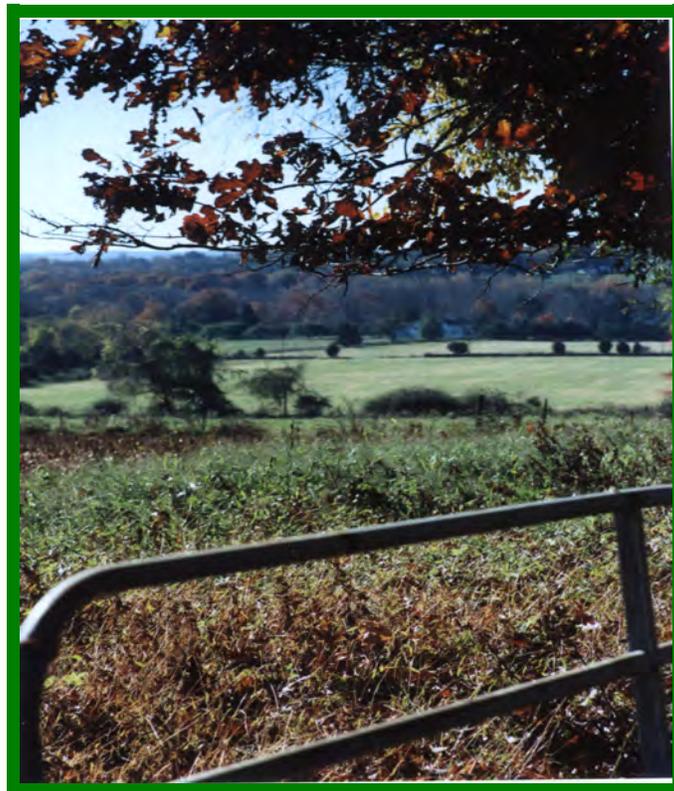


# The Readington Township Environmental Resource Inventory



*Prepared By ~*  
**The Readington Township  
Environmental Commission**

*Environmental Consultant ~*  
**pH Princeton Hydro, LLC**

**~ November 2002 ~**

# The Readington Township Environmental Resource Inventory



*Prepared By ~*

The Readington Township  
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Divider Photographs, Frances T. Spann, Chair, Readington Township Environmental Commission

# Introduction



## **Treetop Road Readington Township**

*In the end our society  
will be defined not only  
by what we create, but  
by what we refuse to destroy.*

**~ John Sawhill, The Nature Conservancy ~**

## **Introduction to Environmental Resource Inventory (ERI) Update**

*Introduction ~*

Readington Township is located in northwestern New Jersey in Hunterdon County and contains a diversity of environmental resources (Map 1 & 2). Despite the completion of Interstate 78 and increased development along U.S. Route 22 and State Route 202, the Township is still characterized as a predominantly rural municipality. However, Readington is one of the fastest-growing Townships in the state. Through the years, environmentally-minded Township officials and a devoted citizenry have made a concerted effort to preserve farmland and open space. However, the Township is still under severe pressure to accommodate projected population growth.

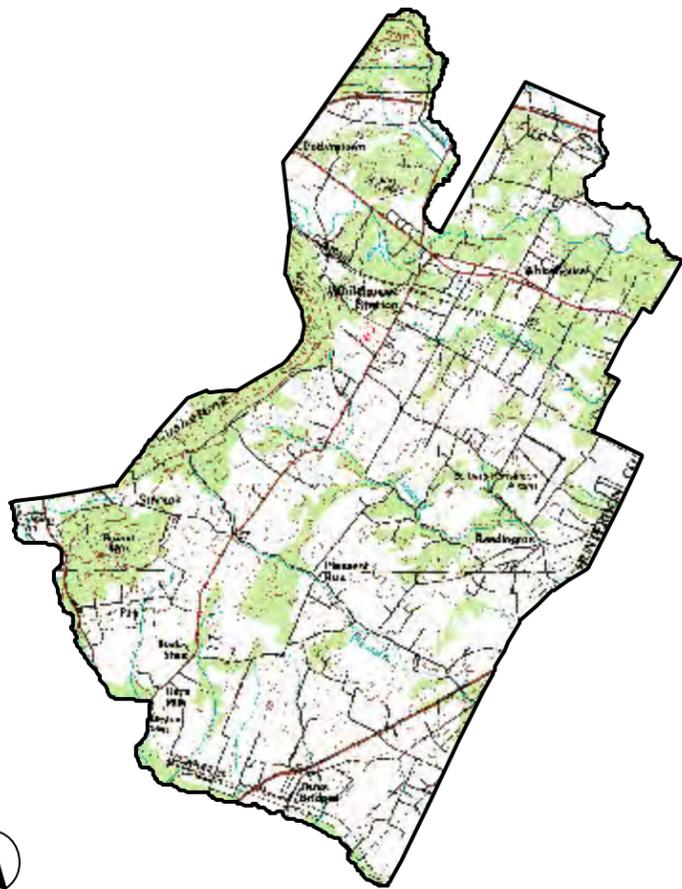
Due to development pressure, an outdated Natural Resource Inventory (Environmental Assessment Council 1974), and an interest in utilizing Geographic Information System (GIS) technology, the Township Environmental Commission requested an updated environmental resource inventory (ERI). The intent was to provide Readington Township with an additional planning tool to balance expected growth with the protection of valuable natural resources. The goals of the Readington Township Environmental Commission's ERI update effort were the following:

- To locate significant remaining resources throughout the Township, and
- To provide the Township with an updated and comprehensive environmental planning tool for protecting remaining resources by integrating a) existing current Township protection efforts, b) recent scientific information, and c) the most current Geographical Information System (GIS) maps available from federal and state agencies.

Phase II of the ERI focuses on the surface water, groundwater and floodplain resource information in the Township. The flora and fauna sections, along with the information on vernal pools and historical resources have also been enhanced in this updated ERI.

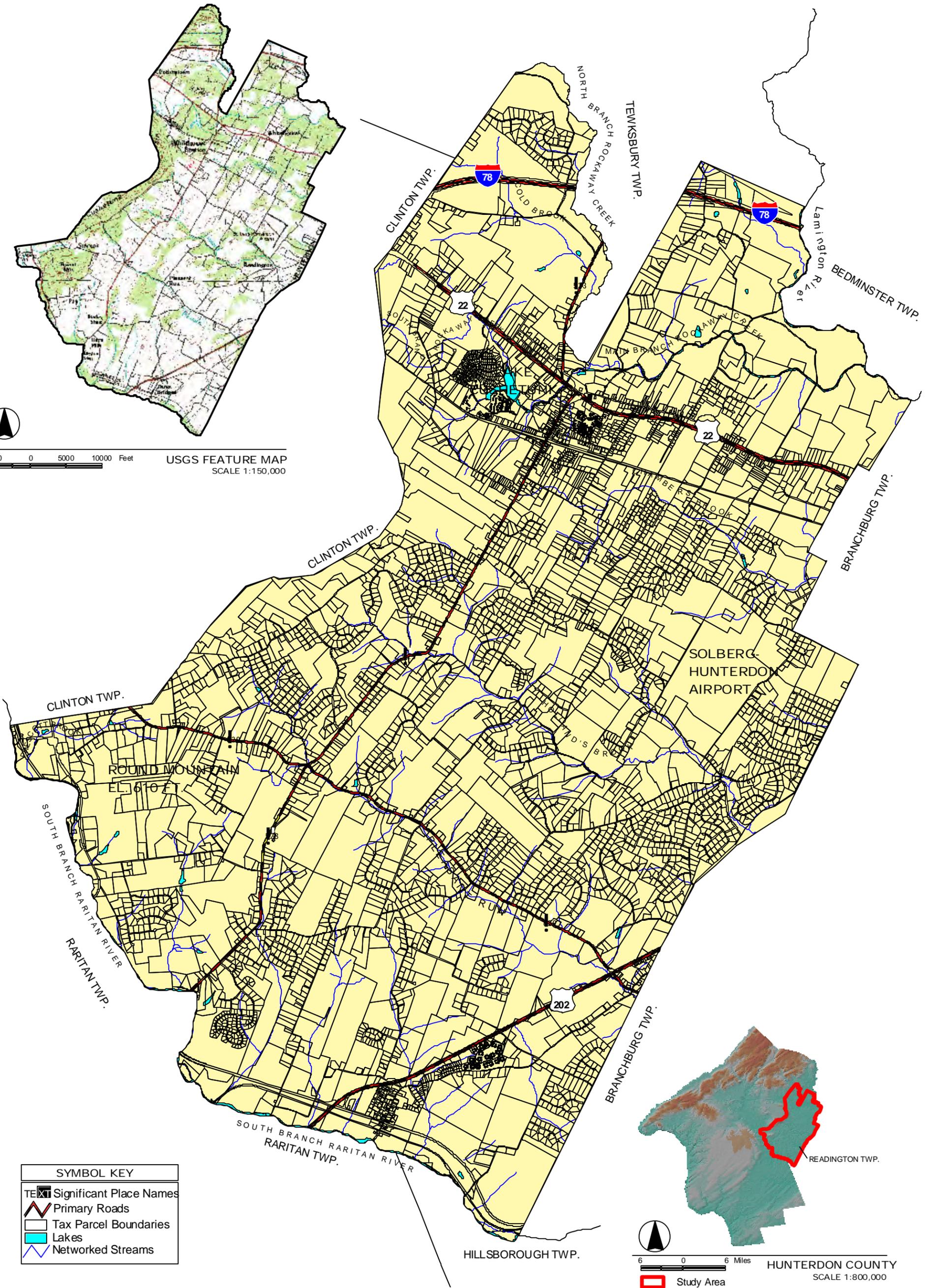
*Plan Components~*

The Readington Township Environmental Resource Inventory (ERI) is a comprehensive compilation of text, maps, and charts that fully describe the current environmental resources in the Township. The plan contains an overview of current resource protection information, a comprehensive resource inventory, and a resource protection plan. The ERI also contains the most updated GIS mapping and database technology available through the New Jersey Department of Environmental Protection (NJDEP) and other sources. All GIS data contained in this inventory may be reviewed at the Township. The updated information may now be used in their current state to produce color images depicting the environmental resources and their spatial distribution throughout the Township. Environmentally sensitive areas are highlighted on these maps to provide the user with additional information about the relative importance of the resources.



5000 0 5000 10000 Feet

USGS FEATURE MAP  
SCALE 1:150,000

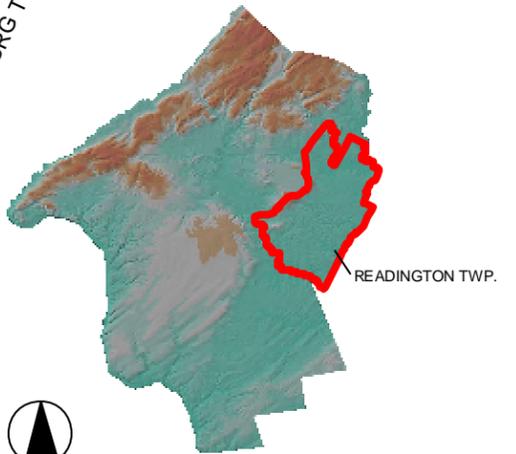


SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



6 0 6 Miles  
Study Area

HUNTERDON COUNTY  
SCALE 1:800,000



### READINGTON TOWNSHIP, NRI, 2000

5000 0 5000 10000 Feet

SCALE 1:80,000

Map Projection: State Plane of New Jersey, NAD 83, Feet



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, Monochromatic Bitmap Geographic Images of Hunterdon County, New Jersey.  
Scale 1:24,000  
New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000  
TMP map, supplied by Yager and Associates.  
Scale (unknown)

NOTES:  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.

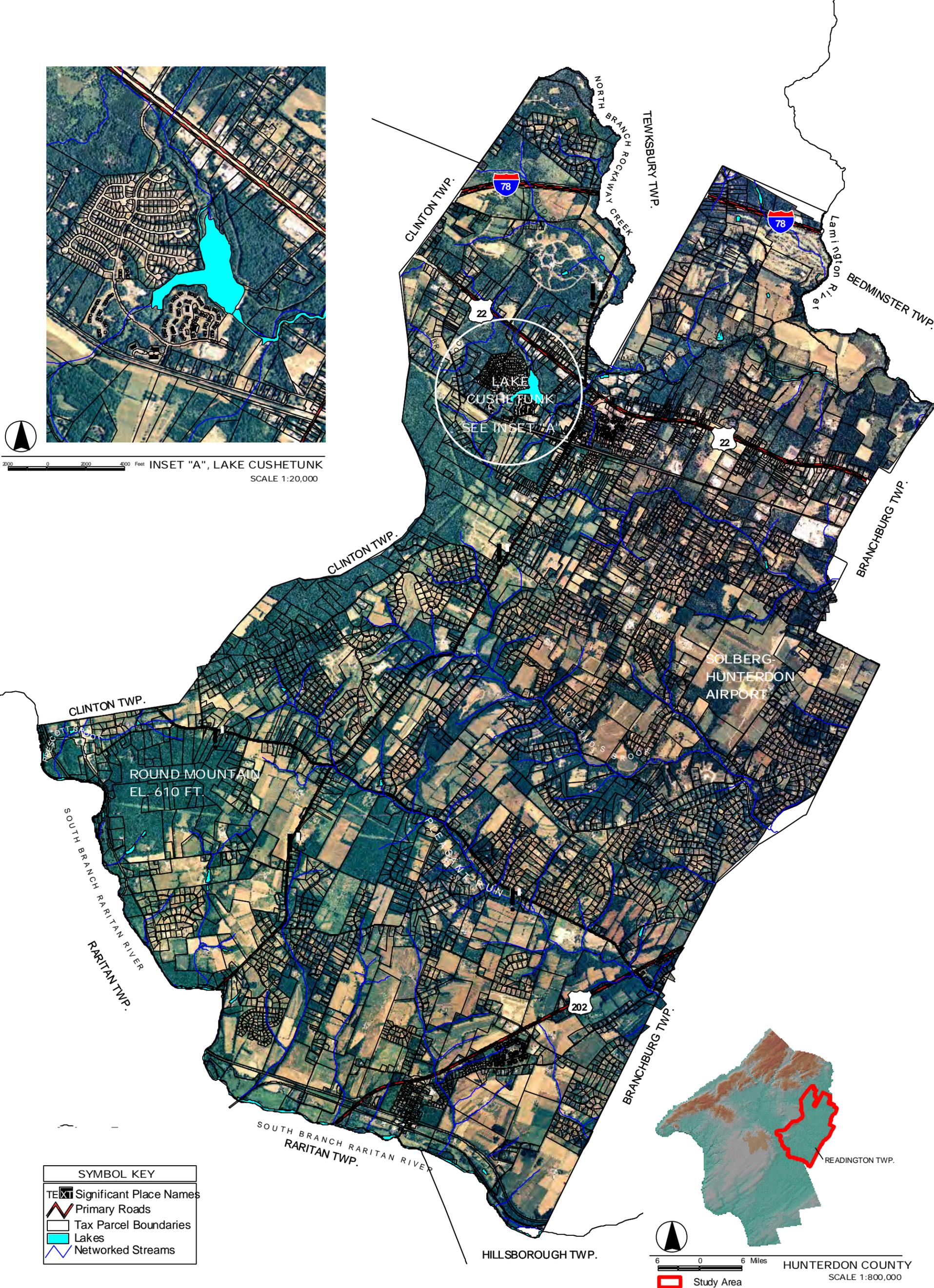
2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

### Map 1: Readington Township Regional Location/ Tax Parcel Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

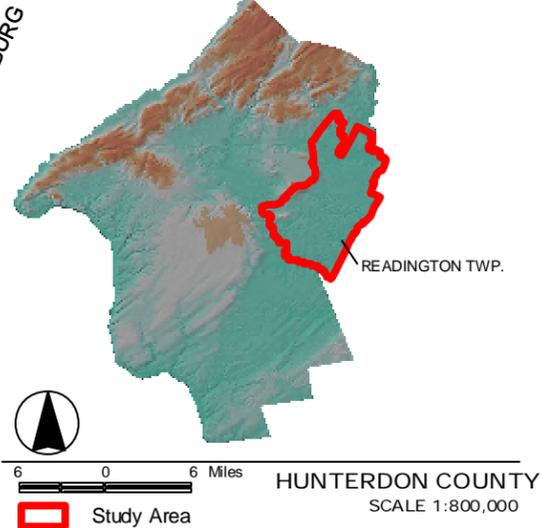
Project No.: 160.02





INSET "A", LAKE CUSHETUNK  
SCALE 1:20,000

SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



HUNTERDON COUNTY  
SCALE 1:800,000  
Study Area

**READINGTON TOWNSHIP, NRI, 2000**



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, Monochromatic Bitmap Geographic Images of Hunterdon County, New Jersey.  
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Aerial Photography, Care of Hunterdon County  
Scale One Meter Resolution

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Map 2: Readington Township Aerial Photography/ Tax Parcel Map	
DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



## *Plan Methodology ~*

Several information sources were used to obtain the most updated environmental resource information. Information sources for local planning and protection materials included the Readington Township Master Plan and Zoning Ordinance, the Readington Township Open Space Inventory, and recent Conservation, Natural Resources and Agriculture Element amendments to the Township Master Plan as well as amendments and supplements to both documents.

Information sources for the Environmental Resource Inventory (ERI) included several federal, state and local agencies. These included the United States Environmental Protection Agency (EPA), the United States Department of the Interior, the New Jersey Office of State Planning, the New Jersey Department of Environmental Protection (NJDEP). Local agencies such as the Hunterdon County Soil Conservation District and the Hunterdon County Planning Board were also contacted for updated resource information. The New Jersey Water Supply Authority, Raritan Basin Study, has been consulted to update much of Phase II.

Digital mapping information (GIS) was obtained from the NJDEP GIS Data Web Site. GIS information was also made available directly from Readington Township and from the Township's planning firm (Clarke, Caton, and Hinz). Digital overlay analysis was completed in order to determine the extent and the vulnerability of environmental resources within Readington Township.

For instance, the zoning map (Map 4) was compared, through GIS overlay analysis, with the mapping coverage illustrating steep slopes (Map 6), and the state natural heritage and critical habitat coverages (Map 11) were overlaid with the NJDEP map showing areas of concentrated development (Part III).

In addition, habitat data provided by the NJDEP (Map 11) was used to determine the extent, location, and vegetational make up of riparian corridors (part II, riparian corridors). The zoning ordinance was often consulted to see if sufficient resource protection regulations were currently in place to protect existing habitat. Several additional overlay exercises were completed in order to create the resource vulnerability map contained in Part IV (Map 17).

## Findings ~

Readington Township still contains a significant amount of valuable environmental and cultural resources including preserved agricultural open space, wildlife habitat, and riparian corridors. Readington's current planning documents contain examples of the Township's efforts to protect such resources. Examples include open space set-asides in residential developments, steep slope regulations, and impervious coverage restrictions. However, more can be done to protect Readington's remaining resources. This inventories findings are as follows:

### **Planning, Development, and Conservation Findings**

- Between 1960 and 2000, the population of Readington Township has increased by 157%.
- The majority of development in the Township up to 1986 took place along primary travel corridors (Routes 202, 523, 629, and 22).
- The headwater areas of Readington's streams and tributaries have experienced quite a bit of development since 1986. In fact, a significant amount of Holland's Brook headwater areas and land adjacent to Holland's Brook were developed between 1986 and 1997 (NJDEP, 2001). Similar trends were found in the land areas adjacent to Lake Cushetunk and the main stem of the Rockaway Creek and Lamington River.
- Land use/cover in Readington Township is comprised of approximately 32% urban, 30% forested, 29% agricultural, 8% wetlands, 0.5% water, and 0.5% barren (NJDEP, 1997).
- The environmentally sensitive planning area (PA5) designation has been given to approximately 9% of Readington Township.
- The Readington Township Land Development Ordinance contains over thirty environmental resource protection tools.
- As of July 2002, the Township has successfully preserved approximately 6,002 acres of farmland and open space. An additional 426 acres are currently under contract.

## **Environmental Resource Findings**

- Eighty-two percent (82%) of the soils in Readington present severe limitations to the placement of individual, on-lot septic systems, 26% present severe limitations to building structures, and another 16% have moderate to severe erosion potential.
- Forty-two percent (42%) of the total acreage in the Township contains prime agricultural soils, and 33% of the Township contains soils of statewide importance.
- A total of seven protected bird species, two protected amphibian species, one protected plant species, and a Natural Heritage Priority Site (Solberg-Hunterdon Airport) have been formally documented (NJ Natural Heritage Database), while several more species have been noted by environmental professionals but have not been formally documented.
- Readington Township contains 3, 888 acres of priority grassland habitat, 3, 987 acres of priority forested habitat, and 818 acres of priority wetlands (NJDEP, Landscapes Program).
- The vernal pool program of the NJDEP is working to certify pools in Readington Township.
- All streams and tributaries within the Township, except for one, are classified as category two, freshwater waterways (FW-2), and water quality must be *maintained* within the state water quality standards. The North Branch Rockaway Creek is classified as Category I and must be protected from any measurable or predicted changes in water quality.
- The segment of the South Branch Rockaway Creek, extending from where it crosses the easternmost Lebanon Borough boundary, downstream to Lake Cushetunk, has been recently petitioned (January 2002) for upgrade to C1 classification due to the established occurrence of threatened and endangered species (wood turtle). As announced in April 2002, in concert with Earth Day, the Governor has nominated the stream for this upgrade and reclassification.
- According to the USEPA's 303d list of impaired waters (2002), which is based on the water quality reports prepared by the NJDEP (305 b reports), a number of the Township's streams are considered impaired from the perspective of their ability to consistently meet their designated uses. These include Chambers Brook, South Branch Raritan River, Rockaway Creek, and Lamington River, which are either/or chemically or biologically impaired. Other waterbodies, such as Lake Cushetunk are documented as being eutrophic and impacted by excessive nutrient and sediment loading.
- The surface waters of the Township, in their existing state, whether impaired or not, are extremely valuable resources requiring protection, management and restoration. Many of these streams originate as headwaters within the boundaries of the Township (e.g., Chambers

Brook and Holland's Brook). Protection of their baseflow and quality is within the purview of the Township's Planning Board, Zoning Board of Adjustment, Environmental Commission and Township Committee. These streams provide habitat in many cases for State listed species as well as other biota sensitive to changes in quality and quantity of flow. In addition, the surface waters and many of the wetlands that occur within the boundaries of the Township are part of the Raritan River drainage, a source of drinking water for a large portion of Central New Jersey's residents. The Raritan River is an impaired waterbody that needs to be protected from further degradation and environmental impact.

- Evidence of flooding, and alteration of stream channel geomorphological alterations, are evidenced in segments of Chambers Brook and South Branch Rockaway Creek immediately upstream of Lake Cushetunk. The observed modifications of the stream channel in some of these cases appears to be the direct result of land development and the scour and impact caused by excessive runoff or an increase in peak flow.
- The one-hundred foot riparian corridors in the Township are fairly well buffered, however agricultural uses along some waterways are not as well-buffered.
- The aquifers beneath Readington Township are federally-designated *Sole Source Aquifers* requiring review of all federally funded projects in the Township.
- Of the fourteen groundwater wells monitored by NJDEP, all were well within the NJDEP's specific groundwater quality criteria (Class II A & Practical Quantitation Levels).
- There are no federal Superfund sites, decommissioned or active landfills, or solid waste transfer stations in Readington, however there are 126 registered hazardous waste generators, 4 regulated storage tanks, 65 chemical storage facilities, and 11 active or pending state hazardous waste contamination sites in the Township.
- Common nonpoint source pollutants associated with urban (32% of land area) and agricultural (29% of land area) uses in the Township include: eroded soil, phosphorus, nitrogen, pesticides, heavy metals, salts, and thermal energy.

Based on the findings previously stated, this report recommends the following goals and actions to adequately preserve Readington's resources for future generations:

### **Guiding Principles & Primary Resource Preservation Goals**

- Maintain large, intact patches of native vegetation and prevent fragmentation by development.

- Establish and implement priorities for species and habitat protection.
- Maintain connections among habitat by protecting corridors for movement.
- Maintain significant ecological processes in protected areas.
- Contribute to the regional persistence of rare species by protecting their habitat locally.

**Primary Resource Protection Action Items**

- Work with developers, homeowners, and others to maximize buffer areas along river and stream corridors.
- Develop riparian corridor greenways fostering conservation of riparian buffers and passive recreation and implementing programs recommended by the Readington Township Greenways Work Group.
- Utilize funding from governments and private foundations to continue preserving historic districts and villages in the Township, including East Whitehouse, Readington, Stanton, Three Bridges and the Pleasant Run Historic District. Ensure the integrity of these areas through green belting.
- Continue to obtain additional funding to purchase and maintain open space areas identified as valuable habitat and those areas addressing the biological principles stated above.
- Opportunities to preserve diminishing farmland should continue to be actively pursued.
- Involvement in county easement purchase program, state fee simple program, and Township easement purchase/option program should continue.
- The Township should consider use of transfer of development rights between non-contiguous parcels.
- Balance the opportunity for recreation by the public with the habitat needs of wildlife.
- Consider habitat restoration activities on existing recreational land in the Township.
- Implement a habitat conservation education program linking farmers with habitat restoration funding programs.

- Development in areas with excessive slopes, particularly those above 15% should be limited.
- To the extent possible, steeply sloping land should be left in its natural condition or maintained in grass or tree cover.
- Proper steps should be taken to ensure that residential or commercial development does not jeopardize the aquifer's ability to recharge and supply the Township with the necessary potable water.
- Future developments should ensure that groundwater supplies are not subject to degradation due to failing or improperly designed on-lot disposal systems.
- To protect groundwater quality in non-sewered areas, minimum residential lot sizes or maximum permitted density should be set appropriately.
- Local regulations should require that all development proposals delineate wetlands and their transition areas as part of the development review process.
- Consideration should be given to implementing a wetland buffer protection education program.
- Collect better base flow and low flow data on streams.
- The Township should consider additional development standards to restrict and eliminate disturbance in all critical/vulnerable areas (e.g., most erosive soils, steepest slopes, state designated grassland, wetland, and forest habitats).
- An increased minimum residential lot size should be considered in order to bring the Township's zoning into closer conformance with the carrying capacity of the soils in the AR zone.
- Revisions to the zoning ordinance, particularly less intensity of development in business zones and residential office zones should be considered.
- Environmental impact assessments and studies should be completed for all development proposals, particularly those located in areas noted in this ERI.
- Best management practices (BMPs) should be required for all development proposals including stormwater quality treatment, measures to increase stormwater recharge, and the elimination of in-stream stormwater discharge.

- Proposed golf course developments, whether or not associated with residential units, should be required as part of the Environmental Impact Statement preparation process to examine and comment on potential impacts to surface and groundwater quality and groundwater supply. Specifically, this should entail the development of a surface water and ground water quality monitoring program developed as per the recommendations presented in NJDEP's Guidance for the Siting of Golf Courses in New Jersey. This entails the establishment of sampling wells and/or surface stations, and the monitoring of specific water quality parameters and biological indicators before, during and after construction and operation of the golf course. In addition, proposed and existing golf courses should develop environmentally and economically sound management plans/programs, that include integrated pest management (IPM) programs, drought management plans, buffer zone development/maintenance plans, soil testing programs to minimize unnecessary phosphorus fertilizer applications, no-mow zones near surface waters, and chemical (pesticide/fertilizer) application plans that do not allow the application of turf care products in advance of anticipated precipitation events. Finally, all golf courses should be required to file for a Water Allocation Permit (WAP) with the Bureau of Water Allocation, NJDEP as part of the development process.
- The Township should implement recent revisions to water quality management rules in order to protect surface and groundwater resources.
- More restrictions to the amount and location of impervious surfaces should be considered in light of the established direct and indirect impacts associated with increasing amounts of impervious surface cover. Although, overall the percentage of imperviousness Township-wide is relatively low (2%), there are areas adjacent to critical resources that are well in excess of 10% impervious and other areas that will likely to be subject to a rapid, significant increase in impervious cover. This increase, and the need to manage impervious surfaces results from documented negative impacts on groundwater infiltration and recharge, increases in pollutant loading and increases in the scour, erosion and destabilization of stream and riparian corridors.
- Additional open space set asides should be considered, particularly in vulnerable areas noted in the ERI.
- Increased capital should be set aside and grants obtained to conduct and/or complete additional resource analyses, obtain Geographical Information System (GIS) capabilities for use in Township development reviews, and to revise current regulations relative to the added protection of valuable natural resources.
- This ERI should be used as a tool in the review of all development proposals considered by Readington Township.

- Impact minimization through the implementation of conservation and preservation measures, including the purchase and preservation of farm land and farm land development rights.
- Preservation and protection of sensitive wetland and aquatic site features.
- Minimization of disturbance and use of alternative landscaping.
- Reduce the generation of chloride related contaminants and their subsequent impacts to the biota and quality of the Township's streams through the implementation of roadway de-icing/salt management reduction.
- Implementing simple source prohibition practices. Examples of such simple source prohibition practices that have been implemented in other municipalities, such as Sparta Township, Borough of Mountain Lakes, and Byram Township, include pet waste management ordinances, non-phosphorus fertilizer ordinances, and mandatory septic inspection and pump-out ordinances.
- Township should prepare and enforce appropriate maintenance measures for all drainage and pollution control structures and BMPs.

## Part I ~

# Resource Planning and Resource Protection Overview



**View from Meadow Road,  
Readington Township**

*The Goal of Environmental Protection shall be to Protect Environmentally Sensitive Areas, Preserve the Natural Environment, and Ensure a Compatible Balance Between Economic and Environmental Interests.*

**~ The Readington Township Master Plan,  
Environmental Protection Goal~**

## **Readington Township, Resource Planning & Protection Overview**

### *Introduction ~*

Readington Township contains a diversity of environmental resources. Although the Township remains rural, the area has experienced a significant amount of development through the years. Increased development results in varying degrees of environmental impact. Usually, habitats containing a variety of native vegetation and wildlife are replaced with less diverse human habitats and an altered landscape.

Development has a variety of direct and indirect impacts upon environmental resources and the ecological stability of an area. When land is developed the existing wildlife is displaced to remaining open areas. There is also a well-documented correlation between increased development and increased nonpoint source pollution. Surface runoff, erosion and sedimentation are natural occurrences, however they are accelerated when land is developed. For instance, when vegetated soils are replaced with impervious surfaces (e.g., roads, homes, driveways, and parking lots), stormwater runoff, erosion, and sedimentation increase.

In addition, there is also a relationship between the way land is used with the type and the amount of pollutants resulting from a particular land use. For example, a forested area will contribute approximately two-hundred and twenty pounds of soil per acre per year to our local streams and lakes. Adhering to the soil particles is approximately a quarter pound of phosphorus and over two pounds of nitrogen. Residential land contributes almost five-hundred pounds of soil, over a pound of phosphorus and over seven pounds of nitrogen. While our soils, wetlands, woodlands, lakes and streams have natural pollutant filtering capabilities, their ability to cleanse pollutants is diminished as the density of development and the amount of pollution increases.

Readington Township feels it is important to identify the location of remaining natural resources and to understand their ecological significance. However, it is just as important to understand how the Township is planning for the location, intensity, and design of new development in order to maintain the integrity and capacity of its natural resource systems. The following section addresses the planning and regulatory framework that is currently in place in order to protect Readington Township's environmental resources.

State & Local Environmental Resource Regulations & Planning Policies ~

Many agree that New Jersey has one of the most comprehensive State level regulatory frameworks in the nation. The state also has a long tradition of land development law, regulation, planning policy, and project procedure. The following sections address the State Planning Act, the State Development and Redevelopment Plan, the Municipal Land Use Law, and other environmental regulations directly and indirectly pertaining to environmental resource protection in Readington Township.

The *New Jersey State Planning Act* was adopted in 1985 and requires sound land use planning to conserve natural resources, provide housing and public services and promote economic growth. The guiding natural resource protection principle of the State Planning Act is that natural resources should be conserved because the protection of environmental qualities are “vital to the quality of life and economic prosperity.”

The New Jersey State Planning Act required that the state prepare and periodically update *The State Development and Redevelopment Plan* and include, among other planning objectives, objectives addressing land use and resource conservation. The current Plan was adopted in March 2001, contains five planning areas (metropolitan, suburban, fringe, rural, and environmentally sensitive), five planning centers (e.g., urban, town, regional, village, and hamlets), and a variety of goals and strategies addressing development intensity and resource protection.

The criteria for the development of planning centers is based upon development density, available infrastructure, population, land area, and proximity to suburban centers. Of the eight statewide goals included in the State Development and Redevelopment Plan, half of them directly address conservation of natural resources, environmental protection, and preservation of cultural and open space areas, and sound planning decisions.

The *New Jersey Municipal Land Use Law*, enacted in 1975, is the enabling legislation that assigns state land use regulatory authority (e.g., zoning) to Hunterdon County and Readington Township. The purpose of the Municipal Land Use Law is to encourage land use and land development procedures that ensure public health, safety, welfare, and morals.

Enhancement and preservation of the natural, cultural, historic, and visual environment are goals included in the Municipal Land Use Law. In addition, the Readington Township Master Plan,, Subdivision and Site Plan Ordinance, Zoning Ordinance and all other development review procedures are enabled by the Municipal Land Use Law.

### State Planning Area Boundaries ~

The state planning area boundaries within Readington Township include suburban (PA2), fringe (PA3), rural (PA4), environmentally sensitive rural (PA4/5), environmentally sensitive (PA5), and park (P) categories. The Planning Area Map (Map 3) illustrates the location and extent of the state planning area boundaries in Readington Township.

The *rural state planning area* (PA 4) is the most extensive within Readington Township, and comprises almost thirty one percent (31%) of the total land area in the Township. The primary intent of this designation is protection of agricultural uses, open space area, habitat and recreational opportunities.

The *fringe state planning area* (PA3) comprises approximately 25% of the land area in the Township. The fringe designation is for areas situated at the edges of suburban development areas and is characterized by a predominantly rural landscape with small, free standing developments served by on-site water and sewage facilities. The transportation network in the fringe state planning area is generally rural, two lane roadways.

Approximately 19% of the land in Readington has been designated an *environmentally sensitive, rural state planning area* (PA 4/5). This boundary is categorized based on a combination of environmental and rural characteristics including the protection of agricultural uses and land containing valuable ecosystems, wildlife habitats, and other significant environmental features.

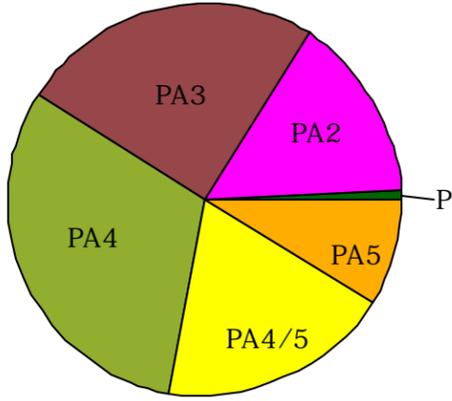
The *suburban state planning area* (PA 2) is characterized by an availability of vacant, developable land, an almost exclusive reliance upon automobile transportation, the provision of public sewage and water facilities, and a lower density of land development than metropolitan areas. Approximately 15% of the land area in Readington Township has been designated as suburban.

