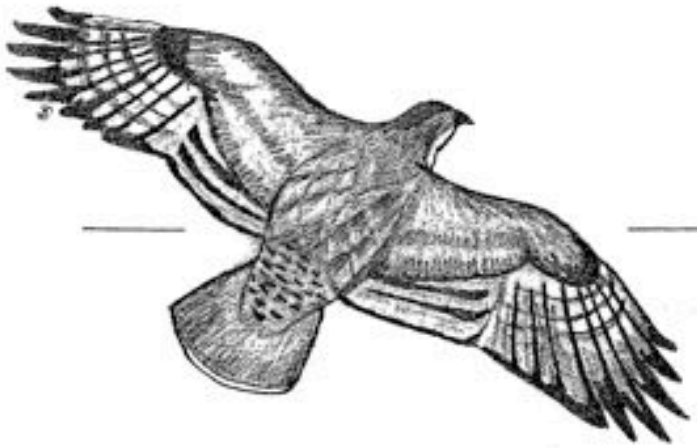
NATURAL RESOURCE INVENTORY

Borough of Highland Park, New Jersey



NATURAL RESOURCE INVENTORY

BOROUGH OF HIGHLAND PARK

MIDDLESEX COUNTY, NEW JERSEY

Prepared for the Highland Park Environmental Commission
by:

Townplan Associates
Eleven Tindall Road
Middletown, New Jersey 07748
(908) 671-6400

May 26, 1992

This document was prepared with the aid of a grant from the New Jersey Department of Environmental Protection and Energy, Office of Environmental Services.

BOROUGH OF HIGHLAND PARK

H. James Polos, Mayor

Borough Council

Joy Norsworthy
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Frank Reff
Ted Choplick

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Michael Rosenberg, Chairman

Arnold Henderson
Richard Marx
Anthony Puniello
Eugene Young
Lynn Miller
David Sack

Townplan Associates· Project Staff
Richard S. Cramer, Jr., P.P., ALC.P., Project Manager
Linda J. Brennen, P.P., AI.C.P., E.P.
Barbara Schwartz, P.P., AI.C.P.
Barbara Stueber
T. Andrew Thomas

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This copy of the Highland Park Natural Resources Inventory was generated from a Xeroxed hard copy of the 1992 report by scanning and optical characterization recognition (OCR) technology. The format has remained as close to the original as possible. The maps on pages 6, 11, 18, 31, and 40, which in the original document were 11 x 14 inches have been reduced to fit on a 8.5 x 11 pages. All of the maps were in black and white. Tables 1 and 2 (pages 21, 22 and 23) were scanned and placed on their respective pages. Many of the images in the Xeroxed copy were so poor that they have not been reproduced. Comments are inserted where these images were located. The document has been checked for accuracy of the OCR but any errors remaining are my fault.

Allan Williams
Environmental Commission
February 18, 2010

INTRODUCTION

The great naturalist Louis Agassiz was once asked where he had gone on his summer holiday. His answer was that he had traveled half-way through his backyard. Highland Park, though small in area and largely developed, is rich in both its natural and man-made features. Agassiz, for one, would find much to linger over and enjoy in a community that, in addition to its backyards, boasts a major tidal river, small stream corridors and an ecological preserve that provides a core habitat for a diversity of plant and animal species.

Moreover, the community's appealing tree-lined streetscape includes a variety of stylistically notable buildings, which contribute to the attractiveness of Borough neighborhoods.

The Highland Park Environmental Commission has compiled this Natural Resource Inventory as part of its efforts to identify significant natural and cultural features within the Borough. The inventory is a basic reference tool that will assist the Commission as it continues its ongoing effort to study and make recommendations on open space preservation and resource protection within the Borough.

By evaluating and identifying the notable features within the community, the Borough is better positioned to move ahead and to act to protect the desirable elements of its environment. In this way, the oft repeated lament that "you don't know what you've got 'til it's gone" need not be sung again and the community can enjoy the benefits of a diverse, attractive and healthy environment.

SURFICIAL GEOLOGY

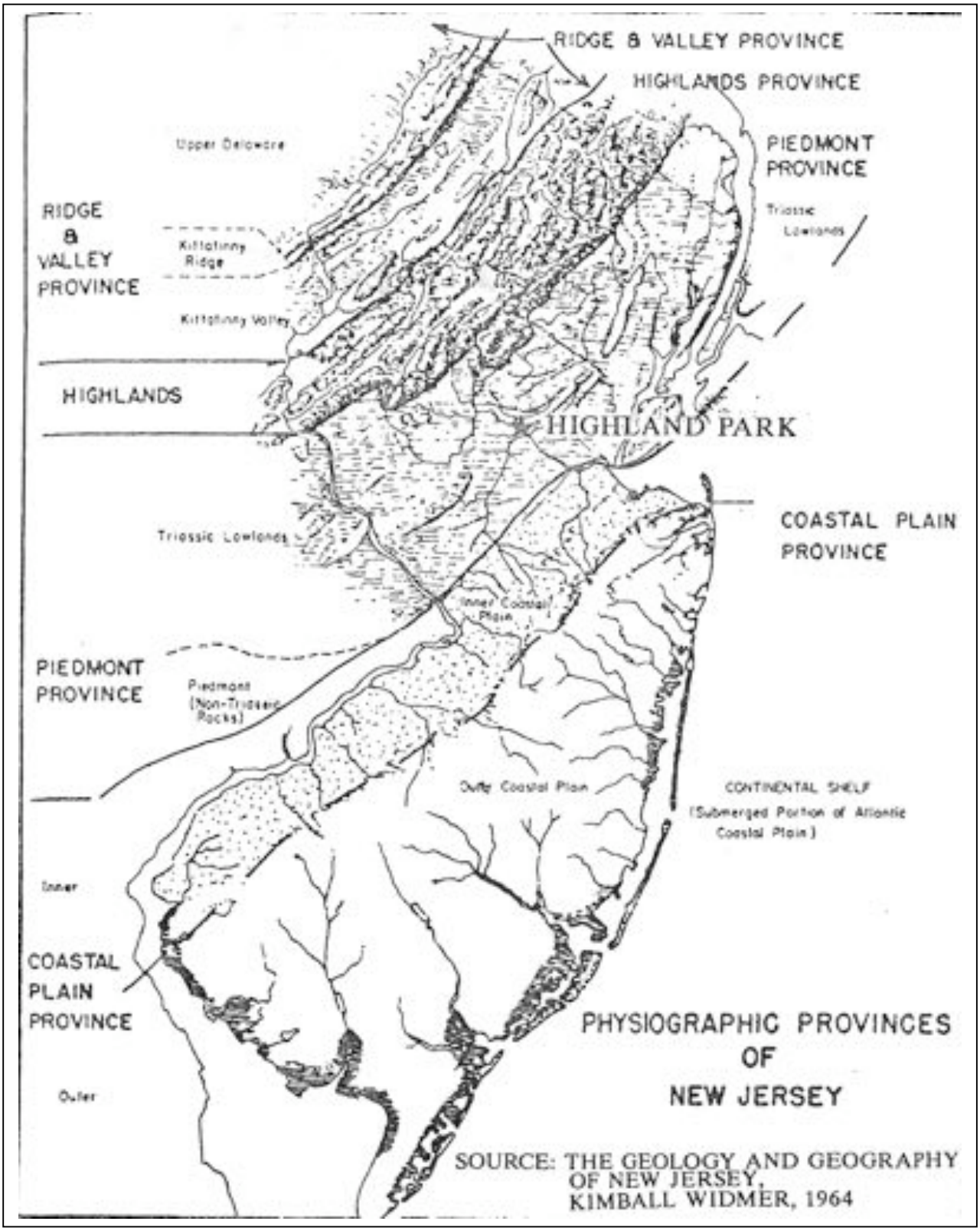
The Borough of Highland Park is located in the Piedmont Plain Province, one of the geologic physiographic provinces in New Jersey, shown on Map 1. Each physiographic province in New Jersey is characterized by a similar sequence of rock types, geologic history and geologic structures. The Piedmont Plain in New Jersey covers approximately one-fifth of the State, occupying portions of Hunterdon, Morris, Passaic, Mercer, Somerset and Middlesex counties and the whole of Union, Essex, Hudson and Bergen counties. In the area of Highland Park, the Piedmont Plain is characterized by flat to rolling relief, with elevations of approximately 100 feet above sea level. The Plain is underlain primarily by a 6,000 - 8,000 foot thick layer of red sandstone and red shale known as the Passaic Formation (formerly the Brunswick Formation). The Passaic Formation is composed of Triassic age sedimentary rock that extends from Delaware to Connecticut and Massachusetts. The Triassic age rock was deposited between 150 and 180 million years ago, when the land was covered by the sea. The Passaic Formation is reddish in color, indicating that the climate in the time of the formation of the rock was semi-arid, thus stabilizing the red iron-bearing pigments in the mineral matrix. Within Highland Park, stream corridors have eroded and cut into the formation exposing the formation's sidewalls. This can be seen along Mill Brook northwest of the Amtrak Line.

Although there is some variability from north to south in the characteristics of the formation, typical structural features include extensive near vertical fracturing and block faulting which are repetitive and continuous over large areas.

The rock of the Passaic Formation provides the parent material of the reddish soils characteristic of Highland Park. Over time, the rock has disintegrated through weatherization and has combined with decomposed organic material to produce the soils found in Highland Park.

In most places the depth to the shale bedrock, which underlies the soils of the Borough is shallow to moderately shallow, being only ten to twenty inches. The red shale bedrock is relatively soft and excavations are possible with trenching machines or backhoes.

In terms of potential for the presence of radon, the New Jersey Department of Environmental Protection and Energy has classified Highland Park as Tier 1, High Potential. Radon is a naturally occurring radioactive gaseous element emitted from the geologic features underlying the Borough.


RIDGE & VALLEY PROVINCE
HIGHLANDS PROVINCE
PIEDMONT PROVINCE
Upper Delaware
Triassic Lowlands
RIDGE & VALLEY PROVINCE
Kittatinny Ridge
Kittatinny Valley
HIGHLANDS
HIGHLAND PARK
COASTAL PLAIN PROVINCE
Triassic Lowlands
Inner Coastal Plain
PIEDMONT PROVINCE
Piedmont (Non-Triassic Rocks)
Outer Coastal Plain
CONTINENTAL SHELF
(Submerged Portion of Atlantic Coastal Plain)
Inner
COASTAL PLAIN PROVINCE
Outer
PHYSIOGRAPHIC PROVINCES OF NEW JERSEY
SOURCE: THE GEOLOGY AND GEOGRAPHY OF NEW JERSEY, KIMBALL WIDMER, 1964

CLIMATE

The climate description in this section has been taken from the Middlesex County Soil Survey and is applicable to the conditions in Highland Park.

Middlesex County is hot in the summer and rather cold in winter. Precipitation, which averages 45 inches per year, is well distributed throughout the year. Winter precipitation frequently occurs as snow, but the ground does not usually stay covered for more than a few days at a time.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at New Brunswick on January 22, 1961, is -6 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred on July 7, 1957, is 102 degrees.

Of the total annual precipitation, 24 inches, or 54 percent, usually falls in April through September. The growing season falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest I-day rainfall during the period of record was 7.66 inches at New Brunswick on August 28,1971. Thunderstorms occur on about 25 days each year, and most occur in summer.

The average seasonal snowfall is 17 inches. The greatest snow depth at anyone time during the period of record was 19 inches. On the average, 13 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in mid-afternoon is about 54 percent. Humidity is higher at night, and the average at dawn is about 73 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, 12 miles per hour, in March.

