different animal species have different requirements for food and shelter. An area with diverse vegetation provides a variety of wildlife habitats that can support a larger number of wildlife species than an area with little vegetational diversity. Besides the habitats corresponding to the seven vegetation categories presented previously, the transitional area where two of these habitat types meet (i.e., forest grading into open field) is valuable to wildlife. These transitional areas are termed "edge" habitat. Due to the greater variety of vegetational species in edge habitats these areas provide excellent nesting, resting, and feeding sites for wildlife.

Harding Township contains two large relatively undisturbed areas that provide excellent wildlife habitat: the upland forest of the Jockey Hollow section of Morristown National Historical Park and the wetland forest/emergent habitat of the Great Swamp. In addition, there are many areas of undeveloped forest and open land throughout the township. A number of streams cross the township and very few areas have been densely developed. There are many acres of high quality wildlife habitat within Harding Township.

Open water habitat in the township includes Silver Lake and Mt. Kemble Lake as well as numerous smaller lakes and ponds. Fish species as wel as certain species of amphibians (northern red salamander, cricket frog) and reptiles (mud turtle, stinkpot turtle) utilize this habitat. Many species of waterfowl including geese, ducks, and loons use open water habitats extensively for resting and feeding.

Emergent habitat hosts a wide variety of wildlife spec rfowl use these areas for resting, nesting, and feeding. This habitat contains more amphibian and reptile species than any other habitat in the township. Mammals utilizing this habitat for food and shelter include muskrat, moles, foxes, raccoons, and bats. Most of the Great Swamp is composed of this habitat type.

Wetland forests cover large portions of the Great Swamp as well as areas adjacent to the township's streams. Mammals such as the red-backed mouse, star-nosed mole, raccoon, and opossum live in this habitat. Certain species of frogs, salamanders, turtles, and snakes are adapted for life in these moist woodlands. Birds, including flycatchers, woodpeckers, owls, warblers, kinglets, nuthatches, and thrushes nest and feed in these areas.

Grassland comprises the majority of the central section and isolated areas are found in all sections of the township. Many species and classes of wildlife use open lands for feeding. This is a particularly important habitat for birds. In addition, the white-tailed deer and certain small mammals (mice, moles) occupy this habitat.

Dense residential or commercial areas contain very little wildlife. Animals common to this habitat are not disturbed by the noise and disruption of concentrated human activity. These species include the house mouse, Norway rat, striped skunk, mourning dove, bluejay, robin, and starling.

Forest is common throughout the township and it is the predominant habitat in Jockey Hollow. These areas provide ideal habitat for the white-tailed deer which has undergone a significant increase in population in recent years. Other animals that use these areas for shelter and feeding include mice, squirrels, foxes, toads, snakes, owls, hawks, woodpeckers, and warblers. A number of wildlife species found in upland forests also occur in suburban woods. However, due to the increased disruption of habitat from housing, many species are present in lower densities and some species (particularly avians such as hawks and owls) are nearly absent from these areas.

Figure 11, Critical Habitats map, indicates the presence of various kinds of wildlife, including both federal and state Threatened and Endangered Species. The map is color coded with a rank that indicates the presence of the various classes of wildlife. Within the areas shown as red, yellow, or orange are the following species:[10]

Federal Threatened or Endangered	State Endangered	State Threatened	State Special Concern
Bog Turtle	American Bittern	Barred Owl	Great Blue Heron
	Bobolink	Cooper's Hawk	
	Bog Turtle	Red Headed Woodpecker	
	Blue Spotted Salamander	Wood Turtle	
	Red Shouldered Hawk		

Nuisance Wildlife Species

Reduction of natural predators and/or creation of more favorable environments can cause population explosions of species, substantially affect ironment and quality of life. Both causes have rapidly increased the populations of white-tailed deer and non-migrating Canada geese in Harding Township. Reduction of hunting and natural predators and changes in land use, especially the fragmentation of forested areas and increased areas of lawn, have favored their proliferation. The increasingly large populations of these species have caused substantial ecological impacts.