The *environmentally sensitive planning area* (PA5) designation has been given to approximately 9% of Readington Township. This area is categorized based on the existence of large, contiguous tracts of land containing valuable ecosystems, wildlife habitats, prime forest lands, scenic vistas, significant geologic, topographic or hydrologic features. Criteria for this designation is based primarily on habitat characteristics including trout production watersheds, pristine non-tidal watersheds, aquifer recharge areas, habitats supporting endangered or threatened species, contiguous freshwater wetland systems, prime forested areas, natural areas of exceptional value with population densities outside of urban and town centers with less than one-thousand people per square mile.

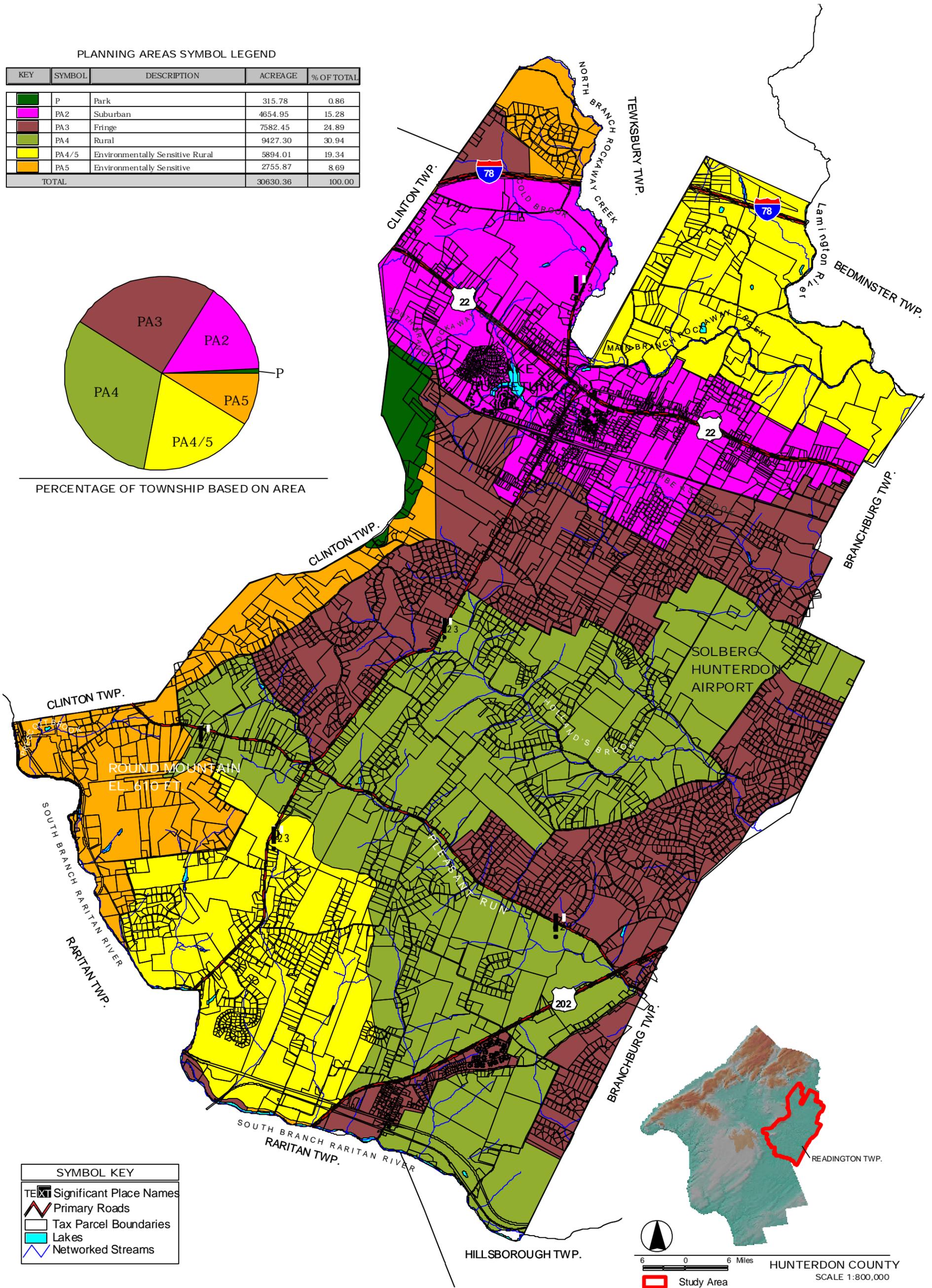
One percent (1%) of the land area in Readington is designated as the *state park planning area*. This planning area is characterized by parklands, areas creating contiguous park systems as well as active and passive recreational facilities.

PLANNING AREAS SYMBOL LEGEND

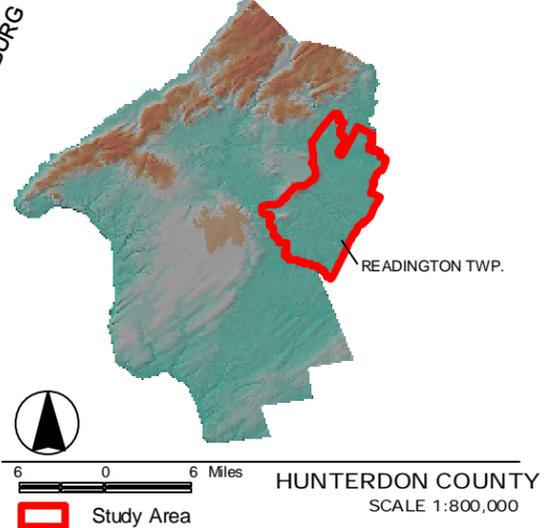
KEY	SYMBOL	DESCRIPTION	ACREAGE	% OF TOTAL
	P	Park	315.78	0.86
	PA2	Suburban	4654.95	15.28
	PA3	Fringe	7582.45	24.89
	PA4	Rural	9427.30	30.94
	PA4/5	Environmentally Sensitive Rural	5894.01	19.34
	PA5	Environmentally Sensitive	2755.87	8.69
TOTAL			30630.36	100.00



PERCENTAGE OF TOWNSHIP BASED ON AREA

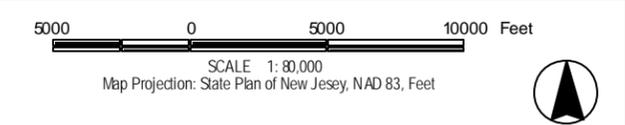


SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



HUNTERDON COUNTY  
SCALE 1:800,000  
Study Area

READINGTON TOWNSHIP, NRI, 2000



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, Monochromatic Bitmap Geographic Images of Hunterdon County, New Jersey.  
Scale 1:24,000  
New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000

NOTES:  
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Map 3: Readington Township State Planning Area Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

The Readington Township Master Plan ~

The Readington Township Master Plan (Clarke & Caton 1990) contains information and explicit policy statements intended to guide future development. The Township Master Plan contains the policy basis for the regulations contained in the municipal zoning ordinance and zoning map.

The Readington Township Master Plan contains the following planning elements intended to guide the physical, economic, and social development of Readington Township:

- |                                    |                                |
|------------------------------------|--------------------------------|
| ❖ Land Use                         | ❖ Historic Preservation        |
| ❖ Housing                          | ❖ Circulation                  |
| ❖ Conservation & Natural Resources | ❖ Utilities                    |
| ❖ Agriculture                      | ❖ Recycling & Waste Management |
| ❖ Community Facilities             | ❖ Zoning Consistency Statement |
| ❖ Parks, Recreation & Open Space   |                                |

As required by the Municipal Land Use Law, the Master Plan was reexamined, and recommendations for land development, policy and regulatory revisions were included (Clarke, Caton & Hinz 1995). Pertinent to environmental resource protection, the re-examination report recommended that open space preservation be integrated into the land development process, that the development of a greenway network be included as a sub-plan element to the Conservation and Natural Resource Element, that environmental resources be preserved, and that environmental impacts be included in the land use element.

The following elements of the Master Plan have been amended and supplemented since 1990 (Clarke, Caton & Hinz 1998):

- |   |  |
|---|--|
| ❖ Land Use  | ❖ Planning Consistency                                   |
| ❖ Conservation, Natural Resources and Agriculture | ❖ Photographic Tour of the Agricultural Residential Zone |
| ❖ Parks, Recreation & Open Space                  |  |

---

**The Conservation, Natural Resources & Agriculture Element**

The historic interest in agricultural preservation and the Township's interest in the preservation of environmental resources is evident in the Master Plan and amendments to the Master Plan. Indeed, the agricultural preservation policy defines farmlands as an irreplaceable natural resource which is set forth in the following goal:

*Preserve Farmlands and encourage their continued use recognizing that farming is an important component of the economy of the Township, the region, and the state, and that agricultural lands are an irreplaceable natural resource and a key element of the Township's rural character.*



Associated policies seek the preservation of large agricultural areas, zoning that guides appropriate development intensity, residential clustering, and the acquisition of development rights and open space in agricultural areas. The environmental protection goal included in the Readington Township Master Plan is as follows:

*Conserve and protect as many environmentally sensitive areas as possible. To that end (i) continue to require new development to observe rigorous performance standards to minimize any potential adverse environmental effects; and (ii) relate development standards and the permitted intensity of use to the carrying capacity of the soil and groundwater quality and to the objective of preserving farmland, open space and natural features.*



---

**The Land Use Plan Element**

The revisions recommended in the 1995 (Clarke et al.) reexamination study resulted in a revised land use plan element. The land use element in the 1998 (Clarke et al.) amendments to the Readington Master Plan resulted in a new agricultural residential land use category (AR Land Use Category) and eventually a new zoning district category (AR Land Use District). A portion of lands previously zoned RR (1 dwelling unit per three acre lot) were now zoned AR (1 dwelling unit per five-six acre lot). The additional zoning district was designed to implement the goal of preserving agriculture as an industry, preserving environmental resources. The end result was that the AR zoning district reduced development capacity in areas previously zoned Rural Residential (RR). The AR zoning district now comprises the largest percentage of land area in Readington Township (See Map 4, Zoning).

*The Readington Township Zoning Ordinance ~*

Zoning is a set of standards controlling the location, type, and intensity of development on site. After the Readington Township Planning Board adopted the amendments to the Master Plan, and more importantly the Land Use Plan, revisions were made to the Land Development Ordinance. The Zoning Districts adopted are illustrated as Map 4, and are the same as the land use districts noted in the Land Use Element of the Master Plan. In Readington Township the following Zoning Districts regulate land use, limit and restrict the use of buildings and structures to permitted uses, regulate lot coverage, lot size and lot dimensions, and require performance standards (Table 1.1).

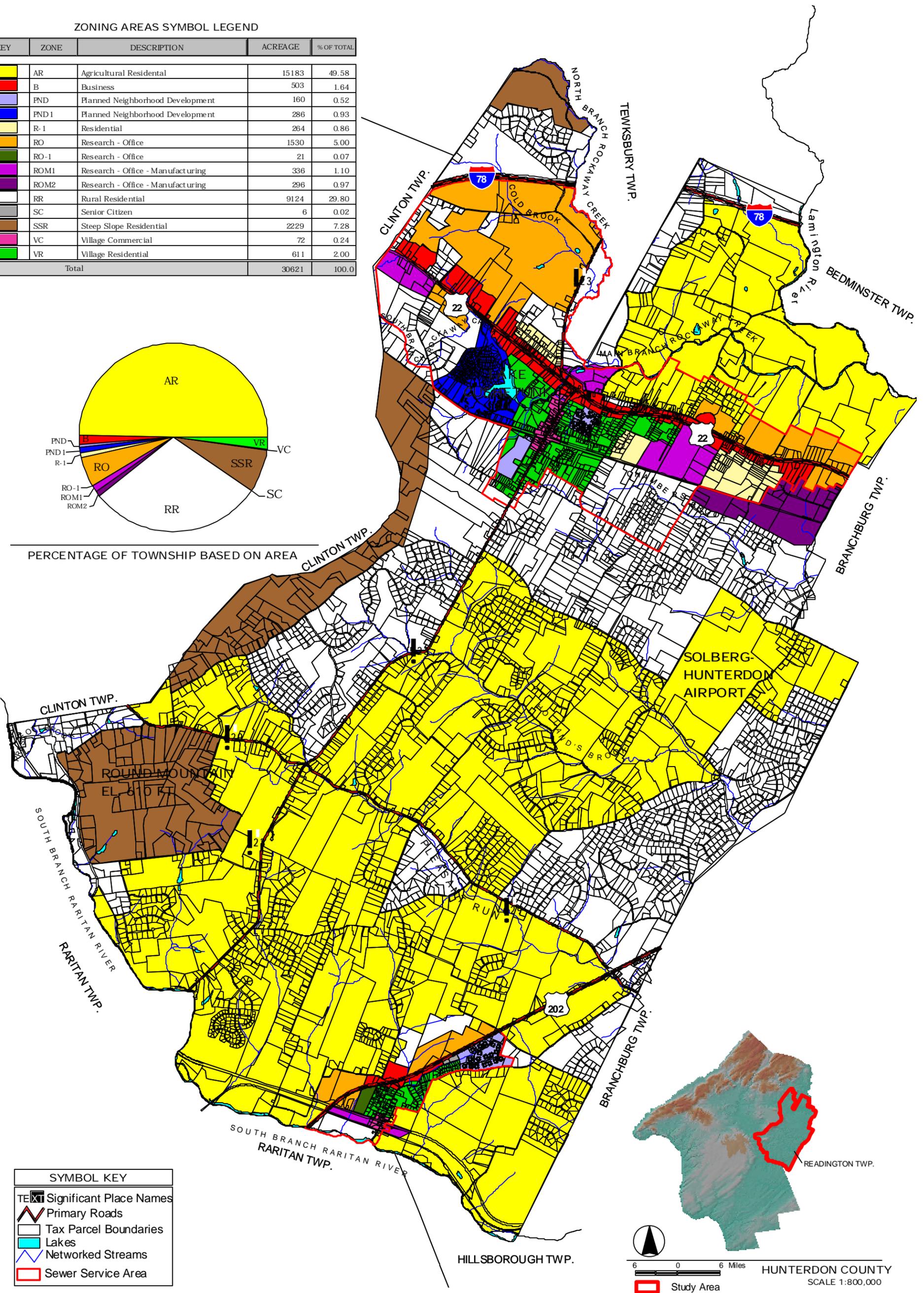
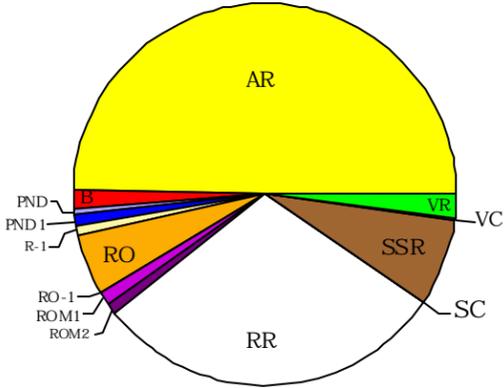
**Table 1.1 Zoning Standards & Associated Information**

Zoning District	Land Area Percentage (% of Total)	District Regulations & Pertinent Notes
Agricultural Residential (AR)	50	One dwelling unit (du) Per five to six acre lot, established to protect agricultural lands, to base residential density upon the soils ability to absorb contaminants from septic fields, to ensure groundwater supply and quality, three development types allowed: single family (six acre lot), cluster with open space, and agricultural cluster with 70% open space
Rural Residential (RR)	30	1 du per three acre lot, established to allow the interior of the Township to remain rural while allowing for residential development, three development types allowed: single family, conventional subdivisions (or open space clusters with 33.3% open space), and agricultural cluster with 50% open space.
Steep Slope Residential (SSR)	8	One du per five acre lot, established to protect slopes exceeding 15% and areas with basalt and diabase bedrock, and to deter ecological impacts of developing topographically constrained areas, allowable development types: lot clustering to a minimum two acre size.
Research Office (RO)	4	Minimum lot size is ten acres for new lots, FAR ratios, established for research and office uses exclusive of manufacturing, maximum impervious coverages included.
Business (B)	2	Minimum lot size of two acres, established to accommodate highway oriented "highway strip" businesses.
Research Office Manufacturing (ROM 1)	1	Lot size ten acres or less with restricted range of uses on lots less than ten acres, established to broaden the non-residential tax base for local employment, areas with direct access to highways, and serving regional and national markets.
Village Residential (VR)	2	One dwelling unit (du) . for 20,000 square foot lots, minimum five acre tracts, clustering for Townhouses with open space permitted on tracts 20 acres or greater, established to expand existing villages and for single family homes on smaller lots,
Research Office Manufacturing Park (ROM 2)	1	Established to broaden the non-residential tax base for local employment, planned office parks areas in a campus setting with direct access to highways.

<b>Zoning District</b>	<b>Land Area Percentage (% of Total)</b>	<b>District Regulations &amp; Pertinent Notes</b>
Planned Neighborhood Development (PND 1)	1	Allows for 2.65 du per acre, for tracts of land twenty-five acres or more, established to allow for a variety of housing types at higher development densities, zone notes the location of critical environmental areas.
Residential (R- 1)	1	Residential One Acre Zone, established for areas with existing residential character with community water and waste facilities, buffers required between R-1 and existing commercial/industrial areas, allowable development types: single family detached homes, farms, and parks.
Planned Neighborhood Development (PND)	.25	Density is 4.1 du per acre for tracts of land twenty-five acres or more, less than twenty-five acres areas with public facilities, and accessibility to public transportation, established to allow for a variety of housing types and to allow for low to moderate income housing,
Village Commercial (VC)	.25	Established for village pattern, mixed (retail and office) use commercial areas.
Research Office (RO-1)	.25	Minimum lot size is ten acres for new lots, FAR ratios, established for research and office uses exclusive of manufacturing and warehouses, areas adjacent to VR district, maximum impervious coverages included.
Senior Citizen (SC)	.25	Providing age restricted housing in low and moderate income housing for citizens sixty-two years or over

ZONING AREAS SYMBOL LEGEND

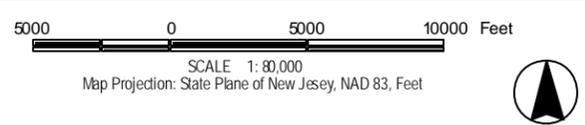
KEY	ZONE	DESCRIPTION	ACREAGE	% OF TOTAL
	AR	Agricultural Residential	15183	49.58
	B	Business	503	1.64
	PND	Planned Neighborhood Development	160	0.52
	PND1	Planned Neighborhood Development	286	0.93
	R-1	Residential	264	0.86
	RO	Research - Office	1530	5.00
	RO-1	Research - Office	21	0.07
	ROM1	Research - Office - Manufacturing	336	1.10
	ROM2	Research - Office - Manufacturing	296	0.97
	RR	Rural Residential	9124	29.80
	SC	Senior Citizen	6	0.02
	SSR	Steep Slope Residential	2229	7.28
	VC	Village Commercial	72	0.24
	VR	Village Residential	611	2.00
Total			30621	100.0



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams
	Sewer Service Area



READINGTON TOWNSHIP, NRI, 2000



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, New Jersey.  
 Scale 1:24,000  
 New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey  
 Scale 1:24,000  
 TMP map, supplied by Yager and Associates.  
 Scale (unknown)

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Map 4: Readington Township Township Zoning Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



The Readington Township Land Development Ordinance also contains provisions governing reviews, requirements, and actions relating site development proposals. The following environmental resource protection tools are included in the Ordinance :

- |  |   |
|--|---|
| ❖ Agricultural Easement Provisions                                       | ❖ Open Space Requirements (Less floodplains, wetlands, and steep slopes) & Listed Conservation Priorities |
| ❖ Aquifer Testing Requirements   | ❖ Percolation Test Requirements   |
| ❖ Buffer Size and Landscaping Requirements                               | ❖ Proof of Drinking Water, Water Potability and Wastewater Treatment Availability                         |
| ❖ Bulk Storage Restrictions  | ❖ Residential Cluster and Planned Development Provisions  |
| ❖ Conservation Easement Requirements                                     | ❖ Set back Requirements   |
| ❖ Deed Restriction Requirements (Open Space & Agricultural Preservation) | ❖ Sign Regulations  |
| ❖ Development Density Standards  | ❖ Steep Slope (Critical Area) Regulations   |
| ❖ Environmental Impact Statement Requirements                            | ❖ Stormwater Treatment Requirements   |
| ❖ Erosion and Sedimentation Control                                      | ❖ Stream Corridor Protection Regulations  |
| ❖ Establishment of Protective Zoning Districts (AR, RR, SSR)             | ❖ Top Soil Removal Restrictions   |
| ❖ Floodway, Flood fringe, Floodplain, and Flood hazard Restrictions      | ❖ Truck Traffic Regulations   |
| ❖ Height Restrictions  | ❖ Tree Protection Regulations (SSR Zone)  |
| ❖ Maximum Impervious Surface Restrictions                                | ❖ Waste Disposal & Storage Restrictions   |
| ❖ Minimum Contiguous Land Requirements                                   | ❖ Wastewater & Water Supply Requirements  |
| ❖ Noise Restrictions   |   |
| ❖ Odor Restrictions  |   |
| ❖ Woodland Protection  |   |

*Readington Township Resource Protection Efforts ~*

There are a variety of state regulations and programs intended to protect environmental resources. Examples include but are not limited to the Freshwater Wetlands Protection Act, The Flood Hazard Area Control Act, the Stormwater Management Rules, and Flood Hazard Area Control Regulations.

Through the years, Readington Township has completed resource protection studies, agricultural/open space and resource inventories, photographic tours, volunteer water quality monitoring programs, and position papers. These efforts have served to preserve and protect a significant amount of farmland and open space, and to strengthen the Readington Township Master Plan and the Land Development Ordinance.

**The Readington Township Open Space Preservation Program**

The Readington Township Open Space Advisory Committee was created in 1978. The effort resulted in the successful passage of a one-million dollar open space bond referendum and an Open Space Master Plan. Subsequently, Green Acres Funding helped active citizens and officials purchase land and implement cluster zoning. In the early 1990's efforts to promote greenway corridors were initiated. A Greenways Plan was completed in 1993 and served as an addendum to the Readington Township Master Plan.

In 1992, the Township environmental commission, with the help of an ad hoc group of Township residents, Township committee members and members of other Township boards, began to explore the formation of greenways throughout the Township. Recognizing that much of the preserved land at that point was in small isolated parcels that provided neither recreation nor habitat, the Greenways Committee sought to link such areas to provide a range of benefits to residents.

After a series of informational sessions and public meetings, a greenways plan was written that had as its central focus a realistic plan that would serve a variety of environmental and recreational purposes. The plan involves a voluntary effort between willing landowners and the Township. The goals for the greenway effort were:

- Maximize buffers along stream corridors,
- Protect and preserve historic districts,
- Protect and preserve remaining woodlands and steep slopes,
- Compliment the existing farmland preservation program by linking open areas,
- Protect and preserve scenic vistas, and
- Create linkages among natural, cultural, and recreational resources.

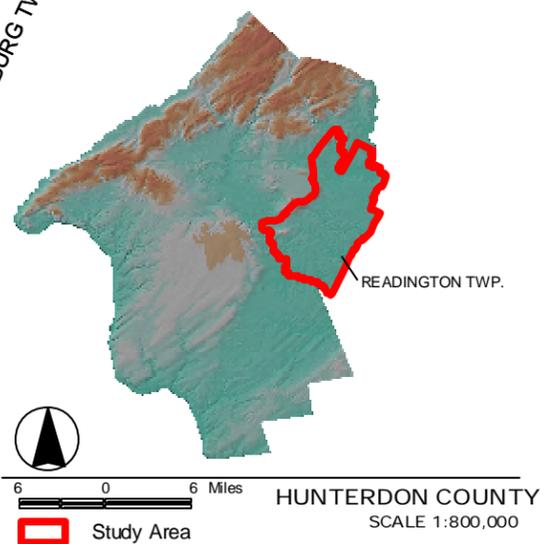
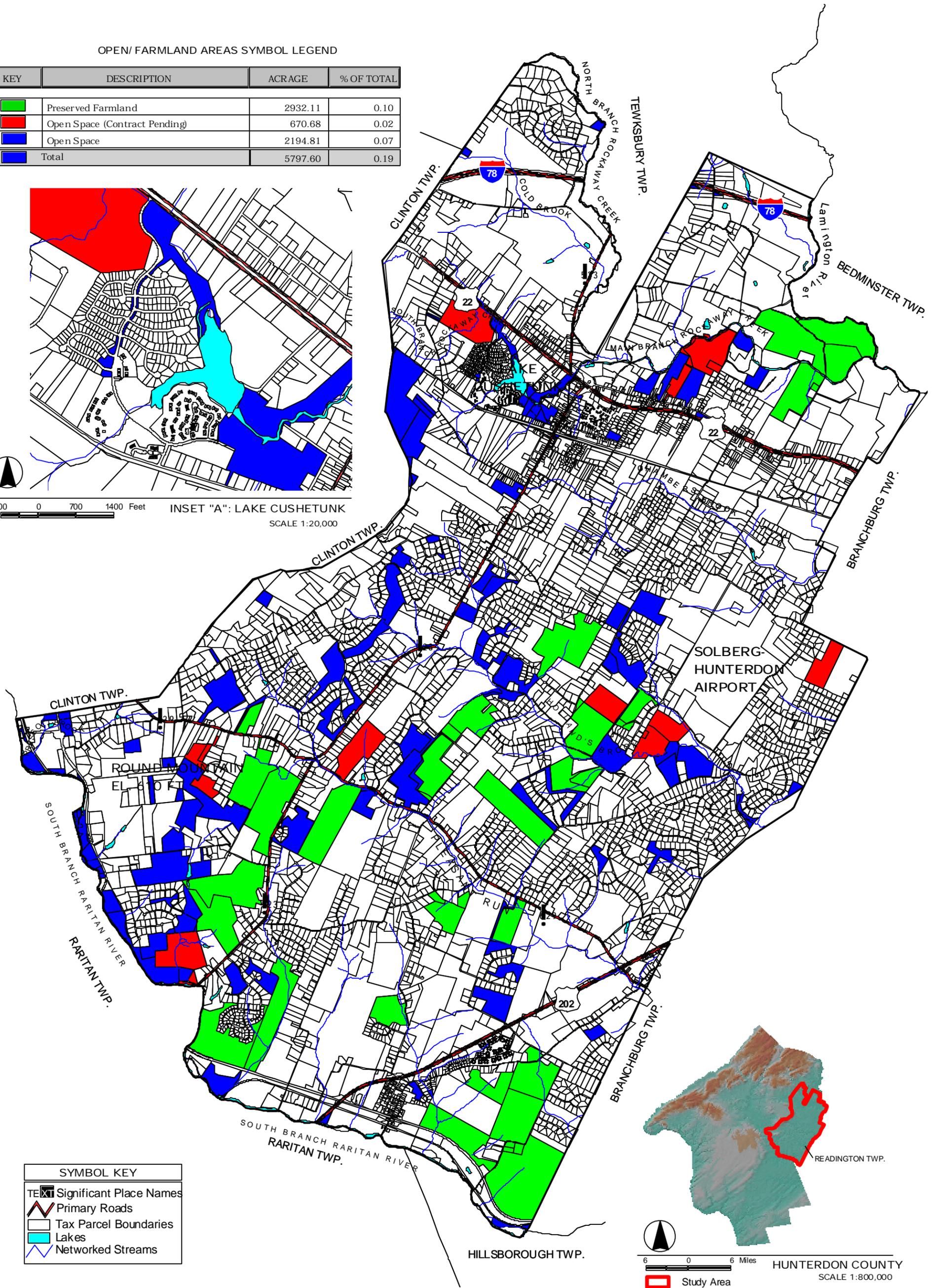
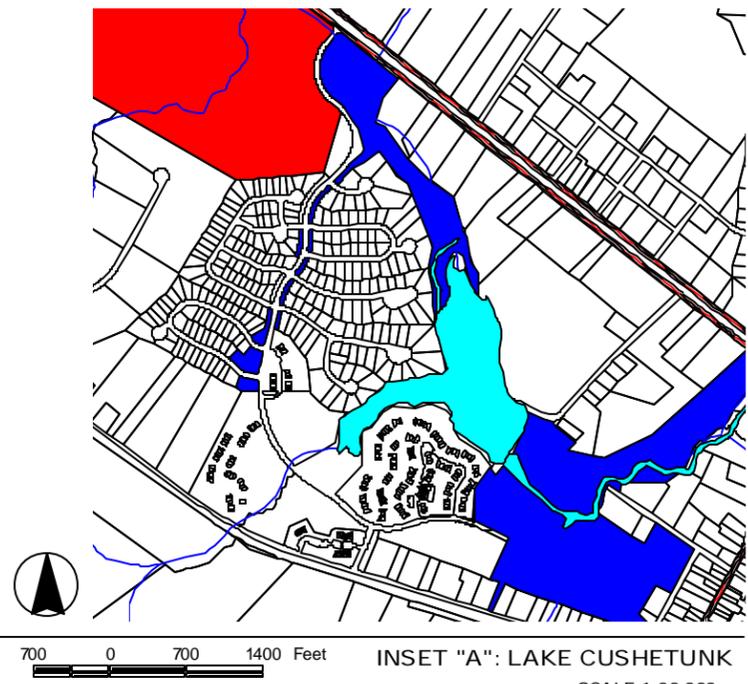
The Readington Township Greenways Plan and Open Space Inventory were adopted as part of the Township's Master Plan in 1996 and have since served as guidance in planning open spaces in residential developments and the purchase of open parcels for preservation.

In 1994, another referendum for the purchase of open space was overwhelmingly approved by Township voters. Using goals outlined in the greenways plan, now part of the Master Plan, properties that came available could be evaluated for their preservation value. The Township produced maps delineating remaining open spaces in the Township.

Due to the diligence of Township officials, the Planning Board, the Environmental Commission and a supportive citizenry, efforts have been taken to acquire and set aside open space. All open space properties currently preserved, awaiting closing, or awaiting contract as of December 1999 are illustrated on Map 5, Open Space and Farmland. As of July 2002, the Township has successfully preserved approximately 6,002 acres of farmland, environmentally sensitive lands and public open space. An additional 426 acres are under contract. The Open Space Preservation program is expected to continue well into the future. As new lands are acquired and more open space preserved, it will be necessary to periodically update the open space and farmland map.

OPEN/ FARMLAND AREAS SYMBOL LEGEND

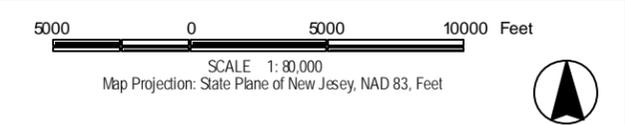
KEY	DESCRIPTION	ACRAGE	% OF TOTAL
	Preserved Farmland	2932.11	0.10
	Open Space (Contract Pending)	670.68	0.02
	Open Space	2194.81	0.07
	Total	5797.60	0.19



**SYMBOL KEY**

	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams

READINGTON TOWNSHIP, NRI, 2000



The Soil Survey Geographic data base, U.S. Department of Agriculture, Natural Resources Conservation Service, Soil Survey of Hunterdon County  
Scale 1:24,000  
New Jersey, Department of Environmental Protection, GIS data  
Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000

NOTES:  
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2. TIC MARKS INDICATE NEW JERSEY STATE PLANE COORDINATES.

Map 5: Readington Township Preserved Open Space & Farmland Area

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



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## **The Natural Resources Protection Program**

The backbone of a successful land preservation program and an environmentally-protective land development program is an updated environmental resources inventory (ERI). To prevent loss of the Township's environmentally sensitive areas, the ERI should be periodically updated.

In 1974, an inventory was completed for Readington in concert with the Rockaway Creek Basin Study (Environmental Assessment Council, Inc. 1974). The comprehensive report listed physical, biotic, social, and historic features within the Township. An environmental management plan was not included in the 1974 natural resource inventory. .

In addition to the efforts described in the previous open space preservation program section, subsequent Master Plans for the Township required environmental assessments. The Conservation and Natural Resources and Agriculture Element in the Townships Master Plan (Clark & Caton, 1990) contained information on the topography, geology, soils, farmland soils, preserved farmland, hydrology, and critical environmental impact areas in Readington Township. Impact areas included areas with steep slopes, flood hazard, and wetlands. The lack of mature woodland areas was also a stated area of concern.

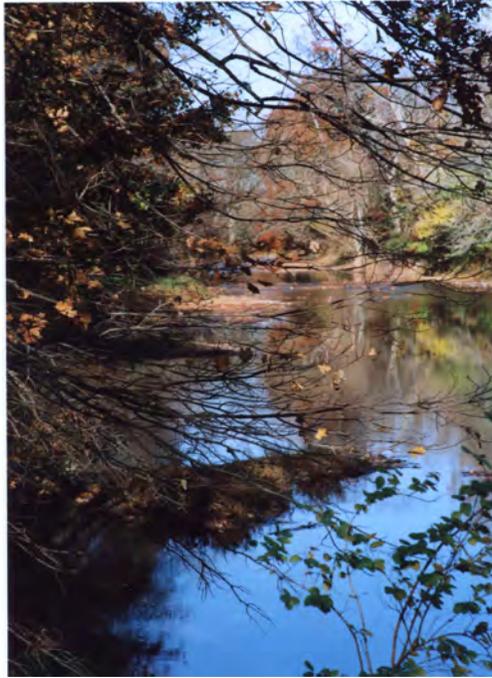
The Master Plan Reexamination report (Clarke, Caton, & Hinz 1995) illustrated a change in environmental protection approach by stating a need to protect stream corridors and scenic vistas. This particular recommendation illustrated a trend taking place in the larger environmental protection arena; that of protecting habitats (e.g., forested, wet, stream corridors) as well as individually significant natural resource features (e.g., the Federally Threatened and State Endangered bog turtle) supported by the habitat.

The Conservation, Natural Resources & Agriculture Element was amended in 1998. The supporting documentation for the amendment again contained traditional resource information including topography, geology, soils, agricultural soils, and wetlands. Accounting for changes in the State Development and Redevelopment Plan as well as ground and surface water quality standards, information on groundwater resource quantity and quality protection were added to this element.

The following section of the Readington Township Environmental Resource Inventory (ERI) update contains resource inventory information suggested by Readington Township, but is also indicative of regulatory and environmental protection approach changes. The inventory is comprised of maps, pie charts, photos, diagrams, and narrative describing the location, extent, and type of environmental resources present in Readington Township.

## **Part II ~**

# **The Environmental Resource Inventory**



**Rockaway Creek  
From Island Road,  
Readington Township**

*The Conservation of Resources and the Protection of  
Environmental Qualities are vital to  
Quality of Life and Economic Prosperity*

**~ The New Jersey State Planning Act~**

## **THE READINGTON TOWNSHIP ENVIRONMENTAL RESOURCE INVENTORY**

Introduction ~

Having previously described the methods by which environmental resources are protected within the context of regional and local land development regulations, the following section contains the Environmental Resource Inventory (ERI). Information included in this section includes a short narrative describing the value, location and the extent of the most significant environmental resources remaining in Readington Township. Each section also contains a color map depicting the environmental resources and their spatial distribution throughout the Township.