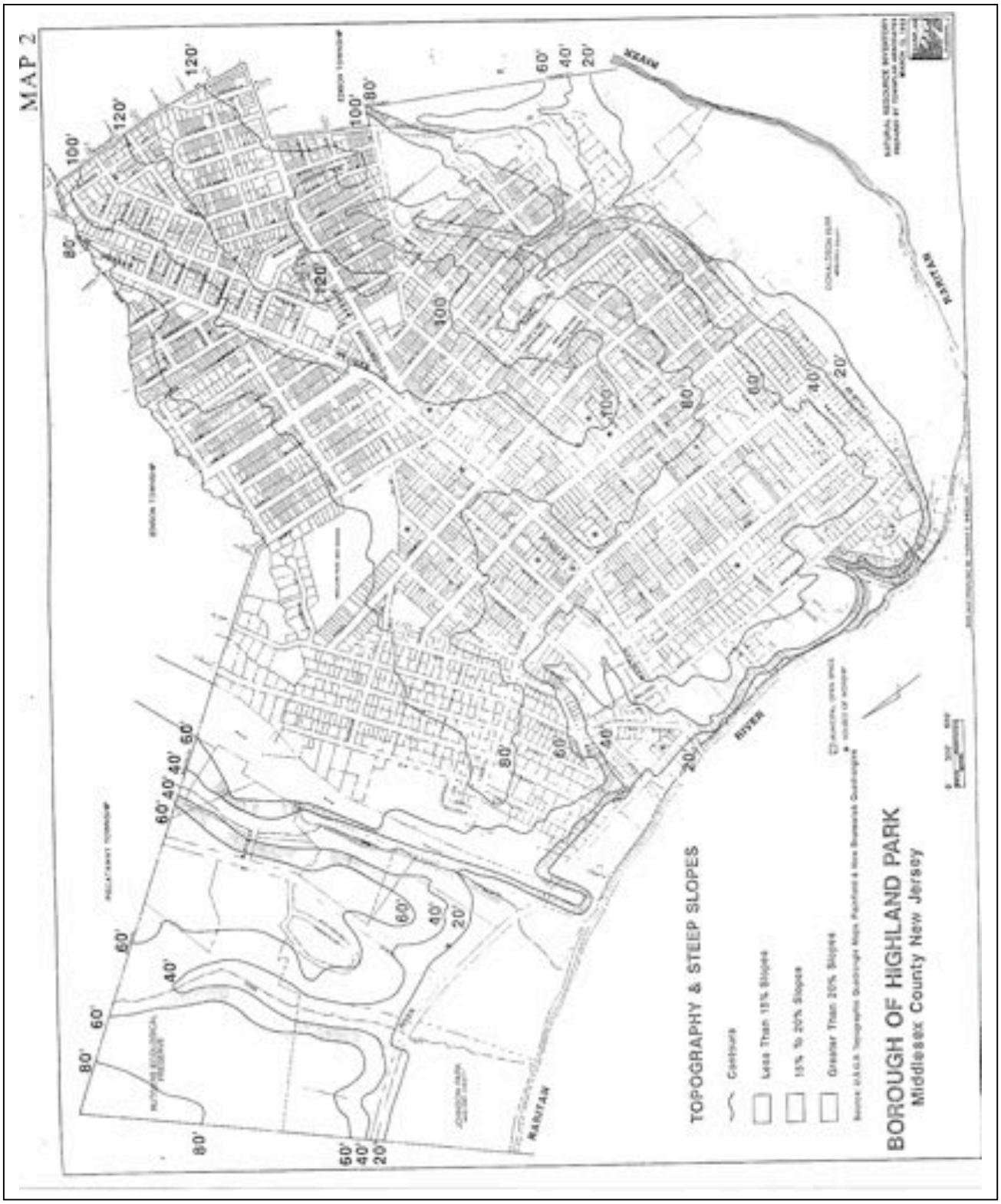
TOPOGRAPHY AND SLOPE

The topography in Highland Park consists of flat to gently rolling relief and is depicted on Map 2. In some locations, notably stream corridors and low-lying areas, elevations have been altered in the process of building the town. The highest points in Highland Park, having elevations of approximately 120 feet, are located near Harvard Street and McCallum Place in the northeastern portion of the Borough. Areas of steep slopes (greater than 15%), as shown Map 2, are characteristic of the stream corridor areas in the Borough and are located along the Raritan River, Buell Brook, Mill Brook and in the southeastern portion of the Borough.

Slopes limit the use of land and are an important consideration in land use planning. Slope is measured as the change in elevation (vertical distance) over horizontal distance. It is expressed as a percentage. For example, a fifteen (15) foot elevation over one hundred (100) feet of horizontal distance (15/100) is a fifteen (15) percent slope. Steep slopes can increase the cost of grading and can require more sophisticated footings and pilings to support high density dwellings. Slope is also a critical factor in erosion and runoff. Steep slopes, particularly those that are greater than ten (10) percent, pose a greater risk of erosion hazard than do more gentle slopes and flatlands. Where slopes have been denuded of vegetation, adjacent land and water bodies may be inundated with sediment during a rainstorm. Among the results are losses of wildlife, water quality and an aesthetic landscape. Slopes greater than ten (10) percent cause problems in roadway and driveway design. Slopes greater than fifteen (15) percent are potentially critical environmental impact sites and efforts should be made to keep them in their natural state or maintained in grass or tree cover.

On the positive side, slopes can be used to separate different components of the landscape and can be used in site designs for subdivisions, parks, and commercial or industrial areas. Slopes can also be used to provide creative sites for plantings and structures.

Map 2 - Page 6


MAP 2
TOPOGRAPHY & STEEP SLOPES
Contours
Less Than 15% Slopes
15% To 20% Slopes
Greater Than 20% Slopes
BOROUGH OF HIGHLAND PARK
Middlesex County New Jersey
RARITAN
RIVER

SOILS

The Soil Conservation Service has prepared a Soil Survey of Middlesex County, which identifies soil series throughout the County. A soil series is composed of soils that have a similar soil profile or sequence of natural layers (horizons). All soils of a series have major horizons that are similar in thickness, composition, and arrangement. Soils of a series may, however, display differences in the texture of the underlying material or surface layer. Soil series are further divided into phases, which are differentiated based on such factors as slope, stoniness, salinity, wetness, and degree of erosion. The type of soil found in a given location is the result of many factors including climate, time, presence of plant and animal species in the area, topography and the composition of the unconsolidated mass covering the earth's surface in that location. Six (6) soil series have been identified in Highland Park and are shown on Map 3. The soil series present in Highland Park are the Klinesville, Lansdowne, Nixon, Psamments, Rowland and Urban Land soil series. The soil descriptions provided below have been taken from the Middlesex County Soil Survey.

Klinesville (KWB, KvD, KvE)

There are three (3) phases of the Klinesville soil series in Highland Park. These phases are differentiated based upon the slope of the land where the Klinesville soil series is located. The Klinesville soil series in Highland Park is a well-drained soil with moderately rapid permeability.

Klinesville Urban Land Complex (KWH)- The majority of the soil in Highland Park is Klinesville-Urban Land Complex - 0% - 5% (KWB). A soil complex is a soil type that consists of two or more soils, or one or more soils and miscellaneous areas (in this case, an urbanized area) too intricate to map. The KWB series is characterized by nearly level to gently sloping, well - drained Klinesville soils and areas used for urban development. In this location of the Borough, the soils and urbanized areas are so intertwined that they cannot be mapped separately. About forty (40) percent of the KWB unit is Klinesville soils. Typically, the surface layer is a dark reddish brown shaly loam about eight inches thick. The subsoil is a dark reddish brown shaly loam four inches thick. Dark reddish brown shale bedrock is at a depth of twelve inches. Another forty (40) percent is coverage by concrete, asphalt, buildings and other impervious structures. The undisturbed soil areas are mainly in yards and are generally suitable for lawns, shade trees, vegetable gardens, and ornamental plantings.

Klinesville shaly loam - 0% - 5% slopes (KvB) is located in the northwestern portion of the Borough. It is gently sloping and well-drained and found on ridges, divides, side slopes, and toe slopes. The surface layer is dark brown shaly loam and about eight inches thick. The dark reddish brown shaly

silt loam is about four inches thick. Shale bedrock is found at a depth of about twelve inches. Permeability is moderately rapid and available water capacity is low. The soil is subject to frost heaving. Runoff is slow and the erosion hazard is slight. Organic matter content is moderate. Rooting depth is restricted by the shale bedrock. In unlirned areas, the surface layer and the subsoil are very strongly acid. Because of the low available water capacity, the soil is not well-suited to woodland. Seedling mortality is high because of the shallowness to bedrock and the low available water capacity. The common trees are northern red oak, white oak, and chestnut oak.

Klinesville shaly loam· 5% • 15% slopes (KvD) is located at scattered points throughout the Borough. It is sloping to moderately steep and is well drained. It occurs on ridges, divides, side slopes, and toe slopes. The surface layer is dark brown shale loam about eight inches thick. The subsoil is dark reddish brown shaly silt loam four inches thick. The shale bedrock is at a depth of twelve inches. Its characteristics with respect to permeability, frost heaving, available water capacity, organic matter content, rooting depth, acidity, woodland suitability, and common tree types are the same as the KvB soils. Because of its steeper slope, however, the hazard of erosion is considered moderate.

Klinesville shaly loam 15% . 25% slopes (KvE) is also located at scattered points throughout the Borough. It is moderately steep to steep and is well-drained, occurring principally on side slopes. The surface layer is dark reddish brown shaly loam about six inches thick. The shale bedrock is found at about twelve inches. Included with the mapping of this soil are areas with slopes greater than twenty-five (25) percent, some of which are vertical bluffs, soils with no surface layer, or areas of exposed bedrock. Such conditions, for example, can be observed along the Mill Brook, north of the Amtrak Line. Its characteristics with respect to its permeability, frost heave, available water capacity, common tree types, organic matter content, and rooting depth are similar to the KvB and KvD soils. Because of the steep slopes, runoff is rapid and the erosion hazard is severe. In unlimed areas, the surface layer is extremely acid and the subsurface is strongly acid.

Lansdowne (LUA)

Another soil series complex located in Highland Park is the (LUA) Lansdowne-Urban Land Complex series (LUA). This soil series consists of nearly level to gently sloping, moderately well-drained and somewhat poorly drained soils and areas that are used for urban development. A protrusion of LUA extends from the northeastern portion of the Borough inward. It is found on terraces and lawns. As with the Klinesville Urban Land Complex, the soils and urbanized areas are in such an intricate pattern that it is not practical to map them separately. About forty (40) percent of this area is Lansdowne

soils. The surface layer is dark brown silt loam about seven inches thick. The upper part of the subsoil is yellowish red silty clay loam nine inches thick. The lower part is mottled red silty clay fourteen inches thick. The substratum is red very shaly silty clay to a depth of sixty inches or more. About forty (40) percent of the complex is impervious coverage by buildings, asphalt, concrete and other materials. Permeability is slow in the areas of undisturbed soils and variable in other locations. Runoff is slow and the erosion hazard is slight. The available water capacity is high in undisturbed areas and low in locations dominated by cuts, fills and urban land. Unlimed areas are very strongly acid. Undisturbed areas are mainly in yards and around structures. They tend to be very shaly, but are suitable for lawns, shade trees, vegetable gardens and ornamental plantings.

Nixon (NCB)

The Nixon-Urban Land Complex (NCB) soil series is present in the northeastern portion of Highland Park. This series consists of nearly level to gently sloping, well-drained Nixon soils used for urban development. As with the other urban land units, the soils and urbanized areas are so intermeshed that separate mapping is impractical. About forty (40) percent of this unit is Nixon soils. The surface layer is brown loam about eight inches thick. The upper part is yellowish red loam nineteen inches thick. The lower part is yellowish red sandy loam ten inches thick. The substratum is brown stratified sandy loam extending to a depth of sixty inches or more. About forty (40) percent of the Nixon complex is covered by the impervious surfaces of buildings, asphalt, and concrete. Permeability is moderate in the subsoil and moderately rapid in the substratum. Runoff is slow to medium and the hazard of erosion is moderate. Available water capacity is moderate in undisturbed area and low in locations of cut and fill. Most un1irned areas are very strongly acid. Undisturbed areas are mainly in yards around buildings. These locations are generally suitable for lawns, shade trees, vegetable gardens, and other ornamental plantings.

Psamments (PN)

A small pocket of Psamments, (PN) nearly level, is located in the southeastern section of Highland Park. This soil series consists of deep, well-drained or moderately drained soils in regraded borrow areas that have been smothered The variability of the unit makes on-site investigation necessary to determine the suitability of the unit for any use.