White-tailed Deer
(Odocoileus virginianus)

As large herbivores, white-tailed deer (Odocoileus virginianus) individually consume large amounts of vegetation and collectively can have a substantial effect on the forest understory, reducing the amount and health of understory vegetation and in some areas virtually eliminating it. Harding's deer population is estimated at more than 100 per square mile, more than five times the generally accepted biological carrying capacity of 15-20 deer per square mile.[11] In many areas the "browse line" is clearly visible, four to fi et above the forest floor. Thriving and varied native plant communities are being replaced by invasive monocultures of Japanese stiltgrass, garlic mustard and Japanese barberry, plants not preferred by deer. These changes reduce biodiversity and the health of impacted ecosystems. Food and breeding habitat for birds

[10] Species listing and category is from Version 1.0 of the New Jersey Landscape Project, 2002.
[11] NJDEP Division of Fish and Wildlife estimate based on analysis of 2002-2003 deer harvest in the area.

and mammals are reduced. Tree seedlings are destroyed or damaged, leaving few saplings to replace aging trees.

Canada Geese
(Branta canadensis)

Large numbers of Canada geese (Branta canadensis) have in Harding Township since the 1980s, attracted by grassy lawns and numerous ponds. They compete for food and nesting sites with other species of waterfowl, stripping vegetation from newly planted fields, and polluting ponds with 3/4 pound of droppings per goose per day. Nutrients from goose droppings can cause excessive growth of algae in ponds and slow-moving streams, making these waterbeds less able to support fish, frogs and other water-dependent species.

Vital Stream and Forest Corridor Habitat

Morristown National Historical Park and the Great Swamp National Wildlife Refuge are the most unique habitats in Harding Township. Each area provides a thriving, undisturbed reservoir of vegetation and wildlife because it is protected from major disruption and development. Other critical habitats in the township are those that provide corridors connecting these two unique habitats. Two such critical corridors, Primrose Brook and Silver Brook, are particularly important links between the large undisturbed areas of high quality wildlife habitat. By allowing animals to move from one major habitat area to another, the value and quality of all these areas is enhanced. The continuing viability of these corridors as habitats for wildlife in Harding is essential to maintaining a high diversity of wildlife species resulting in more diverse ecosystems resilient to disturbance.

The scrub-shrub habitat at the edge of' both brooks is an important element making both corridors suitable for wildlife movement. Much of the length of both brooks has not been highly disturbed by dense residential areas. Primrose Brook passes just west of a housing development around Mt. Kemble Lake. Silver Brook passes through an area of significant undeveloped open space and areas of houses on large lots. In many areas, the stream corridors are surrounded by upland forest and suburban woods. Silver Brook is bordered by extensive floodplain and wetland areas. These provide habitat beyond the immediate stream corridor, which can accommodate wildlife movement. These areas adjacent to streams are also very critical to protecting their fragile water quality.

Habitats that are utilized by threatened and endangered species and that are currently large enough in area to support these species are also critical. The township contains numerous large areas of open land and suburban woods as well as smaller areas of upland forest (see Figure 10, Vegetative Cover map). These habitats are utilized by a number of the threatened or endangered bird species in the township. Merlins, grasshopper sparrows and the peregrine falcon utilize open lands. Cooper's hawk and the barred owl use upland forests. Maintaining contiguous areas of these habitats large enough to support these threatened and endangered species will assure the continued presence of these valuable wildlife species Township.

These varied and undisturbed habitats are an important natural resource for the township. These areas improve Harding's overall environmental quality, ensure the perpetuation of valuable wildlife species, provide opportunities for public education and awareness, and contribute to the aesthetic appeal of the township. Through the maintenance of wildlife movement corridors, the "green buffering" of streams, and the protection of large areas of habitat important to threatened and endangered species, Harding Township will be able to maintain these diverse and unique natural habitats.