A more *traditional* definition of environmental resources and a notable philosophical contrast describing sustainable environmental planning is cited below:

***Any form of matter or energy obtained from the environment  
that meets human needs.***

***~ G. Tyler Miller Jr. ~***

***Creating sustainable communities is not simply a matter of  
avoiding a few wetlands, or saving a few acres of open space, or  
putting in place a few nonpoint pollution best management  
practices. Rather, it is a matter of considering ecological limits  
and environmental impacts in every aspect of community design.***

***~ Timothy Beatly ~***

Interactions between the ecosystem components are also an important part of presenting resource inventory information. The five ecologically-related components commonly identified include: humans, climatic elements, geologic and soil features, plants, and animals. Since humans are unique in their ability to alter the environment through the land development process, use of this inventory is intended to provide guidance to the local officials, staff, planning board, zoning board, developers, and citizens of Readington Township. It is intended to be used as a land development and resource protection tool. The inventory allows better decision-making when the Township is confronted with a proposed development or the desire to protect certain areas as open space.

*Readington Township, The Demographic and Physiographic Setting ~*

**Location**

Readington Township is located in northeastern New Jersey in Hunterdon County between 40° 40' to 40° 30.5' north latitude and 74° 52' to 74° 43' west longitude. The municipality covers an area of approximately 47.85 square miles (30, 621 acres). Elevation ranges from two to three-hundred feet above sea level to seven-hundred feet (Cushetunk Mountain Peaks). The majority of the land in Readington averages three-hundred feet above sea level.

**Population**

Demographic information including tallies, comparisons and projections, is an important component of environmental resource planning. Demographic data, when applied correctly, provides the municipality with a sense of the extent of growth, comparative data with other municipalities in the region, and the probable locations where growth will take place. For instance, the table below shows a significant population growth since 1960, and illustrates that the Township population has more than doubled. In fact, between 1960 and 2000 the population increased by approximately 157% (United States Census). Population density figures, or the number of people per square mile of land, has also increased in Readington Township.

**Table 2.1 Historic Population Growth**

<u>Year</u>	<u>Population</u>
1960	6,147
1970	7,688
1980	10,855
1990	13,400
2000	15,803

*United States Census 2000*

Although all data associated with the most recent census is not yet available, the Hunterdon County Planning Board expects another increase for Readington Township. Based on population projections prepared by the County Planning Board in 1992, note an additional 20% increase by 2010.

Other worthwhile socio-economic demographic data, as they relate to environmental resource protection, are noteworthy. For instance, in 2000 the median household income in Readington Township was \$95,356, while the median family income was \$106,343. The median household and family incomes in Hunterdon County were \$79,888 and \$91,050, respectively. When compared with Hunterdon County figures, the median income levels are much higher in Readington. In addition, housing values, educational attainment, employment, and annual wage data are also higher than the county average (United States 2000 Census (American Fact Finder, <http://www/factfinder.census.gov>) & Hunterdon County). This type of demographic information is helpful. It often correlates with the ability, understanding, and willingness of a population to contribute funding to open space and environmental resource protection efforts.

*Land Use Data~*

It is helpful to compare the way that land was used in the past with current land use information. Aerial photographs are one way to make a comparison (Map 2). In relation to environmental resources, other land use indicators may also be used to determine development pressures placed upon the Township's significant environmental resources. Often the number of building permits, and the number of subdivisions approved are considered as well as how the numbers compare with regional trends. Readington Township has experienced an average increase

in building permits issued since 1983, (66 issued in 1983 vs. 102 in 1992) however the highest number of permits were issued in 1985 (297 permits) and 1986 (503 permits). On average, the number of permits issued was higher than surrounding municipalities. In terms of subdivisions approved between 1984 and 1992 the average number was again higher than in the early 1980's and higher than other Hunterdon County municipalities. In 1984, the number of lots approved was 68 and in 1992 the number was 104. The highest number of subdivisions approved was in 1992.

Once growth and location are determined, impacts to environmental resources may be ascertained. This type of analysis is provided in Section III of this study whereby environmental resource vulnerability is determined based on demographic and land use trends in relation to the existence of significant environmental resources. Section III also applies the most recent state Land Use and Land Cover information (USGS & NJDEP 2001) to determine the affect of impervious cover on the environmental resources in Readington Township.

#### *Climate~*

Climate is an important component of a resource inventory, and temperature is one of the most important facets of climate. Temperature affects all living organisms, as it influences the chemical reactions necessary for growth. In addition, precipitation and light are facets of climate that affect vegetational growth and habitat composition.

The climate in Readington Township is classified as *continental*. It is characterized by significant difference in seasonal temperatures and considerable fluctuation in daily temperature. These climatic characterizations are due to the northwesterly prevailing winds originating in Canada during winter months and the moist tropical air masses originating in the Gulf of Mexico and eventually converging in New Jersey. Winter temperatures during the month of January average 27.9 ° F , while July temperatures average 73.2 ° F. Yearly temperatures average 53 ° F and the average date of the last killing frost is May 12.

Annual precipitation for Readington Township averages 46.94 inches. During winter months an average of fifty inches of snow is attributed to Northern New Jersey as well as a high frequency of ice storms. The length of daylight, as measured at New Brunswick is 9.5 hours in January, nearly 12 hours in March and September, and the longest day of the year in June at 15 hours. The number of clear, sunny days is approximately 60% of the total days in the fall and spring and 55% in the winter months (Collins and Anderson 1994).

## Air Quality~

The effects of air pollution are well-known including odor, low atmospheric visibility, corrosive damage to buildings, damage to plant and animal life, human respiratory system damage, and major ecosystem disruption.

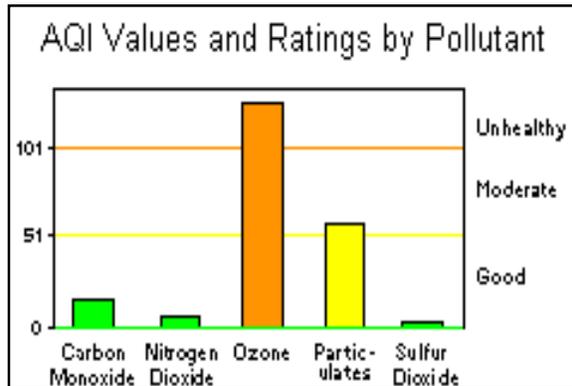


Figure 2.1: NJDEP Air Quality Monitoring

Nationwide comparisons show that New Jersey has poor air quality due to the type and density of industry, the density of population, and the overall reliance of the population upon automobiles. In the early 1990's every New Jersey County failed to meet national ozone standards (ground-level). Serious human health problems are attributed to air pollution. Environmental repercussions are also common. For instance, skies clouded with smog result in a reduced amount of sunshine, which in turn, negatively affects several ecological cycles. Studies have shown damage to tree and crop growth, and many scientists feel atmospheric pollution is an increasing threat to New Jersey vegetation.

The air quality in Readington Township was determined by accessing historical air quality monitoring data available from the New Jersey Department of Environmental Protection's air quality monitoring program. The air quality findings are presented and based on a national system called the Air Quality Index (AQI). The AQI compares pollutant levels to national health standards, takes into account multiple pollutants, and assigns an air quality rating ranging from good to unhealthy.

The pollutants considered in the AQI include carbon monoxide, nitrogen dioxide, ground-level ozone, particulates, and sulfur dioxide. The carbon monoxide health standard is 9 parts per million, while the health standard for ozone is 0.08 parts per million. The closest air quality monitoring station in the Northern Delaware Valley Region is located in Flemington, New Jersey. During the 1985-1999 time period, the national health standards for carbon monoxide were not exceeded at the Flemington monitoring station. Data for ground-level ozone exceedences was only available for the 1998-1999 time period, because the eight hour exceedence standard for New Jersey is fairly new. In 1998 ozone health standards were exceeded twenty-three times, while in 1999 the standards were exceeded twenty-one times during the spring and summer months (Figure 2.1).

## Physiography, Geology, Topography, and Slope~

Readington Township is located within the *Piedmont Physiographic Province* or the *Triassic Lowlands*. This province constitutes approximately 20 % or 1,500 square miles in New Jersey. The *Raritan Valley Lowland Element* of the Piedmont Physiographic Province contains low rolling plains with southeasterly sloping topography. The Piedmont is flat in areas with slightly rolling, predominantly gentle slopes.

As the Conservation, Natural Resources & Agriculture element of the Master Plan states, the topography of land is important in environmental planning. Identifying steeply sloping areas and then protecting them from high density development is important for a number of reasons. For instance, steeply sloping areas in the Township pose land development, soil erosion, and water quality problems (e.g., stormwater runoff & sediment loads). When steeply sloping areas are left untouched, they are scenic and often contain valuable habitat for flora and fauna.

Map 6 illustrates the topography and slopes in Readington Township. Although most of Readington Township is within the zero to eight percent slope range, there are several areas containing steep (10-15%) and very steep (15%-25%) slopes. The steepest slopes are located east of Round Valley Reservoir along the municipalities western border with Clinton Township. Slopes in this particular area range from eight to twenty-five percent. Round Mountain, bordering Raritan Township in the southwestern portion of the municipality, and Round Top Mountain just over the Readington border in Tewksbury Township contain slopes in the twenty-five to forty percent range. The Rockaway Creek, Holland's Brook, Pleasant Run, and tributaries to the South Branch Raritan River all contain slopes in the eight to twenty five percent range.

## **Geology**

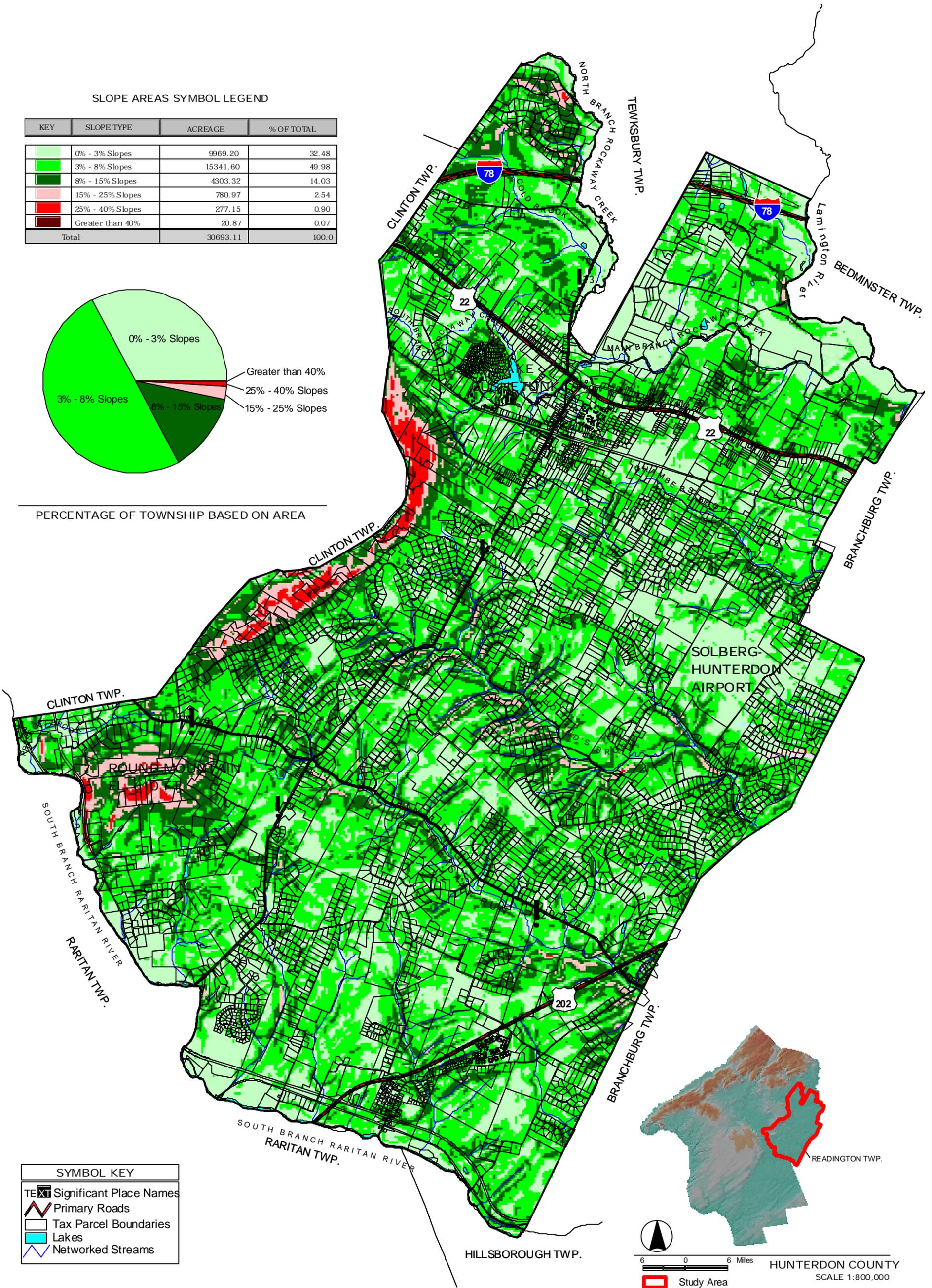
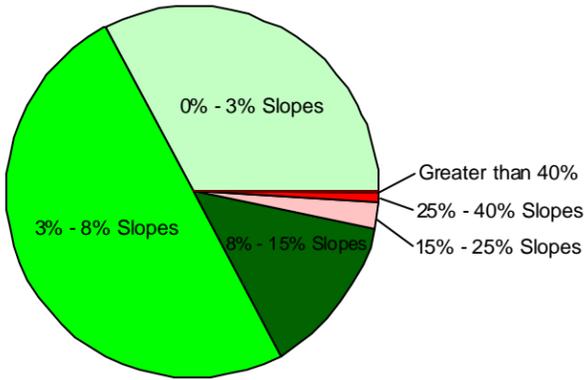
Readington Township is within the Triassic basin, is underlain primarily by shales of the Brunswick formation, and also experiences Stockton sandstone, volcanic basalt, and diabase formation occurrences. Several references cite that the shales form the topographic low plains throughout the majority of the Township with volcanic rocks present at higher elevations (e.g. Cushetunk and Round Mountains). Both sandstone and volcanic rock have been commercially removed at quarries and sold locally and regionally.

The geologic features of an area (Map 7) interact with the physical (e.g., temperature, relief, drainage), biological (e.g., plant and animal interactions), chemical (e.g., pH, chemical cycling), and human (e.g., development, pollution) elements in a given area. With respect to vegetation and the wildlife associated with vegetation, the relief, drainage, soil and underlying rock formations will affect floral and faunal succession and diversity.

In relation to the human element, the geology of an area may influence the development potential or the pollution vulnerability of an area. One example is that sites presenting geological constraints (e.g., structural limitations) to cost-effective construction may be left alone and therefore preserved, while sites containing certain formations (e.g., carbonate formations) may be more vulnerable to groundwater pollution. Pollution vulnerability as it relates to the geologic formations present in Readington Township will be addressed in Section III of this study.

SLOPE AREAS SYMBOL LEGEND

KEY	SLOPE TYPE	ACREAGE	% OF TOTAL
	0% - 3% Slopes	9969.20	32.48
	3% - 8% Slopes	15341.60	49.98
	8% - 15% Slopes	4303.32	14.03
	15% - 25% Slopes	780.97	2.54
	25% - 40% Slopes	277.15	0.90
	Greater than 40%	20.87	0.07
Total		30693.11	100.0



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



READINGTON TOWNSHIP, NRI, 2000



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, Monochromatic Bitmap Geographic Images of Hunterdon County, New Jersey. Scale 1:24,000  
 New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey Scale 1:100,000  
 NJ Geologic Survey, Data Download Site Large Format DEM, Statewide Scale 30 meter resolution  
 TMP map, supplied by Yager and Associates. Scale (unknown)

NOTES:  
 1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
 2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

Map 6: Readington Township Slope Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

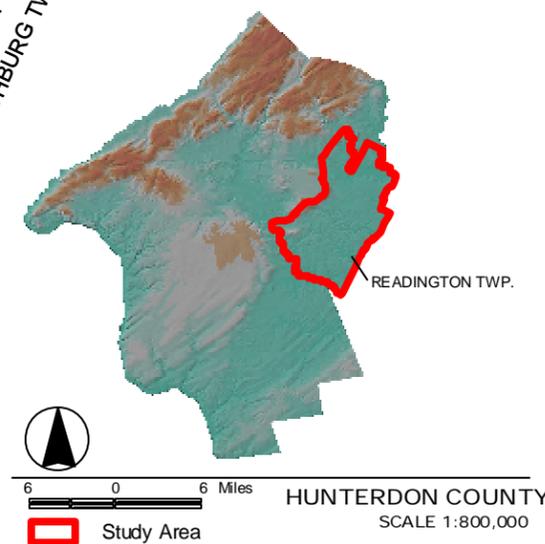
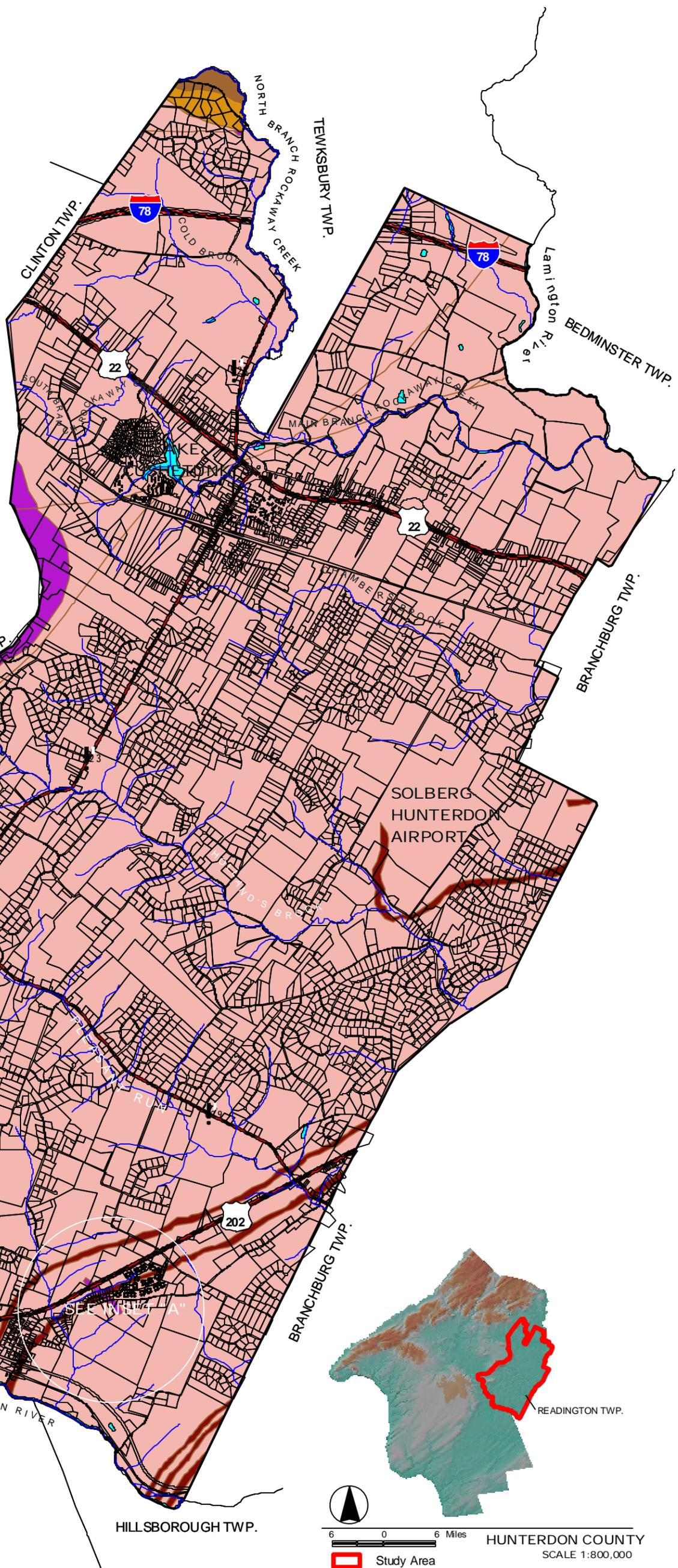


GEOLOGIC FORMATION AREAS SYMBOL LEGEND

KEY	GEOLOGIC DESCRIPTION	LABEL	ACREAGE	PERCENTAGE
	Feltville Formation	Jf	45.38	0.15
	Granophyre	Jg	238.86	0.78
	Jurassic Diabase	Jd	605.95	1.97
	Jutland Klippe Sequence	OCjt	30.43	0.10
	Lockatong Formation	Trl	0.00	>0.01
	Orange Mountain Basalt	Jo	80.03	0.26
	Passaic Formation	JTrp	29104.12	94.78
	Passaic Form. Gray bed	Trpg	405.47	1.32
	Stockton Formation	Trs	197.90	0.64
TOTAL			30708.14	100.0



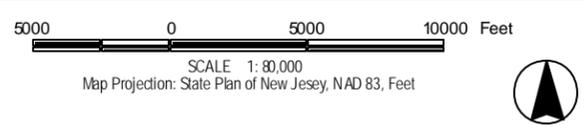
INSET "A": GEOLOGIC DETAIL  
SCALE 1:20,000



HUNTERDON COUNTY  
SCALE 1:800,000  
Study Area

SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams

READINGTON TOWNSHIP, NRI, 2000



New Jersey, Department of Interior, Geologic Survey, GIS data Downloads, Geology of Hunterdon County, New Jersey. Scale 1:24,000  
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 TMP map, supplied by Yager and Associates. Scale (unknown)

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Map 7: Readington Township Geology Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



*Soils, Soil Erosion Potential and Soil Suitability for Septic Systems~*

The soils of Hunterdon County were formed under forest cover (primarily hardwoods) from either residual material weathered from underlying rocks or transported material deposited by water, glacial ice, wind, or gravity. In Readington Township, the soils are derived largely from the weathering of the underlying Brunswick shale. These soil formation processes, coupled with various soil qualities such as texture (e.g., sand, silt, clay), water-holding capacity, and nutrient content, are active factors in determining the resident biological community. Likewise, plants, micro-organisms, soil invertebrates (e.g., earthworms), and other animal life living in and on soils are active factors in soil formation.

These two dynamic processes interacting simultaneously determine, in large part, the living environmental resources that persist and sustain themselves in a given locale. The interruption of this relationship, whether through excavation, development, or altering hydrologic regimes, will adversely affect the surrounding environmental resources. For instance, soil erosion, the loss of fertile agricultural soils, and nonpoint source water pollution are three closely related problems. Therefore, the implementation of judicious conservation measures, such as restricting development on hydric soils or on soils immediately up gradient and down gradient of strong slopes, and the preservation of farmland with prime agricultural soils would serve to minimize perturbations to the surrounding environmental resources.

The United States Department of Agriculture (USDA) Soil Conservation Service's (SCS), now the Natural Resource Conservation Service (NRCS), *Soil Survey of Hunterdon County, New Jersey* (USDA 1974) identifies 44 soil series in Hunterdon County. Depending upon the USDA source used (hard copy or Internet) approximately 24 soil series and 50 phases (or mapping units) within these 44 County-wide series occur in Readington Township (Map 8).

Soil erosion potential, or erosion hazard, is the potential of a soil to erode itself naturally if not adequately protected. It is unrelated to historical erosional tendencies. The major factors that determine erosion potential are soil texture, organic matter content, structure, hydraulic conductivity, and to a lesser extent, slope.

Soils are usually ranked according to their relative erosion potential into the following classes:

<b><u>Erosion Hazard</u></b>	<b><u>Annual Soil Loss</u></b> <i>(metric tons per hectare)</i>
None	0 tons/hectare
Slight	< 2.5 tons/hectare
Moderate	2.5 to 10 tons/hectare
Severe	10 to 25 tons/hectare
Very severe	> 25 tons/hectare
<i>Note: 2.471 acres per hectare</i>	

Under many circumstances, erosion is more closely related to the configuration of the soil surface than to other factors, such as slope. Erosion potentials are meaningful only if the condition of the surface and of the plant cover are given (USDA 1981). The erosion hazards that are presented in many soil surveys assume full vegetative cover, such as woodland, and are therefore inappropriate to apply to cleared or developed land. Where applicable, soil surveys typically present an erosion hazard for those soil types that are likely to be used for purposes other than that of wood lot management (e.g., agriculture).

Most of the soils found in Readington Township have a high water table and a shallow depth to bedrock. Depth to seasonal high water level is the distance between the surface and the highest level reached in most years by ground water or water perched over a fragipan (hard impervious layer). Depth to bedrock is the distance between the surface of the soil and the upper surface of the rock layer. These characteristics, along with slope, stoniness, and permeability, largely determine the suitability of most soils for septic systems and building foundations. Development sites with a moderately high water table are typically drained or filled to alleviate this condition. Where rapidly permeable soils overlay fractured bedrock, such as Brunswick Shale, a septic system will often appear to function efficiently, but groundwater contamination can occur from the movement of improperly filtered septic effluent into the aquifer. If the bedrock is shallow and un-fractured, insufficiently filtered effluent can run along the rock barrier and enter surface waters (Clark, Caton & Hintz, 1998).

The following table (Table 2.2) , reproduced here in part from the “*Township of Readington, Amendment to the Master Plan*” (Clarke, Caton, & Hintz 1998), summarizes the most relevant factors in determining the suitability of soil types for development.

**Table 2.2 Development Limitations of Soils**

Soil Series	Mapping Units Occurring in Readington	Depth to Seasonal High Water Table (feet)	Depth to Bedrock (feet)	Erosion Potential	Septic System Limitations	Limitations for Building Foundations	
						With Basements	Without Basements
Abbottstown	AbA, AbB	0.5 to 1.5	3.5 to 5+	Slight	Severe	Severe	Moderate
Alluvial land	Ac, Ae	1 to 3	4+	Slight	Severe	Severe	Severe
Annandale & Edneyville	ApB	5+	6 to 10+	Slight	Moderate	Slight to Moderate	Slight
	ApC	5+	6 to 10+	Moderately severe	Moderate	Moderate	Moderate to Severe
Athol	AtB, AtC2	5+	4 to 7+	Slight to moderately severe	Moderate	Slight	Slight
	AtD2	5+	4 to 7+	Severe	Severe	Moderate	Moderate
Birdsboro	BdA, BdB, BcC2	3+	5 to 10+	Slight	Slight to Severe	Slight	Slight
Bowmansville	Bt	0 to 1	3.5 to 10+	Slight	Severe	Severe	Severe
Bucks	BuB, BuC2	5+	3.5 to 5+	Slight to moderately severe	Moderate	Slight	Slight
Califon	CbB	0.5 to 2.5	6 to 10+	Slight	Severe	Severe	Moderate
Chalfont	CdB	0.5 to 1.5	3.5 to 6+	Slight	Severe	Severe	Moderate
Hazleton	HaC2	4+	4 to 5+	Slight	Severe	Slight	Moderate
Klinesville	K1C, K1D	3 to 5+	1 to 1.5+	Severe	Severe	Severe	Moderate
Lansdowne	LbB	1 to 2.5+	3.5 to 5+	Slight	Severe	Severe	Moderate
Legore	LgC	4+	5 to 8+	Slight to moderate	Moderate	Slight	Slight
	LgD	4+	5 to 8+	Severe	Severe	Severe	Severe
Lehigh	LhB, LhC2	0.5 to 2	3.5 to 5+	Slight	Severe	Moderate	Moderate
Mt. Lucas	MoB	0.5 to 2.5	4 to 8+	Slight to moderate	Severe	Moderate	Moderate
Mt. Lucas-Wachung	MwB	0.5 to 2.5	4 to 8+	Moderate	Severe	Severe	Severe

Soil Series	Mapping Units Occurring in Readington	Depth to Seasonal High Water Table (feet)	Depth to Bedrock (feet)	Erosion Potential	Septic System Limitations	Limitations for Building Foundations	
						With Basements	Without Basements
Neshaminy	NeC2	5+	4 to 8+	Moderately severe	Moderate	Moderate	Slight
	NhC	5+	4 to 8+	Moderately severe	Severe	Moderate	Moderate
	NhD, NhZ	5+	4 to 8+	Severe to very severe	Severe	Severe	Severe
Neshaminy-Mt. Lucas	NkC	5+ 0.5 to 2.5	4 to 8+ 4 to 8+	Slight	Severe Severe	Moderate Severe	Moderate Severe
Norton	NoB, NoC2	5+	4 to 10+	Slight	Severe	Moderate	Slight
	NoD2	5+	4 to 10+	Severe	Severe	Moderate	Moderate
Penn	PeB, PeC2	4+	1.5 to 3.5	Slight	Severe	Moderate	Slight
	PeD	4+	1.5 to 3.5	Moderately severe	Severe	Moderate	Moderate
Penn - Bucks	PfC2	4+ 4+	1.5 to 3.5 1.5 to 3.5	Moderately severe	Severe Moderate	Moderate Slight	Slight Slight
Raritan	RbA, RbB	1 to 2	5 to 7+	Slight	Severe	Severe	Moderate
Readington	RcC2	1.5 to 3	3.5 to 5+	Moderately severe	Moderate	Moderate	Slight
Reaville	ReA, ReB, ReC2	1 to 2	1.5 to 3.5	Slight to moderately severe	Severe	Severe	Moderate
Reaville, wet variant	RfA, RfB	0 to 1	1.5 to 2.5	Slight to moderate	Severe	Severe	Severe
Rough broken land	RfF	Variable	Variable	Severe	Severe	Severe	Severe
Rowland	Ro	1 to 2.5	4 to 6+	Slight	Severe	Severe	Severe
Turbotville	TuB	0.5 to 1.5	5 to 8+	Moderate	Severe	Severe	Moderate

With regard to limitations, Table 2.2 and the associated geographic information system maps provide the following information on soil limitations:

- **Soils and limitations to building structures** - Soils will also present limitations when viewed in light of their abilities to handle the weight of structures (e.g., homes). Approximately 26% of the soils in the Township present severe limitations and 2 % present moderate to severe limitations (buildings with basements). Approximately 10% of the soils in the Township present severe limitations and 3% present moderate/severe limitations (buildings without basements).
- **Soils and on-lot septic system constraints**- Approximately 82% of the soils in Readington Township present severe limitations to the placement of individual, on-lot septic systems. In addition 17 % present moderately severe limitations for on-lot septic systems (Map 10).
- **Soils and land development erosion potential**- Approximately 8% of the soils in the Township present severe erosion potential, 8% moderate/severe, and 15% slight to moderately severe erosion potential when sites are developed (Map 8).

### **Agricultural Soils**

Many farmers in Readington Township and elsewhere in New Jersey wish to continue tilling the best soils. The importance of conserving farmland and open space was discussed in section one of this inventory (Map 5). However, agricultural soils are discussed here. Readington Township is still quite rural. The agricultural soils map (Map 9) illustrates that, of the total acreage in Readington Township, the municipality still contains approximately 42% prime agricultural soils and 33% soils with statewide importance.

*Prime agricultural soils* are those exhibiting adequate natural rainfall, temperatures conducive to farming, lack of excessive moisture, proper pH, adequate permeability, soils deep enough to store adequate moisture storage and aid root growth, and a lack of gravel, cobbles or stones. The Hunterdon County Soil Conservation District lists thirty-two (32) prime farmland soils in Hunterdon County.

Readington Township contains ten (10) prime agricultural soils including:

- **Atb-** Athol gravelly loam, 2-6 percent slopes
- **BdA-** Birdsboro silt loam, 0 to 2 percent slopes
- **BdB-** Birdsboro silt loam, 2 to 6 percent slopes
- **BuB-** Bucks silt loam, 2 to 6 percent slopes
- **MoB-** Mount Lucas silt loam, 0 to 6 percent slopes
- **NoB-** Norton loam, 2 to 6 percent slopes
- **PeB-** Penn shaly silt loam, 2 to 6 percent slopes
- **RbA-** Raritan silt loam, 0 to 2 percent slopes
- **RbB-** Raritan silt loam, 2 to 6 percent slopes
- **TuB-** Turbotville loam, 2 to 6 percent slopes

*Soils of Statewide Importance* are those prime agricultural lands suited to the production of regional crops. Soil suitability for this category include adequate water, season, temperature, steepness, aspect, or other attributes required for regionally significant crops. The Hunterdon County Soil Conservation District (USDA 1974) lists thirty-six (36) soils of statewide importance in the County. Readington Township contains eighteen (18) of them including:

- **AbA-** Abbotstown silt loam, 0 to 2 percent slopes
- **AbB-** Abbottstown silt loam, 2 to 6 percent slopes
- **ApC-** Annandale and Edneyville gravelly loams, 8 to 15 percent slopes
- **AtC2-** Athol gravelly loam, 6 to 12 percent slopes, eroded
- **BuC2-** Bucks silt loam, 6 to 12 percent slopes, eroded
- **CdA-** Chalfont Silt loam, 0 to 2 percent slopes
- **LbB-** Lansdowne silt loam, 0 to 6 percent slopes
- **LgC-** Legore gravelly loam, 6 to 12 percent slopes
- **LhB-** Lehigh silt loam, 2 to 6 percent slopes
- **LhC2-** Lehigh silt loam, 6 to 12 percent slopes, eroded
- **NeC2-** Neshaminy silt loam, 6 to 12 percent slopes, eroded
- **NoC2-** Norton loam, 6 to 12 percent slopes, eroded
- **PeC2-** Penn shaly silt loam, 6 to 12 percent slopes, eroded
- **PfC2-** Penn-Bucks complex, 6 to 12 percent slopes, eroded
- **RcC2-** Readington silt loam, 6 to 12 percent slopes eroded
- **ReA-** Reaville silt loam, 0 to 2 percent slopes
- **ReB-** Reaville silt loam, 2 to 6 percent slopes
- **ReC2-** Reaville silt loam, 6 to 12 percent slopes

Readington Township is lucky in that it contains approximately 12,765 acres of prime agricultural soils (42 % of the total land area) and approximately 9,965 acres of soils of statewide importance (33 % of the total land area). Additional information on the agricultural capabilities associated with each soil listed and the official series descriptions, may be obtained from the Hunterdon County Soil Survey (USDA 1974), the Hunterdon County Soil Conservation District, and the Readington Township Master Plan (Clarke and Caton 1990) and Master Plan Amendments (Clarke, Caton and Hintz 1998).

### **Limitations and Uncertainties of Soil Survey Data**

Far more relevant than expounding the details of each soil phase in this ERI, it is important to understand the limitations of a typical USDA Soil Survey when using these data to make environmental resource management decisions. For example, although some ground-truthing for the presence of established soil series in the Township may have been conducted by the USDA, the majority of the mapping data that appears on this, or any Soil Survey, have not been field-verified. This is because soil maps were created by hand-drawing directly onto an aerial photograph, either the estimated boundaries of a ground-truthed soil series, or a best approximation of the series most likely to be present.