Rowland (Ro)

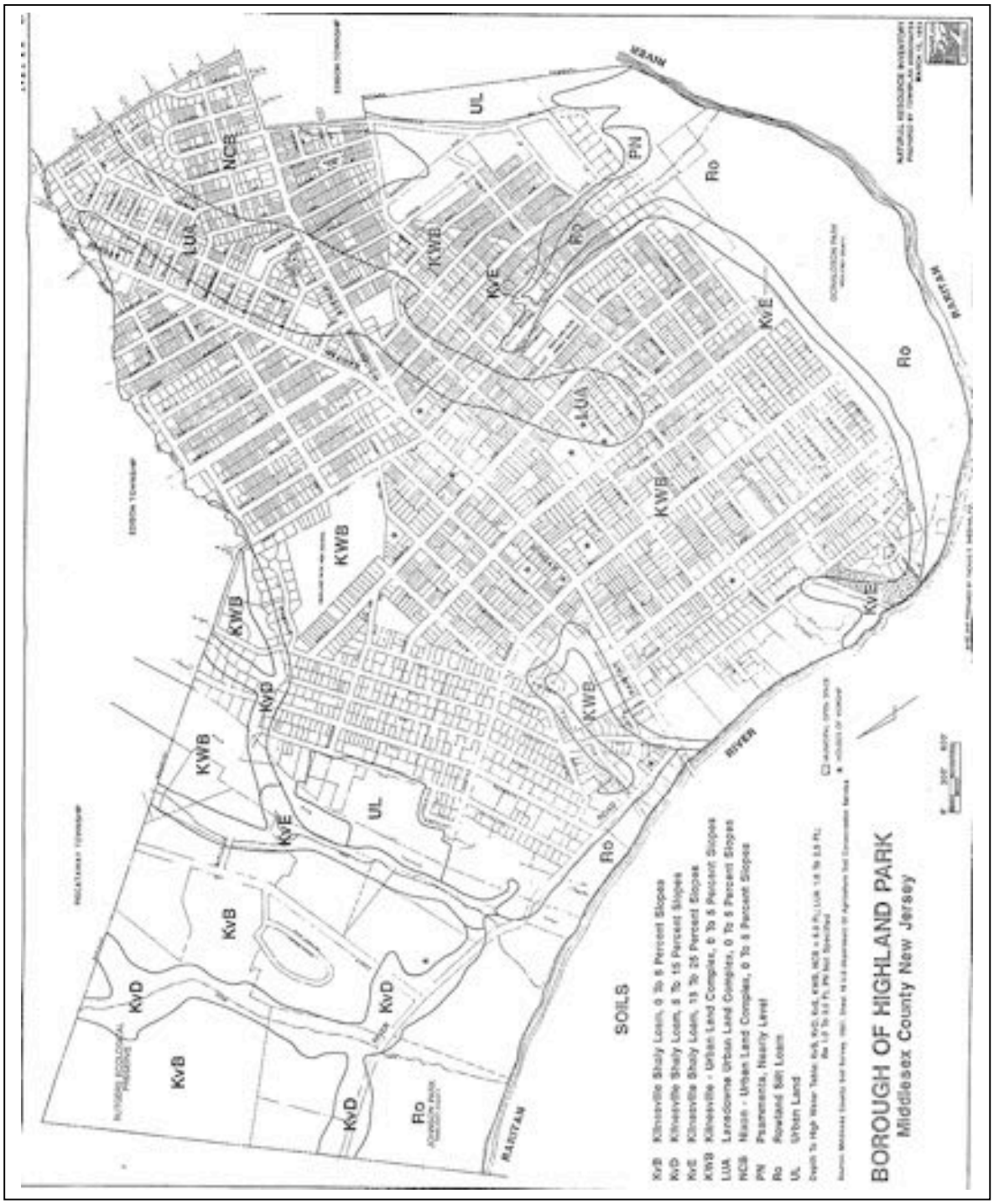
The Rowland series (Ro) consists of deep, moderately well-drained or somewhat poorly drained soils. The Rowland series is considered a Group 3 hydric soil, which is a soil displaying hydric conditions in a few places; however additional verification of hydric conditions (i.e.,

a field survey) is needed. Hydric soils are used as an indicator of the presence of wetlands. In Highland Park the Rowland series has been identified in two places along the Raritan River in the Soil Survey of Middlesex County issued by the Soil Conservation Service. It is the only hydric soil in the Borough. A comparison of the attached Soils Map and Hydrological Features Map shows that areas of Rowland Soil coincide with Palustrine and Modified wetlands. This soil is nearly level and moderately well-drained or poorly drained. Its main problems are seasonal wetness and flooding. It is characteristically found in floodplains along streams and drainage ways extending to the toe of slopes. The surface layer is brown silt loam about seven inches thick. The subsoil is dark brown and reddish brown silt loam about thirty-three inches thick. The substratum. is gray silt loam and dark gray sandy loam to a depth of sixty inches or more. Soils with more clay in the subsoil are found along the Raritan River. The permeability is moderate or moderately slow. Available water capacity is high. The water table is at a depth of one foot to three feet from late winter to early spring. Rooting depth is restricted by the high water table. Flooding occurs about once a year. In unlimed areas, the surface layer is medium acid and the subsoil is strongly acid. The soil is well-suited to a variety of trees, mainly scarlet oak, pine, white oak, sweetgum, ash, and red maple.

Urban Land (UL)

The final soil series located in Highland Park is Urban Land (UL). This series is characterized by area where greater than eighty (80) percent of the surface is covered with structures. Most of its area has been excavated or filled with material. On-site investigation is needed to determine the potential or limitations of this unit for any use. UL is located in the central northwestern portion of the Borough and along its eastern boundary with Edison Township.

Map 3- Page 11


BOROUGH OF HIGHLAND PARK
Middlesex County New Jersey
SOILS
KvB Klinesville Shaly Loam, 0 To 5 Percent Slopes
KvD Klinesville Shaly Loam, 5 To 15 Percent Slopes
KvE Klinesville Shaly Loam, 15 To 25 Percent Slopes
KWB Klinesville - Urban Land Complex, 0 To 5 Percent Slopes
LUA Lansdowne Urban Land Complex, 0 To 5 Percent Slopes
NCB Nixon - Urban Land Complex, 0 To 8 Percent Slopes
PN Pyramenta, Nearly Level
Ro Rowland Silt Loam
UL Urban Land
RARITAN RIVER

HYDROLOGICAL FEATURES

Hydrological features of Highland Park include its ground and surface waters and associated drainage areas, stream corridors, floodplains and wetlands. These features are shown on Map 4.

Groundwater

The Passaic Formation, which underlies Highland Park is one of the aquifers, or water bearing rock formations, which lie beneath Middlesex County. Groundwater in the aquifer is replenished by natural precipitation and is found in the fractures and joints of the formation. While this allows for large volumes of water storage, well-flow is difficult to predict because of the random nature of the cracks. The water table is also subject to rapid lowering during drought and is vulnerable to contamination. For these reasons, the potable water supply in Highland Park is obtained from purveyors that utilize surface water supplies from outside the Borough.

The Borough landfill site underwent a period of activity from 1940 to 1977 during which wastes were buried and the area covered and regraded. The fill site is approximately eight acres and is located south of Donaldson Street. Its extent, shown on Map 4, is based upon mapping prepared by the Borough consulting engineers from research and site investigations. Monitoring wells, to detect the impact of the landfill on groundwater in the localized area of the landfill, were installed on the landfill site in 1988. Leachate discharge from the landfill to the groundwater is occurring. Although most of the monitored parameters of water quality as reported by the Borough consulting engineers do not indicate a serious environmental impact, certain water quality parameters, such as benzene, are being exceeded. The parameters, which have been cited as concerns are volatile organics (benzene), lead, fecal coliform and ammonia nitrogen. It is believed that the coliform and ammonia nitrogen originate from sources outside the landfill, such as leaking sanitary sewer pipes.

Drainage Areas

Highland Park lies within the drainage basin of the Raritan River. Ultimately, the surface waters and storm water sewers of the Borough drain into the River. There are, however, four large drainage sub-areas as shown on the Hydrological Features Map (Map 4), some of which are tributary to the smaller streams that course through the Borough. The boundaries of these area are related to surface topography and elevations. From Redcliff Avenue to Franklin Street, the Borough pitches to the south and drains into the Raritan River. From that area to north

of Cedar Lane, the Borough drains either into Mill Brook, which enters the Raritan River in Johnson Park northwest of the Amtrak Line, or, in the case of a triangular area of the Borough west of the intersection of Raritan and Woodbridge Avenues, directly into the River. The balance of the Borough north of Cedar Lane is drained by Buell Brook, which enters the Raritan at Johnson Park.

Stream Corridors

Hydrological features in Highland Park include several stream corridors, including the Raritan River, which forms the Borough's southern border; Buell Brook in the northwestern portion of the Borough, and Mill Brook, which runs along the Borough border with Edison Township travelling southwest toward the Amtrak Line. These streams are classified as non-trout waters under the NJDEPE surface water quality standards. Other stream corridor areas have been altered or piped during the building of Highland Park. Remnants of these corridors can be found in the vicinity of Valley Place and at the foot of Sixth Avenue.

Stream corridors in Highland Park are relatively narrow strips of land on either side of a stream. They are a valuable environmental resource. A stream corridor includes the floodway and the permanent channel of a brook or stream.

Comment: Picture of Mill Brook did not reproduce well.

Legend of Picture: *The Mill Brook stream corridor is an attractive water feature that runs fast and cuts into the bedrock of the Passaic formation.*

Stream corridors are vital to the maintenance of the ecological and hydrological functions of the surface water system. The soils and vegetation associated with stream corridors aid runoff and flood control; sediment control; stream bank and stream bed erosion control; nutrient uptake and water quality; habitat protection and groundwater recharge.

Public benefits of stream corridor conservation in Highland Park would include scenic and aesthetic benefits, the protection of important wildlife habitat, as well as opportunities for open space preservation, nature trails, walkways and parks.

Prudent stream corridor management should include design standards requiring buffers at least sixty-five (65) feet wide between the limits of disturbance and the stream bank. The buffer should be wide enough to include the 100 year floodplain and slopes which exceed ten (10) percent. Recommendations on minimum stream corridor buffer width have been compiled in a technical reference document to the New Jersey State Development and Redevelopment Plan. The document, entitled The New Jersey Freshwater Wetlands Protection Act as it Relates to Stream Corridor Buffer Considerations in the State Development and Redevelopment Plan, is available from the New Jersey Office of State Planning. The buffer area should be protected by public acquisition or by deed restrictions and conservation easements required as a condition of local development approval. However, where development has already encroached into a corridor, buffering requirements and development restrictions may have to be modified in light of existing conditions.

Floodplains

Highland Park contains areas along Buell Brook, Mill Brook, and the Raritan River, which are subject to flooding. The basis for delineating the flood prone areas is the 100 year floodplain as mapped in 1977 in the Flood Insurance Rate Maps of the Federal Emergency Management Agency. These maps delineate those areas of the Borough, which, in any given year, have a one percent chance of flooding.

The floodplain consists of two major parts - the floodway and the flood fringe. The floodway is the stream channel and the adjacent overflow area, which, in a storm event, will carry the major portion of the flood flow. Velocities and depth of inundation in a storm event are greatest in the floodway. The flood fringe, which occupies higher elevations outside the floodway, also becomes inundated but velocities and water depth are less than in the floodway. Municipalities are required to enact minimum regulation controlling development within the floodplain in order to participate in the National Flood Insurance Program. Such regulations are minimum standards and a municipality may enact more stringent regulations than those set by federal or state agencies in order to control floodplain development and thereby prevent human injury and property damage.

Wetlands

The New Jersey Department of Environmental Protection and Energy has mapped freshwater wetlands throughout the state of New Jersey. Based on the mapping available for Highland Park, several areas of wetlands throughout the Borough have been identified. These wetlands are located primarily along the Raritan River, Buell Brook and Mill Brook. It should be noted that the state mapping provides a general indication of the presence or absence of wetlands. Where development is proposed, a field investigation and delineation of wetlands should be conducted and the developer should obtain a Freshwater Wetlands Letter of Interpretation from the New Jersey Department of Environmental Protection and Energy indicating the precise boundaries of any wetlands, state open waters or wetlands transition areas on the site.

Freshwater wetlands became an important component of development regulations in the United States in 1985 when the U.S. Supreme Court ruled that the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers were required to regulate wetlands in accordance with Section 404 of the Clean Water Act of 1977. Permits were required for a variety of regulated activities including dredging or the placement of fill in both coastal and freshwater wetlands. Coastal wetlands already received Statewide protection in New Jersey under the Wetlands Act of 1970. In 1987, the New Jersey State Legislature enacted the Freshwater Wetlands Protection Act which became effective on July 1, 1988. This Act was designed to further protect wetlands within the State.

'\Vetlands are defined by the New Jersey Department of Environmental Protection and Energy (NJDEPE) as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions". This leads to a three parameter approach to determine the presence of wetlands. The three parameters are soil, vegetation, and hydrology.

The Freshwater Wetlands Protection Act called for the preparation of statewide freshwater wetlands mapping. These maps, which were prepared at a scale of 1:12000 (1"=1000'), provide a general guide to the approximate location and extent of wetlands. The attached Hydrological Features Map interprets this mapping for Highland Park.

Wetlands are classified using the United States Fish and Wildlife Service Cowardin Classification System, which is based on a combination of factors, primarily vegetation and hydrologic association. The classification is hierarchical. The broad "system" level consists of Palustrine, Riverine, Lacustrine, Marine, and Estuarine. The first three systems are freshwater systems.

Palustrine systems can represent freshwater marshes, bogs, swamps, and bottomland forest.

Riverine systems represent freshwater rivers and their tributaries, and can be either tidal or non-tidal.

Lacustrine systems include deep water lakes, reservoirs, and deep ponds.

Marine systems include the open ocean and associated coastline.

Estuarine systems represent tidal brackish waters and their associated wetlands.