A LISTING OF SOILS PARTICULAR TO HARDING TOWNSHIP WITH THEIR PROPERTIES

MAP SYMBOL	SOIL NAME	GENERAL CHARACTERISTICS	DRAINAGE QUALITIES	EROSION HAZARD	DEPTH TO SEASONAL HIGH WATER TABLE	DEPTH TO BEDROCK	LIMITA-TIONS FOR SEPTIC	LIMITA-TIONS FOR SEPTIC
Ad	Adrian Muck	Nearly level organic soil with a high water table - ponding or flooding in winter and spring is typical; found in limited areas of the Great Swamp.	Very Poorly Drained	—	0'	10'+	Severe	Severe
Ae	Alluvial Land	Typically found near streams and in slightly higher areas at edge of flood plains, flood hazard areas (Passaic River) .	Very Poorly Drained	—	1' – 4'	6'+	Severe	Severe
Bd	Biddeford Silt Loam	Deep, nearly level soils - found in depressions, along streams and in the basin of glacial Lake Passaic (extensively throughout the Great Swamp). Permeability is slow; poor workability - swampy quality and vegetation.	Very Poorly Drained	—	0'	10'+	Severe	Severe
Ca/Cc	Califon Loam/Califon Gravelly Loam	Deep soils found in nearly level to steeply sloping areas — mostly in waterways or seepage areas at base of slopes in granite gneiss uplands west of Route 202. Contains gravel & cobbles.	Somewhat Poorly Drained	Moderate to severe especially on steeper slopes of 8 - 15%	1/2' - 4'	6'+	Moderate to Severe	Severe
Cd	Califon Loam, Friable subsoil Variant	Deep, gently sloping soils found in waterways and swales on uplands west of Route 202. Somewhat gravely.	Somewhat Poorly Drained	—	1/2' - 4'	10'+	Moderate to Severe	Moderate
Cm	Carlisle Muck	Deep organic soils in low swampy areas; Great Swamp.	Very Poorly Drained	—	0'	10'+	Severe	Severe
Co	Cokesbury Gravelly Loam	Deep, nearly level to gently sloping soils found in a limited area near 1-287. Coarse fragments; stone content high.	Poorly Drained	—	0'-1'	6'+	Severe	Severe
Cs	Cokes bury Extremely Stony Loam	Similar to above but contains an extremely stony surface layer - boulders - parallels Primrose Brook, west of Route 202.	Poorly Drained	—	0'-1'	6'+	Severe	Severe
Ed	Edneyville Gravelly Loam	Deep, gently to steeply sloping soils containing granitic gneiss gravel, cobbles and stones (covers much of the northwest part of the township west of Route 202).	Well Drained	Moderate to severe. High if steeply sloping	10'+	6' - 10'+	Slight to moderate Severe if steeply sloping	Slight to moderate Severe If steeply sloping.
El	Ellington Variant	Formed from somewhat gravelly material derived from shale, siltstone and sandstone. High fine sand content. Found principally in the northeastern part of the township.	Somewhat Poorly Drained	Severe in the limited steeper areas.	1/2' - 4'	10'+	Severe	Moderate
Kl	Klinesville	Shallow, steep, well drained shaly soils formed in material weathered from shale bedrock.	Well Drained	Severe	N/A	1' - 1-1/2''	Severe	Severe
Ml	Minoa Silt Loam	Deep, nearly level to gently sloping soils at slightly elevated areas within glacial Lake Passaic (in Harding, within the Great Swamp). Soils formed in thick lacustrine sediment. Depth to bedrock is unknown. High silt and very fine sand content.	Somewhat Poorly Drained	—	1/2' - 1-1/2'	10'+	Severe	Severe
Ms	Muck (shallow over clay)	Decomposed organic material over clay commonly found around bogs and swampy areas (Great Swamp). Frequently flooded.	Very Poorly Drained	—	0'	10'+	Severe	Severe
Mu	Muck (shallow over loam)	Decomposed organic material over stratified silt loan, loam or silt clay loam, typically found in depressions and along streams (Great Swamp).	Very Poorly Drained	—	0'	10'+	Severe	Severe
Ne	Neshaviny Gravelly Silt Loam	Deep, gently to steeply sloping soils containing gravel and stones, formed in weathered material from underlying basalt bedrock; deep and fertile with only moderate drainage and erosion difficulties. Found extensively throughout the central portion of Harding.	Well Drained	Moderate	10'+	4' - 10'	Slight to Moderate	Slight to Moderate
Nf	Neshaminy Very Stony Silt Loam	Similar to above but thinner surface layer and shallower depth to bedrock. Found on steeper slopes among the Neshaminy Gravelly Silt Loam soils; contains excessive stones	Poorly Drained	Moderately Severe	10'+	4' – 10'	Severe	Severe
Pa	Parker Gravelly Sandy Loam	Deep, gently to steeply sloping soils containing large amounts of angular granitic stones, cobbles and gravel. Found west of Route 202, typicall ops.	Well Drained	Severe	10'+	4' - 10'	Slight to Moderate	Slight to Moderate
Pb	Parker Very Gravelly Sandy Loam	Similar to above, but with fewer stones and surface layer is 50% gravel. Generally found in very steep areas northwest of Jockey Hollow Road.	Well Drained	Severe	10'+	4' - 10'	Severe	Severe