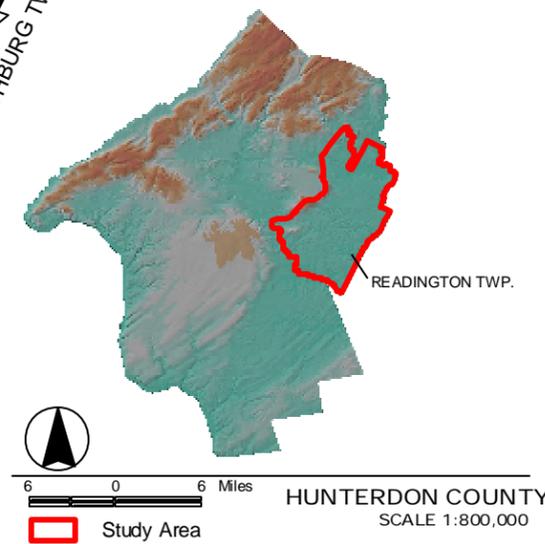
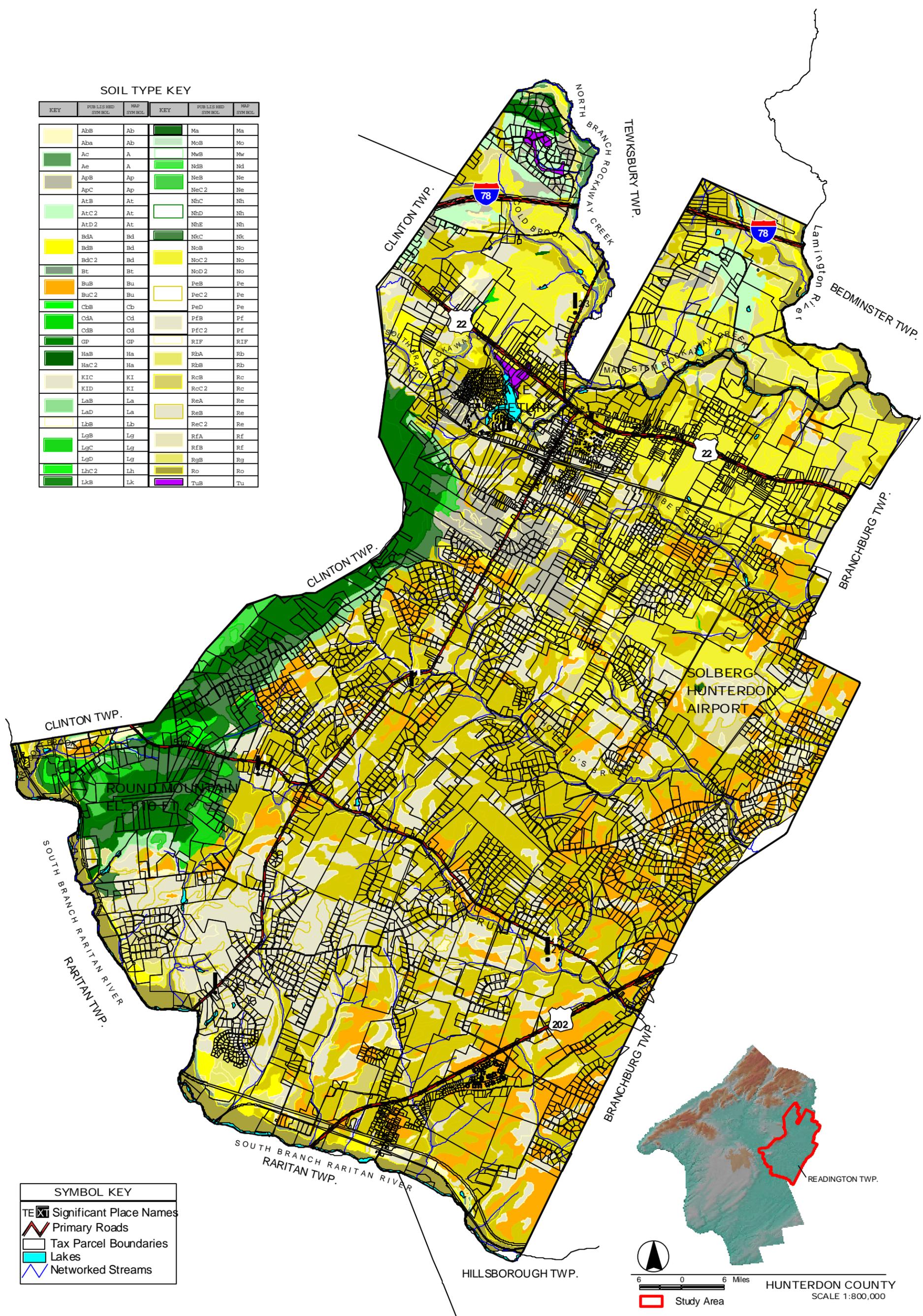
These approximations were based on topography, landscape features, historical land use patterns, and a visual interpretation of the vegetation type present. Inherent in this method were errors in the interpretation of the aerial photographs, particularly as they pertained to vegetation type.

Additional information to augment the 1974 soil survey is contained in the Soil Survey Manual (USDA 1981) where additional information on horizon designations, hydraulic conductivity classes and soil-water relations were, to a certain extent, amended. Field logs are also kept by local USDA/ National Resource Conservation District offices regarding Township-specific field verification surveys.

Another major factor contributing to variability is the method by which soil series are assigned. Although soil series provide the user with distinct boundaries between soil characteristics, soils in nature exhibit great variability within a series, and therefore represent more of a gradient of characteristics rather than a distinct type. Many “marginal” soils that exhibited characteristics of one or more established series were arbitrarily assigned to a series. Furthermore, soil types that did not exhibit characteristics typical of any established soil series were arbitrarily assigned to any number of the more inclusive soil series. Finally, due to their scale, most soil maps cannot show contrasting soil types that are less than 3 to 4 acres in size. Soil types that occupy areas less than these are usually grouped together with the adjacent soil types. These limitations reveal the importance of ground-truthing soil survey data as part of the decision-making process.

SOIL TYPE KEY

KEY	PUB LIS SHED SYM BCL	MAP SYM BCL	KEY	PUB LIS SHED SYM BCL	MAP SYM BCL
AbB	Ab	Ma	Ma	Ma	
Aba	Ab	MoB	MoB	Mo	
Ac	A	MwB	MwB	Mw	
Ae	A	NdB	NdB	Nd	
ApB	Ap	NeB	NeB	Ne	
ApC	Ap	NeC2	NeC2	Ne	
AtB	At	NhC	NhC	Nh	
AtC2	At	NhD	NhD	Nh	
AtD2	At	NhE	NhE	Nh	
BdA	Bd	NkC	NkC	Nk	
BdB	Bd	NoB	NoB	No	
BdC2	Bd	NoC2	NoC2	No	
Bt	Bt	NoD2	NoD2	No	
BuB	Bu	PeB	PeB	Pe	
BuC2	Bu	PeC2	PeC2	Pe	
CbB	Cb	PeD	PeD	Pe	
CdA	Cd	PfB	PfB	Pf	
CdB	Cd	PfC2	PfC2	Pf	
GP	GP	RIF	RIF	RIF	
HaB	Ha	RbA	RbA	Rb	
HaC2	Ha	RbB	RbB	Rb	
KIC	KI	RcB	RcB	Rc	
KID	KI	ReC2	ReC2	Rc	
LaB	La	ReA	ReA	Re	
LaD	La	ReB	ReB	Re	
LbB	Lb	ReC2	ReC2	Re	
LgB	Lg	RfA	RfA	Rf	
LgC	Lg	RfB	RfB	Rf	
LgD	Lg	RgB	RgB	Rg	
LhC2	Lh	Ro	Ro	Ro	
LkB	Lk	TuB	TuB	Tu	

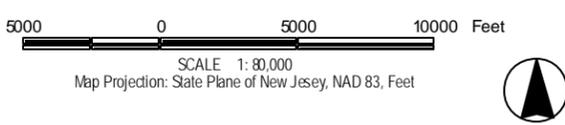


HUNTERDON COUNTY  
SCALE 1:800,000

**SYMBOL KEY**

TEXT	Significant Place Names
Primary Roads	Primary Roads
Tax Parcel Boundaries	Tax Parcel Boundaries
Lakes	Lakes
Networked Streams	Networked Streams

READINGTON TOWNSHIP, NRI, 2000



Soils coverage supplied by Township Planner, Caton, Clarke and Hintz, 1999, as extracted from the Master Plan.  
Scale (unknown)  
New Jersey, Department of Environmental Protection, GIS data  
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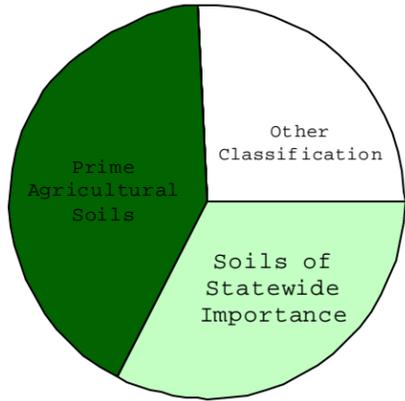
Map 8: Readington Township Soil Series Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.:	160.02

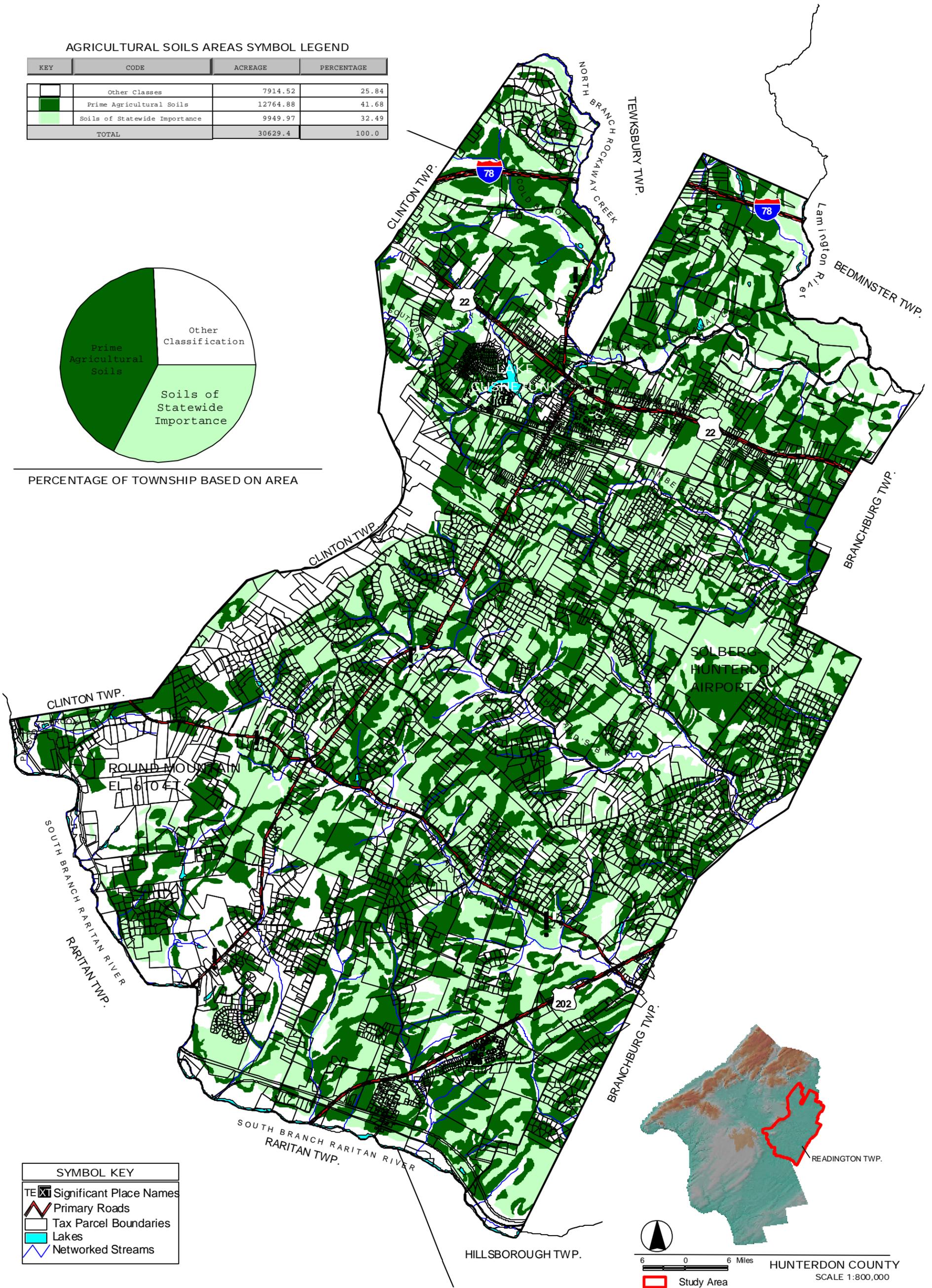


AGRICULTURAL SOILS AREAS SYMBOL LEGEND

KEY	CODE	ACREAGE	PERCENTAGE
	Other Classes	7914.52	25.84
	Prime Agricultural Soils	12764.88	41.68
	Soils of Statewide Importance	9949.97	32.49
TOTAL		30629.4	100.0



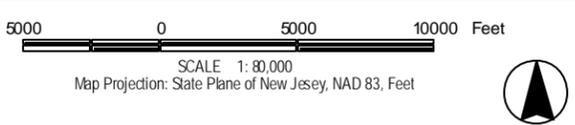
PERCENTAGE OF TOWNSHIP BASED ON AREA



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



READINGTON TOWNSHIP, NRI, 2000



Soils coverage supplied by Township Planner, Caton, Clarke and Hintz, 1999, as extracted from the Master Plan.  
 Scale (unknown)  
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 2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

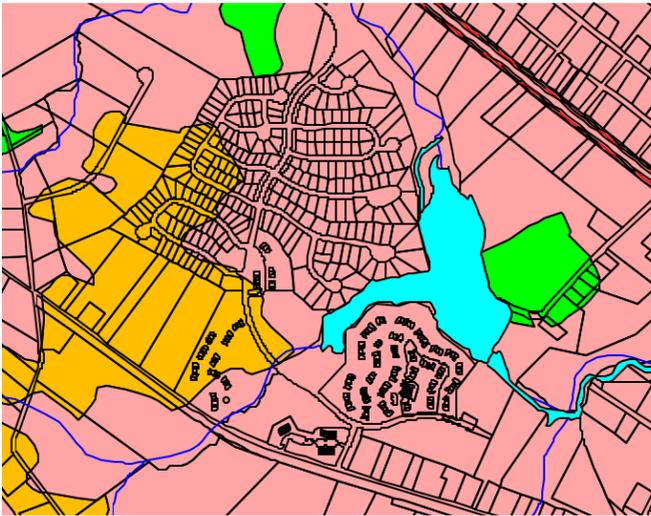
Map 9: Readington Township Agricultural Soils Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

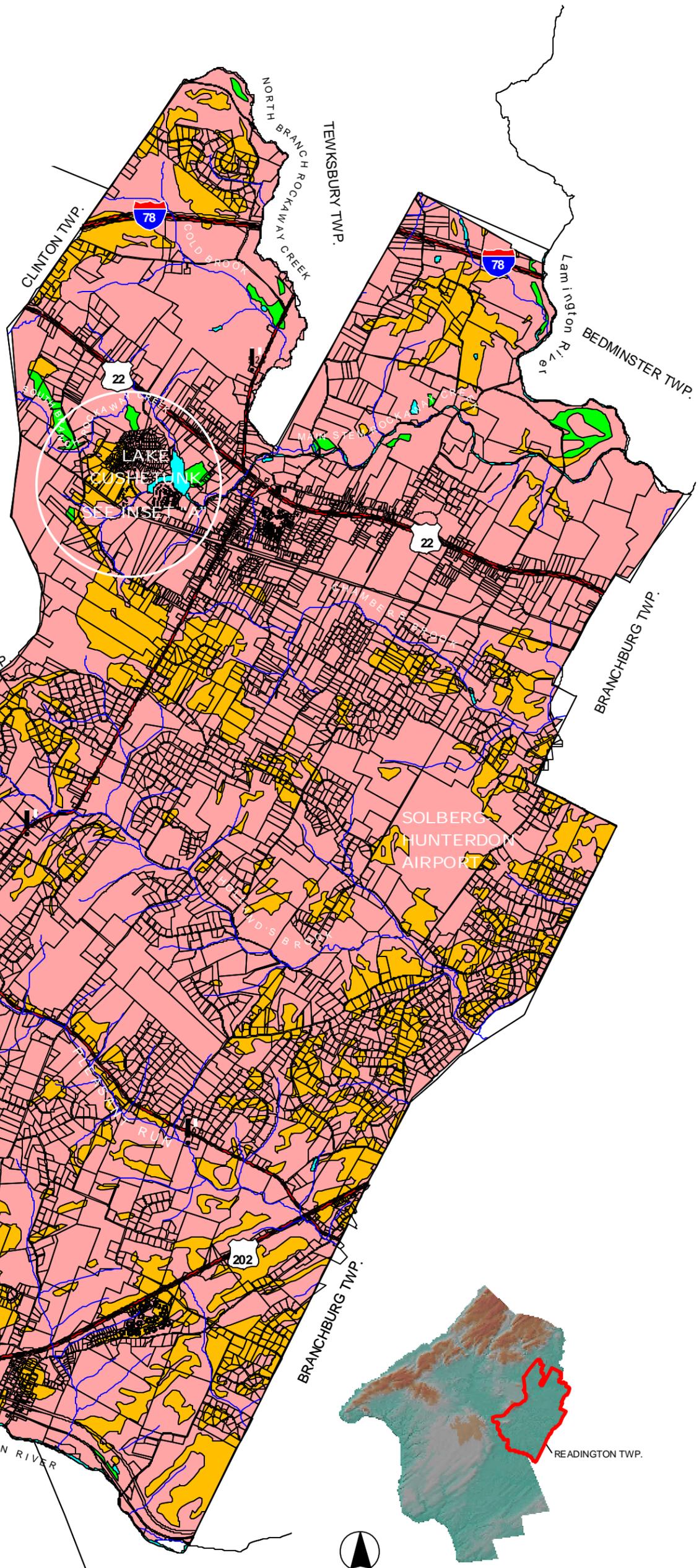
SEPTIC SUITABILITY AREAS SYMBOL LEGEND

KEY	CLASSIFICATION	ACRAGE	PERCENTAGE
	A- HIGHLY SUITABLE	378.27	1.24
	B- MODERATELY SUITABLE	5052.56	16.52
	C- NOT SUITABLE	25158.80	82.25
Total		30589.63	100.0



700 0 700 1400 Feet

INSET "A": LAKE CUSHETUNK  
SCALE 1:20,000



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



6 0 6 Miles  
Study Area

HUNTERDON COUNTY  
SCALE 1:800,000

READINGTON TOWNSHIP, NRI, 2000

5000 0 5000 10000 Feet  
SCALE 1:80,000  
Map Projection: State Plane of New Jersey, NAD 83, Feet



Soils coverage supplied by Township Planner, Caton, Clarke and Hintz, 1999, as extracted from the Master Plan.  
Scale (unknown)  
New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000  
TMP map, supplied by Yager and Associates.  
Scale (unknown)

NOTES:  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

Map 10: Readington Township Septic Suitability Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



*Flora, Fauna, and Critical Habitat ~*

**History of Vegetation**

The pattern and composition of plant communities in Readington Township has been highly influenced by man. When the Lenni Lenape Indians moved into New Jersey and the Raritan Basin, they cleared river valleys for villages and crop cultivation. Once European settlers arrived in the early 1600s, more forested lands were cleared for cultivation. By 1778, the forests of the Raritan Basin were completely cleared and the land was used for agriculture.

In Readington Township, land use patterns have shifted from rural/agricultural to residential. As a result, fields that were farmed for hundreds of years have been left fallow. In these areas where agriculture has ceased, the process of natural plant succession begins. The abandonment of fields at different times has created a patchwork of successional fields/grasslands, and woodland of various ages throughout the Township. Temporal habitats such as grasslands provide habitat to several rare bird species. The development of land for residential homes has had the most noticeable affect on the vegetation in the Township. This conversion of natural habitats to the maintained landscapes of residential communities also leads to a loss of wildlife species that depend on specific habitat for survival. The NJDEP, Division of Fish & Wildlife, Endangered & Nongame Species Program, has developed the Landscape Project in order to identify critical forested, forested wetland, emergent wetland and grassland habitats for endangered and threatened wildlife (Map 11). Man's influence on plant communities can also be seen in the presence of non-native invasive species in a variety of community types. Species such as Norway maple, princess tree, and garlic mustard are frequent components of forest communities. Invasive herbaceous species such as reed canary grass, and purple loosestrife dominate many wetlands. The spread of these opportunistic species tends to reduce the species richness of local communities.

**Forestland Today**

The Piedmont section of the Raritan Basin contains mixed oak, mesic woodlands and hardwood swamps. Approximately 32% of the subwatersheds of the Upper Raritan Watershed Management Area (WMA) contain greater than 50% vegetative cover. The Upper Raritan WMA currently possesses 36% forest cover. Typically forests in Readington Township are found in areas with steep slopes (15% - greater than 40% slopes) (Maps 6 and 16). Round Mountain, with an elevation of 610 feet, the highly sloped area bordering Clinton Township, and the northern corner of Readington Township below the North Branch Rockaway Creek, are covered in coniferous and deciduous forest. Holland's Brook and its tributaries, as well as Pleasant Run and its tributaries, have land with 15% to 25% slopes along their edges. This land is also forested in patches and corridors.

The forest of Readington Township are host to wood turtle, (State-listed threatened species), bald eagle (Federally-listed threatened species), and cooper's hawk, (State-listed threatened species).

### **Grassland Today**

Grasslands are expansive open areas, which may be cultivated or fallow. They are often the most easily developed areas due to the lack of protection ordinances and lack of physical building constraints. As a result, many of the grassland species are either threatened or endangered, making the Readington Township grasslands unique and valuable natural resources. Many bird species find nesting and over-wintering spots in the grasslands of Readington Township. Species identified as nesting in the Township include grasshopper and savannah sparrows (State-listed threatened species), bobolink, (State-listed threatened species), vesper sparrow, and upland sandpiper (State-listed endangered species). As of 1995, agricultural land occupied approximately 25.1% of the land cover of the Upper Raritan WMA.

### **Historical Fauna Information**

White-tailed deer, elk, black bear, turkey, beaver, and other animals were hunted by the Lenni Lenape Indians. When the Dutch settlers arrived, there were reports that elk, rabbits, foxes, wolves, wild cats, squirrels, beavers, minks, otters, skunks, bears, shad, bass and sturgeon were common in the area. By the mid-eighteenth century, panther, deer, bear, wolves, wild cats, red and gray foxes, raccoons, and otters became scarce in New Jersey due to hunting and trapping for the fur trade.

### **Fauna Today**

Readington Township possesses a variety of distinct terrestrial and aquatic plant communities. The species richness of the Township is anticipated to be relatively high due to the presence of a variety of habitat types, and the structural diversity associated with woodlands of various ages, composition and sizes. As a result of the diversity of community types, the Township provides suitable habitat for a number of wildlife species. Although portions of the Township is relatively highly suburbanized the presence of extensive areas of contiguous forest provide suitable habitat for a variety of rare and sensitive species such as certain neotropical migrant birds and larger mammals. However, the current landscape complexity of the Township does not always lead to positive wildlife experiences. Due to the juxtaposition of woodlands and open fields or lawns, species such as Virginia white tailed deer have become increasingly abundant and has led to increased conflicts with man.

Aquatic communities include lakes, small ponds, streams and rivers. Each of these community types provide distinct habitats and thus support populations of different species. Due to the presence of a diversity of aquatic habitats the aquatic species present in the Township is

relatively rich. A list of wildlife species anticipated to utilize the site is provided in Appendices A and B. A list of birds of Hunterdon County is included in Appendix C.

White-tailed deer, woodchuck, eastern cottontail, striped skunk, Virginia opossum, raccoon, eastern gray squirrel, and eastern chipmunk have been reported throughout the Raritan Basin. Fish, including channel catfish, large and smallmouth bass, northern pike, bluegill, crappie, carp, perch, and trout can be found in the Basin. There are four Natural Heritage priority wildlife sites in the Raritan Basin, one of which is Solberg Airport in Readington Township.

### **Role of Habitat in Determining Community Structure**

The plants and animals inhabiting a region, such as the area within a Township's boundaries, are the aggregate of the various biotic communities occupying the different habitat types present (Robichaud and Buell 1973). These habitat types have been determined by the geology and climate of the region, as modified by natural and human disturbance. The greater the diversity in habitat types, the greater the diversity in the resulting biological communities.

There is also great ecological value in communities displaying qualities other than diversity. Such areas may display low habitat and species diversity, but may serve to function as an important component to the surrounding communities or region. These benefits include, but are not limited to, satisfying the habitat requirements for a portion of an organism's life cycle, ameliorating the effects of erosion or flooding, or often overlooked, providing the necessary edge habitat (i.e., ecotone) for whichever community it is adjacent to; edge habitat typically exhibits the greatest species richness (total number of different species) for an area (Smith 1986).

### **Rare, Endangered, Threatened, and Locally Significant Flora and Fauna**

In the Natural Heritage Database, as of August 14, 2002, a total of seven protected bird species, two protected amphibian species, and one protected plant species are documented to have been observed in Readington Township (Appendix A). Along with the results of the Readington Township database search, the explanations of the codes and the full list of Hunterdon County species, can be found in Appendix A. The general location of threatened and endangered species and state designated critical habitat are mapped in this inventory (Map 11). The species are listed in Table 2.3 and a more detailed description of the species can be found in Appendix B. The exact location of a listed species is not available to the public since many of the species can be impacted by human activities and collection.

**Table 2.3 Natural Heritage Index Rare & Endangered Species<sup>1</sup>**

Scientific Name	Common Name	Federal Status	State Status	Number of Sightings	Date Last Observed	Watershed/ Subwatershed Area
<i>Birds</i>						
<i>Accipiter cooperii</i>	Cooper's Hawk	NA	Threatened	1	July 7, 1991	Pleasant Run
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Formerly threatened	Endangered	1	June 24, 1996	Lamington River
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	NA	Threatened	5	July 18, 1996	Raritan (South Branch) and Lamington Rivers
<i>Passerculus sandwichensis</i>	Savannah Sparrow	NA	Threatened	4	July 18, 1996	Raritan (South Branch) and Lamington Rivers
<i>Poocetes gramineus</i>	Vesper Sparrow	NA	Endangered	3	June 28, 1996	Raritan River (South Branch)
<i>Bartramia longicauda</i>	Upland Sandpiper (formerly Upland Plover)	NA	Endangered	2	1982	Raritan (South Branch) and Lamington Rivers
<i>Dolichonyx oryzivorus</i>	Bobolink	NA	Threatened	4	July 18, 1996	Raritan (South Branch) and Lamington Rivers
<i>Reptiles</i>						
<i>Clemmys insculpta</i>	Wood Turtle	NA	Threatened	3	June 1999	South Branch Rockaway Creek
<i>Clemmys muhlenbergii</i>	Bog Turtle	Formerly threatened	Endangered	1	April 1998	Raritan (South Branch) River

<sup>1</sup> Information provided is per the Natural Heritage Data Base. Readers should be aware that the index is periodically updated and doesn't reflect recent local sightings of threatened or endangered species, for example the Chambers Brook wood turtle sighting in 2000. Please refer to the NJ Natural Heritage Database on Threatened or Endangered Species for Hunterdon County (Appendix A).

Scientific Name	Common Name	Federal Status	State Status	Number of Sightings	Date Last Observed	Watershed/ Subwatershed Area
<i>Plants</i>						
<i>Triosteum angustifolium</i>	Narrow-leaved Tinker's Weed	NA	Endangered	1	August 26, 1937	Raritan (South Branch) River

The Cooper's hawk primarily inhabits deciduous forests, and to a lesser degree, coniferous forests, particularly if interrupted with meadows and clearings, providing the much needed aforementioned edge habitat. The bald eagle nests in or on the forest edge, and within close proximity to a large body of water. The grasshopper sparrow, savannah sparrow, vesper sparrow, upland sandpiper (formerly upland plover), and bobolink are all considered to be grassland birds, requiring open habitats with some species-specific preferences. The grasshopper sparrow requires large, open fields with little or no woody growth and tends to prefer dry fields that are sparsely vegetated. In contrast, the savannah sparrow and bobolink nest in densely-vegetated, lush, moist, fallow fields or hayfields with little or no bare ground. The upland sandpiper and vesper sparrow share similar habitats, and are often found together. Although both species require expansive open habitats, the upland sandpiper is relatively more dependent on the presence of tall grass, in addition to short grass. All of these bird species require some structure (e.g., fenceposts or natural structure) in their habitat to serve as an elevated perch for singing males.

In New Jersey, the bog turtle inhabits hummocky wetlands that possess greater than 60 percent open canopy. These wetlands are dominated by herbaceous vegetation (sedges and grasses) growing on soft soil, fed by perennial springs or seeps. These hummocks may be formed by vegetation, soil, or rotting tree stumps. The wood turtle, also known as "red-leg", prefers clean, unpolluted streams within or near hardwood swamps or wet floodplains. The narrow-leaved tinker weed (also known as horse-gentian, feverwort, feverfew, and wild coffee) is a coarse plant reaching 30 inches in height, with yellowish flowers in late spring and summer, and orange or red berries. It is found in moist woods and thickets.

**Locally Significant Habitat**

The NJ Natural Heritage Database also notes that the Solberg-Hunterdon Airport and surrounding open space are designated as a Natural Heritage Priority Site (Appendix A). A Natural Heritage Priority Site is a critically-important area for conserving biological diversity. Considered as environmentally-sensitive land, these sites contain some of the best and most viable occurrences

of protected species and natural communities. They do not, however, cover all of the known habitat for endangered and threatened species in the Township. The boundaries of the Solberg Airport site were established to include nesting habitat for one State endangered and three State threatened bird species. Each site is ranked according to its significance for biological diversity, ranging from B1 to B5. Ranks B1 to B3 are generally of global interest; ranks B4 and B5 are of state significance. The site is currently ranked as "B5", described as "of general biodiversity interest". Solberg Airport is currently the only Natural Heritage Priority Site in Readington Township.

The Natural Heritage Database also indicates areas in Readington Township that have documented habitat that is considered to be suitable for protected species (Map 11). Known as Natural Heritage Index Maps, these areas are depicted as the shaded rectangles in a computer-generated grid, with each rectangle measuring 330 acres in size. This grid overlay is intended to be used as a general guide to point to areas which may be of significance for endangered biological diversity. To use this tool, a proposed project is located on the Natural Heritage Index Map, and noted as to whether it is documented to contain potentially suitable habitat for protected species. The Natural Heritage Program may then be contacted for information specific to that grid, albeit some of the data may be confidential.

The Natural Heritage Index Maps indicate that documented suitable habitat for protected species tends to be located at the northern and southern ends of Readington Township, but conspicuously absent from the center of the Township. The documented areas appear to be distributed over a range of habitats including, but not limited to, forested areas as well as open areas, open water, agricultural land, and developed land.

However, the low resolution of the Natural Heritage Index Maps (330-acre sized grids) precludes any definitive statements as to the specific habitats that are documented, and updated information (beyond 1999) is not yet available. As stated in the above paragraph, the Office of Natural Lands Management should be contacted for grid-specific information that is available to the public.

### **Landscape Level & Critical Area Mapping Information**

In 1994, the New Jersey Division of Fish and Wildlife (Endangered and Non-game Species Program) adopted a landscape level approach to the protection of rare species. The program goal is to protect biological diversity and functioning ecosystems. The philosophy of the program is that protection of threatened, endangered and rare species can only be accomplished if the *habitat supporting the species* is protected. Priority species include all state and federally listed wildlife. In some cases selected non-listed, area-sensitive species are included (e.g. neotropical migrant land birds) but assigned less priority.

The “landscape level perspective” is upon large areas called landscape regions that support ecologically similar plant and animal communities. New Jersey’s landscape regions include: the Delaware Bay, the Pinelands, the Piedmont Plains, the Skylands, and the Atlantic Coastal areas. Readington Township falls within the *Skylands Landscape Region* (NJDEP <http://www.state.nj.us/dep/fgw/ensp/pdf/landbro.pdf>).

The Skylands landscape region includes all or part of Hunterdon County. The region contains contiguous and extensive tracts of forests that support diverse wildlife communities that include such rare species as red-shouldered hawk, goshawk, cerulen warbler, timber rattlesnake and long-tailed salamander. Within the freshwater wetland system in the Skylands Landscape, bog turtles and great blue herons are found.

The New Jersey Landscape Program personnel also created GIS mapping for the forest, wetland and grassland habitats. Although there is an overlap between the forest and wetland habitat coverages, the species ranking methodology accounts for the overlap. For instance, species requiring forested wetlands for survival are included in the wetland mapping and ranking, while those requiring forested habitats are included in the forest mapping coverages. The resulting mapping combines rare species location information with land use/land cover classification data. It delineates contiguous patches for each habitat, and then intersects the threatened and endangered species location data with the habitat patches. The GIS coverages identify and map areas of critical habitat for rare species within each landscape region. The information “provides a highly accurate, reliable and scientifically sound bases for habitat protection within each landscape” (NJDEP <http://www.state.nj.us/dep/fgw/ensp/pdf/landbro.pdf>). Each critical area classification (e.g., wetland, grassland, and forest) contains five (5) priority ratings ranging from “lower priority” to “higher priority”. The habitat mapping for Readington (Map 11) indicates that there are several critical forest, wetland, and grassland habitats throughout the Township. They are listed below and illustrated on the map.

- **Critical Forest Habitat, Round Valley Reservoir** - A critical forested area (approximately 1,018 acres/.75 square miles) is located east of Round Valley Reservoir. It contains priority species, is adjacent to conserved areas, and contains contiguous forests undivided by major roads.
- **Critical Wetland Habitat, North & South Branches & Main Stem Rockaway Creek** - Priority is given to forested wetlands associated with documented threatened and endangered species, adjacent to preserved areas, and containing buffer areas adequate enough to support certain wetland species (e.g., Wood turtle, Tremblays salamander). High priority forested wetlands are located on the North and South Branches of the Rockaway Creek. A larger, critical wetland area (approximately 252 acres/.4 square miles) is situated along the Main Stem Rockaway Creek and east of Mill Road.

- **Critical Grassland Habitat, Island Road & Solberg Airport Area** - Critical areas for grassland-dependent species and open habitat (approximately 1,018 acres/2 square miles) are located in the northeast portion of the Township adjacent to Island Road, Meadow Road and the Lamington River. Critical grassland habitat is also located in the vicinity of Solberg-Hunterdon Airport, Readington Road, and Pine Bank Road (approximately 287 acres/.50 square miles).

Additional information regarding critical habitat is contained on Map 11.

### **Critical Wildlife Habitat**

Development along the Route 22 corridor in Readington Township, has impacted the presence and availability of critical wildlife habitat along sections of Rockaway Creek and the Lamington River. This has in turn contributed to a reduction in critical wildlife habitat associated with the North Branch Raritan River, which supports the lowest percentage of critical habitat in the Upper Raritan WMA. To date critical wildlife habitat loss has not been as great along the tributaries of the South Branch Raritan River or the South Branch itself. However, with the expansion of Route 31, and continuing land development activities within the Township itself, the potential for the loss of such habitat along these waterways.