Wetlands within Highland Park are predominantly Palustrine Systems, with a limited area of Riverine wetlands found along Mill Brook. Buell Brook is part of a Palustrine system. The Raritan River is classified as Riverine tidal open waters in the vicinity of the Albany Street Bridge, and as an unknown water regime downstream of the Bridge.

With the exception of Palustrine systems, each system is divided into subsystems relative to tidal water levels or water depths.

Palustrine systems and subsystems of the other categories are further divided into "classes" based on general appearance or dominant vegetation (i.e., rock bottom, unconsolidated shore, emergent wetland, forested wetland, etc.).

Subclasses further divide the wetland type to define substrate (i.e., mud, sand, cobble, etc.) or vegetative dominance (i.e., lichen, broad-leaved deciduous, needle-leaved evergreen, etc.).

Table 1 provides an outline of the classification system, which is utilized under the wetlands key on Map 4. Areas identified as MODL (modified lawn) may have been a wetland but have been intentionally altered to create a lawn area and may no longer be functioning as a wetland. In Highland Park, Donaldson Park is identified as a modified lawn area.

Table 1

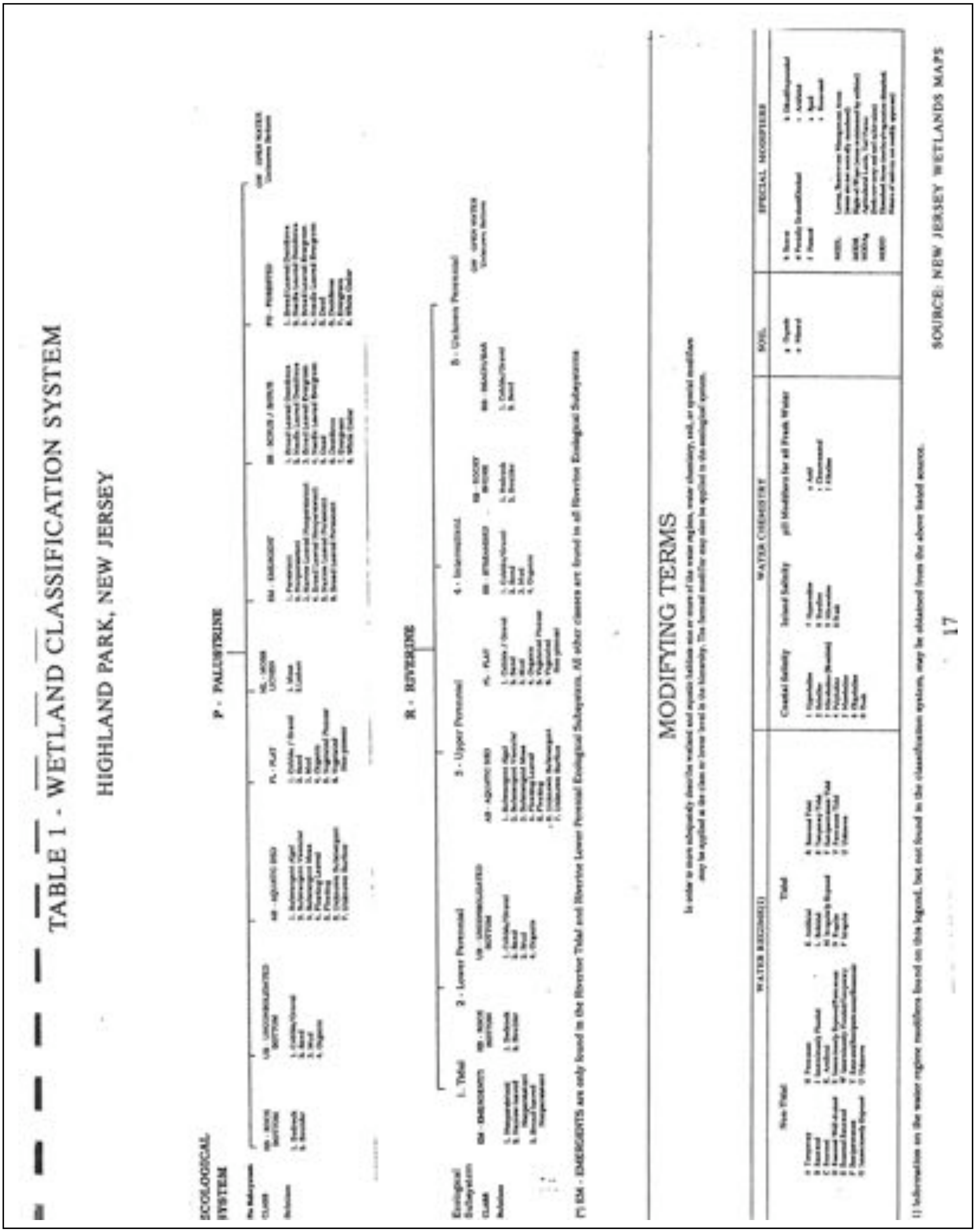


TABLE 1 - WETLAND CLASSIFICATION SYSTEM
HIGHLAND PARK, NEW JERSEY
ECOLOGICAL SYSTEM
P - PALUSTRINE
R - RIVERINE
1 - Tidal
2 - Lower Perennial
3 - Upper Perennial
4 - Intermittent
5 - Unknown Perennial
MODIFYING TERMS
WATER REGIME(1)
WATER CHEMISTRY
SOIL
SPECIAL MODIFIERS
SOURCE: NEW JERSEY WETLANDS MAPS
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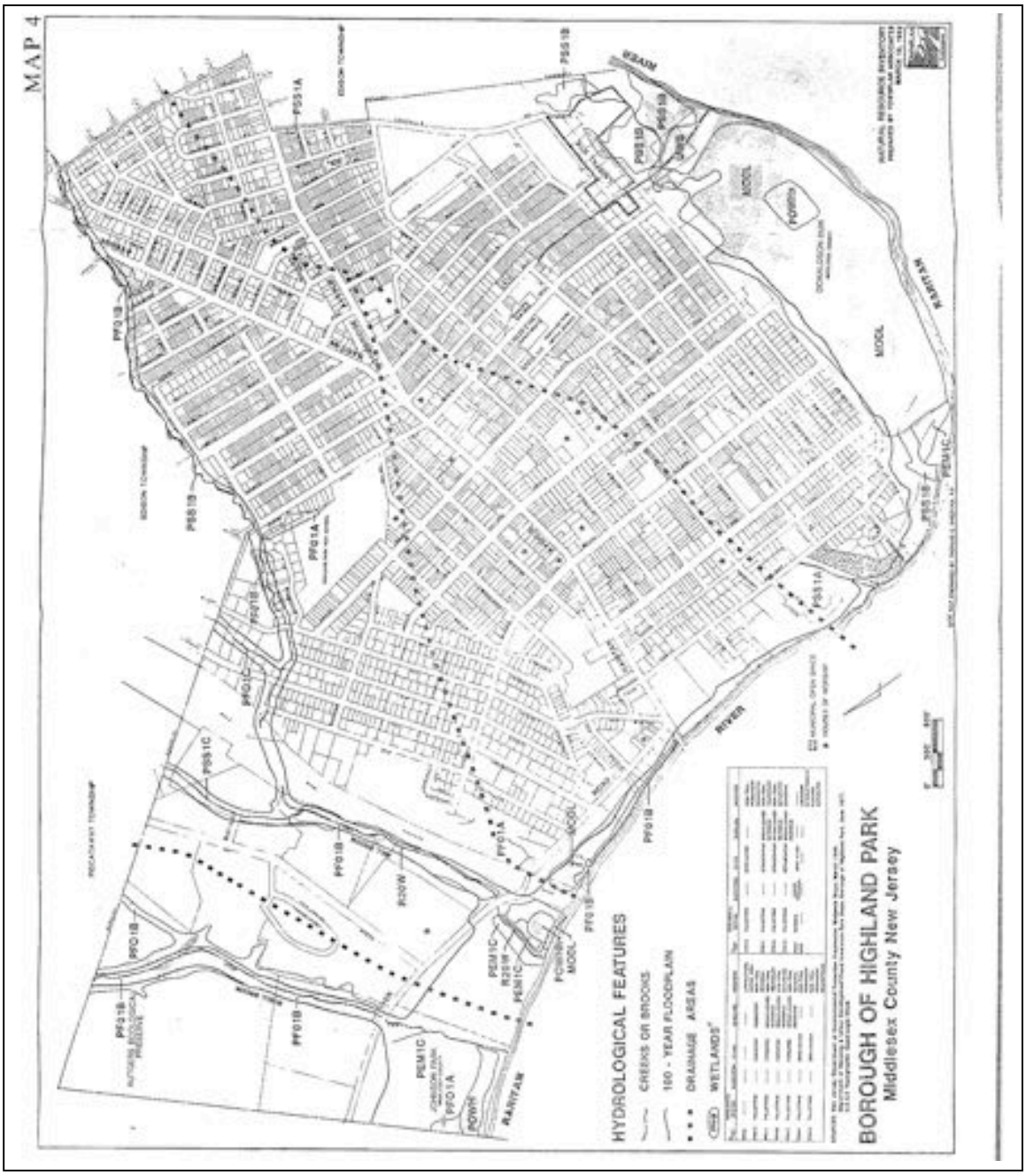
Map 4 -Page 18


MAP 4
HYDROLOGICAL FEATURES
CREEKS OR BROOKS
100 - YEAR FLOODPLAIN
DRAINAGE AREAS
WETLANDS
BOROUGH OF HIGHLAND PARK
Middlesex County New Jersey
RARITAN
RIVER
MODL

WILDLIFE HABITAT

The variety and health of wildlife population, which inhabit or visit an area is closely linked to the physical environment of the region. It is also an indicator of the quality of the habitat areas it occupies. This, in turn, may have implications for the well-being of the human population within the area. F'ishkills, for example, can indicate polluted water; unproductive ospreys point to toxic chemicals in the ecosystem.

Among the most significant characteristics which contribute to the attractiveness of a location to a species are the availability of food, water and cover, and the presence of predatory species. The variation in these elements from place to place is, in large part, responsible for the diversity in species among locations. The Borough of Highland Park, with the presence of the Raritan River, related stream corridors and parks, boasts a diverse array of wildlife species.

Red tailed hawk and evidence of white tail deer have been observed in the area of Mill Brook in Highland Park. A large colony of spongy arrowhead, a plant species considered to be rare by the New Jersey Department of Environmental Protection and Energy, Office of Natural Lands Management, is located upstream of Donaldson Park in Highland Park. In addition, a portion of the Rutgers Ecological Preserve and Natural Teaching Area is located in the northwestern portion of Highland Park.

The Rutgers Ecological Preserve was established by the Board of Governors of Rutgers University in 1976. The Preserve supports a wide variety of wildlife due to the diversity of habitats within the Preserve. Such habitat includes successional fields and woodlands areas, mature forested uplands and lowland

Comment: Picture of Rutgers Ecological Preserve did not reproduce

Legend of Picture: *The Rutgers Ecological Preserve provides an extended area of diverse habitats that support a variety of wildlife.*

areas along stream corridors. Over 200 species of vertebrates have been recorded on the preserve, in addition to numerous species of insects and invertebrates. Both aquatic and land species have been recorded in the Preserve. Ten species of fish, including the American Eel, Spottail Shiner, Blacknose Dace, Creek Chub, White Sucker, Creek Chubsucker, Banded Killifish, Mummichog, Bluegill, and Tessellated Darter have been observed in streams in the Preserve. Typical amphibians and reptiles found in the Preserve include the Eastern Red-backed Salamander, American Toad, Spring Peeper, Green Frog, Eastern Box Turtle, and Racer. Birds are also abundant in the Preserve, as well as along the Raritan River, with over 150 species represented. Among these 150 species are various species of Warblers, Wrens, Thrushes, Hawks, Ospreys and Owls. At least 25 species of mammals inhabit the Preserve, including White-tailed Deer, Eastern Gray Squirrel, Gray Fox and Raccoon.

In addition to the habitat provided by the Rutgers Ecological Preserve, wildlife adapted to suburban areas is abundant in Highland Park. Typical suburban wildlife species which are likely to be present, or have been observed, in Highland Park include Rabbits, Squirrels, Raccoons, Opossum, Ground Hogs, Skunks, Canada Geese, Herring Gulls, Ring-billed Gulls, Great Black-backed Gulls, and a variety of songbirds. Highland Park also contains areas, which are suitable habitat for the Red Bat, Big Brown Bat, House Mouse, White Footed Mouse, Shorttail Shrew, and Eastern Chipmunk.

Table 2 lists the array of mammals which could he found within Highland Park and the Rutgers Ecological Preserve. Table 3 lists the array of bird species which could be observed in the area.