MAP SYMBOL	SOIL NAME	GENERAL CHARACTERISTICS	DRAINAGE QUALITIES	EROSION HAZARD	DEPTH TO SEASONAL HIGH WATER TABLE	DEPTH TO BEDROCK	LIMITA-TIONS FOR SEPTIC	LIMITA-TIONS FOR SEPTIC
Pe	Parker-Edney-ville Extremely Stony Sandy Loam	Combination of Parker and Edneyville soils in steep areas with boulders, stones, cobbles and gravel.	Well Drained	Severe	10'+	4' - 10'	Moderate to Severe	Moderate to Severe
Pf	Parker Rock Outcrop Complex	Parker soils with extensive rock outcropping; in very steep areas mainly west of Route 202 and north of Tempe Wick Road.	Excessively Drained	Severe	10'+	4' - 10'	Severe	Severe
Ph	Parsippany Silt Loam	Deep, poorly drained soils found in stratified sediment of lacustrine origin with high water permeability, low stability and high water table. Found in the Great Swamp, along the Passaic River near I-287 and along Silver Brook.	Poorly Drained	—	0' - 1'	10'+	Severe	Severe
Pk	Parsippany Silt Loam, Sandy Loam Substratum	Similar to above but with a thin substratum of fine sandy loam. Found extensively in the Great Swamp, Loantaka Brook and Great Brook.	Poorly Drained	—	0' - 1'	10'+	Severe	Severe
Pl	Pattenburg Gravelly Loam	Deep, gently to strongly sloping gravelly soils found generally in an area formed by Sand Spring Road, Glen Alpin Road, and I-287. Well suited to farming and pasture.	Well Drained	Moderate	10'+	3-1/2' – 10'	Slight to Moderate	Slight to Moderate
Pn	Penn Shaly Silt Loam	Found extensively throughout the northern half of the township east of I-287. These soils are moderately deep, well drained with shale fragments with high silt content.	Well Drained	Moderate to Severe	4' -6'	1-1/2' - 3-1/2'	Severe	Slight to Moderate
Po	Penn-Klinesville Shaly Silt Loam	Combination of Penn and Klinesvlle found in the Van Beuren & Red Gate Drained Road area amidst other Penn Soils in areas of steeper slopes. Largely shaly with a shallow range of depth to bedrock.	Moderately	Severe	4' -6'	1-1/2' - 3-1/2'	Severe	Severe
Pt	Pompton Sandy Loam	Deep, nearly level soils found In the south east portion of the Great Swamp in Harding and near the Loantaka and Great Brooks. Formed in sandy, gravelly glacial outwash derived principally from granitic material. Very acid soils with moderate organic content in surface layer.	Somewhat Poorly Drained	Moderate	1/2' - 1-1/2'	10'+	Severe	Moderate to Severe
Pv	Preakness Sandy Loam	Found in a limited area of the Great Swamp amidst Pompton soils, in low areas. Sandy loam textured soil with a fairly high water table.	Poorly Drained	—	0' - 1'*	6'+	Severe	Severe
Re	Reavlle Shaly Silt Loam, Deep Variant	These soils are found scattered throughout the north central portion of the Township and to the west along I-287 and the Passaic River. They are found mainly at the base of steeper slopes and in waterways and are formed in the material weathered from underlying shale bedrock or in local alluvium.	Moderate to Poorly Drained	—	1/2' - 4'	3-1/2' -5'	Severe	Moderate to Severe
Rm	Riverhead Gravelly Sandy Loam	These soils formed in the sandy and gravely outwash derived mainly from granitic material containing a small amount of shale, sandstone, quartzite and conglomerate. It is found in a somewhat limited area just west of Green Village and in the northeast tip of the Township near Madison.	Well Drained except when steep.	Slight to moderate except when steep.	10'+	10'+	Slight	Slight
Ro	Rockaway Gravelly Sandy Loam	A small band of this deep, gently sloping soil is found paralleling Glen Alpin and Blue Mill Roads near Bayne Pond. They are well drained and formed in sandy loam glacial till mainly of granitic material.	Well Drained	Slight	1-1/2' - 10'	10'+	Moderate	Slight
Ue, Um, Up	Urban Land	These soils are generally re-worked as a result of community development and are therefore excluded from this review.	—	—	—	—	—	—
Wh	Whippany Silt Loam	A few areas of these deep, poorly drained soils exist in the Great Swamp, along Pleasant Plains Road.	Somewhat Poorly Drained	—	1/2' - 1-1/2'	10'+	Severe	Severe
Wl	Whippany Silt Loam/ Sandy Loam Substratum	Found along Primrose Brook, Loantaka Brook and a small area within the Great Swamp. This soil has a thin layer of sandy loam over a dominantly sandy loam layer below 40 inches.	Somewhat Poorly Drained	—	1/2' - 1-1/2'	10'+	Severe	Severe