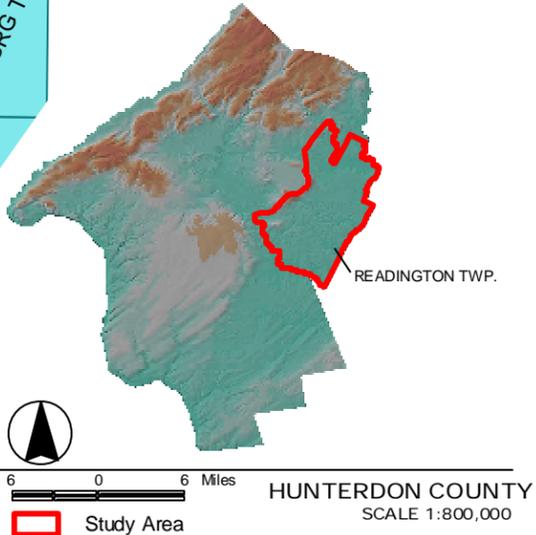
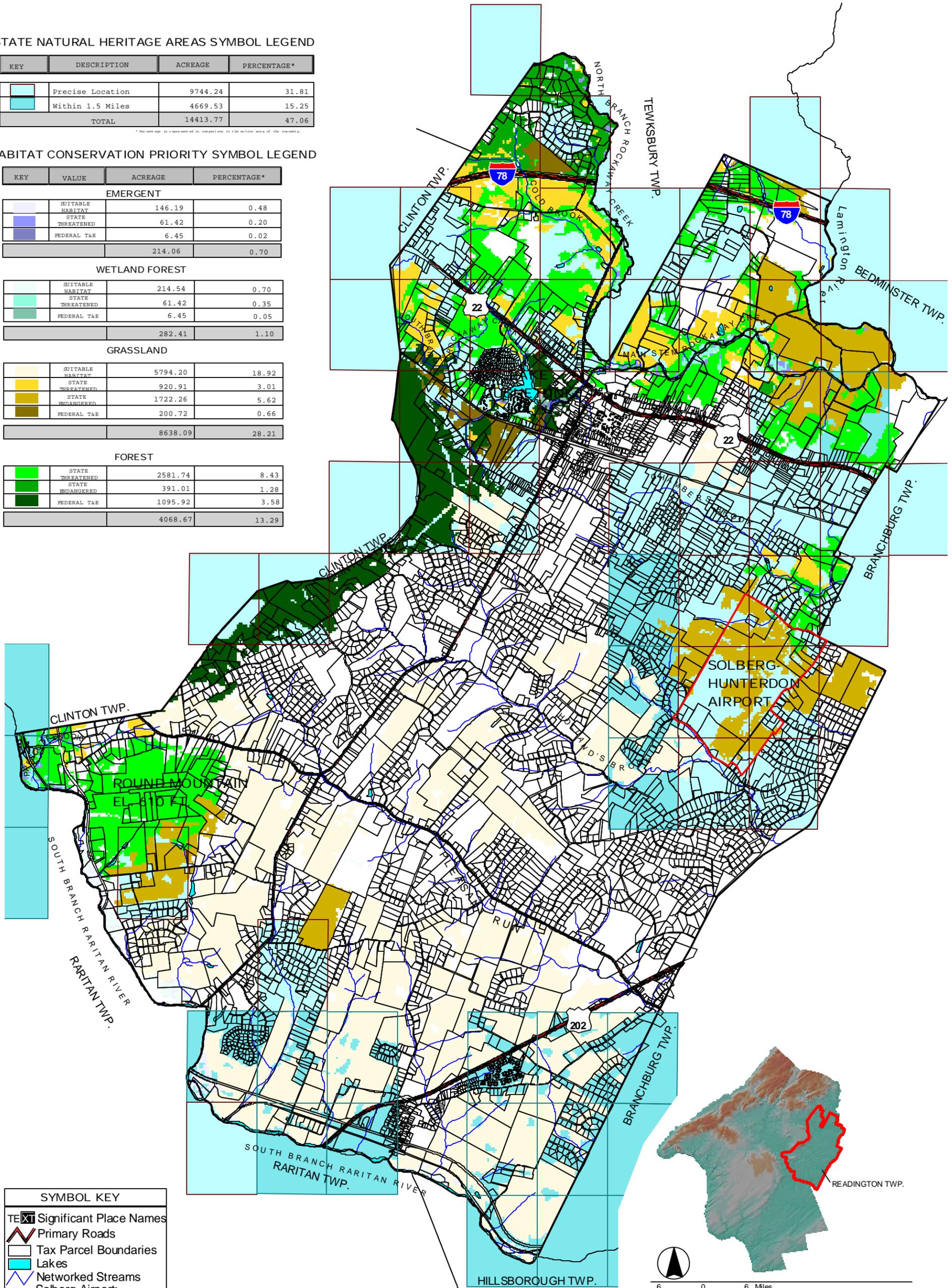
STATE NATURAL HERITAGE AREAS SYMBOL LEGEND

KEY	DESCRIPTION	ACREAGE	PERCENTAGE*
	Precise Location	9744.24	31.81
	Within 1.5 Miles	4669.53	15.25
	<b>TOTAL</b>	<b>14413.77</b>	<b>47.06</b>

\* Per cent age is a represent of in comparison to the entire area of the township.

HABITAT CONSERVATION PRIORITY SYMBOL LEGEND

KEY	VALUE	ACREAGE	PERCENTAGE*
<b>EMERGENT</b>			
	SUITABLE HABITAT	146.19	0.48
	STATE THREATENED	61.42	0.20
	FEDERAL T&E	6.45	0.02
	<b>TOTAL</b>	<b>214.06</b>	<b>0.70</b>
<b>WETLAND FOREST</b>			
	SUITABLE HABITAT	214.54	0.70
	STATE THREATENED	61.42	0.35
	FEDERAL T&E	6.45	0.05
	<b>TOTAL</b>	<b>282.41</b>	<b>1.10</b>
<b>GRASSLAND</b>			
	SUITABLE HABITAT	5794.20	18.92
	STATE THREATENED	920.91	3.01
	STATE ENDANGERED	1722.26	5.62
	FEDERAL T&E	200.72	0.66
	<b>TOTAL</b>	<b>8638.09</b>	<b>28.21</b>
<b>FOREST</b>			
	STATE THREATENED	2581.74	8.43
	STATE ENDANGERED	391.01	1.28
	FEDERAL T&E	1095.92	3.58
	<b>TOTAL</b>	<b>4068.67</b>	<b>13.29</b>



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams
	Solberg Airport
	Natural Heritage Priority Site

READINGTON TOWNSHIP, NRI, 2000



Natural Areas Information provided by NJ Department of Environmental Protection Office of Natural Lands Management, Natural Heritage Program and converted by pH. Scale 1:24,000  
 New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey Scale 1:100,000  
 TMP map, supplied by Yager and Associates. Scale (unknown)  
 Niles, L.J., J. Myers, and M. Valent. 1999. The Landscape Project for the Protection of Rare Species. Project Report. Endangered and Nongame Species Program, New Jersey Division of Fish and Wildlife, New Jersey Department of Environmental Protection. Pp. 26, v. 1.0 Scale 1:24,000

NOTES:  
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Map 11: Readington Township Natural Heritage Database Features and Critical Habitat

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	



## **Vernal Pools**

A vernal pool is a closed depression that lacks a permanent above ground outlet. In New Jersey, the pool typically is covered with ice during the winter months; and then filled with meltwater and stormwater runoff from winter and spring snow and rain. In the late summer, a vernal pool is generally dry. Because of this seasonal dry down, a vernal pool cannot support breeding populations of fish. It is due to the ephemeral flooding of these depressions and the absence of fish that make these areas unique habitats important to a variety of amphibians.

Those species that have evolved to use these seasonally inundated wetlands, where they will not be eaten by fish, are the “obligate” vernal pool species. They must use a vernal pool for various parts of their lifecycle. In turn, if an obligate species is using a body of water, that water is a vernal pool.

According to NJAC 7:7A-1.4., four criteria must be satisfied to define a vernal habitat:

- Occurs in a confined basin depression without a permanent flowing outlet
- Features evidence of breeding by one or more species of fauna adapted to reproduce in ephemeral aquatic conditions
- Maintains ponded water for at least two continuous months between March and September of a normal rainfall year
- Is free of fish throughout the year, or dries up at some time during the year

The NJDEP, Division of Fish and Wildlife, are coordinating with their staff and Rutgers University to determine location of vernal habitats throughout the State. Aerial photographs are used to determine likely areas for vernal pools. Field investigations are then conducted to evaluate the status of the area tentatively identified on the photographs as vernal pools. Local volunteers are then assigned to a spot to log records of observations, in order to see if the aforementioned criteria are met.

In the USGS Flemington NJ Quad, there are three vernal pools listed in Raritan. There are, however, no certified pools in Readington Township. This does NOT mean that there are not any pools, it is just that the Land Use Regulation Program (LURP) and the local volunteers, have not had the time to find them yet. The vernal pool program, whose purpose is to determine if an area meets the definition of a “vernal habitat”, and to place the area on a DEP list of certified vernal habitats, has only been around for 1 year. It will take time to find all of the sites.

A more in depth description of the LURP Freshwater Wetlands Vernal Habitat Protocol, along with the Flemington NJ Quad map, is included in Appendix D.

Historic Features In Readington Township ~

***An Essential Fact of Historic Preservation Is That, Unlike Many Other Endeavors, Its Absence is Often the Most Compelling Argument For Its Existence. In Fact, After an Important Historic Resource Is Lost, People Inevitably Question Why It Wasn't Saved.***

***~ NJ Historic Preservation Office ~***

Readington Township has a rich history. Historic documents note that colonial settlement began as early as 1710 and that the area experienced decades of rural agrarianism (Stephanie Stevens, personal communication). The arrival of railroads in 1847 gave rise to some commerce and industry. As a result, the Township has a number of significant historic features it wishes to protect. In fact, the historic preservation goal included in the Township Master Plan (Clarke & Caton 1990) is to *protect significant historic sites and villages through the preservation of structures.*

Readington Township was created by Royal Charter 15 July 1730. Its government commenced shortly thereafter and has continued uninterrupted to the present.

Located on the riverfront of the South Branch of the Raritan, the oldest remaining house in Readington is the Ryerson house. This lovely Dutch style house dates from c. 1733.

Readington has five National Register Historic Districts: Potterstown Rural Historic District, Taylor's Mill Historic District, Stanton Rural Historic District, Readington Village Historic District and South Branch Historic District. Along with the districts, the Readington Train Station Library is a National Register Building.

Throughout the Township there are hundreds of buildings that are listed in the Historic Sites of Hunterdon County book which was adopted as the historic element of the Hunterdon County Master Plan. Subsequently, Readington Township adopted the Readington element and incorporated it into their Master Plan. Several additional structures were added during the Master Plan review of 1990.

Along with structures, there are 13 private "burying" (family) grounds remaining with gravestones dating from 1744 to the late 19<sup>th</sup> century. These are recorded and located on private property.

A barn survey to identify remaining New World Dutch barns in the Township was conducted during 1995. Although it did not include all of the Township barns, the most endangered structures were identified and architectural drawings rendered. This is an ongoing survey which will be

completed in the future.

During 2000-01 all of the farms in Readington were photographed. These photos are the property of the Hunterdon County Cultural and Heritage Commission and will be available on request. All of the old farms with attendant outbuildings are historic.

- **Roads:** Traversing Readington are historic roads. Old York Road is one of the oldest roads in America. It connected Philadelphia to Elizabethtown and subsequently New York City. Centerville was the stop for the pre-revolutionary Swift Sure Stage Coach Line and the horse barn remains as an historic site. Old Highway in White House was the “Raritan Path” eventually the “County Road” and then in 1806 the original New Jersey Turnpike.
- **Mills:** Colonial Mill Sites in Readington are marked with blue historic signs. They are also recorded in the book “Forgotten Mills of Readington” by Township Historian Stephanie Stevens. Taylor’s Mill on Rockaway Road is a ruin. It is on the National Register due to its Revolutionary War involvement.
- **Schools:** Several one-room schoolhouses remain although they are in private hands. At one time there were eleven one-room schoolhouses; by the 1950's children were transported to consolidated schools and the one roomers were sold. Cold Brook School, an 1828 one-room stone schoolhouse was restored by volunteers and serves as a Township museum.
- **Villages:** Potterstown, White House, Whitehouse Station, Dreahook, Readington, Stanton, Pleasant Run, Centerville and Three Bridges are existing villages. Earlier times in our history they were centers of activity surrounded by farms.
- **Churches:** Readington Reformed Church parish is the earliest remaining parish in the Township having been established in 1719 in North Branch. The congregation moved to Readington c. 1738. Present church is the third building in the village.

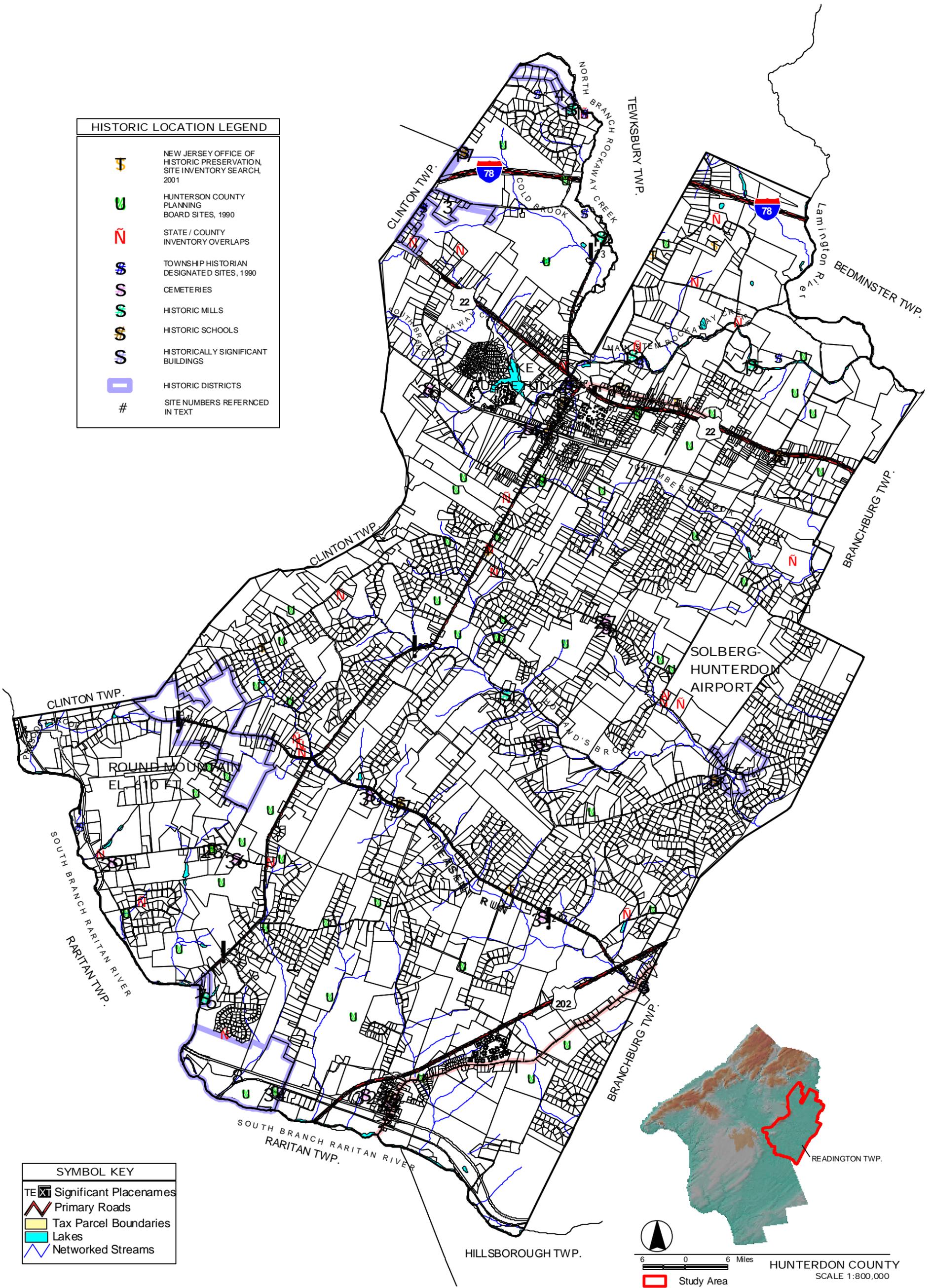
The New Jersey State Office of Historic Preservation (NJDEP) was consulted for an inventory listing of historic sites. The search resulted in over fifty (50) historic places. The majority of sites are dwellings constructed during the eighteenth and nineteenth centuries.

The Hunterdon County Master Plan contains a “Sites of Historic Interest” element and contains over ninety historic sites, structures, and villages within Readington Township. The determination is based upon history, architecture, setting, and use.

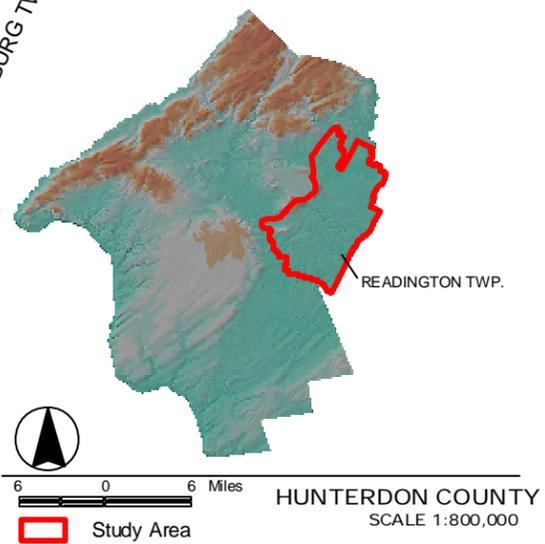
The following map contains historic sites on the New Jersey State list, the Hunterdon County

list, and a list prepared in 1990 by the Township historian. The majority of sites are noted on the cultural historic features map on the next page with the exception of those sites on the state register with outdated lot and block numbers (Map 12).

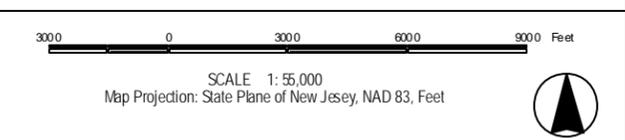
HISTORIC LOCATION LEGEND	
	NEW JERSEY OFFICE OF HISTORIC PRESERVATION, SITE INVENTORY SEARCH, 2001
	HUNTERSON COUNTY PLANNING BOARD SITES, 1990
	STATE / COUNTY INVENTORY OVERLAPS
	TOWNSHIP HISTORIAN DESIGNATED SITES, 1990
	CEMETERIES
	HISTORIC MILLS
	HISTORIC SCHOOLS
	HISTORICALLY SIGNIFICANT BUILDINGS
	HISTORIC DISTRICTS
#	SITE NUMBERS REFERNCED IN TEXT



SYMBOL KEY	
	Significant Placenames
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



**READINGTON TOWNSHIP, NRI, 2000**



Historic/ Cultural Information Adapted from tabular Lists of Historic Locations from: State, County and Township Levels.  
 Scale N/A  
 New Jersey, Department of Environmental Protection, GIS data  
 Web Site Downloads State Municipalities of New Jersey  
 Scale 1:100,000  
 TMP map, supplied by Yager and Associates.  
 Scale (unknown)

NOTES:  
 1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
 2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

Map 12: Readington Township Cultural / Historical Features Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02
Project No.: 160.02	

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## Readington Township Surface Water Resources ~

Readington Township lies within the Upper Raritan Watershed Management Area (NJDEP Watershed Management Area #8). Consisting of the North Branch and the South Branch of the Raritan River and encompassing over 1,000 square miles, the Raritan River watershed is the largest river basin contained fully within New Jersey. This important surface water resource provides a variety of functions. It is an important supply of potable water, provides various forms of recreation and serves as habitat for numerous species, including some recognized as threatened and endangered. It is also a surface water system that has had its share of problems and impacts, most of which can be directly traced to development of the watershed. Composing these surface waters are streams, lakes, ponds, wetlands, and floodplain areas. Inherently associated with these surface waters are other important resources such as groundwater, aquifers and aquifer recharge areas. This section of the Environmental Resource Inventory investigates and discusses these vitally important, yet often threatened and compromised, resources.

### **Surface Water Resources**

#### **Sub-Watersheds and Major Waterways**

There are a number of major streams, all of which are part of the Upper Raritan Watershed, that either originate or flow through Readington Township. Specifically these are the South Branch Raritan River, the North Branch Rockaway Creek, South Branch and Main Stem Rockaway Creek, Pleasant Run, Holland's Brook, Chambers Brook, Lamington River, and Prescott Brook (Table 2.4). There are several small lakes and ponds in the Township. Lake Cushetunk is the only major impoundment. Totaling approximately twenty-four acres, and located in the northern sector of Readington Township (Map 13), the lake was formed by the damming of the South Branch Rockaway Creek. In terms of land area, the following table indicates the approximate watershed area associated with each of the Township's major rivers and streams.

**Table 2.4 Sub-watershed Area for Each Major Waterway**

Sub-watershed Areas	Drainage Area Occurring Within Township (Acres)
South Branch, Raritan River	10,414
North, South Branch & Main Stem Rockaway Creek	6,046
Pleasant Run	5,033
Holland's Brook	5,848
Chambers Brook	3,956
Lamington River	847
Prescott Brook	66

The northern third of the Township is part of the North Branch Raritan drainage system. Contained within this system are the North and South Branch of Rockaway Creek, the Main Stem of Rockaway Creek, Lamington River and Chambers Brook. The southern approximate two thirds of the Township are part of the South Branch Raritan drainage system. Contained within this system are Pleasant Run, Prescott Brook and Holland's Brook.

**Water Quality of Readington Townships Streams**

NJAC 7:9B includes a classification scheme for all the surface waters of the State. The classification scheme is intended to establish the designated uses for a particular waterbody as determined by its current water quality condition. NJAC 7:9B also provides specific standards for given water quality parameters ranging from those associated with the support of aquatic life (e.g., pH, dissolved oxygen and temperature) to nutrients (total phosphorus) and contaminants (e.g., total suspended solids, petroleum hydrocarbons and arsenic). Primary regulatory goals include maintaining and protecting exceptional waterways, and improving degraded waterways through pollution discharge limitations (e.g., anti-degradation). The authority for the protection and management of the quality and associated attributes of the surface waters of Readington Township are via the New Jersey Water Pollution Control Act (NJSA 58:10A-1 et seq) and The Water Quality Planning Act (NJSA 58:11A-1 et seq) as well as the Federal Clean Water Act. Table 2.5 provides a summary of the existing classifications for the surface waters of Readington Township (Map 13).

**Table 2.5 Surface Water Length, Classification & Designated Uses As Per NJAC7:9B**

Surface Water Resource	Total River Length (Mi) <sup>1</sup>	Drainage Basin (Acres) <sup>1</sup>	Stream Reach	Classification <sup>2</sup>
South Branch, Raritan River	116	25,466	Source to dam north of Flanders-Drakestown Rd, and two tributaries originating north and east of Budd Lake Airfield	FW2-NT (C1)
			Dam to confluence with Turkey Brook	FW2-TM (C1)
			Confluence with Turkey Brook to Rt. 512 bridge	FW2-TP (C1)
			Rt. 512 bridge to downstream end of Packers Island, except segment described below	FW2-TM
			Rivers and tributaries within Ken Lockwood Gorge Wildlife Management Area	FW2-TM (C1)
			Downstream end of Packers Island to confluence with North Branch, Raritan River	FW2-NT
North Branch Rockaway Creek	26	11,173	Source to Rt. 523 bridge	FW2-TP (C1)
			Rt. 523 bridge to confluence with South Branch	FW2-TM
South Branch Rockaway Creek <sup>3</sup>	44	14,103	Headwaters and associated tributaries to Lake Cushetunk	FW2-TM (C1)
			Lake Cushetunk to confluence with Main Stem Rockaway Creek	FW2-TM
Main Stem Rockaway Creek	6	4,833	Confluence of North and South Branches to Lamington River	FW2-NT
Pleasant Run	17	6,919	Entire length	FW2-NT

<sup>1</sup> As per NJDEP GIS database.

<sup>2</sup> FW2-NT (C1) - Fresh Water Category Two, Non-Trout, Category One  
 FW2-TM (C1) - Fresh Water Category Two, Trout-Maintenance, Category One Waters  
 FW2-TP (C1) - Fresh Water Category Two, Trout-Production, Category One Waters  
 FW2-TM - Fresh Water Category Two, Trout-Maintenance  
 FW2-NT - Fresh Water Category Two, Non-Trout

<sup>3</sup> As per proposed NJDEP administrative rule, published in the NJ Register, Monday, 18 November 2002.

Surface Water Resource	Total River Length (Mi) <sup>1</sup>	Drainage Basin (Acres) <sup>1</sup>	Stream Reach	Classification <sup>2</sup>
Holland's Brook	18	7,966	Entire length	FW2- NT
Chambers Brook	8	6,583	Entire length	FW2-NT
Lamington River	12	8,948	Source to Rt. 206 bridge	FW2-NT (C1)
			Rt. 206 bridge to confluence with Rinehart Brook	FW2-TM (C1)
			Confluence with Rinehart Brook to Camp Brady bridge, Bedminster	FW2-TP (C1)
			Camp Brady bridge to Rt. 523 bridge	FW2-TM
			Rt. 523 to North Branch, Raritan River	FW2-NT
Prescott Brook	13	7,218	Entire length	FW2-TM

<sup>1</sup> As per NJDEP GIS database.

<sup>2</sup> FW2-NT (C1) - Fresh Water Category Two, Non-Trout, Category One  
 FW2-TM (C1) - Fresh Water Category Two, Trout-Maintenance, Category One Waters  
 FW2-TP (C1) - Fresh Water Category Two, Trout-Production, Category One Waters  
 FW2-TM - Fresh Water Category Two, Trout-Maintenance  
 FW2-NT - Fresh Water Category Two, Non-Trout

Assessing the quality and environmental status of surface water resources involves an understanding of the various types of environmental data used to measure and quantify water quality. These data are obtained by measuring a combination of stream attributes including physical features (e.g., stream depth, geomorphometry), hydrologic and hydraulic characteristics (e.g., stream base flow, stream peak flow, MAC CD10), chemical quality (e.g., dissolved oxygen, temperature, pH), and biological assemblage (e.g., macro-invertebrates, fish, algae and macrophytes). It is also determined by examining and measuring the types and amounts of contaminants (heavy metals, pesticides, aromatic hydrocarbons, sediment, bacteria, etc.). Once the data are obtained and analyzed, regulatory and non-regulatory management options can then be identified.

Water quality planning in New Jersey is guided by the Statewide Water Quality Management Program Plan. The plan originally divided New Jersey into twelve (12) water quality planning areas, however, there are now twenty (20) watershed management areas in the state. As previously mentioned, Readington Township is within the Upper Raritan Watershed Management Planning Area (WMA 8). The NJDEP is the lead agency authorized to carry out water quality planning within the WMA. However, as stakeholders, the Township, through the Environmental Commission, Planning Board and Township Committee, can take an active roll in crafting water resource planning and restoration initiatives for the Township's waterways and waterbodies. Furthermore, the Township, through ordinances and master planning, can develop a framework for the protection, enhancement and restoration of streams, lakes and ponds.

The New Jersey Surface Water Quality Standards are intended to primarily protect and maintain the quality of surface water resources relative to satisfying their designated uses. The standards can also be used to promote the improvement and restoration of degraded streams and lakes. It should be noted however that the Surface Water Quality Standards are in themselves allowable minimums or allowable maximums. That is, for some parameters, they establish the minimum conditions (for example, in the case of dissolved oxygen) that must be maintained for the sustenance of aquatic life or the satisfaction of a particular use. However, for contaminants the values presented in the Surface Water Quality Standards represent the current maximum allowable concentration. The allowable concentrations for some parameters may be designed to protect human health while for others they represent concentrations above which impairment to aquatic life or intended use will occur. Permits are required for any discharge of pollutants (e.g., treated sewage effluent, stormwater) into rivers, creeks, and lakes. The goal of the permit program, New Jersey Pollutant Discharge Elimination System (NJPDES), is to disallow activities that degrade water quality. Allowable permitted concentrations or levels have historically been computed on a site-specific basis accounting for the assimilative capacity and dilution potential of the subject waterbody. Initiatives currently promoted by NJDEP (e.g., Total Maximum Daily Load and Regional Stormwater Management Plans) are intended to evaluate the water quality impacts in-total of point and non-point source pollution and develop a more comprehensive, watershed-scale approach to the management of potential water quality impairments. Again, measures, whether legal or voluntary, at the Township level that support the evaluation and assessment of water quality and

water quality impacts on a more regional or watershed based scale should be encouraged and promoted.

Category One (C1) waterways must be protected from any measurable or predicted changes in water quality. Waters classified as such, are protected by the State's anti-degradation policies (NJAC 7:9B-1.5 (d) 1-9). All other waters classified as Category Two (C2) are to be maintained within the range of quality standards established for that waterbody's classification. The majority of the rivers and streams in Readington Township are classified as C2 waterways with the following designated uses:

- Maintenance, migration and propagation of the natural and established biota;
- Primary and secondary contact recreation;
- Industrial and agricultural water supply;
- Public potable water supply after conventional filtration; and
- Any other reasonable uses.

The four water bodies classified as trout maintenance (e.g., South Branch Raritan River, South Branch of the Rockaway Creek, the North Branch of the Rockaway Creek, and the Prescott Brook) are able to support trout throughout the year, and must meet more stringent water quality standards (e.g., maximum concentrations) than those designated as non-trout waters. Non-trout waters are generally not suitable for trout but are suitable for a wide variety of other fish species. The North Branch Rockaway Creek is classified as trout production, which means that the waters are designated for use by trout for spawning or nursery purposes during their first summer. Furthermore, that segment of the South Branch Rockaway Creek, extending from where it crosses the easternmost Lebanon Borough boundary, downstream to Lake Cushetunk, has been recently petitioned (January 2002) for upgrade to C1 classification due to the established occurrence of threatened and endangered species (wood turtle). As announced in April 2002, in concert with Earth Day, consideration has been given to this proposed upgrade and reclassification. The January petition and the April press release can be found in Appendix E.

Reports and data pertaining to historic and current water quality conditions of the streams of Readington Township were obtained and reviewed in the development of this document. This encompassed information compiled by the NJDEP, USGS, and Township. Most of the data contained in these reports identify the water quality of the Township's streams, although acceptable for many parameters and uses, to display evidence of impact and degradation. It should be noted, because of the different objectives, schedules, stations and parameters monitored as part of each of these efforts, there are some data inconsistencies and data gaps. Although this does not inhibit the overall assessment of the Township's surface water quality and the identification of impacts to or changes in water quality, it does impede to some extent long-term trend analysis.

The 1974 Readington Township ERI includes some of the earliest references to the status

and water quality of the Township's waterbodies. The 1974 ERI concluded that based on the results of the tested parameters (inorganic chemical ions, phosphate, nitrate, coliform bacteria, dissolved oxygen, and biological chemical demand) the overall water quality of the monitored streams was acceptable. The 1974 ERI results were in turn compared to The NJDEP (Draft Water Quality Inventory Reports, 2000) (Ambient Biomonitoring Network, 1995-2000), and the USGS Surface Water Database (1998-2001).

The New Jersey Water Quality Inventory Reports describe the status and trends in water quality. Attainment of designated uses, including aquatic life, recreation, industrial, agricultural, fish and shellfish consumption are also described in the reports. Locally, the information is useful as it describes the status and trends of local water bodies and their progress toward meeting water resources goals. Fourteen reports have been completed since 1975, however, not all streams have been consistently monitored since program inception. In Readington Township, the South Branch Raritan River (Stanton Station), Holland's Brook, and Rockaway Creek have been monitored periodically. Monitoring parameters have included: dissolved oxygen, temperature, nutrients, bacteria, heavy metals, and pH.

The 1996 state water quality inventory 305(b) reports, for the North and South Branch Raritan River Drainage Area, indicated that the South Branch Raritan River (Stanton), Holland's Brook (Readington), and Rockaway Creek (Island Road) were given a "non-impaired" biological impairment rating. The 1998 state 305 (b) report did not contain classification data. The draft 305(b) report for 2000 indicated a "non-impaired" biological impairment rating for the South Branch of the Raritan River (Stanton) and the Rockaway Creek (White House).

The United States Geological Survey (NJ District) also monitors water quality on the South Branch Raritan River (Stanton). For this monitoring station, water quality data (temperature, pH, Conductivity, dissolved oxygen) for the period of October 1, 1998 to 2001 were available. For that time period, dissolved oxygen, pH and temperature were all concluded to be within the range of optimal conditions for stream ecosystems. Ammonia nitrogen was generally low, nitrate/nitrite concentrations were below the drinking water standards, but high enough to stimulate excessive algal and aquatic plant growth. Total phosphorus concentrations were generally low, but occasional high measurements were enough to stimulate excessive algal and aquatic plant growth. Finally, fecal coliform levels sporadically exceeded the state limits for contact recreational uses. The report speculated that the frequent contravention of the coliform standard in 1996 was due to the higher than normal frequency of storm events in 1996.

The 2000 New Jersey Water Supply Authority report on the Setting of the Raritan River Basin contains use impairment information for some of the Township's streams, specifically South Branch Raritan River, Lamington River and Rockaway Creek Main Stem. For the South Branch, water quality violations pertaining to temperature, pH, phosphorus and fecal coliform are noted, as is the stream's impaired use relative to contact recreation and aquatic life support. With the

exception of temperature violations, the same violations are reported for both the Lamington River and Rockaway Creek. Use impairment for both of these waterbodies also pertain to contact recreation and aquatic life support.

Aside from chemical data, certain biological data and indicators can be used to assess water quality. One of the better biological indicators of water quality is the assemblage of macroinvertebrates (e.g., aquatic insects, clams, snails, crayfish) present in a water body. In general, water chemistry analysis provides a short-term, acute assessment of prevailing conditions. These conditions can be affected by prevailing flow, storm events, isolated discharges, or similar temporally linked influences. Unless an adequate database is available, the chemical data alone may not be sufficient to establish trends or identify true impairments. Conversely, biological data is typically more reflective of long-term conditions and tends not have the potential site-specific variability as chemical data. Certain biological data of value for the assessment of stream quality and stream impact, are available through the New Jersey Department of Environmental Protection's Ambient Biomonitoring Network. Biological impairment may be caused by several major factors including nutrient enrichment, habitat degradation, or discharge of toxic chemicals. Water quality impairment has a direct impact upon the distribution, abundance and diversity of macro invertebrates. Therefore the presence of pollution-tolerant macroinvertebrates (e.g., midges and worms) allows biologists to evaluate and arrive at conclusions concerning existing water quality or water quality impacts.

In 1994, 162 monitoring stations were sampled in the Raritan Region as part of the Ambient Biomonitoring Network program. The bioassessment data indicated that 34.6 % of the streams in the Raritan Region were non-impaired, 40.6 % were moderately impaired, and 24.8 % were severely impaired. Based on the 1999 data, 35.2 % of the streams were classified as non-impaired, 55.6 % as moderately impaired, and 9.2 % as severely impaired. Thus, although there was little change in the number of non-impaired sites, substantially fewer severely impaired sites were reported in 1999 relative to 1994. However, the number of moderately impaired sites increased over that same time frame from 40.8 % to 55.6 % (Figure 2.2). It would appear that the majority of the decline in the condition of these streams are related to an increase in non-point source pollutant loading.