While many of the birds of Table 3 - including some species classified by New Jersey as endangered or threatened - would find their preferred habitat only along the river or in the Ecological Preserve, many also on occasion are known to use Highland Park's more developed areas as stopover points. In Johnson Park, at the edge of the developed area of Highland Park, a single small marshy pond by the railroad bridge and the mouth of Mill Brook has in recent years afforded sightings of Sora Rail, various shorebirds, and at least five members of the Heron/Egret family: Great Blue Heron, Black-crowned Night Heron, Green-backed Heron, Common Egret, and Snowy Egret.

In residential portions of Highland Park, a yard with some shrubbery and bird feeders can attract upwards of twenty-five (25) species. One resident recalls observing: Goldfinch, Carolina Wren, House Wren, Ruby-throated Hummingbird, Cedar Waxwing, Brown Creeper, White-breasted Nuthatch, Red-breasted Nuthatch, Downy Woodpecker, Flicker, Rose-breasted Grosbeak, Northern Oriole, Redstart, Yellow-rumped Warbler, Chickadee, Tufted Titmouse, White-throated Sparrow, Song Sparrow, House Sparrow, House Finch, Dark-eyed Junco, Catbird, Mockingbird, Cardinal, Bluejay, Robin, Brown-headed Cowbird, Red-winged Blackbird, Common Grackle, European Starling (including one that has learned to imitate a wolf whistle), and two rarer yard visitors:. Sharp-shinned Hawk and Ring-necked Turtledove.

Among desirable insects, Monarch, Tiger Swallowtail, and Mourning Cloak butterflies are conspicuous (supported by such common larval food plants as milkweed, wild cherry, and willow, respectively). Also fairly abundant but requiring a closer attention to notice are the small Skippers and Hummingbird Clearwing moths visiting flowers, or the Dragonflies and Damselflies that may venture into yards quite far from their watery hatching places.

For such small creatures as the desirable butterflies, no very large habitat is required, so that Highland Park has a good potential for preserving and enhancing its butterfly population. The chief requirement (since flowers for the adult butterfly to visit are abundant in Highland Park gardens) is larval food plants left unmowed and unsprayed from egg-laying season through pupal hatching. Thus a patch of violets in the corner of a yard may support Fritillary species; hollyhock or thistles, the Painted Lady; and nettles in an unfrequented corner of park or open space, the Red Admiral - all of these being attractive species observed visiting Highland Park gardens.

TABLE 2 - NEW JERSEY MAMMALS

Highland Park NRI

COMMON NAME	SCIENTIFIC NAME	-HABITAT- FOREST	WET FOREST	MARSH	FIELD/ SCRUB	FOREST FRINGE	URBAN LAND	SPECIAL HABITAT REQUIREMENTS	RANGE WITHIN NEW JERSEY
BATS									
Little Brown Myotis	Myotis lucifugus					X	X	caves	north
Big Brown Bat	Eptesicus fuscus	X					X	caves, buildings	state
Red Bat	Lasiurus borealis	X			X	X		trees	state
Hoary Bat	Lasiurus cinereus	X						evergreens	state
Evening Bat	Nycticeius humeralis	X					X	hollow trees, buildings	south
Silver-haired Bat	Lasionycteris noctivagan	X					X	trees, cracks, buildings	state
Eastern Pipistrelle	Pipistrellus subflavus	X			X	X	X	caves, mines	state
RODENTS									
Black Rat	Rattus rattus				X		X	mainly buildings, docks	state
Norway Rat	Rattus norvegicus				X		X	buildings, farm fields	state
Marsh Rice Rat	Oryzomys palustris			X					cent., south
Eastern Woodrat	Neotoma floridana					X		rocky areas	north
Muskrat	Ondatra zibethicus			X				water areas	state
House Mouse	Mus musculus				X		X	buildings, farm fields	state
Meadow Jumping Mouse	Zapus hudsonius			X	X			moist fields-dense woods	state
White Footed Mouse	Peromyscus leucopus	X			X			brushy areas	state
Wood Mouse	Peromyscus sp.	X				X			state
Short-tailed Shrew	Blarina brevicauda	X			X				state
Least Shrew	Cryptotis parva		X	X	X			grassy areas	state
Masked Shrew	Sorex cinereus			X				moist fields-dry woods	state
So. Red-backed Vole	Clethrionomys gapperi		X						state
Meadow Vole	Microtus pennsylvanicus			X	X			also woodland glades	state
Woodland Vole	Microtus pinetorum	X			X			pine forests	state
So. Bog Lemming	Synaptomys cooperi			X				meadows	state

TABLE 2 - NEW JERSEY MAMMALS

COMMON NAME	SCIENTIFIC NAME	-HABITAT- FOREST	WET FOREST	MARSH	FIELD/ SCRUB	FOREST FRINGE	URBAN LAND	SPECIAL HABITAT REQUIREMENTS	RANGE WITHIN NEW JERSEY
SMALL MAMMALS									
Eastern Mole	Scalopus aquaticus			X	X			loose soil	state
Starnosed Mole	Condylura cristata		X	X				occasionally lawns	state
Opossum	Didelphis virginiana	X			X			also farmlands	state
Striped Skunk	Mephitis mephitis	X			X		X		state
Raccoon	Procyon lotor		X					streams	state
Long Tail Weasel	Mustela frenata	X	X		X	X		likes farms & streams	state
Mink	Mustela vison		X	X				streams	state
Eastern Cottontail	Sylvilagus floridanus	X			X	X		thickets & brush piles	state
New Eng. Cottontail	S. transitionalis	X			X	X		brushy areas	state
European Rabbit	Oryctolagus cuniculus				X			open fields	state
Groundhog	Marmota monax				X	X		fields	state
Eastern Chipmunk	Tamias striatus		X		X		X	wood piles & stone walls	state
East. Gray Squirrel	Sciurus carolinensis	X					X		state
Fox Squirrel	Sciurus niger	X						pine forests	south
Red Squirrel	Tamiasciurus hudsonicus	X						pine forests	state
So. Flying Squirrel	Glaucomys volans	X						Hick., Oak, Beech, Maple	state
Red Fox	Vulpes vulpes	X			X	X		farms	state
Grey Fox	Urocyon cinereoargenteu	X			X	X		farms	state
White-tail Deer	Odocoileus virginianus	X			X	X		farms adj. to woods	state

SOURCE: Whitaker, John O. Jr., "THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN MAMMALS", Alfred A. Knopf, New York, N.Y., 1980, 745 pps.

COMPILED BY: Townplan Associates, 1992

Highland Park NRI

TABLE 3- BIRD SPECIES – Page 24

LOONS	American Kestrel (Sparrow Hawk)	Great Horned Owl
Red-throated Loon	Merlin (Pigeon Hawk)	Barred Owl (LT)
Common Loon	Peregrine Falcon (LE)(FLE)(Y)	Long-eared Owl
		Northern Saw-whet Owl
GREBES	**UPLANDS GAMEBIRDS**	
Pied-billed Grebe (LE)	Ring-necked Pheasant	**GOATSUCKERS**
Horned Grebe	Ruffed Grouse	Common Nighthawk
	Northern Bobwhite	Whip-poor-will
CORMORANTS		
Double-crested Cormorant	**RAILS &. ALLIES**	**SWIFTS**
	Sora	Chimney Swifts
HERONS, EGRETS &. WATERFOWL	Common Moorhen (Common Gallinule)	
American Bittern (LT)(Y)	American Coot	**HUMMINGBIRDS**
Great Blue Heron (LT)(N)		Ruby-throated Hummingbird
Great Egret (Common Egret)	**SHOREBIRDS**	
Snow Egret	Black-bellied Plover	**KINGFISHER**
Little Blue Heron	Semipalmated Plover	Belted Kingfisher
Tri-colored Heron (Louisiana Heron)	Killdeer	
Cattle Egret	Greater Yellowlegs	**WOODPECKERS**
Green-backed Egret (Green Heron)	Lesser Yellowlegs	Red-headed Woodpecker
Black-crowned Night Heron	Solitary Sandpiper	Red-bellied Woodpecker
Tundra Swan (Whistling Swan)	Spotted Sandpiper	Yellow-bellied Sapsucker
Mute Swan	Upland Sandpiper (LE)(B)	Downy Woodpecker
Snow Goose (Blue Goose)	Ruddy Turnstone	Hairy Woodpecker
Brant	Red Knot	Northern Woodpecker
Canada Goose	Sanderling	
Wood Duck	Semipalmated Sandpiper	**FLYCATCHERS**
Green-winged Teal	Western Sandpiper	Olive-sided Flycatcher
American Black Duck	Least Sandpiper	Eastern Wood-Pewee
Mallard	Pectoral Sandpiper	Yellow-bellied Flycatcher
Northern Pintail	Long-billed Sandpiper	Acadian Flycatcher
Blue-winged Teal	Common Snipe	Alder Flycatcher
Northern Shoveler	American Woodcock	Willow Flycatcher
Gadwall	Red-necked Phalarope (Northern Phalarope)	Least Flycatcher
American Wigeon		Eastern Phoebe
Canvasback	**GULLS &. TERNS**	Great Crested Flycatcher
Redhead	Laughing Gull	Western Kingbird
Ring-necked Duck	Bonaparte's Gull	Eastern Kingbird
Lesser Scaup	Ring-billed Gull	
Black Scoter	Herring Gull	**LARKS**
Common Goldeneye	Iceland Gull	Horned Lark
Buffiehead	Lesser Black-backed Gull	
Hooded Merganser	Glaucous Gull	**SWALLOWS**
Common Merganser	Great Black-backed Gull	Purple Martin
Red-breasted Merganser	Common Tern	Tree Swallow
Ruddy Duck	Forster's Tern	Northern Rough-winged Swallow
	Least Tern	Bank Swallow
VULTURES	Black Tern	Cliff Swallow
Turkey Vulture		Barn Swallow
	PIGEONS &. OOVES	
BIRDS-OF·PREY	Rock Dove	
Osprey	Mourning Dove	
Bald Eagle		
Northern Barrier (Marsh Hawk) (LE)(Y)	**CUCKOOS**	
Sharpe-shinned Hawk	Black-billed Cuckoo	
Cooper's Hawk (LE)(W)	Yellow-billed Cuckoo	
Red-shouldered Hawk		
Broad-winged Hawk	**OWLS**	
Red-tailed Hawk	Common Barn-Owl	
Rough-legged Hawk	Eastern Screech-Owl	

TABLE 3 - BIRD SPECIES – Page 25

CROWS & JAYS	**WOOD WARBLERS**	Lincoln's Sparrow
Blue Jay	Blue-winged Warbler	Swamp Sparrow
American Crow	Golden-winged Warbler	White·throated Sparrow
Fish Crow	(Brewster's Warbler)	White-crowned Sparrow
	(Lawrence's Warbler)	Dark-eyed Junco (Slate-colored Junco)
TITMICE	Tennessee Warbler	Lapland Longspur
Black-capped Chickadee	Orange-crowned Warbler	Snow Bunting
Carolina Chickadee	Nashville Warbler	
Tufted Titmouse	Northern Warbler	**BLACKBIRDS &. ALLIES**
	Yellow Warbler	Bobolink (LT)
NUTHATCHES	Chestnut-sided Warbler	Red-winged Blackbird
Red-breasted Nuthatch	Yellow Warbler	Eastern Meadowlark
White-breasted Nuthatch	Cape May Warbler	Rusty Blackbird
	Black-throated Blue Warbler	Common Grackle
CREEPERS	Yellow-rumped Warbler (Myrtle Warbler)	Brown-headed Cowbird
Brown Creeper	Black-throated Green Warbler	Orchard Oriole
	Blackburnian Warbler	Northern Oriole
WRENS	Pine Warbler	
Carolina Wren	Prairie Warbler	**OLD WORLD SEED EATERS**
House Wren	Palm Warbler	Pine Grosbeak
Winter Wren	Bay-breasted Warbler	Purple Finch
Marsh Wren	Blackpoll Warbler	House Finch
	Cerulean Warbler	Red Crossbill
THRUSHES &.ALLIES	Black-and-white Warbler	White-winged Crossbill
Golden-crowned Kinglet	American Redstart	Common Redpoll
Ruby-crowned Kinglet	Prothonotary Warble	Pine Siskin
Blue-gray Gnatcatcher	Worm-eating Warble	American Goldfinch
Eastern Bluebird	Ovenbird	Evening Grosbeak
Veery	Northern Waterthrush	
Gray-cheeked Thrush	Louisiana Waterthrush	**WEAVER FINCHES**
Swainson's Thrush	Kentucky Warbler	House Sparrow (English Sparrow)
Hermit Thrush	Connecticut Warbler	
Wood Thrush	Mourning Warbler	**Source:** Field Checklist of Birds for
American Thrush	Common Yellowthroat	New Brunswick, New Jersey,
	Hooded Warbler	Compiled by Charles F. Leck,
MIMICS	Wilson's Warbler	Department of Biological Sciences,
Gray Catbird	Canada Warbler	Rutgers University, 1983
Northern Mockingbird	Yellow-breasted Chat	
Brown Thrasher		LE - Listed as endangered in the State
	TANAGERS	FLE - Listed as endangered at the Federal level
PIPITS	Summer Tanager	LT· Listed as threatened in the State
Water Pipit	Scarlet Tanager	Y • Present year-round, breeds
		N - Present year-round, not recorded breeding
WAXWINGS	**GROSBEAKS, BUNTINGS '& SPARROWS**	W - Present during the winter
Cedar Waxwing	Northern Cardinal	B - Present during the summer, breeds
	Rose-breasted Grosbeak	
SHRIKES	Blue Grosbeak	
Northern Shrike	Indigo Bunting	
Loggerhead Shrike	Dickcissel	
	Rufous-sided Towhee	
STARLING	American Tree Sparrow	
Eastern Starling	Chipping Sparrow	
	Field Sparrow	
VIREOS	Vesper Sparrow	
Solitary Vireo	Lark Sparrow	
Yellow-throated Vireo	Savannah Sparrow (LT)(W)	
Warbling Vireo	Grasshopper Sparrow	
Philadelphia Vireo	Fox Sparrow	
Red-eyed Vireo	Song Sparrow	

VEGETATION

Many factors influence vegetation including climate, soils, hydrology and human activities. Lying on the Piedmont uplands of red shale, the Borough would, without human intervention, have been characterized by a mixed oak forest dominated by varieties of oak (Red Oak, White Oak, and Black Oak) and by chestnut trees. Lowland areas would have been characterized by Pin Oak, red Maples, elms, Black Gum, willows, and sycamore trees.