Source: Soil Survey of Morris County, New Jersey; U.S. Department of Agriculture Soil Conservation Service; August 1976, compiled and annotated in 1990.
Note: The mapping symbols contained in this chart do not contain the reference to the degree of slope typically found in the Soil Survey. The Soil Survey utilizes a letter symbol added to the above map symbols to denote steepness of slope; for example C slopes are 8 to 15 percent. This ERI contains a separate section dealing exclusively with topography in Harding.

HISTORIC DEVELOPMENT PATTERNS

(Adopted March 14, 2005; Reorganized under "Community Characteristics" February 25, 2008)

Introduction

The purpose of this section is to generally describe Harding's history and the historic context of its historic resources. The National Register of Historic Places defines a historic resource as a property that embodies one or more of the following criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of history.
2. It is associated with the lives of persons significant in our past.
3. It embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high art ic values, or represents a significant and distinguishable entity whose components lack individual distinction.
4. It has yielded, or is likely to yield, information important in prehistory or history.

Harding contains historic resources that qualify under each of these criteria. Abundant resources contributing to an understanding and appreciation of our history are scattered throughout the township, many of which form the basis for seven municipally designated historic districts, four of which are also State and Nationally Registered. The context of Harding's historic resources generally relates to three eras in the township's history described below.

A Concise History of Harding

The original inhabitants of Harding were the Delaware (or Lenape) Indians of Algonquin stock. Their history, in what would become Harding, is unrecorded and limited to a relatively few artifacts. Recorded history essentially begins in 1713. What is now most of Morris County was purchased from the Lenape and made part of Burlington County under the ownership of the West Jersey Proprietors. Original surveys in the Harding area were carried out in 1715 and 1717 by the first recorded landowners who included William Penn and James Logan. The general ownership of the area was disputed by factions in East Jersey and resolved in their favor in 1743.[12] As early as the 1790s the center of what is now Harding was referred to as New Vernon, a place name for what was then considered part of Morr rliest recorded inhabitants were the families Lindsley, Tuttle and Goble.[13]

By the time of the Revolution, most of Harding's current road system was in place supporting a sparse pattern of rural development. The Morristown area, including the future area of Harding, was the focus of considerable military operations during the Revolutionary War, utilizing the road system for the movement of troops and a major encampment of the Continental Army at Jockey Hollow during the winter of 1779-80.