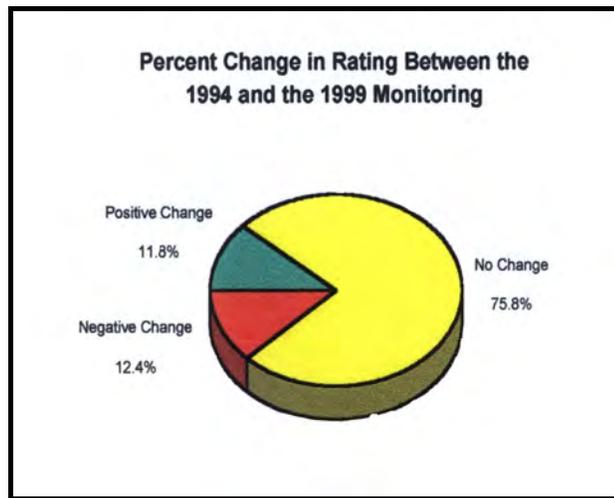


Figure 2.2: WMA 7, 8, 9, and 10 1999 Benthic Macroinvertebrate Data  
NJDEP Ambient Biomonitoring Network (NJDEP 1999)

A summary of these data, as well as chemical testing data, are contained in the Water Quality Amendment to the Master Plan of Readington Township (May 2002). Within that report water quality and impairment information for the major streams of the Township are presented and summarized. Specifically, the report's findings are as follows:

- Rockaway Creek Main Stem - Sanitary Quality poor, phosphorus levels elevated, reported use impairments pertain to contact recreation and support of aquatic life. Increasing evidence of nutrient enrichment
- North Branch Rockaway Creek - Based on 1999 and 2000 data collected East of Rte 523, the stream is classified as non-impaired.
- South Branch Rockaway Creek - Based on 1999 and 2000 data collected for that segment east of Mountain Road, the stream is classified as non-impaired. However, based on the Nelson Street data, the stream has evolved from a non-impaired status in 1999 to a moderately impaired status in 2000.
- Lamington River - Based on 1999 Ambient Biomonitoring Network data, approximately 86% of the river is considered non-impaired and 14% moderately impaired. These conditions have changed little compared to the 1994 Ambient Biomonitoring Network data. However, the stream has had measurable levels of

seven of the eight commonly measured pesticides. This appears correlated with the fact that a large portion of the stream's Readington watershed traverses golf courses.

- Chambers Brook - The stream is considered moderately impaired and its ability to support aquatic life compromised. However, the stream does support wood turtle and is recognized as providing wood turtle habitat.
- Holland's Brook - Between 1996 and 1999 the stream's quality declined. In 1996 classified as non-impaired, but by 1999 classified as moderately impaired.
- Pleasant Run - Based on macroinvertebrate data, the stream's classification has changed between 1996 and 1999. In 1996 the headwater areas were considered moderately impaired, but the lower reaches non-impaired. Based on the 1999 data, the headwaters are considered non-impaired and the lower reaches moderately impaired.
- Prescott Brook - Nominal information is contained in the 2002 report, but increasing evidence of impairment caused by the dualization of Route 31 appears to be occurring.
- South Branch Raritan River - Based on the 1999 Ambient Biomonitoring Network data, approximately 63% of the river is considered non-impaired, with 37% moderately impaired. Elevated pesticide readings, marginally acceptable fecal coliform levels, and elevated phosphorous concentrations.

Data contained in the 2000 New Jersey Water Supply Authority report on the Setting of the Raritan River Basin identify similar impacts and impairments for the South Branch Raritan River, Lamington River, Chambers Brook and Rockaway Creek Main Stem as summarized above.

In addition to the stream resources discussed above, there are a number of impoundments located within the Township. The most important, in terms of size and function, is Lake Cushetunk.

Lake Cushetunk is located at the easterly terminus of the South Branch Rockaway Creek. The lake is considered eutrophic and impacted by heavy sediment loading. Elevated concentrations of total phosphorus have been recorded in the lake. Macrophyte growth is extensive and dense, but limited mostly to the shallow sections of the lake. Sediment in-filling has impacted recreational use of the lake, especially at its northern end, at the mouth of South Branch Rockaway Creek, and in the cove located along the south western shoreline.

In terms of recreational fish consumption, recent (2002) health advisories issued by NJDEP and the NJ Department of Health and Senior Services warn of statewide elevated concentrations of

mercury in fish. The statewide advisory for all state freshwaters recommends the general population should not eat more than one meal per week of largemouth bass, smallmouth bass, and chain pickerel. The statewide advisory for high-risk individuals (i.e., pregnant women, women planning pregnancy within one year, nursing mothers, and children under five years old) differ, it is recommended that they not eat bass, pickerel, yellow bullhead, or sunfish more than once per month. There is also a “water body specific” advisory for the Raritan River (at Neshanic Station, Somerset County) that is applicable to Readington. For the Raritan River, this advisory recommends one meal per week for the high risk population for the following species: largemouth bass, smallmouth bass, redbreast sunfish, brown bullhead, and rock bass; and no restrictions for the general population.

**Surface Water Flow**

Flow data and water quality data for the Township’s streams were compiled from USGS records for the South Branch Raritan River, the South Branch Rockaway Creek and the main stem of the Rockaway Creek and included in the 1974 Natural Resource Inventory. In 1974 USGS gauge data indicated lowest flows during June to October and highest flows during March and April. Local citizens have reported surface water levels dropping through the years, and flooding during storms to be more frequent. In general, low surface flows are speculated to be due to increased groundwater use and decreasing aquifer recharge. Increased flooding is speculated to be due to an increase of impervious surfaces, development of aquifer recharge areas and encroachment into floodplain area. Flow data is available to some extent for all the Township’s streams through the USGS. These data are summarized Table 2.6. The location of the monitoring stations referred to in Table 2.6 are presented on the surface water map (Map 13).

**Table 2.6 Minimum, Maximum and Mean Flows for Select Readington Township Streams (USGS Daily Mean Discharge Data 2001)**

<b>Location</b>	<b>Drainage Area (Mi<sup>2</sup>)</b>	<b>Min. Flow (cfs)</b>	<b>Max. Flow (cfs)</b>	<b>Mean Flow (cfs)</b>
South Branch Raritan (Stanton) #01397000	147	76 cfs	2470 cfs	1273 cfs (22 years)
South Branch Rockaway Creek (White House) #01399670	13.2	4 cfs	361 cfs	183 cfs (18 years)
Rockaway Creek (White House) #01399700	27.1	13 cfs	1052 cfs	533 cfs (8 years)
Holland’s Brook At Readington #01398197	9	1 cfs	284 cfs	143 cfs (5 years)

The stream flow data in Table 2.6 was compared with flow data included in the Readington Township Natural Resource Inventory (Environmental Assessment Council, 1974). The minimum and maximum flows for the three streams (Holland's Brook data not available in 1974) have increased since 1974. However, it cannot be unequivocally determined whether these changes are due to watershed development impacts or are the function of other natural or reporting variables.

The 2000 New Jersey Water Supply Authority report on the Setting of the Raritan River Basin also contains information pertaining to flow and the flow regime of select Readington Township streams. In the Upper Raritan watershed, there are a large number of first order stream. These streams are small and flow tends to be confined to the stream channel. Within Readington Township, many of the streams are larger (second order) and have broad, well defined floodplains. Examples of such streams are Chambers Brook, Lamington River, the Main Stem of Rockaway Creek and the South Branch Raritan River. Evidence of flooding, and alteration of stream channel geomorphological alterations, are evidenced in segments of stream channels, for example portions of Chamber Brook and South Branch Rockaway Creek immediately upstream of Cushetunk Lake. The observed modifications of the stream channel in some of these cases appears to be the direct result of land development and the scour and impact caused by excessive runoff or an increase in peak flow.

The New Jersey Water Supply report also contains relevant minimum, low flow data from some of the Township's streams. These data are contained below in Table 2.7.

**Table 2.7 USGS 7-Day 10-year Low Flow Data for Select Readington Township Streams (NJWSA 2001)**

<b>USGS Gauging Station Number</b>	<b>Station Location</b>	<b>MA7 CD10 (cfs)</b>
#01397000	South Branch Raritan (Stanton Station)	46
#01399700	South Branch Rockaway Creek (White House)	5.7

Admittedly, these data are limited but point to the need for additional monitoring of base flow in the streams of Readington Township. The MA7 CD10 data are considered extreme low flow, drought related stream flows. At flows of these magnitudes, the biological carrying capacity of the systems is stressed, as is the ability to assimilate pollutant loading, whether from point or non-point sources. In addition, under such conditions, temperature stresses increase, dissolved oxygen saturation decreases and biological impairments associated with the proliferation of algae may increase. The combined effect of these conditions is usually the loss of biota.

Conversely, not a tremendous amount of regional data are available pertaining to flooding and the impacts of land development on flooding. However, the South Branch Rockaway Creek was

the study site of one of the significant assessments of stormwater quantity management conducted in the State. That study, the South Branch Roackaway Creek Stormwater Management Study (NJDEP 1986), modeled the response of the watershed with respect to the attenuation of the 100 year peak flow under different management options and alternatives. The results of that study, in part were used to develop the existing NJDEP Stream Encroachment regulations, which in turn is the basis for the peak flow attenuation requirements of the Township's Stormwater Management Ordinance. The Study documented that attenuating post-development peak flows to pre-development conditions did not alleviate flooding and peak flow problems. The study results also documented the benefits of regional stormwater flood and quantity management and identified problems associated with the indiscriminate use of detention basins.

### *Floodplains & Riparian Corridors~*

#### **Floodplains**

Floodplain areas are transitional regions comprised of both aquatic and terrestrial habitats. Within the floodplain, because of its unique hydrology, are often a host of dependent plant and animal species. This environmental resource provides ecological, aesthetic, and recreational benefits. In addition, because of its natural ability to attenuate and store flood waters, it also provides an economic benefit. When preserved, floodplains buffer homes and businesses from the hazards and damage related to flooding. Associated with this ability to store flood water is the recharge of aquifers and the trapping of sediments and particulate pollutants. Preserved floodplain areas offer travel corridors for wildlife, often creating linkages between upland areas. They also can provide recreational opportunities.

The Readington Township Master Plan (Clarke & Caton 1990) states that the Township's floodplains have experienced degradation, particularly in land areas adjacent to the South Branch of the Raritan River and the Rockaway Creek. Readington Township's floodplain areas are illustrated on Map 13, and additional floodplain resource information is provided in Table 2.8.

**Table 2.8 Floodplain Resources<sup>1</sup>**

Surface Water Resource	River Length (Mi)	Drainage Basin (acres)	Floodplain Area <sup>2</sup> (acres)
South Branch, Raritan River	116	25,466	704
South Branch Rockaway Creek	26	11,173	232
North Branch Rockaway Creek	44	14,103	251
Main Stem Rockaway Creek	6	4,833	329
Pleasant Run	17	6,919	134
Holland's Brook	18	7,966	131
Chambers Brook	8	6,583	101
Prescott Brook	13	7,218	0
Lamington River	12	8,948	181

**Riparian Corridors**

The riparian zone of a river, stream, or other body of water is the land adjacent to that body of water that is, at least periodically, influenced by flooding (Mitsch & Gosselink 1986). The riparian buffer zone, is the area of trees and other herbaceous vegetation growing along the course of a river, creek, or stream and within the riparian zone. An adequate buffer zone is important for a variety of reasons. A vegetated buffer zone reduces the impact of periodic flooding, because the vegetation reduces the amount of run off reaching the channel. The soil and vegetation acts as a storage area for flooded waters. In addition, the trees within the riparian corridor provide shade, thereby maintaining cooler water temperatures for aquatic life.

With regard to streambank erosion, the vegetation in buffer zones forms a physical barrier that holds soil and prevents it from washing away during storms. The buffer also reduces the velocity of surface water (stormwater) runoff. As the velocity of stormwater is reduced, sediments and “pollutants” (e.g., chemicals and nutrients) settle out of the stormwater before it enters the stream. Therefore, a vegetated riparian corridor enhances the water quality of the stream.

In addition to water quality enhancement, the vegetated riparian zone provides important nesting and feeding habitat for wildlife and provides a travel corridor for wildlife movement.

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<sup>1</sup> As per NJDEP GIS database.

<sup>2</sup> Floodplain area combines one-hundred year (A, AE zones) and five-hundred year (X500 zone) floodplain areas.

Recreational trails are also a possibility in stream buffer areas, especially if the buffer areas join other buffered corridors. Unfortunately, approximately 37% of the riparian land cover for the Upper Raritan WMA was converted to agriculture (19%) and urban (18%) land uses by 1995.

As per the Raritan Basin Watershed Management Project (NJWSA 2000), the “historic” riparian area is considered that part of the stream corridor defined by the 100-year flood prone area, soils with a seasonal high water table within 18 inches of the surface, stream side wetlands and their associated transition areas, as well as, depending on stream order, a 150-foot or 300-foot wildlife green belt. These historic riparian areas represent the natural stream side conditions that existed prior to land development and associated man-made disturbances to the streams and their adjoining corridors. Over time, either as a result of changes to the hydrology and/or hydraulics of these streams and waterways, or as a result of filling, clearing or other direct disturbances, in many cases the dimensions of the historic riparian corridor has decreased in size and has become altered in terms of composition and function.

As reflected in the research and findings of the NJWSA, NJDEP , USGS and others, the riparian corridor of a stream is variable in size, being a function of a number of topographic, soil, hydrologic and vegetative factors. Regardless of the means used to define a riparian corridor, the fact of the matter is that these areas are important to the health and welfare of the streams and waterways of Readington Township.

In order to determine the location and composition, as well as obtain a better understanding of the adequacy of the Township’s existing riparian corridors, an analysis was conducted using the Geographic Information System (GIS). In one case, overlaid on the most recent (1999) high resolution aerial photographs of Readington Township (Map 2) was the 100 foot stream buffer required for all new development activities (as per Chapter 148 land Development Ordinance of Readington Township, §148.69). In the second case, the GIS was once again used to overlay the 100 foot stream buffer on the most recent land use/land classification system map (USGS/NJDEP, 2001). The resulting data generated under both scenarios was analyzed with respect to land use within the 100 foot buffer, specifically for the purpose of identifying encroachments and/or impacts to potential riparian corridor acreage. The following information was derived from that analysis:

- The North Branch Rockaway Creek, South Branch Rockaway Creek, and Main Stem Rockaway Creek- East of Lake Cushetunk, the creek is very well buffered until it approaches open farm fields in the Island Road area. The creek remains less buffered as it flows east to the confluence with the Lamington River. The buffer associated with the South Branch Rockaway Creek is predominantly brushland and scrubland.
- The Lamington River- A portion of the Lamington River runs along the northeast border of

the Township. As the river crosses Interstate 78, the Fiddlers Elbow Country Club, River Road, through farmlands, and joins the Rockaway Creek, it is moderately to sparsely buffered. The Lamington buffer is primarily comprised of deciduous forest and deciduous wooded wetlands.

- Chambers Brook- The headwater areas of the Chambers Brook support predominantly residential land uses. East of Flemington-White House Road (Route 523), some buffering exists as the brook flows eastward. Extensive woodlands buffer the brook from Kosciusko Road to Coddington Road, but to a lesser extent in the farm fields located between Ridge Road and the Somerset County line. The Chambers Brook buffer supports deciduous forest and brushland scrubland.
- Holland's Brook- Much like the Chambers Brook, residential land has encroached upon the one-hundred foot land area buffering the Holland's Brook. The headwater areas of the Holland's Brook (west of Route 523) flow through the Stanton Ridge Golf Course and are, to a certain extent, residentially developed. However as the brook flows eastward, it is well buffered to the Somerset County border. The one-hundred foot riparian buffer adjacent to the Holland's Brook supports cropland and pastureland followed by deciduous forest, and brushland/scrubland.
- Pleasant Run- Farmlands, forests, residential homes, and open fields surround the headwater areas of Pleasant Run. As the stream flows east it is well buffered. Pleasant Run Road runs parallel to the Pleasant Run for most of its reach in the Township. The road's proximity to the northern side of the stream impacts the size and the quality of buffer for this side of the stream. In addition, the deciduous forests and brushland/scrubland buffer is periodically interrupted by residential uses.
- Prescott Brook-Only about 66 acres of the Prescott Brook watershed are in Readington Township. There are no stream miles managed and there are an average of 2.61 stream crossings per kilometer.
- South Branch Raritan River- A portion of the South Branch Raritan River runs along the southern border of Readington Township. The river is well buffered and forested as it meanders through the South Branch Reservation and crosses Route 523. However, less buffering is evident in the Dart's Mill/Flemington Junction/Pennsylvania Avenue areas. Buffering again improves as the river runs eastward through the South Branch Nature Preserve to the Somerset County border. Overall, the land cover evident in the one-hundred foot buffer is cropland/pastureland followed by residential, deciduous forest, deciduous wooded wetlands, and brushland/scrubland.

In terms of the application of 100 foot buffer to development, it should be noted that the 100 foot buffer requirement applies only to site plans and subdivisions. That is, as per the Township's land use development regulations and ordinances, all streams, as defined in the ordinance, are offered protection in the form of a 100 foot buffer on either side of the stream channel. The objective of the buffer is to protect streams, stream corridors, riparian areas and other similar sensitive stream related environmental features from disturbance, encroachment and other related development impacts. Many of these streams, because of their size or lack of adjacent wetlands, are not provided protection under the State's Freshwater Wetland Act. The buffer requirement provides a means of protecting streams and their associated riparian areas from degradation and impact. Pre-existing development is not subject to the stream corridor protections provided through the stream buffer ordinance. Much of the historical impairment of the riparian corridors associated with Chambers Brook, Holland's Brook, and Pleasant Run pre-date the passage of the Township's Stream Corridor Ordinance. Degradation of these corridors arose primarily as a result of agricultural development, commercial development, and residential development. Impacts to riparian corridors continue to occur even in developed areas due to homeowner maintenance practices, such as mowing lawns to a stream's edge or the clearing of vegetation adjacent to streams.

FLOOD PLANE AREAS SYMBOL LEGEND

KEY	ZONE	DESCRIPTION	ACREAGE	% OF TOTAL
[Red]	A	Areas of 100-year flood: factors not determined	535.64	1.76
[Yellow]	AE	Areas of 100-year flood: BFE's determined	1351.54	4.43
[White]	X	Areas of minimal flooding	28464.26	93.30
[Green]	X500	Areas of 500-year flood	156.49	0.51
Total			30507.93	100.0

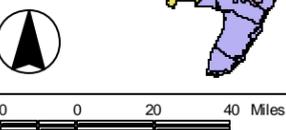
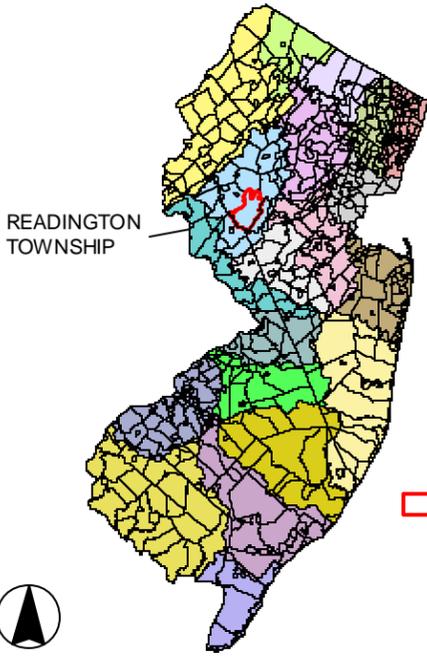
RIVER STATION SYMBOL LEGEND

KEY	LATITUDE	LONGITUDE	USGS NO.	STATION NAME
[Yellow V]	40 de. 34°21'	74 de. 52°10'	139700	Raritan Station
[Yellow V]	40 de. 37°10'	74 de. 46°25'	1399670	Rockaway Creek at White House Station
[Red V]	40 de. 33°30'	74 de. 43°50'	1398107	Holland Brook Station at Readington

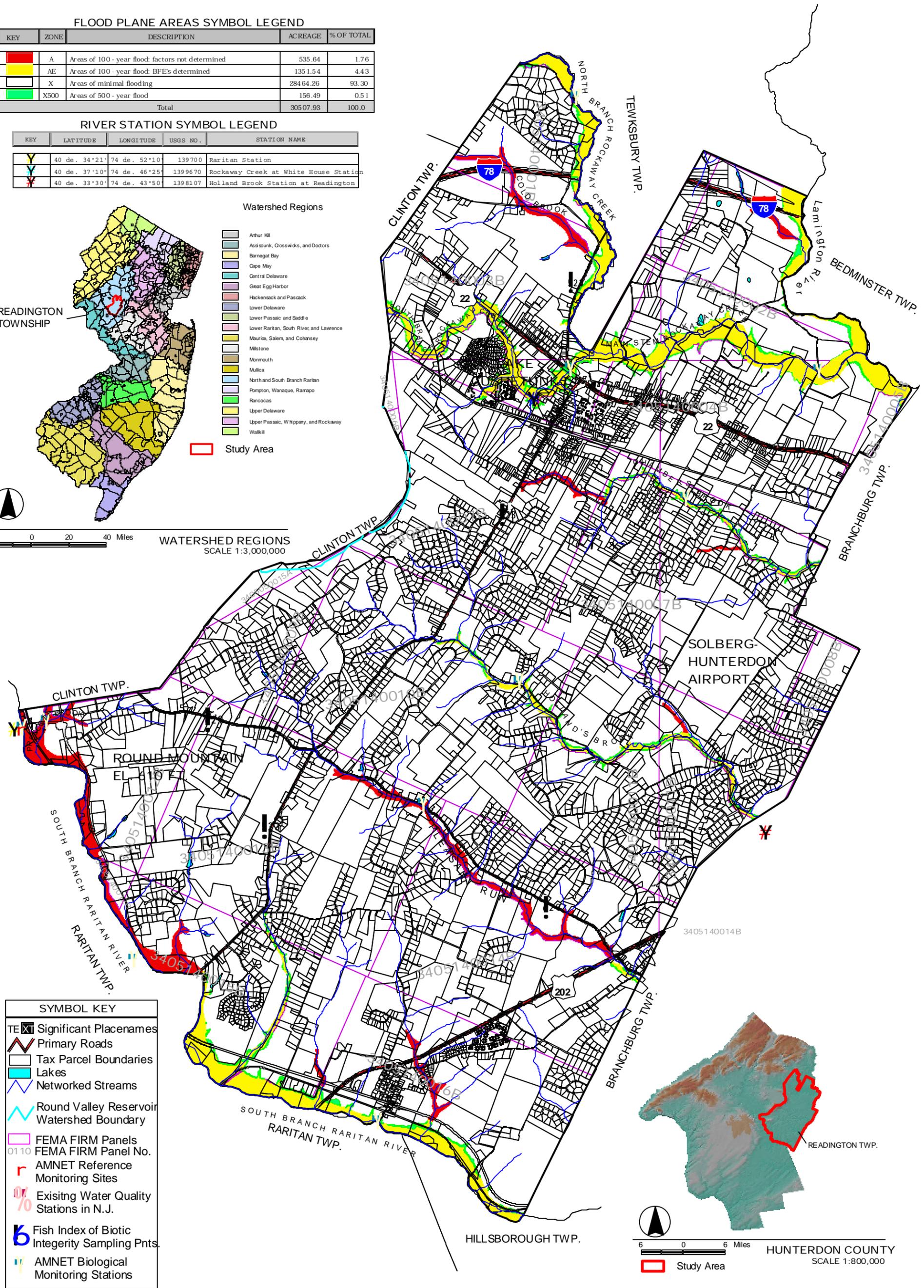
Watershed Regions

- [Light Blue] Arthur Kill
- [Light Green] Assiscunk, Crosswicks, and Doctors
- [Light Yellow] Barnegat Bay
- [Light Purple] Cape May
- [Light Cyan] Central Delaware
- [Light Orange] Great Egg Harbor
- [Light Pink] Hicensack and Passack
- [Light Blue-Gray] Lower Delaware
- [Light Green-Gray] Lower Passaic and Saddle
- [Light Purple-Gray] Lower Raritan, South River, and Lawrence
- [Light Yellow-Gray] Maurice, Salem, and Cohansey
- [Light Blue-Gray] Milestone
- [Light Orange-Gray] Monmouth
- [Light Green-Gray] Mullica
- [Light Cyan-Gray] North and South Branch Raritan
- [Light Purple-Gray] Pompton, Wanaque, Ramapo
- [Light Blue-Gray] Rancocas
- [Light Orange-Gray] Upper Delaware
- [Light Green-Gray] Upper Passaic, Whippany, and Rockaway
- [Light Yellow-Gray] Walkill

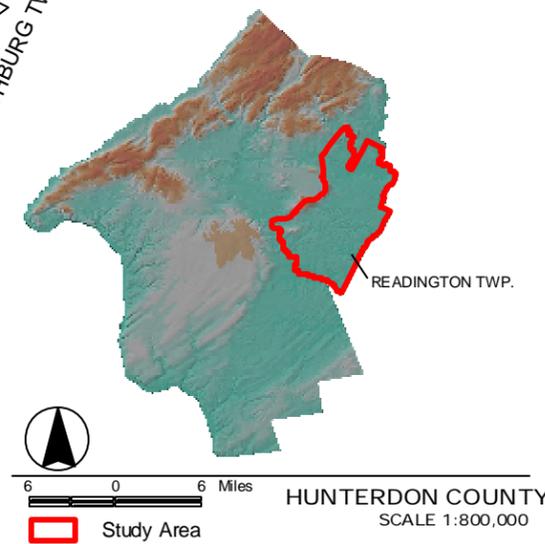
[Red Outline] Study Area



WATERSHED REGIONS  
SCALE 1:3,000,000

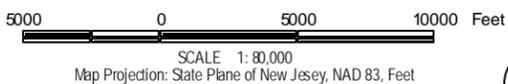


SYMBOL KEY	
[Black X]	Significant Placenames
[Red Line]	Primary Roads
[Black Outline]	Tax Parcel Boundaries
[Blue Polygon]	Lakes
[Blue Line]	Networked Streams
[Blue Line]	Round Valley Reservoir Watershed Boundary
[Pink Polygon]	FEMA FIRM Panels
[Pink Polygon]	FEMA FIRM Panel No.
[Red Line]	AMNET Reference Monitoring Sites
[Red %]	Existing Water Quality Stations in N.J.
[Blue B]	Fish Index of Biotic Integrity Sampling Pnts.
[Yellow V]	AMNET Biological Monitoring Stations



HUNTERDON COUNTY  
SCALE 1:800,000  
[Red Outline] Study Area

READINGTON TOWNSHIP, NRI, 2000



SCALE 1:80,000  
Map Projection: State Plane of New Jersey, NAD 83, Feet



Flood Planes provided by Digital FEMA FIRM map panels, compiled in Q3 Flood Data Series, Disc 18, New Jersey Puerto Rico, and Virgin Islands.  
Scale 1:24,000  
New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000  
TMP map, supplied by Yager and Associates.  
Scale (unknown)  
USGS Water Data Downloads, NJDEP, Ambient Biomonitoring NetworkDownloads, Bureau of Freshwater Monitoring (AMNST)  
Scale: (unknown)

NOTES:  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.

2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

Map 13: Readington Township Surface Water Resources Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

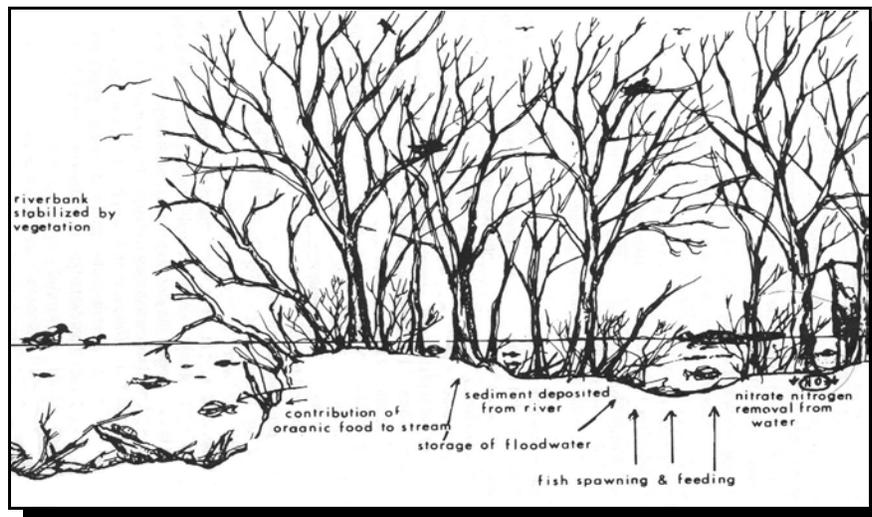
Project No.: 160.02



Wetlands~

Wetlands are among the most important ecosystems and are sometimes described as “the kidneys of the landscape” for the pollutant filtering functions they perform (Mitsch & Gosselink 1986). Wetlands prevent floods, protect shorelines, provide habitat for a wide variety of plants and animals, recharge groundwater aquifers, and cleanse polluted waters. There are approximately 2,368 acres (8%) of agricultural, forested, and herbaceous wetlands in Readington Township (Map 14). As indicated in the previous section, the riparian zone is the land adjacent to Readington’s streams and rivers. The majority of wetlands in the Township are ecologically categorized as “riparian”, because they are located next to the streams and rivers (Mitsch & Gosselink 1986). The National Wetlands Inventory (NWI) mapping equivalent category (Cowardin et al. 1979) is Palustrine.

Palustrine wetlands are distinguished by their unique and valuable combination of high species diversity, high species densities and high productivity. This characterization is due to the abundance of water, periodic flooding, and rich alluvial soils. As a result, there are frequent ecological and physical interactions between the open water, riparian, and upland terrestrial species. The figure below illustrates the ecological and floodwater storage values associated with the palustrine wetlands in Readington Township.



Source: Mitsch, Hutchison & Paulson 1979



Groundwater Resources, Quantity, and Quality ~

There are five major geomorphic provinces in New Jersey - Valley and Ridge, Highlands, Piedmont, Inner Coastal Plain, and Outer Coastal Plain. As shown in Figure 2.3, Readington Township is located in the non-coastal plain (Piedmont), Newark regional aquifer. An aquifer is a geologic formation capable of supplying potable water. The water stored in aquifers is referred to as groundwater. In Readington, groundwater is stored in fractures in the bedrock. In population centers, such as Readington Township, that are highly reliant upon groundwater for potable water, a sustainable, non-polluted or tainted supply of groundwater is imperative. Sustaining this supply requires the protection of those areas where groundwater resources can be replenished and recharged

as a result of the percolation and infiltration of rainfall and runoff. These areas are referred to as aquifer recharge areas. Loss of aquifer recharge areas as a result of land development and the increase of impervious cover, or the migration of contaminants and pollutants, is a serious matter in New Jersey, especially in Hunterdon County where development pressure is great, and the opportunity for aquifer depletion, contamination and impact is significant.

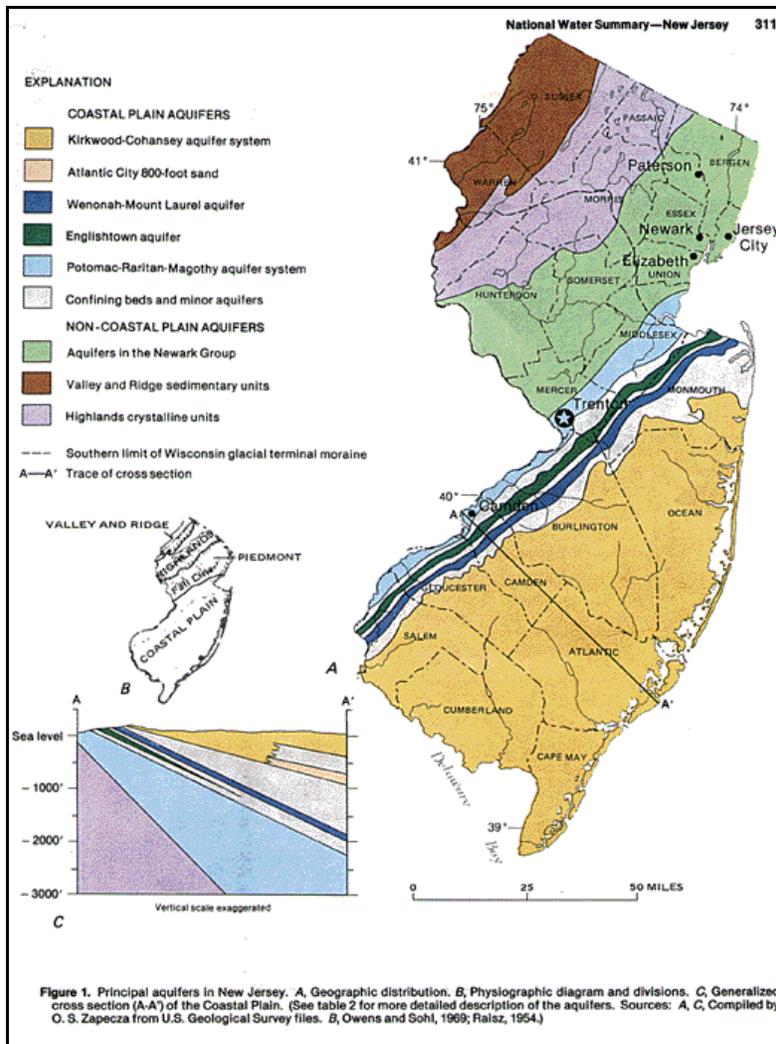


Figure 2.3 New Jersey Geomorphic Provinces

Readington Township is located within the Triassic Basin, and is underlain primarily by shales of the Brunswick formation. The Brunswick formation is the primary aquifer in the Township and is divided into the Brunswick Shale and the Baked Brunswick Shale classes.

Different groundwater yields are associated with each geo-hydrologic class. Approximately ninety-seven percent (97%) of the Township's water supply is obtained from the Brunswick aquifer. Other groundwater supply aquifers are the Diabase, Stockton, and Basalt aquifers (Map 15), but obviously their combined role and importance in drinking water supply is much less than the Brunswick aquifer. Table 2.9 provides data pertaining to actual well yields associated with each aquifer.

**Table 2.9 Estimated Safe Yields**

<b>Aquifer/Formation</b>	<b>Total Estimated Yield (mgd)</b>	<b>Average Domestic Well Yields (gpm)</b>	<b>Additional Information</b>
Brunswick	22.6	19	Storage & movement through fractures and interstices, weathers easily, most water from domestic wells within 300 feet
Diabase	0.36	8	Storage and movement exclusively through fractures, most successful domestic wells obtained 50-100 feet beneath surface
Stockton	0.18	20	Best consolidated aquifer, limited occurrences in Readington, water stored and transmitted by joining fractures and void spaces.
Basalt	0.03	5	Storage and movement exclusively through fractures most successful domestic wells obtained 50-100 feet beneath surface

**Sole Source Aquifers**

According to the USGS, Sole-Source Aquifers (SSA), are those aquifers that contribute more than 50% of the drinking water to a specific area, and the water would be impossible to replace if the aquifer were contaminated. Sole-source aquifers are defined with guidelines set forth by the U.S. Environmental Protection Agency (EPA) as authorized in section 1424(e) of the Safe Drinking Water act of 1974. The aquifers beneath Readington Township are federally designated (Safe Drinking Water Act, Section 1424 e) Sole Source Aquifers. The designation is given to protect drinking water supplies in areas with few or no alternative sources of groundwater. Therefore, if groundwater contamination were to occur, using an alternative source would be extremely difficult and prohibitively expensive. Readington Township is within the SSA referred to as the Northwest New Jersey Fifteen Basin Aquifer System (North Branch Raritan River). Other portions of Hunterdon County, as well as portions of Morris, and Somerset Counties, are within the North Branch Raritan River Basin Aquifer System (NJDEP SSA Petition Documentation 1988).