Today, vegetation in Highland Park can be divided into four general associations: woodland, emergent wetland, open land, and urban land. Table 4 provides the common and botanical names of vegetative species, which can be expected to occur in Highland Park. The accompanying Vegetation Map shows the generalized vegetation found in Highland Park.

Woodlands are undisturbed areas dominated by woody vegetation over twenty feet in height, and include wooded wetlands. The largest contiguous woodland in Highland Park is the Rutgers Ecological Preserve and Natural Teaching Area. Other wooded parcels exist throughout the Borough, including those found along the southeastern border and adjacent to Buell Brook and Mill Brook. Common trees found within the Borough's woodlands include oaks, maples, Sweetgum, Sourgum, birches, ashes, elms, Eastern Red Cedar, Tulip Tree, and cherries. Shrub species typically associated with these trees include sumacs, Japanese Knotweed, Silky Dogwood, Common Elderberry, Sweet Pepperbush, Arrowwood, Spicebush and Winterberry. Herbs typically found in these associations include Cinnamon Fern, Bracken, smartweeds, Jack-in-the-Pulpit, Mayapple, Jewelweed, Clearweed, False Nettle, sedges, and rushes. Common vines include brambles, briars, wild roses, wild grapes, Japanese Honeysuckle, Virginia Creeper, and Poison Ivy.

The dominant emergent wetland associations found in Highland Park are the palustrine emergent wetlands found in small pockets along the Raritan River. Vegetation typically found within these associations are Wild Rice, smartweeds, Common Reed, bulrushes, sedges, and rushes.

The largest examples of open land vegetation can be found in the two County Parks: Donaldson Park and Johnson Park. Larger institutional landlholdings, such as the Cenacle, also provide open land vegetation. Vegetation within this association can be divided into three groups: maintained lawns (eg. Perennial Rye, fescues, crabgrass, clovers, and plantains), open fields (eg. Little Bluestem, Switchgrass, Deertongue and other grasses, as well as goldenrods, asters and other wildflowers) and isolated trees or wooded stands. Trees within the open lands typically reflect a combination of the species common to the local woodland and urban land associations.

Urban land vegetation includes the street trees, lawns, and gardens common to residential areas, as well as the ornamental landscaping found in parking lots and around office and commercial buildings. The species found in these areas reflect the tastes of individuals and varied development periods. Typical street trees include American Sycamore, London Plane, maples, oaks, and elms. Other trees found in developed areas include Eastern Red Cedar, Tree-of-Heaven, Black Locust, Gray Birch, crabapples, flowering dogwoods, cherries, Japanese Maple, Mimosa, American Holly, White Pine, Eastern Hemlock, and Norway Spruce. Typical shrubs include lilacs, rhododendrons, azaleas, junipers, Forsythia, privets, yews, hollies, and roses. Common vines include grapes, Trumpet Creeper, Trailing Arbutus, morning glories, Japanese Honeysuckle, and Wisteria Common herbs include turf grasses, wild onions, clovers, plantains, dandelions and hawkweeds, Pachysandra, vetch, and ivy.

The New Jersey Department of Environmental Protection and Energy, Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, maintains lists of endangered, threatened and rare wildlife species, their habitat and range. The Natural Heritage Program uses the following definitions of endangered and threatened:

> **Endangered** - An endangered species is a species whose prospects for survival within the State are in immediate danger. An endangered species requires immediate assistance or extinction will probably follow.
>
> **Threatened** - A threatened species is one that may become endangered if conditions surrounding the species begin to or continue to deteriorate.

The following three (3) vascular plants are considered to be rare (R) or endangered (E) and were observed in the vicinity of Highland Park.

1. Bur-Marigold (Biden bidentoids) (R)

2. Nutthall's Mudwort (Micranthemum micranthemoides) (E)

3. Spongy Arrowhead (Sagittaria calycina var spongiosa) (R)

Both the Bur-Marigold and the Nutthall's Mudwort were observed in 1918; the recorded observation of the Spongy Arrowhead was made in the 1980's, and the colony, which is among the largest in the state, continues to flourish in Highland Park.

TABLE 4 – VEGETATIVE SPECIES – Page 28

COMMON NAME	BOTANICAL NAME
TREES	
Norway Maple	Acer platanoides
Red Maple	Acer rubrum
Silver Maple	Acer saccharinum
Sugar Maple	Acer saccharum
Tree of Heaven	Ailanthus altissima
Mimosa	Albizia julibrissin
River Birch	Betula nigra
Gray Birch	Betula populifolia
Flowering Dogwoods	Comus ssp.
American Beech	Fagus grandifolia
White Ash	Fraxinus americana
Green Ash	Fraxinus pennsylvanica
American Holly	ILex opaca
Eastern Red Cedar	Juniperus virginiana
Sweetgum	Liquidambar styracii1ua
Tulip Tree	Liriodendron tulipifera
Sweetbay Magnolia	Magnolia virginiana
Apples & Crabapples	Malus ssp.
Sourgum	Nyssa sylvatica
Norway Spruce	Picea abies
Pitch Pine	Pinus rigida
White Pine	Pinus strobus
American Sycamore	Platanus occidentalis
Wild Cherry	Prunus cerasus
Black Cherry	Prunus serotina
White Oak	Quercus alba
Swamp White Oak	Quercus bicolor
Scarlet Oak	Quercus coccinea
Pin Oak	Quercus palustris
Northern Red Oak	Quercus rubra
Black Locust	Robinia pseudoacacia
Sassafras	Sassatfras albidum
Eastern Hemlock	Tsuga canadensis
American Elm	Ulmus Americana
Slippery Elm	Ulmus rubra
SHRUBS	
Sweet Pepperbush	Clethra alnifolia
Silky Dogwood	Cornus amomum
Forsythia	Euonymus alata
Wmterberry	Ilex verticillata
Junipers	Juniperus ssp.
Privet	Ligustrum ssp.
Spicebush	Lindera benzoin
Bajyberry	Myrica pensylvanica
Azaleas	Rhododendron ssp.
Sumac	Rhus ssp.
Roses	Rosa ssp.
Pussy Willow	Salix discolor
Elderberry	Sambucus canadensis
Common Lilac	Syringa vulgaris
Yews	Taxus ssp
Arrowwood	Viburnum dentatum
VINES AND BRIARS	
Trumpet Creeper	Campsis radicans
Trailing Arbutus	Epigaea repens
Ivy-leaved Morning-glory	Ipomea hederacea
Common Morning-glory	Ipomea purpurea
Japanese Honeysuckle	Lonicera japonica
Virginia Creeper	Parthenocissus quinquefolia
Currants	Ribes ssp.
Brambes	Rubus ssp.