The long period from the Revolutionary War until after the Civil War saw slow rural development of farmsteads focused around the small compact villages of New Vernon, Green

[12] Harding a Beautiful and Historic Township, 1715 – 1948, Harold D. Hayward, ThD.
[13] Ibid, pp. 8 and 9.

Village and Logansville. That pattern of tightly clustered villages surrounded by relatively open land is still evident today. In 1866, Passaic Township (now Long Hill Township) was formed, including the area of current Harding.

The early part of the 20th century saw a new and different form of development, that of large estates for wealthy families taking advantage of transportation improvements linking the area to New York and Newark. Estate building began in Morristown in the later part of the 19th century but by the early part of the 20th (particularly the teens and early twenties) Harding had become the focus of such development. The goal of these new residents was to preserve the historic rural landscape that had attracted them to the area. A group of prominent businessmen joined forces with Marcus Northup to settle a long-standing dispute between the northern and southern portions of Passaic Township over the allocation of mo he wealthy residents because of their growing fleets of automobiles. This led to the formation of Harding as a separate township in September 1922, named after President Warren G. Harding.[14]

The new residents of the early 20th century had the resources to purchase large tracts of land, much of which became subject to the "New Vernon Neighborhood Restrictive Agreement." This agreement essentially provided Harding with an early form of zoning, albeit entirely privately enacted. The covenant stated that "there shall be no trade, manufacture or business of any description whatsoever on the properties included in this agreement, unless properly changed by new covenants, adequately adopted by the property owners concerned." Municipal zoning largely limiting development to low density residential development was first enacted shortly thereafter. As a result, little changed in Harding until after World War II.

Eras of Historic Significance in Harding Township

This section is a summary of the eras of historic sign icance in Harding. The Historic Preservation Plan describes in detail how the township's still existing historic resources embody historic significance from these eras.

Harding's Early Development and the Historic Rural Landscape

The early development of the Harding area is of obvious significance to the township and this first stage of development was also its longest lasting historic era. It corresponds to two of the eras that the New Jersey Historic Preservation Office has listed as historically significant in New Jersey: the period of *initial colonial settlement* (1630 – 1775) and the period of *early industrialization, urbanization and agricultural development* (1775 – 1860).[15] In Harding, it encompasses the time period from the early settlement of the area by people of European origins in the early- to mid-18th century to the beginning of the 20th century and the advent of the *estate era*.

[14] Intensive Level Architectural Survey, McCabe & Associates, Inc., 2004, p. 24.
[15] Statewide Contexts for Evaluating the Historic Significance of Cultural Resources, New Jersey Historic Preservation Office Guidelines for Architectural Surveys, p. 16.

The first settlers were probably the John Lindsley and Stephen Tuttle families. In 1743, the Conger family opened a tavern near the corner of Blue Mill and Sand Spring roads. Additional early settlers included: Goble, Tomkins, Fairchild, Muir, Canfield, Miller and Pruden families. Samuel Oliver and Timothy Mills settled in c. 1754, Joseph Wood in c. 1748 and Jacob Bockhoven in 1764.[16]

The historic resources relating to this era are found throughout the township and are still quite common, including numerous structures that make up the historic settlement pattern of the tightly clustered crossroads villages of New Vernon and Green Village, surrounded by scattered, low-density farmsteads. It is also the era during which the township's road system was established, much of which has changed little since that time.

The Revolutionary War

Sites and events associated with the American Revolutionary War are a particularly significant part of Harding's history. The area in and around Harding saw significant events associated with the Revolution during the period from 1777 to 1780. The Morristown area became strategically important when Washington's victories at Trenton and Princeton forced the British to fall back to New York. Washington perceived that the area around Morristown had strategic benefits for the Revolutionary Army to monitor the British in and around New York, which was the headquarters for the British war effort against the colonies. In particular, the heights in the northern part of the township afforded long views of the area towards the British forces in New York. The Continental Army encamped in the area starting in the winter of 1777 at "Loantica," just north of present day Harding, and then again during the winter of 1779-80 on what was then known as "Kimball" (now Kemble) Mountain in Harding.