The SSA designation requires the United States Environmental Protection Agency (US EPA) to review all federally funded projects in areas that could impact the SSA. The review includes projects that could affect areas contributing to aquifer recharge (recharge zone) as well as impacts to areas upstream and therefore contributing to aquifer recharge (stream flow source zone).

### **Groundwater Quantity**

In addition to average well yield, information regarding long-term groundwater well quantity is available through the United States Geologic Society (USGS) and the New Jersey Department of Environmental Protection. Well #190270 (Map 15) is located behind the Readington School on Readington Road (County Road 620). Digital water level recordings (60 minute) are available from 1990 to present. Over the course of that monitoring period, the highest water level recorded was 8.64 feet below the land surface (March 1993) and the lowest water level recorded was 29.70 feet below land surface (September 1995). Monitoring information for the eleven year period is presented in Figure 2.4.

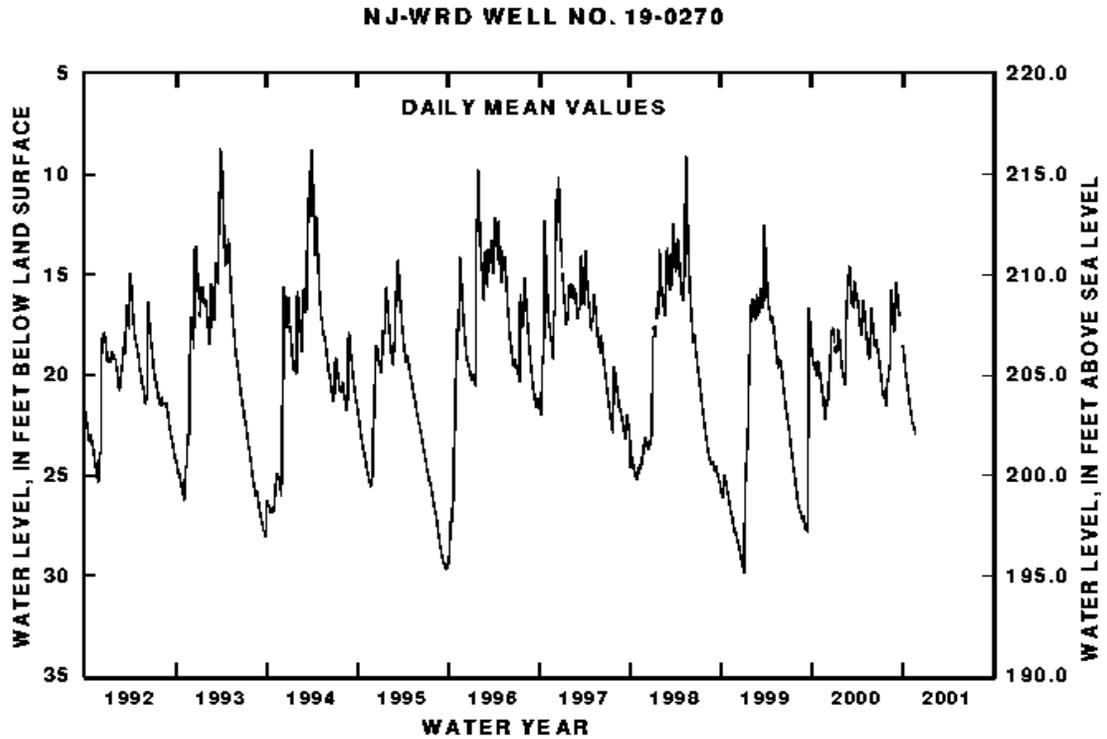


Figure 2.4: Groundwater Level Monitoring  
NJDEP, Water Resources of NJ 2001

Groundwater quality is a concern in densely populated regions of New Jersey. In areas with concentrated development, domestic drinking water may be negatively affected due to the presence of nonpoint sources of pollution (e.g., failing septic systems, leaking storage tanks) in aquifer recharge areas, and the presence of toxic substances (e.g., polychlorinated biphenyls), trace elements, pathogens, and natural radioactivity. Some regional groundwater quality information (e.g., nitrates, pesticides, total volatile organic compounds, natural radium) is available through the United States Geologic Survey (USGS).

The USGS also has a groundwater quality database for fourteen (14) wells within Readington Township. Eight (8) of the wells are located in the Brunswick formation and the remaining six (6) wells are located in the Passaic formation. Ten (10) of the wells are domestic, two (2) are commercial, and the remaining well (well # 19027) is operated by the state of New Jersey. Groundwater quality parameters include the following: dissolved oxygen, pH, specific conductivity, temperature, alkalinity, calcium, magnesium, potassium, sodium, fluoride, sulfate, nitrogen, phosphorus, total dissolved solids, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, lithium, manganese, molybdenum, nickel, selenium, silver, strontium, and natural uranium. Of the parameters monitored, groundwater quality was well within the NJDEPs specific groundwater quality criteria (Class IIA and Practical Quantitation Levels). Tables 2.10 and 2.11 provide an overview of USGS monitored wells in Readington Township and groundwater quality data from selected wells.

**Table 2.10 Groundwater Well Information**

USGS Well Number/Well Name	Formation	Location (Latitude/Longitude)	Well Notes
190018 Stanton Reformed Church	Brunswick	40° 34' 30" / 74° 50' 20"	Domestic-190' deep
190019 Bertrant Property	Brunswick	40° 35' 4" / 74° 48' 24"	Domestic-150' deep Slightly Elevated pH detected
190064	Brunswick	40° 33' 03" / 74° 48' 04"	Domestic-193' deep
190065 Bruce Jensen Property	Brunswick	44° 33' 04" / 74° 47' 33"	Domestic-190' deep
190066 Maintenance Building	Brunswick	40° 38' 16" / 74° 43' 39"	Domestic-260'deep
190067 Mohawk Manufacturing Industrial Well	Brunswick	40° 36' 23" / 74° 44' 04"	Industrial-150' deep Slightly Elevated pH detected
190084 Cole Property	Brunswick	40° 34' 05" / 74° 44' 10"	Domestic-77' deep
190228 Accettola Property	Brunswick	40° 33' 38" / 74° 50' 31"	Domestic-200' deep
190270 Readington School	Passaic	40° 35' 17" / 74° 45' 25"	State of NJ-101' deep Slightly Elevated pH detected
190331 Stanton Property	Passaic	40° 35' 24" / 74° 48' 50"	Stanton Properties-85' deep
190364 Middleton Property	Passaic	40° 33' 03" / 74° 48' 04"	Domestic-240'deep
190365 Huang Property	Passaic	40° 33' 25" / 74° 44' 46"	Domestic-175' deep
190366 Collucci Property	Passaic	40° 34' 24" / 74° 45' 33"	Domestic-200' deep
190367 Bray Property	Passaic	40° 34' 53" / 74° 46' 32"	Domestic-175' deep

**Table 2.11- USGS Groundwater Quality Data**

USGS Code	USGS Parameter Description	Parameter Values			
	Well Number	403517074452501	403524074485001	403623074440401	403730074453301
	Sample Date	8/12/1994	8/31/1994	1/10/1986	1/6/1986
00059	Flow Rate gal/min				45
00095	Specific Conductance mS/cm AT 25 oC	97	369	310	665
00300	Dissolved Oxygen (mg/L)	7.2	6.8	4.6	4.8
00400	pH, water, whole, field	6.2	7.4	7.9	7.7
00608	Ammonia-N Dissolved (mg/L AS N)	0.02	0.01		
00613	Nitrite-N Dissolved (mg/L AS N)	<0.01	<0.01		
00623	Ammonia-N plus Organic Dissolved (mg/L AS N)	<0.2	<0.2		
00631	Nitrite-N plus Nitrate-N Dissolved (mg/L AS N)	1.9	2		
00671	Orthophosphate-P Dissolved (mg/L AS P)	0.21	0.19		
00930	Sodium Dissolved (mg/L AS NA)	9.9	14		19
00935	Potassium Dissolved (mg/L AS K)	0.9	1.5		1.4
00940	Chloride Dissolved (mg/L AS CL)	2.4	4.5		24
01000	Arsenic Dissolved (mg/L AS AS)	<1	1		
01046	Iron Dissolved (mg/L AS FE)	230	<3		M
01049	Lead Dissolved (mg/L AS PB)	<1	<1		<10
01056	Manganese Dissolved (mg/L AS MN)	17	2		<1
01090	Zinc Dissolved (mg/L AS ZN)	27	4		<3
32102	Carbon Tetrachloride, Water, Unfiltered, Recoverable (mg/L)		0.2		
32103	1,2-dichloroethane Total (mg/L)		<0.2		
34010	Toluene Total (mg/L)		<0.2		
34030	Benzene Total (mg/L)		<0.2		
72016	Depth to Bottom of Sample Interval (Ft below LSD)		85		

a) Data for the following sites are included:

USGS 403517074452501 READINGTON SCHOOL- Well No. 190270 in Table 2.10

USGS 403524074485001 STANTON PROP MW-1- Well No. 190331 in Table 2.10

USGS 403623074440401 INDUSTRIAL-1- Well. No. 190067 in Table 2.10

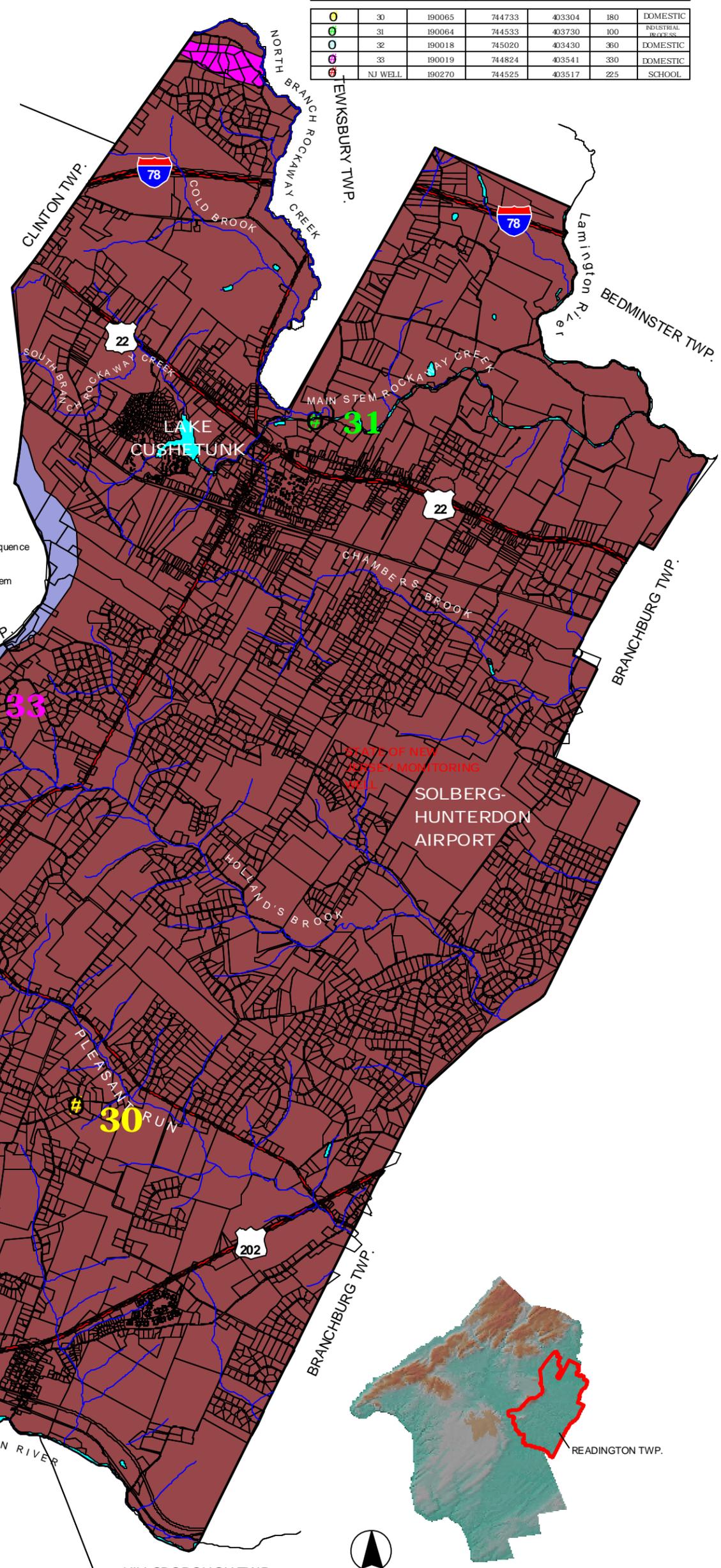
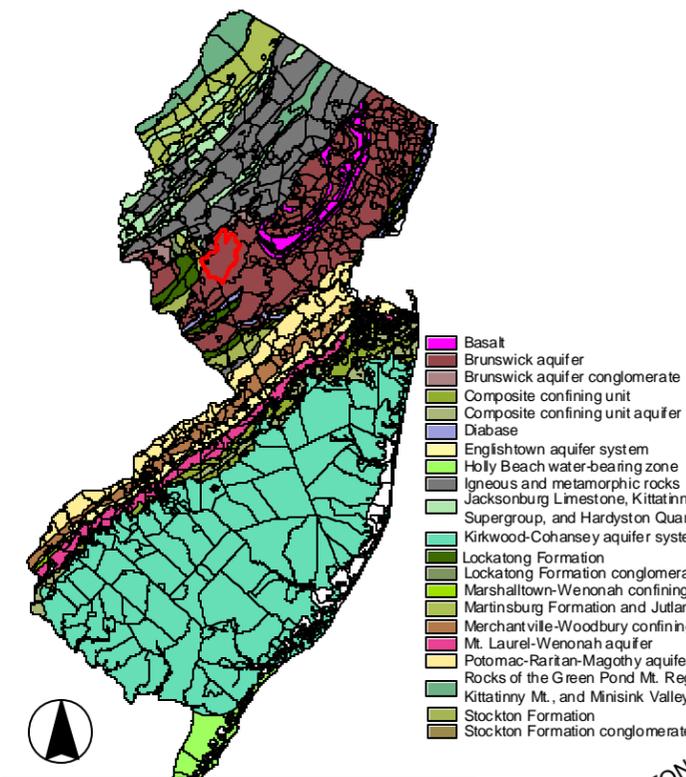
USGS 403730074453301 1-INSIDE PLANT

**AQUIFER SYMBOL LEGEND**

KEY	ABBR.	RANK	AQUIFER NAME	AC REAGE	PERCENTAGE
ba	ba	C	Brunswick Aquifer	295 69.86	96.77
bs	bs	D	Basalt	79.55	0.26
db	db	E	Dia base	678.25	2.22
sf	sf	C	Stockton Formation	227.75	0.75
Total				227.75	0.75

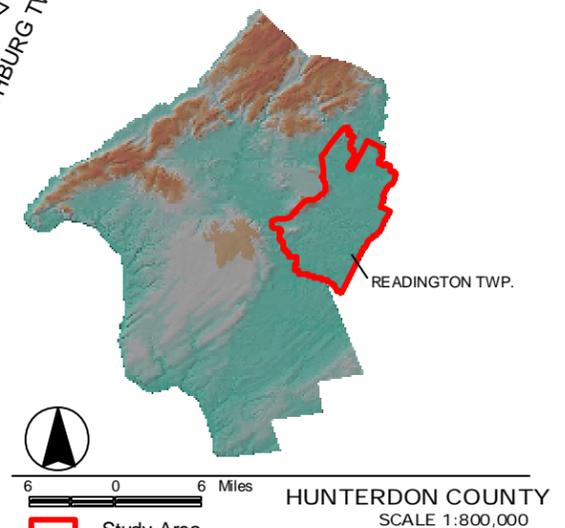
**COMMUNITY WELL SYMBOL LEGEND**

KEY	WELL #	USGS_ID	LONGITUDE	LATITUDE	ELEV.	WELLUSE
0	30	190065	744733	403304	180	DOMESTIC
1	31	190064	744533	403730	100	INDUSTRIAL
2	32	190018	745020	403430	360	DOMESTIC
3	33	190019	744824	403541	330	DOMESTIC
4	NJ WELL	190270	744525	403517	225	SCHOOL



**SYMBOL KEY**

- Text: Significant Place Names
- Red line: Primary Roads
- Black outline: Tax Parcel Boundaries
- Blue area: Lakes
- Blue line: Networked Streams
- Blue circle with '9': Well Locations



**READINGTON TOWNSHIP, NRI, 2000**

5000 0 5000 10000 Feet

SCALE 1:80,000  
Map Projection: State PlanE of New Jersey, NAD 83, Feet

Hunterdon County, Digital TMP Coverage, Yager and Associates. Scale (Unknown)  
New Jersey, Department of Environmental Protection, GIS data  
Web Site Downloads State Municipalities of New Jersey,  
NJDEP Wetland Inventories, Countywide  
Community Wells Information, updated June 27, 2000  
Scale N/A  
NJ Geologic Survey, GIS data downloads, Bedrock  
Aquifers of New Jersey.  
Scale 1:100,000

**NOTES:**  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

**Map 15: Readington Township Aquifers & Community Wells Map**

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

**pH**

## Surface and Groundwater Resource Protection~

Surface water, wetland and groundwater resources are all hydrologically linked. Thus the proper management of these resources requires a concerted, integrated approach. This starts with the proper identification and classification of the resources (as was done above), continues to the identification of potential risks to those resources, which leads then to the development of an integrated management and protection plan. The basics of a resource protection plan should involve, to a large extent, the preservation and conservation of the resources, the protection of resources from impact, and the minimization of pollutant generation. The following address these elements within the context of the ERI, focusing on pollution prevention.

- Impact Minimization Through the Implementation of Conservation and Preservation Measures

Source reduction controls, resource conservation, resource preservation and land use planning are all highly effective methods of minimizing both short and long-term development related water quality impacts. These measures reduce or eliminate environmental impacts before they occur given their inherently preventative nature. Limiting the entry of pollutants into the environment or avoiding the disturbance of sensitive habitats, are ultimately preferable to implementing cleaning up, mitigation or restoration activities. While there exists many ways to reduce the pollutant loading of runoff, by reducing the amount and number of contaminants entering the environment in the first place, the level of protection provided the environment is much greater. The following are conservation, preservation and source control measures that should be embraced and promoted by Readington Township.

- Preservation and Protection of Sensitive Wetland and Aquatic Site Features

As part of the preparation of the ERI, information pertaining to the Township's surface water and wetland features have been identified and mapped. Using these data as a base, the protection of wetlands, ponds, lakes and streams should be emphasized through compliance with the Wetland Protection Act, the Clean Water Act and other State and Federal initiatives, regulations and laws. This should also extend to minimization of clearing along stream corridors or the unnecessary filling of wetlands or crossing of waterways.

- Minimization of Disturbance and Use of Alternative Landscaping

Development activities in given sections of the Township are inevitable. When development occurs, minimizing site disturbance and utilizing alternative landscaping are impact

preventative techniques that decrease erosion, eliminate the need for continual fertilization of lawn areas, decrease pesticide applications and conserves water. Such measures should be promoted at transition points to wetlands, streams or ponds.

- Nutrient and Pesticide Management

By applying the minimum quantity of fertilizer necessary for optimum lawn, landscape and ornamental plant growth, the amount of fertilizer potentially lost to surface and groundwater resources is minimized. Similarly, the controlled, careful use of pesticides, can reduce the amount of product being applied, thereby preventing surface and groundwater contamination. Careful selection of pesticide products can also reduce the likelihood of impacts to non-target organisms. When fertilizer applications are required, they will be timed to maximize plant uptake while decreasing the opportunity for runoff properly - nutrients are most needed in the spring and fall, not throughout the summer. Integrated pest management (IPM) is a common sense approach to pesticide application that follows environmentally conservative methods to maintain pests below pre-defined, acceptable densities. It is now a standard practice for golf courses, nurseries and even some farms. Unfortunately, a considerable amount of waste is associated with lawn care. The concept that if "a little is good, more is better" leads to over-application of product and an increased potential for the off-site transport of pesticides.

- Roadway De-icing/Salt Reduction

This management practice promotes the 'wise use' of road salts. Options include minimizing salt applications on areas that are not extensively utilized and maintaining stringent application controls in sensitive areas. Levels of service and application rates for various locations throughout the Township can be determined prior to the winter season. Depending on the required level of access and public safety concerns, the road de-icing options could range from no salt use, plowing and sanding, or the controlled use of salt or other de-icing agents. Proper management of road salt and sand storage facilities can also eliminate or reduce the occurrence of concentrated runoff. Salt storage should not occur within aquifer recharge areas, near well heads, adjacent to surface waters or wetlands or in floodplains.

Alternative products are under development for use in sensitive areas. For example, calcium magnesium acetate, a combination of dolomitic limestone and acetic acid, is currently being tested. The components of this salt alternative contribute little, if anything, to the degradation of water quality. Where appropriate, the use of these products should be evaluated, especially for the maintenance of roads or parking areas located in close proximity to sensitive surface waters, potable wells, or wetlands.

## **Groundwater Protection**

Due to the heavy regional reliance on groundwater for potable water, the prevention of potential groundwater impacts cannot be understated. In many cases, groundwater contamination can be avoided by developing and implementing simple source prohibition practices. Source prohibitions regulate the storage and use of hazardous materials (fuel, de-greasing agents, pesticides) or materials (such as fertilizers and road salts) within prime aquifer recharge areas or in Tier I well head protection zones. Ideally, the use of specific materials or certain types of activities that utilize hazardous materials are restricted and/or prohibited in areas where rapid recharge to the groundwater may occur. Given the fractured geology of the Township the implementation of source prohibition practices is warranted. However, regulation of this scope is outside the ability or jurisdiction of the Township. Measures of this nature will need to be implemented on a voluntary basis. For this to be successful an aggressive public education campaign is needed. There are a number of source prohibition and control techniques:

- Minimization of Hazardous Substance Use
- Minimization of Waste Generation
- Source Control to Prevent Releases
- Use Limitations
- Remedial Response and Spill Mitigation.

### Implementation of Environmentally Sound Development Practices

Other measures that can be implemented to decrease non-point source pollution and decrease the opportunity for long-term, chronic impacts to surface and groundwater resources, can be implemented as part of environmentally sound development practices.

- Soil Erosion and Sediment Control During the Construction Phase

Soil erosion can be a major water quality problem. The impacts are typically most dramatic during the construction phase of a project when large quantities of soil may become eroded and transported off-site. During construction, acute, significant impacts can occur to wetland and open water environments as a result of the influx of sediments. Besides reduced aesthetics, the impacts can include loss of habitat, occlusion of benthic organisms and even fish kills. The influx of excessive sediment into the waters of the State is in violation of NJAC 7:9. Both the State and the County have developed standard guidelines for the prevention and control of soil erosion. Site Plan Review and Environmental Review at the local level, requires the preparation of Erosion and Soil (E&S) Control Plans, including map(s) showing:

- Areas of excavation, filling, and grading

- Areas where topsoil is to be stockpiled
- All temporary and permanent vegetation, drainage, E&S control features intended to minimize the offsite transport of soil during the construction phase
- A schedule showing initiation and completion of major phases and site preparation activities, including the installation of temporary and permanent vegetation and drainage E&S facilities, anticipated duration of exposure of all major areas of site preparation before installation of E&S measures. The schedule must minimize potential of erosion by exposing the smallest practical area of the site at any given time
- Stormwater Management

Development inevitably results in a certain amount of land use and land cover changes. These changes will result in the potential generation of differing types and amounts of pollutants. In general, as land becomes increasingly developed and the amount of natural land cover is reduced, an increase in the types and amounts of pollutants exported from a site will be experienced. Furthermore, the delivery rate of pollutants generated by stormwater runoff increases as lands become increasingly developed. The effects of land development on pollutant loading can be summarized as follows:

- Hydrology - Increased impervious cover, without adequate mitigation, reduces the infiltration of precipitation, thereby increasing surface runoff and decreasing groundwater recharge. The added volume and energy associated with the resulting storm runoff has the potential to mobilize and transport an increased amount of pollutants. If not adequately mitigated, development related alterations in the hydrology of the watershed can result in lower base flows; storm flows of greater volume, velocity and duration; and an increase in pollutant loading.
- Pollutant generation - The types of pollutants present in surface runoff varies with land use. Typically, the more intensely land is developed (i.e. the greater the amount of impervious cover), the greater the export of pollutants. Pollutants most often associated with land development are nutrients (nitrogen and phosphorus) and suspended sediments. Following development, nitrogen and phosphorus loads increase primarily from the fertilization of lawns, but soil erosion and decomposition of vegetation are other sources. Suspended sediments originate primarily as a result of the erosion of exposed, insufficiently vegetated land surfaces. The generation of heavy metals and petroleum hydrocarbons can also increase as land becomes increasingly developed. The majority of these pollutants are associated with the servicing or maintenance of vehicles or with vehicular emissions.

There are measures that can be integrated into the design of a development that will reduce the hydrologic and pollutant load impacts associated with site development. These measures are commonly referred to as Best Management Practices (BMPs). They are endorsed and required by NJDEP as part of any development, whether residential or commercial. Whether structural (e.g. retention ponds, water quality basins, etc.) or non-structural (e.g. IPM, wetland and waterway buffers, etc.), BMPs can be very effective in reducing the pollutant load of stormwater runoff. Local and State regulations concerning the management of storm water runoff, both during and after development, should be required of any development activity conducted within the Township. Doing so will prevent flooding problems, minimize the off-site transport of pollutants and protect groundwater, surface water and wetland resources from impact.

- Storm water should not be directly discharged from any impervious component of a site to any stream, wetland or aquifer recharge area without some degree of treatment.
- At a minimum, post-development peak flows should be reduced to levels in accordance with the NJDEP Stream Encroachment regulations and the newly adopted Township Stormwater Management Ordinance.
- Emphasis should be placed on the use of vegetated Best Management Practices having a high pollutant removal efficiency, and these BMPs sized in accordance with State and Township standards.
- Where feasible, BMPs that encourage groundwater recharge and minimize the volume of stormwater runoff should be promoted, and these BMPs sized in accordance with State and Township standards.
- Maintenance of Stormwater Collection and Treatment Systems

Regular cleaning of storm drains and catch basins, and the maintenance of all stormwater BMPs are necessary for the long-term performance of these measures. This applies not only to parking lots and roads associated with the commercial or business areas, but with residential areas as well. Sediment and debris accumulate in BMPs, thereby reducing their efficiency over time. The Township should thus prepare and enforce appropriate maintenance measures for all drainage and pollution control structures and BMPs.

# **Part III ~**

## **Pollution &**

## **Natural Resource Vulnerability**



**View from Meadow Road  
Towards Treetop Road,  
Readington Township**

*Fifty percent (50%) of New Jersey's assessed streams, shall fully support aquatic life by 2005. Ninety five percent (95%) shall fully support aquatic life by 2020 (NJDEP).*

*The amount of land permanently dedicated to open space shall be 1, 004, 000 acres by 2002 and 1, 354, 0000 acres by 2010. The amount of land preserved for farmland is 200, 993 acres by 2002 and 550, 993 by 2010 (SADC).*

**~ Key Environmental Indicators and Key Environmental Targets,  
Draft New Jersey State Development and Redevelopment Plan, 2001~**

Natural Resource Vulnerability ~

There are many factors that present a risk to the resources that are important to us. Consider the following population information graph illustrating the most important trend that directly and indirectly affects the extent and the quality of our natural resources:

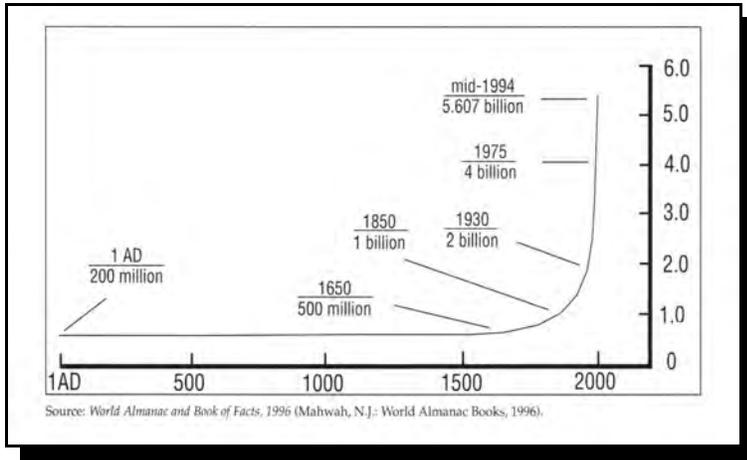


Figure 3.1: Worldwide Population Growth (APA 1996)

Figure 3.1 shows an unprecedented, exponential growth in worldwide population between 1900 and 1960. Similar trends have taken place in the northeastern United States. In the past several decades we have witnessed severe, negative impacts on our natural resources due to exponential population growth, socio-economic, and development trends.

New Jersey is one of the most densely populated states in the nation. An obvious consequence is that extreme pressure is placed on our region's limited natural resources. In addition, zoning and land development policies in our region, as well as personal preferences regarding development, have favored single-family residential development on large lots. We have also witnessed the separation of residential areas from commercial and industrial areas (e.g., zoning districts), and an increased reliance upon automobiles and extensive transportation networks linking our neighborhoods to shopping, manufacturing, and office centers.

This development vision has transformed distinctive, compact, village-centered communities that are surrounded by open space to typically disconnected subdivisions, shopping centers, and office parks with a limited amount of open space. This development pattern is what some professional planners have called "planned sprawl" (Arendt 1994). It is also a development pattern that often results in loss of habitat, intensive use of finite resources (e.g., water, energy), and results in increased point and non-point source pollution. Point source pollution may be traced directly to a single point of discharge. An example is a pipe, channel, or ditch connected to a wastewater treatment plant, landfill, or sludge lagoon.

Nonpoint source pollution is the primary source of surface water and groundwater contamination. It is caused when rainwater or snow melt (e.g., stormwater) flows over land that has been altered by human activity. For instance, agricultural land may contain residual and

accumulated fertilizers, pesticides, herbicides, and animal wastes. When stormwater flows over agricultural land, it washes the nitrogen, phosphorus, individual particles of soil, and chemicals into storm drains, streams, rivers and groundwater. There are associated pollutants common to every type of land use including residential neighborhoods (e.g., lawn chemicals, septic effluent), office parks, shopping centers, and manufacturing facilities (e.g., petroleum based hydrocarbons), and areas experiencing new development (e.g., eroded soils).

There are a myriad of potential negative impacts resulting from loss of habitat, altered landscapes, and point and non-point pollutants. Negative impacts upon our fisheries, water supply, recreational amenities, wetlands, surface water resources, and habitats are well-documented. It is important to note that these are potential, but not always inescapable, sources of pollution. Our local regulations and educational outreach efforts may help foster proper construction, operation, management, and restoration of our land in order to preserve our natural resources. The following section notes potential resource vulnerabilities currently facing Readington Township.

### Land Use Changes & Natural Resource Vulnerability ~

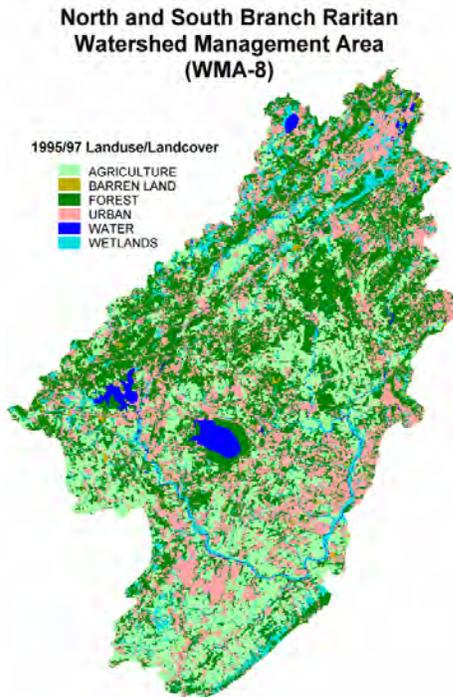


Figure 3.2: NJ Land Use, GIS

<http://www.state.nj.us/dep/gis/digidownload/images/lulc95/w08lu95.gif>

With regard to population and land use changes, Hunterdon County has also experienced growth as well as a loss in open space and habitat. Between 1960 and 1990 the county almost doubled in population and experienced the second highest population growth statewide. Between 1980 and 1990, the County experienced a 24% population growth and population densities increased from 203 to 251 persons per square mile.

Figure 3.2 shows that within the Upper Raritan watershed (WMA-8) the majority of the land remains in either a forested or farmed state. However, significant, dense pockets of development exist. Although most of those are located either along major thoroughfares or are associated with historic areas of development (e.g., Clinton, Lebanon, Whitehouse Station, etc.) there is an increasing rate of development of once open lands reflective of suburban sprawl.

However in 1992, Hunterdon County Tax Assessment Office records indicate that of the total area, fifty-nine percent (59%) of the land use in the county was still



Figure 3.3: Tax Map (Readington Township 1964)

agricultural, followed by residential (22%), vacant (9%), exempt (7%), commercial (2%), and industrial (1%) (Figure 3.3).

Since the completion of the last Natural Resource Inventory for Readington (Environmental Assessment Council 1974), the Township has experienced population increases, land use changes, loss of habitat, and other impacts related to increased development densities.

The early portions of this update (Part II) illustrate a doubling of population growth since 1960 and an increase of approximately 25% between 1980 and 1990. Again, population projections prepared by the Hunterdon County Planning Board for Readington projected 20% population growth by 2010. There is also quite a bit of land use information and land use trend information available through the New Jersey Department of Environmental Protection's geographical information system (GIS).