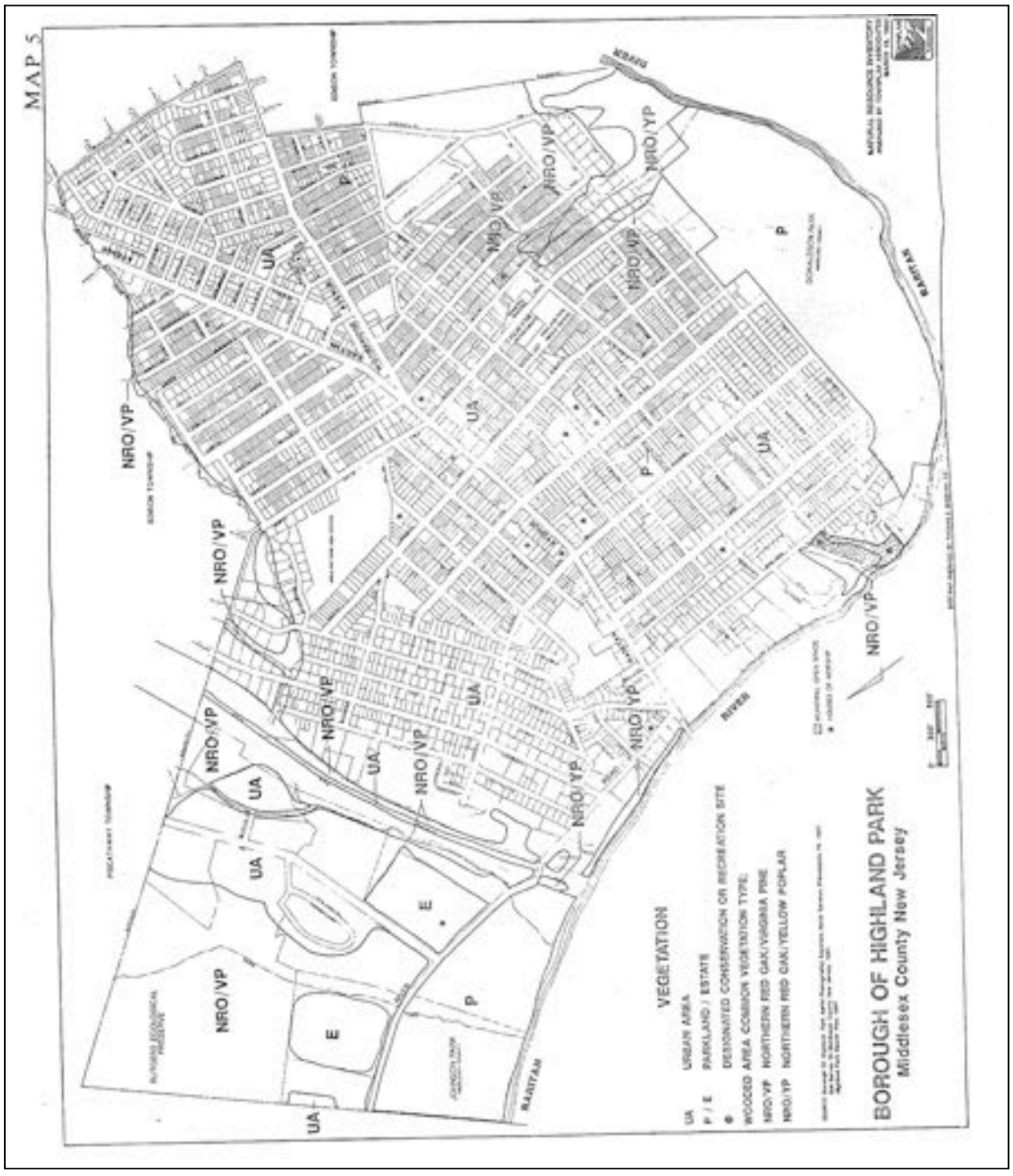
TABLE 4 – VEGETATIVE SPECIES – Page 29

COMMON NAME	BOTANICAL NAME
Briars	Smilax ssp.
Poison Ivy	Toxicodendron radicans
Grapes	Vitis ssp.
Wisteria	Wisteria sinensis
GRASSES, GROUND COVERS & WILDFLOWERS	
Yarrow	Achillea millefolium
Small Flowered Agrimony	Agrimonia parviflora
Ticklegrasses	Agrostis ssp.
Onion	Allium ssp.
Annual Ragweed	Ambrosia artemisiifolia
Little Bluestem	Andropogon scorparius
Jack-in-the-pulpit	Arisaema triphyllum
Biennial Wormwood	Artemisia biennis
Milkweeds	Asclepias ssp.
Lichens	Ascolichenes ssp.
Asters	Aster ssp.
Lady Fern	Athyrium felix-femina
Yellow Rocket	Barbarea vulgaris
Beggerticks	Bidens ssp.
False Nettle	Boehmeria cylindrica
Long-awed Wood Grass	Bracbyelytrum erectum
Bromes	Bromus ssp.
Shepherd's Purse	Capsella bursa-pastoris
Sedges	Carex ssp.
Chickory	Cichorium intyious
Sm Enchanter Nightshade	Circaea alpina
Thistles	Cirsium ssp.
Spring-beauty	Claytonia virginica
Asiatic Day Flower	Commelina communis
Horseweed	Conyza canadensis
Crown Vetch	Coronilla varia
Queen Anne's Lace	Daucus carota
Tick Trefoils	Desmondium ssp.
Panic Grasses	Dichanthelium ssp.
Deer Tongue Grass	Dichanthelium clandestinum
Smooth Crabgrass	Digitaria ischaemum
Hairy Crabgrass	Digitaria sanguinalis
Fragrant Goldenrods	Euthamia ssp.
Fescues	Festuca ssp.
Avens	Geum ssp.
Sweet Everlasting	Gnaphalium obtusifolium
Hawkweeds	Hieracium ssp.
St. John's Wort	Hypericum ssp.
Jewelweed	Impatiens capensis
Rushes	Juncus ssp.
Fall Dandelion	Leontodon autumnalis
Annual Ryegrass	Lolium multiflorum
Perennial Ryegrass	LoUum perenne
Clubmosses	Lycopodium ssp.
Wild Lily-of-the-valley	Maianthemum canadense
Mints	Mentha ssp.
Common Evening Primrose	Oenothera biennis
Cinnamon Fern	Osmunda cinnamomea
Woodsorrels	Oxalis ssp.
Panic Grasses	Panicum ssp.
Switch Grass	Panicum virgatum
Common Reed	Phragmites australis
Clearweed	Pilea pumila
Plantains	Plantago ssp.
Mayapple	Podophyllum peltatum
Smartweeds	Polygonum ssp
Japanese Knotweed	Polygonum cuspidatum
Bracken	Pteridium aquilinum

TABLE 4 – VEGETATIVE SPECIES

COMMON NAME	BOTANICAL NAME
Sorrels and Docks	Rumex ssp.
Bulrushes	Scirpus ssp_
Foxtails	Setaria ssp.
Goldenrods	Solidago ssp.
Skunk Cabbage	Sympiocarpus foetidus
Common Dandelion	Taraxacum officinale
New York Fern	Thelypteris noveboracensis
Marsh Fern	Thelypteris thelypteroides
Clovers	Trifolium ssp.
Corrunon Vetch	Vicia sativa
Violets	Viola ssp.
Turf Grasses	various species
Prepared by. Townplan Associates, 1992	

Map 5- Page 31


MAP 5
BOROUGH OF HIGHLAND PARK
Middlesex County New Jersey
VEGETATION
UA URBAN AREA
P / E PARKLAND / ESTATE
DESIGNATED CONSERVATION OR RECREATION SITE
WOODED AREA COMMON VEGETATION TYPE:
NRO/VP NORTHERN RED OAK/VIRGINIA PINE
NRO/YP NORTHERN RED OAK/YELLOW POPLAR
RARITAN
RIVER

HISTORIC. CULTURAL. SCENIC AND RECREATIONAL RESOURCES

Until the mid-1800's, Highland Park developed slowly. Development gathered speed when rail connections were established, linking the area with Trenton and Philadelphia. Large estates had been built above the Raritan River, most likely to house the wealthy businessmen working across the river in New Brunswick. "Belleview", currently known as the Cenacle Retreat House, is an example of such an estate positioned to take advantage of the river view. The construction of "Belleview" and other grand estates helped to usher the town into a period of urbanization, marked by the initiation of municipal services, and in 1905 the incorporation of the area into the Borough of Highland Park.

The Middlesex County Cultural and Heritage Commission has issued the Middlesex County Inventory of Historic, Cultural and Architectural Resources, 1977-1978. This Inventory identifies those structures and site considered to be of historic and aesthetic significance within the county. The Inventory also evaluates the potential for selected sites to be eligible or possibly eligible for inclusion on the National Register of Historic Places. In 1985, a supplement to the Inventory was issued, further refining the list of eligible sites. Although there are several notable historic residences and residential developments in Highland Park, none have been placed on either the State or National Register of Historic Places.

“Belleview", originally constructed in the early 18th century, was considered as being possibly eligible for inclusion on the National Register in 1978. The 1985 supplement to the Inventory explains that while "Belleview" is "useful for study purposes", alterations to the structure impair the 18th and 19th century architectural quality of the residence and render it ineligible for the National Register.

As the Borough continued to develop during the 19th century as a commuting suburb, a variety of residential architectural styles emerged. Built during the mid to late 19th century, a row of houses along Adelaide Avenue displays styles ranging from Second Empire to Queen Anne to Colonial Revival. East of Adelaide Avenue, at scattered locations, are fine examples of mid to late 19th century vernacular Italianate, Gothic Revival, Stick Style, Queen Anne, and vernacular Second Empire architecture. While the 1978 Inventory indicates that the Adelaide Avenue District was eligible for the National Register, the 1985 supplement removes the District from Register eligibility citing a lack of "integrity, cohesiveness and associative history necessary for eligibility". Local protection of the District, however, is still recommended in the 1985 supplement.

The construction of Livingston Manor in the early 1900's contributed to a rapid increase in population from .500 in 1905 to 4,866 in 1920. Livingston Manor exists as a fine example of an early planned suburban development in Middlesex County. Its block pattern includes mid-block pedestrian walkways to permit cross-access among the long blocks between Madison Avenue and North Second Avenue. The Livingston Manor

District was considered eligible for the National Register of Historic Places in both 1978 and 1985. Located between Second and Madison Avenues (with the exception of Cleveland Avenue) the district represents, early 20th century real estate promotion and contains bungalow style residences with Shingle Style influences. Many of the houses in the District also display influences of the architectural style of Japan and Northern Europe. The most notable house in the District is the Livingston House (81 Harrison Street), which in 1978 was considered to be individually eligible for the National Register. In 1985, the house was incorporated into the District. The Livingston House, constructed in the mid to late 19th century, is a grand residence located on a hilltop with a view of the Raritan River. Built prior to Livingston Manor, much of the grounds of the Livingston House were subdivided into the planned suburban development, thus tying the house to the 20th century suburbanization of Highland Park.

Comment: Picture of Livingston House did not reproduce

Legend: *The Livingston House - an example of the Greek Revival Style and Colonial Revival Style.*

Another notable residence in Highland Park is the Seward Johnson "Castle" on River Road. The "Castle", built c. 1930, brought in pieces from England, is an excellent example of early 20th century estate planning. The "Castle" is also known as "Merriwold" and was identified as being eligible for the National Register both 1978 and 1985.

The development of Highland Park, since the early to mid 20th century has continued in a typical suburban pattern of residential development with a linear business district along Raritan Avenue.

The following structures and districts are shown on the Map 6:

1. Livingston Manor District, bounded on the north by the rear lot lines of buildings facing Cleveland Avenue; on the South by the rear lot lines of buildings facing Lawrence Avenue; on the northeast by the centerline of Madison Avenue; on the southeast by the rear lot lines of buildings facing Lawrence Avenue; and on the west by the centerline of the westerly portion of Lawrence Avenue and the centerline of River Road. Thirteen structures within the district have been identified by the Middlesex County Cultural and Heritage Commission as being noteworthy.

    A. 310 Grant Avenue, Block 167, Lot 44. This is a shingle and clapboard residence with cobbled porch piers and paired wooden columns. It has exposed rafters.

B. 303 Grant Avenue, Block 168, Lot 53. This is a shingle and clapboard residence.

C. Watson Whittlesey House, 5th House on the N.W. side of Harrison Street, from River Road, Block Lot c. 1908. This is a Mission Revival style house characterized by its tapered Tuscan columned porch. The house is historically significant in that its owner, Watson Whittlesey was a major developer of Highland Park., having subdivided Livingston Manor.

D. 241 Grant Avenue, Block 168, Lot 56. This shingled residence has paired wooden porch columns. The exposed rafters have cut-out ends, creating a decorative effect when viewed from the side.

E. 257 Lincoln Avenue, Block 167, Lot 22. This residence has a front gable, which is a dominant characteristic of the variation of the Shingle style bungalow.

F. 254 Lawrence Avenue, Block 165, Lot 26. This is a shingled residence with stick brackets and a dominant arched porch with rusticated brick piers. It has exposed rafters and half-timbered dormers.

G. 235 Lincoln Avenue, Block 167, Lot 24. This shingled residence has pagoda-like window heads and a pedimented entrance porch with Ionic columns.

H. 226 Lincoln Avenue, Block 166, Lot 35. This residence has a shingled exterior finish.

1. 211 Lincoln Avenue, Block 167, Lot 28. This shingled residence has twin gabled dormers with notched-end bargeboards, stick brackets and exposed rafters. This residence displays Japanese influences.

J. 208 Lincoln Avenue, Block 166, Lot 32. This is a clapboard and shingle residence with exposed rafters. The residence displays Japanese influences.

K. Robert Livingston House, 81 Harrison Street, Block 180, Lot 4, c. 1830& 1890. This Greek Revival and Colonial Revival style residence is significant due to its location, affording it a view of the Raritan River. The owner of the house, Robert Livingston, also owned the property later subdivided to create Livingston Manor. The house serves as a link between the era of the great river estates and the early sub urbanization of Highland Park. It is one of the few high style survivors of its period in Middlesex County.

L. 237 Grant Avenue, Block 168, Lot 22. This shingled residence displays Japanese influences.

M. 58 Harrison Street, Block 179, Lot 5, c. 1908. This Bungalow/Shingle style residence is considered to be the best example of the blending of the Bungalow and Shingle styles in Middlesex County.

2. Adelaide Avenue District., including the east side of South Adelaide Avenue from Raritan Avenue to approximately Cliff Court. The west side of South Adelaide Avenue, at the southwest corner of Raritan Avenue is also included in the District. The fourteen, large structures date from the mid 19th century to the early 20th century.

A. 3-5 South Adelaide Avenue, Block 5, Lot 39, c. 1860. This vernacular ltalianate clapboard residence was presumably a four bay building to which a three story and a one story addition were made.

B. Rice Estate, South Adelaide Avenue, at the northwest corner of Raritan Avenue, Block 1, Lot 1, c. 1870. This ltalianate structure is significant in its relationship to the rest of the District. The building is located in an estate setting, in comparison to the small lots that compose the remainder of the District. This relationship provides evidence of the change from estate development to the pattern of suburbanization that occurred in Highland Park in the late 19th to early 20th century. Currently used by the YMYWHA, there have been exterior changes to the building, however, remaining details make the building a good example of its style.

C. 17 South Adelaide Avenue, Block. 5, Lot 36, c. 1880. This residence is a Second Empire style structure with a clapboard exterior (some synthetic siding is also present) and a convex mansard roof with four chimneys. Although alterations have been made to the original structure, the residence maintains its dominating scale and massing in the District. It is presently used as a Funeral Home.

D. 23 South Adelaide Avenue, Block 5, Lot 5, c. 1880. This is a Mansard style residence of good architectural integrity. The building is characterized by its bracketed dentate cornice with a paneled frieze and porch with latticed columns.

E. 29 South Adelaide Avenue, Block 5, Lot 35, c. 1860. This is a vernacular Italianate structure. Although alterations have compromised the architectural integrity of the structure, the scale and form contribute to the overall quality of the District.

F. 35 South Adelaide Avenue, Block 5, Lot 34, c. 1890. This is a Colonial Revival style residence with Queen Anne influences. The clapboard building has a cross gambrel roof with a brick chimney. The front porch has Tuscan columns.

G. 39 South Adelaide Avenue, Block 5, Lot 33, c. 1890- 1900. This Colonial Revival style residence, with Queen Anne influences, has a shingled exterior. The house is significant in its similarity to the Livingston House, leading to the idea that the same architect designed this house as well as the alterations to the earlier house (See lK).

H. 43 South Adelaide Avenue, Block. 5, Lot 32, c. 1900-1920. This is a Georgian Revival style residence with an English bond brick exterior. The style of the residence provides a contrast with the other styles on the street. The home is characterized by a limestone belt course, and slate gabled roof with three gabled dormers.

1. 45 South Adelaide Avenue, Block. 5, Lot 31, c. 1900. This is a Queen Anne style residence with synthetic siding and a slate hip roof with one interior brick chimney.