Jockey Hollow was established in 1933 by the Federal Government as the nation's first historical park to preserve the area of the encampment. Over 80 percent of the National Park is located within the township. The appreciation of the historic gnificance of the Park is enhanced by the preservation of historic resources in the area around it. In particular, Harding's historic road system and the historic rural landscape add substantially to the historic significance of Jockey Hollow. The US Congress has designated the Harding area part of the Crossroads of the Revolution National Area.[17]

Additionally, historic resources associated with this era include the Peter Kemble House on Mt. Kemble Avenue, which is individually listed on the State/National Register and, home of a prominent "Tory" and the site where "Mad Anthony" Wayne negotiated with mutineers from the Continental Army, near the intersection of Tempe Wick Road and Mt. Kemble Avenue.

The Estate Era

No consideration of the history of Harding would be complete without including its estate era. It corresponds to the New Jersey Historic Preservation Office *suburban development* era (1840-

[16] Intensive Level Architectural Survey, McCabe Associates, Inc., 2004, p. 19.
[17] Congress has authorized the US Department of the Interior to conduct a Special Resource and National Resource Area Feasibility Study for the Crossroads of the Revolution in central New Jersey.

1940). In Harding it encompasses the later part of the *Gilded Age*, the period from the end of the 19th century to the early part of the 20th when prominent families of American industrialists first moved to the township having made fortunes in the industrial development of the country. They established country estates by buying up small farms and consolidating them. Among these were Howard Bayne, Seth Thomas, Jr., Henry Colgate, Warren Kinney, T. Towar Bates, and James McAlpin Pyle.

In 1920, they set up the New Vernon Land Company to bu p and control open space within the township subject to the *New Vernon Neighborhood Restrictive Agreement*. The subscribers to the private agreement "pledged to restrict commercial usage and division of property until 1965" and set a minimum lot size of three acres; although there was a verbal understanding that ten acres would be the minimum.[18] The historic resources relating to this era include many surviving estates and the associated rural landscapes preserved through the efforts of this American elite.

Harding's Historic Rural Landscape

In the strictest sense, Harding has long since ceased to be a truly rural community in that it no longer contains a significant population that makes its living from the land. However, it still contains many structures and landscapes that relate to the era when it was a truly rural place. The two together, the structures and the landscape patterns that form their context, give them historic significance for current Harding residents and provide insight into the township's history.

The comprehensive survey of historic resources completed by McCabe & Associates in 2003 catalogs Harding's abundant historic resources. Many contain substantial historic significance in of themselves. The surviving historic landscapes that surround many of them add to their historic integrity. The following is a description of the historic landscapes in Harding and how they came about.

Historic Landscape Patterns in Harding

Harding's strong sense of place is based upon the historic rural landscape patterns that are still evident in many areas of the township today. William Murtagh, formerly Director of the Historic Preservation Program at Columbia University, said "Harding is a unique open space which creates a sense of identity and locality; its historicity was determined by its topography, spacial relationships, roads and circulation patterns and buildings."[19] Harding's still existing historic rural landscape is centered on the two tightly developed villages of New Vernon and Green Village and the numerous structures, most of them dwellings, that make up those villages.

The township's historic rural development pattern is one of contrasts: relatively compact and dense in the villages and open in the surrounding countryside. In both cases there is great variety in size and shape of land holdings as well as the style, size and placement of buildings. These contrasts and variety are still evident. The surrounding agricultural lands, meadows and fields

[18] Intensive Level Architectural Survey, McCabe Associates, Inc., 2004, p. 24.
[19] Historic Preservation Considerations, Harding Township, NJ, Heritage Studies, Princeton, NJ, 1980.

are largely gone; but the sense of surrounding open land still remains in many areas. In addition, historic hedgerows and wooded stream corridors still remain as visible reminders of the rural landscape.

Modern suburban landscapes characterized by uniformity of development are the result of strict zoning and development regulations. Harding's historic landscapes were shaped by other factors and forces. The sections below describe the major forces which shaped Harding's historic landscape and development patterns: geographical constraints and opportunities, the location and design of roads, and economic and social forces.

The influence of Geography on Historic Development in Harding

Geography played a primary role in shaping historic rural landscape patterns in Harding. During the period of early settlement in Harding, the geographical constraints and opportunities associated with topography and sources of water were important concerns of the early settlers, profoundly influencing their decisions on where and how they should establish settlements.

The earliest European settlement of Harding began in the early part of the 18th century, by trappers and loggers and several farm families looking for good arable land to clear and cultivate. The many good streams provided sources of power for forges and mills that provided a variety of necessary services. Little remains of this very early time, but by the Revolutionary War Harding's road system was largely in place, together w sparse, development. What could be termed the major settlement of Harding occurred during the century that followed the American Revolution. By the turn of the 20th century a significant portion of Harding's buildings and most of its public roads were in place.

Topography profoundly affected development patterns. The northern third of Harding consists of the foothills of the New Jersey Highlands. The hilly terrain made development in this area difficult and the associated poorer soils made farming unproductive, precluding extensive clearing and development. The southern third of the township, the Great Swamp, was and is a marshland formed by the melting of the Wisconsin glacier. Though a few farmers drained and cultivated lands within the Great Swamp, settlers used it mainly as a source of building materials and wildlife. The middle third of the township, on the other hand, was relatively well suited for cultivation and development because of its well drained, gently rolling terrain. In this area a community of small compactly clustered villages surrounded by open farmsteads was established.

Water sources were also an important organizing factor in the early Harding landscape. Easy access to water was necessary for the location of farmsteads and villages. Grist mills performed a vital and necessary function for the rural Harding farming community. One mill for about every 40-50 families was typical. Lumber mills provided the necessary b ing materials.

The Influence of Roads on Historic Development in Harding

The importance of the location and design of roads in shaping the character of Harding's historic landscape cannot be overstated. The road system we see and use today was largely in place by the latter part of the 18th century. It came about in what might be described as an "organic" way. Built up from the trails of the original settlers of the area, the Lenape Indians, to more major pathways, they followed the path of least resistance in the natural terrain. They avoided topographic and geographic obstacles where possible, going around or over them. This resulted in the characteristic terrain-following or curvilinear road-scape with extensive horizontal and vertical curvatures we still see today. When the road needed to change direction to avoid obstacles, the resulting curves were often more abrupt than permitted by modern engineering practice.

The physical construction of early roads was also distinct from modern engineering practice. The scale of early roads was small and narrow, invariably no wider than was necessary for two wagons to pass. Drainage was by means of simple ditches along each side.

Much of Harding's public road system has not changed from colonial days. Harding was mapped in 1780 due to the winter encampment at Jockey Hollow. A revolutionary officer today could still find his way around Harding using that map.[20] These characteristics of design and scale still set the pattern for much of Harding's roads today. Indeed they are so common we take them for granted, but their importance to the integrity of historic landscapes should not be underestimated.

The Effect of Economic and Cultural Forces on Harding's Historic Development Pattern

How and where early settlers chose to build and live and how they made their livelihood played an important role in establishing Harding's historic landscapes. Families who were not farm families in early rural America were apt to live in small, compact and relatively higher density villages, usually located at crossroads. This was the pattern for almost 200 years of Harding's history. The typical rural village in Harding contained a school, a church or church outpost and a store. As a result, the village provided the economic and social focus for the community, providing the necessary economic and social services. Four such historic "nodes" existed in Harding: New Vernon, Green Village, Pleasantville and Logansville, although the latter two were too small to be considered true villages.

The compact and tightly developed villages provided a focus to the surrounding countryside. This focus was one of the basic features of Harding's historic landscape providing definition, order and organization. In summary Harding's landscape presented a complex mosaic of varying size, shape and contour defined by streams, hedgerows, tree-rows, fence-rows and roads. The inhabitants lived in widely separated farmsteads. Since the landscape was so open, long views and panoramic vistas were much more common than they are today.

[20] Historic Preservation Considerations, Harding Township, NJ, Heritage Studies, Princeton, NJ, 1980.

Archaeological Resources

Evidence of occupation by the Lenape Indians or predecessors has been found in several areas of Harding. There are several sites where numerous arrowhead or other projectile points have been found concentrated in areas near streams or springs. Some of these sites may contain archaeological evidence important to the history of this area.