J. 51 South Adelaide Avenue, Block 5, Lot 30, c. 1900. This is a Georgian Revival style residence with deep overhanging eaves. The roof is asphalt shingled gable with three gabled dormers and one exterior gable-end chimney.

K 55 South Adelaide Avenue, Block 5, Lot 29, c. 1900-1920. This residence is considered to be one of the better architectural examples in the District. It is a Georgian Revival style building with a gable roof with two exterior gable-end chimneys. The structure is characterized by its cornice, which has unusually long modillions and lunette windows.

L. 59 South Adelaide Avenue, Block 5, Lot 28, c. 1890-1900. This is a Queen Anne style residence, with Georgian Revival features. The integrity of the house has been maintained, except for the addition of a second entrance and modern steps. The house is characterized by its pedimented porch with round gazebo ends and Tuscan columns. The house has a porte cochere under the second floor wing, which is set on brick piers and Tuscan columns and functions as a continuation of the porch. The broken-up complex massing of the structure is typical of the Queen Anne style.

M. 63 South Adelaide Avenue, Block 5, Lot 15, c. 1900. This Georgian Revival clapboard residence has both Queen Anne and Colonial Revival influences. The roof is slate gambrel style with three gabled dormers and one interior end brick chimney.

N. 69 South Adelaide Avenue, Block 5, Lot 16.01, c. 1900. This is a Georgian Revival style shingled residence with a slate gable roof. The roof has two interior brick chimneys. This residence continues the Georgian Revival style found in its immediate area in the District.

3. The "Castle", 433-444 River Road, Block 189, Lot 4, c. 1930 (brought in pieces from England). This is an excellent example of estate architecture and planning from the early 20th century. There are two large clapboard barns at the rear of the site. In addition to the main house, there is a chauffeur's house, the two barns, a gate lodge and two sections of a stone wall remaining on the site.

4. Belleview, 411 River Road, Block 190, Lot 4, c. early 18th century with renovations in the mid to late 19th century. This is a vernacular Greek Revival structure with Colonial Revival renovations. The house was built to take advantage of the view of the Raritan River. In addition to the main house, there is a two story gable roofed house on the property. The date and purpose of the second house are unknown.

5. Franklin Junior High School, Mill Road and 5th Avenue, Block 45, Lot 18.

6. 47 Raritan Avenue, Block 173, Lot 54, residence.

7. 202 Raritan Avenue, Block 22, Lot 2, residence.

8. 215 Magnolia Avenue, Block 22, Lot 22-23, residence.

9. 203 4th Avenue, Block 38, Lot 51, residence.

10. 2nd Avenue at the corner of Raritan Avenue, Block 22, Lot 1, residence.

11. 38 1st Avenue, Block 8, Lot 16, residence.

12. 54 Cedar Avenue, Block 5, Lot 13, residence.

13. 127 Benner Street, Block 14, Lot 19, residence.

14. 133 Benner Street, Block 14, Lot 13 & 17, residence.

15. 215 1st Avenue, Block 15, Lot 7, residence.

16. 126 Benner Street, Block 15, Lot 6.

17. 205 1st Avenue, Block 15, Lot 1, residence.

18. 208 1st Avenue, Block 9, Lot 3, residence.

19. 401 2nd Avenue at the corner of Harper Avenue, Block 26, Lot 1, residence.

20. 100 1st Avenue, Block 18, Lot 18, residence.

21 NW junction of Cedar and Riverview Avenues, Block 12, Lot 2, residence.

22. Woodbridge and Raritan Avenues, Block. 87, Lot 26, World War I Monument.

Areas of Recreational and Scenic Importance

In addition to historic and cultural landmarks, which have been identified, the Borough contains the following features which contribute to the scenic value of Highland Park and provide either developed or potential opportunities for active or passive recreation. Some of these features have been identified earlier in the report because of their environmental characteristics as habitat areas or stream corridors.

Raritan Riverfront - The riverfront is the defining edge of the Borough on its western and southern boundaries. It provides scenic over water views and water-edge habitat areas including that of the rare spongy arrowhead. The riverfront is also developed by two county parks and has the potential for further open space preservation to link the parks via a greenway/blueway system. Two smaller, wooded corridor areas draining into the River at Valley Place and at the foot of South Sixth Avenue are also potential open space links between the Riverfront and the residential neighborhoods of the Borough. The open space linkages could incorporate the landflll site, much of which is undergoing natural succession.

Mill Brook - The Mill Brook stream corridor runs from Duclos Lane westerly through Johnson Park where it joins the Raritan. The Brook is an attractive water feature and provides some notable scenery for residential areas of the Borough. Points of scenic interest include views at the end of Cleveland and Grant Avenues and from the crossings at Lincoln and Harrison Avenues. It is especially notable north of the Amtrak Line, where it runs fast and has cut deeply into the bedrock of the Passaic formation. As part of the wooded corridor parallel to the Amtrak Line, it provides for a wildlife corridor linkage between Johnson Park and the Rutgers Ecological Preserve.

Buell Brook - The Buell Brook stream corridor is an important water link between the Rutgers Ecological Preserve and Johnson Park. It serves an extended and expansive area of open space and wildlife habitat.

Rutgers Ecological Preserve - The preserve, discussed earlier in the inventory, is important he cause its expansive area of habitat supports a great diversity of species in an otherwise developed suburban area.

Johnson Park, Donaldson Park, Karsey Park - These developed parklands provide convenient active recreation as well as passive opportunities for the residents of the Borough. In addition to these parks, the following parcels have been designated as recreation, conservation and/or open space lands on the Borough's Recreation and Open Space Inventory:

> Block 24, Lot 30 and a portion of Lot 12, Between Felton Avenue and South Second Avenue (Tot Lot - .10 acres)
>
> Block 2, Lot 15, Valley Place (Conservation Site - .49 acres)
>
> Block 3, Lot 2, Valley Place (Conservation Site - .12 acres)
>
> Block 3, Lot 39, Valley Place (Conservation Site - 1.15 acres) Block 46, Lots 15-19, South Sixth Avenue (Recreation - .40 acres)

Borough Streetscape - The ambience of the Borough is in part due to patterns of its orthogonal layout and to the attractiveness of its tree-lined residential streets. As a mature community, the street tree plantings of oak, maple and plane trees have matured, and, in some locations, their crowns have created a vaulted lace-work of branches over the street. Another notable aspect is North Eighth Avenue, which was developed in "boulevard" style with a broad median strip planted with a double row of plane trees.

Comment: Picture of Median of North Avenue did not reproduce.

Legend: *The tree lined median of North Eighth Avenue.*

CONCLUSION

The Highland Park Natural Resource Inventory provides a reservoir of information on natural and cultural resources that can be drawn from by the Borough Environmental Commission and other Borough agencies. The text and maps incorporated into this document are designed to assist the Borough as it addresses local environmental issues. By identifying significant natural and cultural features, the Inventory helps focus community efforts for open space preservation, water resource management, soil and landscape protection, protection of flora and fauna, and protection and enhancement of the visual environment. The inventory should be utilized in the decision making that produces planning recommendations and programs for the use and possible use of open land areas. It should also be drawn upon in evaluating the impact of development proposals upon the resource base of the Borough.

Periodically, the Inventory should be reviewed and updated to reflect new research and programs that affect environmental issues. In that way, its value to the community as a practical reference document is maintained and enhanced.

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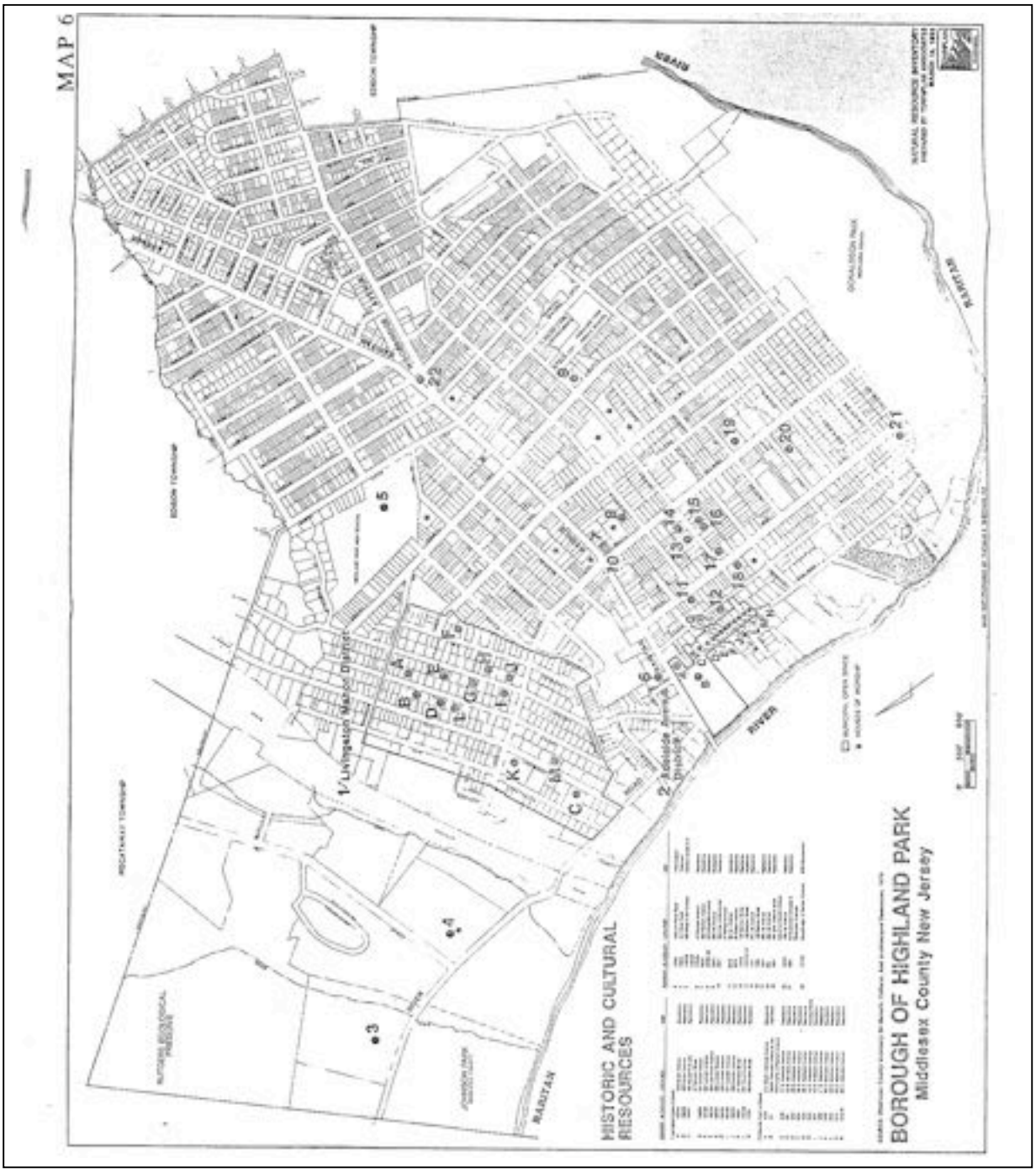
MAP 6
HISTORIC AND CULTURAL RESOURCES
BOROUGH OF HIGHLAND PARK
Middlesex County New Jersey
RARITAN
RIVER

REFERENCES

GEOLOGY

The Geology of New Jersey, Bulletin 50, Geologic Series, Lewis and Kummel, Department of Conservation and Development, State of New Jersey, Trenton, New Jersey, 1940.

Soils of New Jersey, J.C.F. Tedrow, Robert E. Krieger Publishing Co., Malabar, Florida. 1986.

Soil Survey of Middlesex County, United States Department of Agriculture, Soil Conservation Service.

Conversation with Larry Schraeger, Middlesex County Planning Board.

HYDROLOGICAL FEATURES

Technical Reference Documents. The Draft State Development and Redevelopment Plan, January 1988

Report of Historical Aerial photographic Review, Highland Park Landfill. French and Parello Associates, July 1990

Yearly Summary Report, Highland Park Landfill, French and Parello Associates, January 1991

SOILS

Soil Survey of Middlesex County, United States Department of Agriculture, Soil Conservation Service.

WILDLIFE HABITAT

The Audubon Society Field Guide to North American Mammals, John O. Whitaker, Jr., Alfred A Knopf, New York, N.Y., 1980

Ruttgers Ecological Preserve and Natural Teaching Area. Edmund W. Stiles, Ph.D., Rutgers, The State University of New Jersey, 1978

HISTORIC, CULTURAL, SCENIC AND RECREATIONAL RESOURCES

Middlesex Count Inventory of Historic Cultural and Architectural Resources, Prepared for the Middlesex County Cultural and Heritage Commission, Board of Chosen Freeholders, 1977-1979, by Heritage Studies, Princeton, NJ.