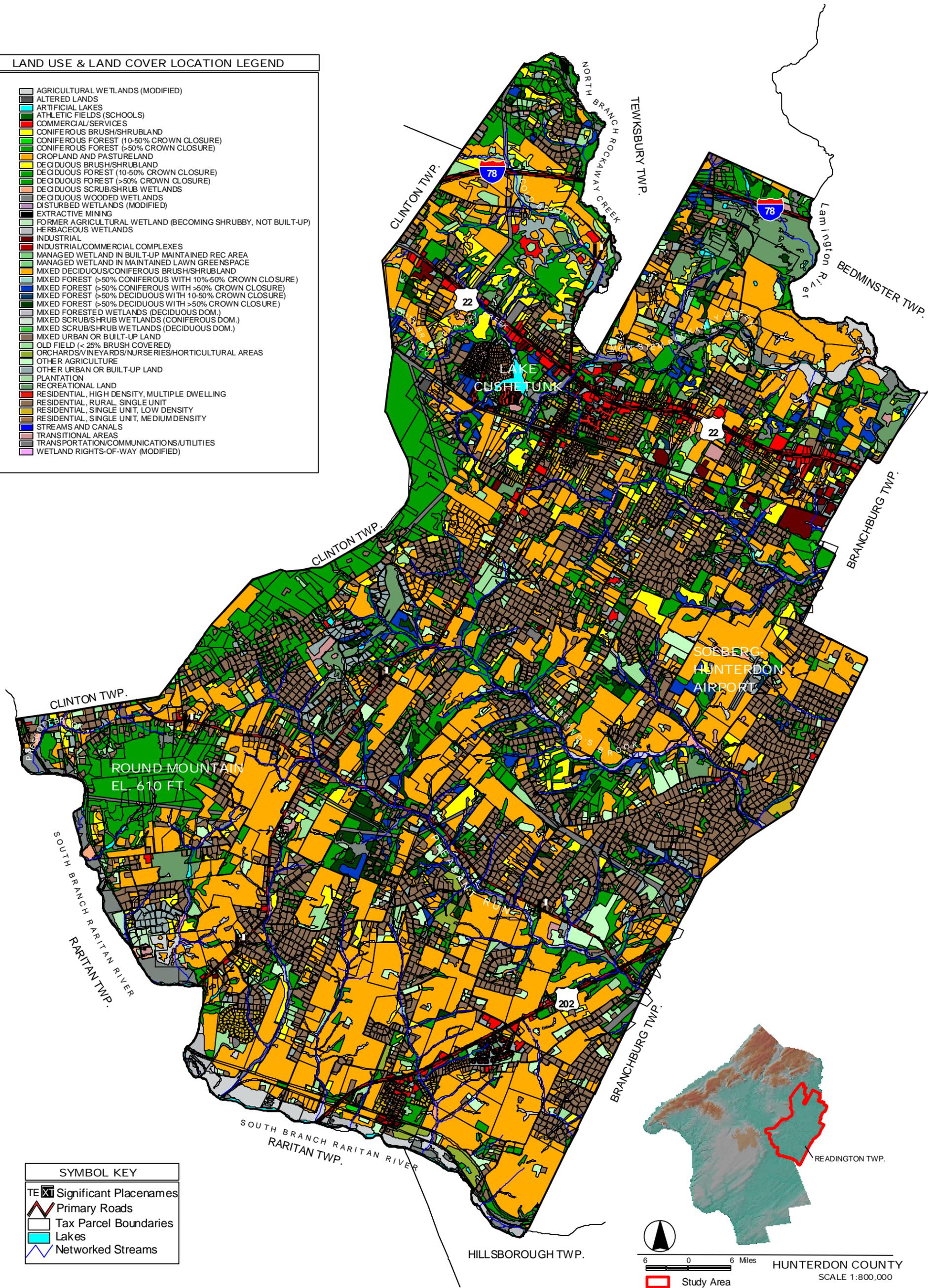
The GIS land use/land cover information available for Readington Township (Map 16) is based upon the Anderson Classification System (USGS 1976). The land use classification system is a hierarchical system based on four digits representing one to four levels of classification. The level I classification is general, level II is descriptive, level III is a more detailed description, and level IV is the *most* detailed level of classification. Within the level I series include urban, agriculture, forest, water, wetlands, and barren lands. Within each level I series are more detailed levels of classification. An example for a forest land code is as follows:

- 4 - - - Forestland
- 43 - - Forestland, Mixed Deciduous/Coniferous
- 431 - Forestland, Mixed Deciduous/Coniferous, Coniferous Prevalent (>50% coniferous)
- 4311 Forestland, Mixed Deciduous/Coniferous, Coniferous Prevalent (>50% coniferous)  
10-50% Crown Closure

Using a level I classification, Readington illustrates that the land use/land cover in the Township contains approximately 31.8 % urban lands, 29.15 % agricultural lands, 30.36% forested lands, 0.55 % water, 7.61% wetlands, and 0.53% barren lands.

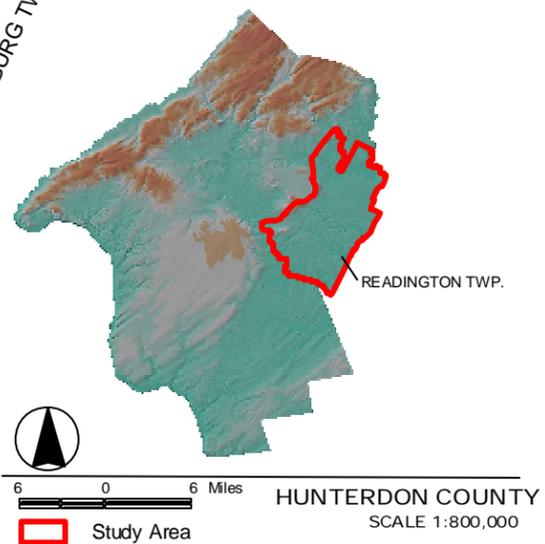
**LAND USE & LAND COVER LOCATION LEGEND**

- AGRICULTURAL WETLANDS (MODIFIED)
- ALTERED LANDS
- ARTIFICIAL LAKES
- ATHLETIC FIELDS (SCHOOLS)
- COMMERCIAL/SERVICES
- CONIFEROUS BRUSH/SHRUBLAND
- CONIFEROUS FOREST (10-50% CROWN CLOSURE)
- CONIFEROUS FOREST (>50% CROWN CLOSURE)
- CROPLAND AND PASTURELAND
- DECIDUOUS BRUSH/SHRUBLAND
- DECIDUOUS FOREST (10-50% CROWN CLOSURE)
- DECIDUOUS FOREST (>50% CROWN CLOSURE)
- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DISTURBED WETLANDS (MODIFIED)
- EXTRACTIVE MINING
- FORMER AGRICULTURAL WETLAND (BECOMING SHRUBBY, NOT BUILT-UP)
- HERBACEOUS WETLANDS
- INDUSTRIAL
- INDUSTRIAL/COMMERCIAL COMPLEXES
- MANAGED WETLAND IN BUILT-UP MAINTAINED REC AREA
- MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE
- MIXED DECIDUOUS/CONIFEROUS BRUSH/SHRUBLAND
- MIXED FOREST (>50% CONIFEROUS WITH 10%-50% CROWN CLOSURE)
- MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)
- MIXED FOREST (>50% DECIDUOUS WITH 10%-50% CROWN CLOSURE)
- MIXED FOREST (>50% DECIDUOUS WITH >50% CROWN CLOSURE)
- MIXED FORESTED WETLANDS (DECIDUOUS DOM.)
- MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)
- MIXED SCRUB/SHRUB WETLANDS (DECIDUOUS DOM.)
- MIXED URBAN OR BUILT-UP LAND
- OLD FIELD (< 25% BRUSH COVERED)
- ORCHARDS/VINEYARDS/NURSERIES/HORTICULTURAL AREAS
- OTHER AGRICULTURE
- OTHER URBAN OR BUILT-UP LAND
- PLANTATION
- RECREATIONAL LAND
- RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
- RESIDENTIAL, RURAL, SINGLE UNIT
- RESIDENTIAL, SINGLE UNIT, LOW DENSITY
- RESIDENTIAL, SINGLE UNIT, MEDIUM DENSITY
- STREAMS AND CANALS
- TRANSITIONAL AREAS
- TRANSPORTATION/COMMUNICATIONS/UTILITIES
- WETLAND RIGHTS-OF-WAY (MODIFIED)

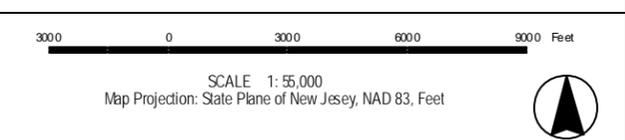


**SYMBOL KEY**

	Significant Placenames
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



**READINGTON TOWNSHIP, NRI, 2000**



Land use & Land Cover Information Collected from New Jersey Department of Environmental Protection, Website: GIS Data Downloads, WMA 8, 1995-97 LULC from Aerial Photography Scale 1 meter resolution  
New Jersey, Department of Environmental Protection, GIS data Web Site Downloads State Municipalities of New Jersey Scale 1:100,000  
TMP map, supplied by Yager and Associates. Scale (unknown)

**NOTES:**  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

**Map 16: Readington Township Land Use & Land Cover Map**

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

### Land Use Trends ~

The 1995/97 land use and land cover and impervious surface map (NJDEP, [http://www.state.nj.us/dep/gis/images/m4m/hunco/readingt\\_tp.html](http://www.state.nj.us/dep/gis/images/m4m/hunco/readingt_tp.html)) was developed to provide trend analysis data for Townships throughout the state. Based on NJDEP methodology information, the trend analysis studies rely upon the comparison of data from one year to another in order to identify areas of change. Baseline land use data in 1986 was compared with 1995/97 data sets to eliminate the need for users to independently compare 1986 and 1995/97 data sets. Due to improvements in technology, the user is instructed to be aware of the more detailed level of 1995/97 data when compared to the 1986 data (NJDEP, General Comments, 2001). Additional information is available from the New Jersey Department of Environmental Protection's Geographical Information System (GIS) website (see references).

The map following the Land Use Trends section illustrates areas developed as of 1986, areas that show "change" or added development between 1986 and 1995/97. The particular land use types (e.g., commercial services, industrial uses, residential development) are extracted for each time period from the GIS data layer to produce the maps. The results allow conclusions to be made about development patterns between two separate time periods, often referred to as "change detection analysis". The trend analysis map for Readington Township illustrates the following:

- The *light yellow lines* on the map indicate areas developed by 1986. Developed areas include residential, agricultural, and commercial developments throughout the Township and emanating from primary travel corridors (e.g., Routes 202, 523, 629, and 22).

Using the geographic information system (GIS) to overlay developed areas with natural resource areas, it is evident that a significant amount of forested, headwater, steeply sloping, agricultural/agricultural soils, severely erosive, high priority forested and grassland habitat areas were developed by 1986.

- The *solid yellow areas* were developed between 1986 and 1995/7. Areas experiencing development in that ten year time period include land within the Rockaway/ Lamington Creek subwatershed (e.g., Halls Mill Road, Whitehouse Station, Lake Cushetunk, Fiddlers Elbow County Club, Meadow/Cedar/Treetop Roads, Lance Road & Taylors Mills Road), Holland's Brook subwatershed (e.g., Brookville Road, Dreahook & Johnson Road, Holland's Brook Road), Pleasant Run subwatershed (e.g., Springtown Road, Sunset Road, Summer Road), and South Branch Raritan subwatershed (e.g., West Woods Church Road, Deer Path Road).

GIS was again used to determine the natural resources lost between 1986 and 1995/97. Similar to the areas developed by 1986, it is again apparent that a significant amount of forested, headwater, steeply sloping, agricultural/agricultural soils, severely erosive, high priority forested

and grassland habitat land areas were developed in the 10 year period.

In addition, a significant amount of Holland's Brook headwater areas and land adjacent to the main stem of the Brook, were developed. Similar trends were indicated in the land areas adjacent to Lake Cushetunk as well as the main stem of the Rockaway Creek and Lamington River.

As the amount of impervious cover (sidewalks, driveways, parking lots etc) approaches or exceeds 10% , in any given watershed, a variety of environmental impacts follow. These include an increase in the rate and amount of non-point source pollutant loading, a loss in baseflow and recharge, a the diversity of fish and other aquatic and semi-aquatic biota, and an exponential increase in stream channel enlargement (McRae & DeAndrea 1999; Brown & Clayton 2000, Schueler 1996).

With regard to impervious surface cover, the NJDEP estimates that Township-wide the total amount of impervious cover constitutes 2% of Readington's total acreage. However, the 2% figure does not suggest that Readington Township is not currently impacted by the problems associated with impervious surfaces. Although Township-wide the percentage is deceptively low, there are clusters of development, many of them near or within critical natural resources areas, that already are impacted by excessive imperviousness and many others that are threatened by an insurgence of unmitigated development. For example, the South Branch Rockaway Creek has an estimated total impervious surface coverage approaching 16%.

Imperviousness has been shown to negatively affect stream resources; several streams in the Township are currently negatively impacted by imperviousness and others are threatened. Development measures intended to decrease impervious cover, promote open space and mitigate for the loss of recharge for the purpose of protecting baseflow and aquifer recharge are warranted.

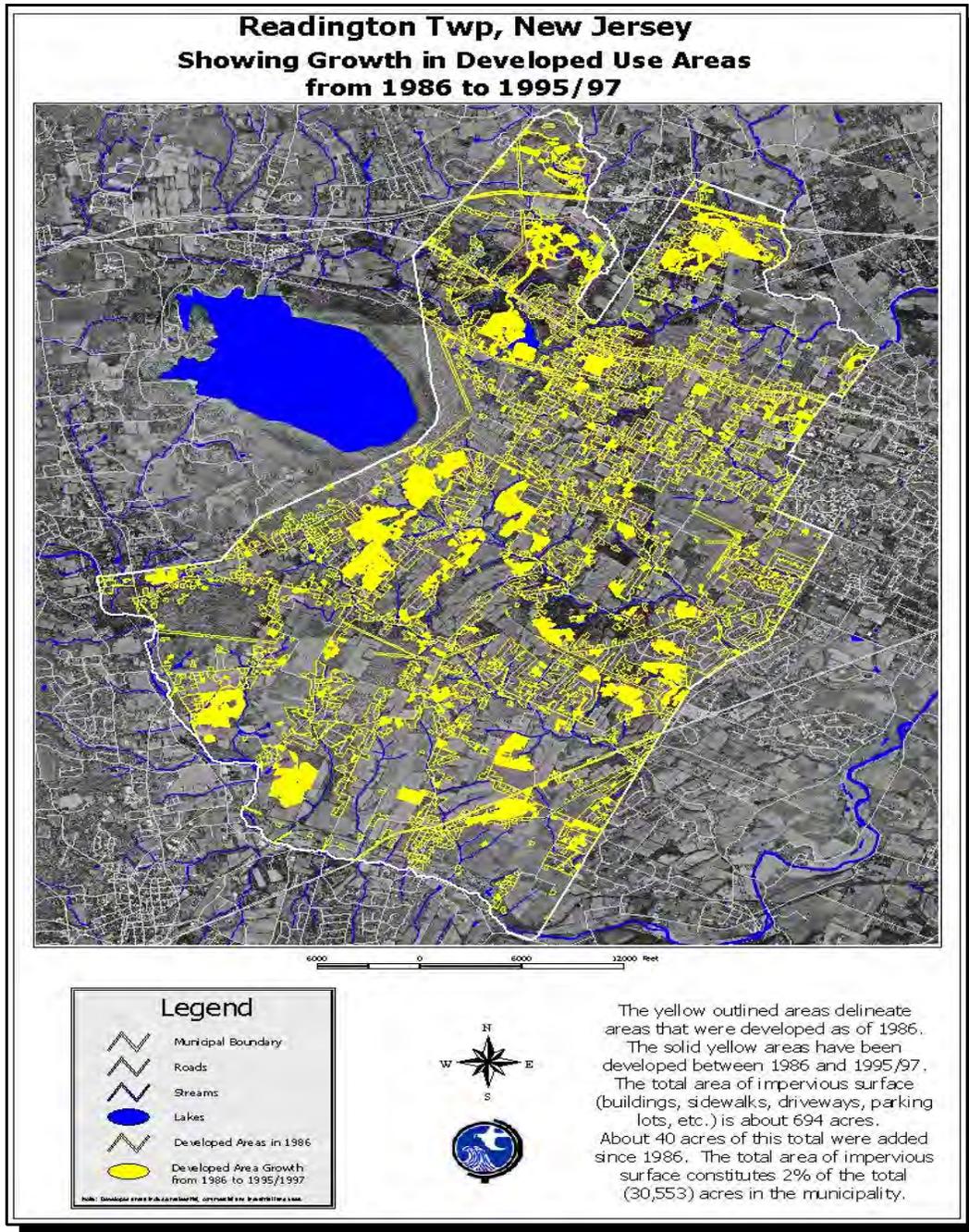


Figure 3.4: Readington Township Development, NJDEP Department of GIS, “Maps For Mayors” ([http://www.state.nj.us/dep/gis/images/m4m/hunco/readington\\_tp.html](http://www.state.nj.us/dep/gis/images/m4m/hunco/readington_tp.html))

Potential Pollution Sources ~

Using the previously discussed level I classification for Readington, one way to determine vulnerability is to assess the predominate land uses in Readington Township (e.g., Urban & Agricultural), associated nonpoint source pollutants, and potential impacts on surface water, fisheries, water supply, wetlands and recreation. The following two tables illustrate the approach:

**Table 3.1 Predominant Land Uses & Associated Pollutants**

<b>Land Use Percentage of Land Area</b>	<b>Associated Nonpoint Source Pollutants</b>
<b>Urban Land, 31.8%</b> <i>(Residential, Commercial, Industrial, Transportation,            Utilities, Active Recreational Areas)</i>	Urban runoff comprised of sediment from construction, phosphorus & nitrogen from lawn care, pesticides from landscaping, heavy metals & salts from de-icing roadways & leaking storage tanks, pathogens from failing septic tanks & sludge, thermal energy from hydrologic & habitat modification.
<b>Agricultural Land, 29.15%</b> <i>(Crops, Pasture, Feeding Operations, Orchards, Ag            Wetlands)</i>	Agricultural runoff comprised of sediments, phosphorus & nitrogen from agricultural fertilizers, pathogens from animal waste, and pesticides & herbicides.

**Table 3.2 Potential Impacts of Associated Pollutants**

<b>Pollutant/ Land Use</b>	<b>Impacts On Fisheries</b>	<b>Impacts On Water Supply</b>	<b>Impacts Wetlands</b>	<b>Impacts On Recreation</b>
<p style="text-align: center;"><b>Sediments</b>  <i>(Construction, Urban Runoff, Gravel Operations, Agriculture, Logging, Hydro modification)</i></p>	Decreases Light Transmisivity, food, cover, dissolved oxygen, spawning habitat, transports absorbed contaminants.	Damages water treatment pumps & equipment, increases treatment costs, reduces reservoir volume, toxic substances adhere to sediments, reduces well yields, decreases river bottom infiltration.	Reduces flood storage, increases peak discharges, and alters habitat.	Decreases water clarity (public health & safety), reduces aesthetic and recreational value, and reduces sport fishing populations.
<p style="text-align: center;"><b>Phosphorus &amp; Nitrogen</b>  <i>(Urban Development, Gravel Operations, Agriculture, Land Disposal, Illegal Waste Disposal)</i></p>	Promotes algae blooms, inhibits aquatic plant growth, favors survival of less desirable species, and reduces dissolved oxygen levels.	Promotes algae blooms (odor & taste), increases treatment costs, increases nitrate concentrations (permitted levels).	Alters wetland vegetation & habitat.	Promotes eutrophication of lakes & rivers, increases algae growth (public health & safety), decreases aesthetic value, degrades fishing and boating activities, reduces tourism and adjacent property values.
<p style="text-align: center;"><b>Metals</b>  <i>(Urban Runoff, Mining, Land Disposal, Natural Deposits)</i></p>	Accumulates in sediments posing risks to bottom dwellers, bio accumulates in fish tissue (public health), affects reproductive rates and life spans of all aquatic organisms, and hinders photosynthesis in aquatic plants.	Increases treatment costs, forms deposits in pipes thereby reducing carrying capacity, colors water, leaves stains on fixtures, and poses health hazards due to toxic metals.	Bio accumulates in food web, hinders photosynthesis, affects reproductive rates and life spans of wetland organisms.	Reduces waterfront property values, and restricts sports fishing when found in fish tissue.

Pollutant/ Land Use	Impacts On Fisheries	Impacts On Water Supply	Impacts Wetlands	Impacts On Recreation
<b>Pesticides &amp; Herbicides</b> <i>(Agriculture, Urban Runoff, Hydrologic Modification, Habitat Modification, Lawn &amp; Golf Course Care)</i>	Accumulates in sediment posing a risk to bottom feeders, bio accumulates in fish tissue, may kill fish & other aquatic organisms, and hinders photosynthesis in aquatic plants.	Causes odors in water supply, increases treatment cost, and carcinogenic effects causing public health risks.	Adversely impacts the survival of wetland flora & fauna.	Reduces waterfront property values, and restricts sports fishing if contamination is found in fish tissue.
<b>Pathogens-Bacteria &amp; Viruses</b> <i>(Agriculture, Urban Runoff, Land Disposal, Septic Tanks, Sludge)</i>	Introduces disease-bearing organisms to aquatic life & closes shell fish areas.	Increases public health risks and treatment costs for drinking water supply.	Introduces harmful organisms to aquatic life and the wetland food chain.	Closes swimming areas.
<b>Thermal</b> <i>(Construction, Mining &amp; Gravel Operations, Logging, Agriculture, Urban Runoff, Hydrologic Modification, Habitat Modification)</i>	Reduces vigor, growth, resistance to disease, and dissolved oxygen. Changes cold water fisheries to warm water fisheries.	Increases temperature thereby accelerating pump/equipment corrosion, promotes biological activity thereby producing odors and poor taste, creates a more favorable environment for pathogens, and increases treatment costs.	May alter wetland vegetation & species composition.	May stimulate growth of algae and aquatic plants thereby reducing water clarity, aesthetic value, sports fishing population, and tourism.
<b>Salts</b> <i>(Mining, Urban Runoff, Construction, Road De-icing)</i>	Increases favor salt-tolerant species, creates stressful environment, destroys habitat and food source plants for some species, and alters species composition of affected areas.	Reduces drinking water quality and increases treatment costs.	Alters wetland vegetation & species composition. Destroys habitat and food sources for wetland animals.	May cause skin and eye irritations.

*Adapted from Massachusetts DEP (1990) and APA Report # 476 (1997).*

Another method of determining natural resource vulnerability and potential pollution is to determine the location of Superfund sites, state hazardous waste sites, regulated storage tanks, sewage and sludge disposal sites, solid waste disposal sites, solid waste transfer stations, underground injection wells, and other regulated facilities. The following information was obtained from the New Jersey Department of Environmental Protection and is provided to present a sense of where these facilities are located throughout the Township:

- **Superfund (CERCLA & SARA) Sites** - In 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the Superfund, in response to the dangers of uncontrolled or abandoned contaminated sites. CERCLA was amended in 1986 by the Superfund Amendments and Re-authorization Act (SARA). CERCLA and SARA require that a National Priorities List (NPL) of sites throughout the United States be maintained and revised at least annually. *There are no federal Superfund Sites located in Readington Township.*
- **Hazardous Waste Generators** - The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 as a response to growing public awareness of serious problems related to disposal of hazardous waste. The hazardous waste provisions of RCRA requires that those entities generating, transporting, or disposing of hazardous waste obtain a permit. *The NJDEP database notes that there are one-hundred and twenty-six (126) registered hazardous waste generators, transporters, and/or disposers of hazardous waste in Readington Township.* The majority of permits are issued to landowners in the Whitehouse Station area.
- **Regulated storage tanks** - Amendments to RCRA (1984) now require that underground storage tanks be registered. *The NJDEP database notes that there are four (4) permitted storage tanks in Readington located on County Line Road and Rattlesnake Bridge Road.*
- **Solid Waste Disposal** - In 1984, the amendments to RCRA required that landfills and surface impoundments have double liners, leachate collection systems, and groundwater monitoring facilities. Subsequent amendments required that landfills and transfer facilities obtain permits and follow strict environmental regulations. *The NJDEP, Division of Solid and Hazardous Waste database notes that there are no landfills, historic/decommissioned landfills, or solid waste transfer stations in Readington Township.*
- **State Hazardous Waste Contamination Sites** - The *Known Contaminated Sites in New Jersey* (KCS-NJ) is a listing of sites in the state where contamination of soil or groundwater is confirmed. Sites listed are those where remediation is either underway or pending. *As of September 1997, 11 sites were listed as having on-site source(s) of contamination. Six (6) sites are categorized as “active” and five (5) sites are “pending”.* Five (5) sites are located along Route 22, the others are located on Stillwell Road, Mill Road, Readington Road, Route

523, Kosciuszko Road, and Willocks Court. It should be noted that the above are only those sites that appear on the State's database records. There may be additional non-recorded landfills or previously closed landfills located throughout the Township. Additional information may be obtained from the NJDEP's *Known Contaminated Sites* listing.

- **Chemical Storage** - The Community Right to Know Act of 1986 (EPCRA) is also known as Title III of the Superfund Amendments and Re-authorization Act of 1986 (SARA). The NJDEPs, Bureau of Chemical Information and Prevention collects, processes, and disseminates information used by the public, emergency planners, and first responders to determine the extent of chemical hazards in the community. *There are sixty-five (65) facilities storing 500 pounds or more of hazardous chemicals in Readington Township.*

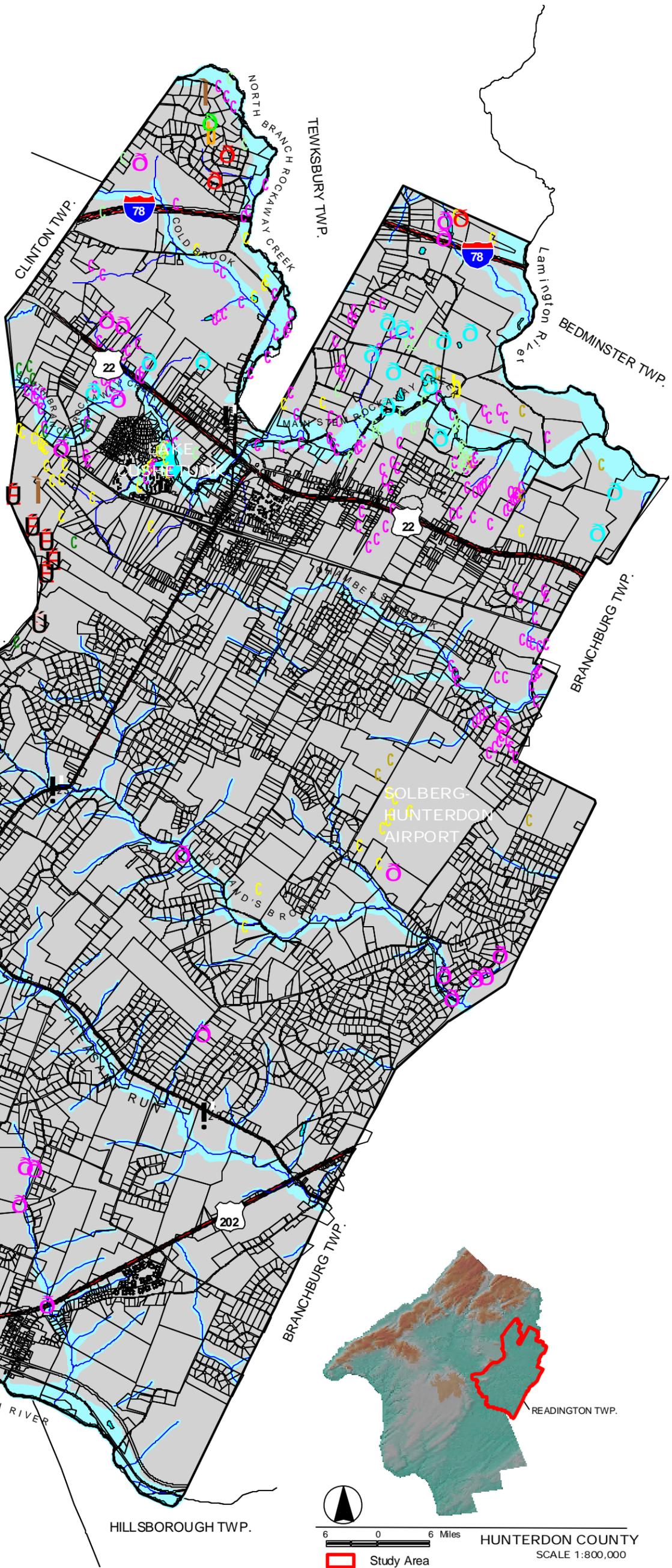
#### *Natural Resource Vulnerability, Overlay Analysis ~*

Geographic information systems (GIS) are tools used to 1) organize and display spatial information and 2) analyze the spatial impacts of alternative decisions. GIS helps natural resource managers to conceive of and implement management alternatives (Moraine 1999). For this Natural Resource Inventory (ERI) extensive organization and display of spatial information was completed (see Maps 1-17) and some analysis in order to determine trends is presented throughout the inventory.

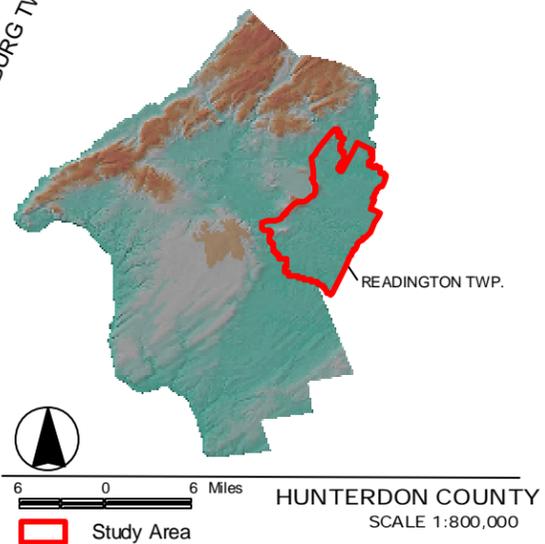
The analysis of spacial patterns in natural systems has progressed dramatically in recent decades due to the rapid development of GIS and remote sensing capabilities (Coulson et al. 1990). Therefore, quite a bit more analysis may be completed in the future. The investigation of the cause and effects of certain development scenarios on ecological processes is one example (e.g, build out scenarios in the business district and potential impacts on high priority forested areas along Route 22).

Although extensive modeling was not the purpose of this ERI, some overlay analysis was completed and more is suggested for the future. Overlay analysis involved selecting those resources determined most vulnerable (e.g., environmentally sensitive planning areas, steeply sloping areas, soils with severe erosion potential, high priority wetlands/forests/grasslands, and surface water resources) and combining the most vulnerable areas to produce one map (Map 17). Map 17 is a first step as it illustrates areas throughout the Township that should be protected and closely considered when reviewing proposed land developments. For the time being, the Township should utilize each updated resource map when reviewing each development proposal and request alternative building scenarios and best management practices when particularly sensitive resources may be impacted.

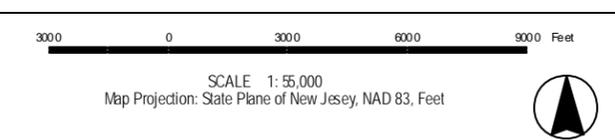
NATURAL RESOURCES VULNERABILITY LEGEND		
	ENVIRONMENTALLY SENSITIVE PLANNING AREAS (PA5) - SEE MAP 3 FOR ACTUAL PLANNING AREA BOUNDARIES	
	ENVIRONMENTALLY SENSITIVE PLANNING AREAS (PA45) - SEE MAP 3 FOR ACTUAL PLANNING AREA BOUNDARIES	
	ENVIRONMENTALLY SENSITIVE ZONING AREAS (SSR) STEEP SLOPE RESIDENTIAL - SEE MAP 4 FOR ACTUAL PLANNING AREA BOUNDARIES	
	ENVIRONMENTALLY SENSITIVE STEEP SLOPE AREAS 15 TO GREATER THEN 40% - SEE MAP 6 FOR	
	STEEP SLOPE AREA BOUNDARIES	
ENVIRONMENTALLY SENSITIVE SOILS WITH SEVERE LAND DEVELOPMENT EROSION POTENTIAL - SEE MAP 8 FOR COMPREHENSIVE AREA BOUNDARIES. SOIL FORMATIONS:		
	A1D2	
	LgD	
	NoD2	
	R1F	
ENVIRONMENTALLY SENSITIVE STREAMS, FLOODPLAINS, AND RIPARIAN WETLANDS, INCLUDING 100 FOOT STREAM BUFFERS - SEE MAPS 13 & 14 FOR MORE COMPREHENSIVE BOUNDARIES.		
NATURAL AREAS VULNERABILITY LEGEND		
ENVIRONMENTALLY SENSITIVE AREAS WITH STATE CONSERVATION PRIORITY - SEE MAP 11 FOR COMPREHENSIVE HABITAT INFORMATION		
FORESTED AREAS	WETLAND AREAS	GRASSLAND AREAS
LOWER PRIORITY	MODERATE PRIORITY	LOWER PRIORITY
HIGHER PRIORITY		HIGHER PRIORITY



SYMBOL KEY	
	Significant Place Names
	Primary Roads
	Tax Parcel Boundaries
	Lakes
	Networked Streams



**READINGTON TOWNSHIP, NRI, 2000**



Natural Resources Map Prepared by Princeton Hydro, from Compiled Data  
Scale 1:55,000  
New Jersey, Department of Environmental Protection, GIS data  
Web Site Downloads State Municipalities of New Jersey  
Scale 1:100,000  
TMP map, supplied by Yager and Associates.  
Scale (unknown)

NOTES:  
1. DATA ACCURACY IS LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES.  
2. THESE MAPS ARE PART OF A RESOURCE INVENTORY CONDUCTED FOR READINGTON TOWNSHIP AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT.

Map 17: Readington Township  
Natural Resource Vulnerability Map

DRAWN BY:	KJM
CHECKED BY:	GMG, SF
REVISED:	07/02/02

Project No.: 160.02

## Part IV ~

# Environmental Resource Management Recommendations



**Rockaway Creek at Island Road,  
Readington Township**

- Maintain large, intact patches of native vegetation and prevent fragmentation by development,
  - Establish & implement priorities for species and habitat protection,
- Protect rare elements and guide development toward areas with “common” features,
  - Maintain connections among habitat by protecting corridors for movement,
  - Maintain significant ecological processes in protected areas,
  - Contribute to the regional persistence of rare species by protecting their habitat locally, and
- Balance the opportunity for recreation by the public with habitat needs of wildlife.

**~ The Seven Biological Principles For Natural Resource Protection,  
American Planning Association, 1997~**

Introduction ~

There are numerous methods and techniques by which valuable natural resources can be protected. The appropriateness of any particular technique is first and foremost determined by the nature of the specific resource, whether that resource be terrestrial, aquatic, historic or aesthetic. The section and implementation of a particular method or technique will also be influenced by upon land development law, environmental protection regulations, regional and local planning codes, local philosophy and funding opportunities. Usually, municipal officials, land developers, local businesses, environmental organizations, and local residents have philosophical differences regarding whether or not land should be preserved, conserved, or developed entirely.

*Preservation* of resources usually means that land is purchased outright and set aside indefinitely. In some cases the preserved land will be provided little or minimum maintenance. In other cases, as with preserved farm land or green ways, a prescribed amount of maintenance will be conducted on a routine basis so as to sustain the ecological or functional attributes of the preserved resource. Only a century ago, the idea of preventing development of a useless “wilderness” area was widely regarded as completely irrational. It is no longer considered irrational by some. Essentially, preservationists feel that land should be set aside, human intervention should be restricted, and the natural systems present on the land should be left untouched and allowed to evolve naturally. Some preservationists feel that life on earth is imperilled by the destruction of nature wrought by human intervention (Blowers 1999) and that all development should stop.

*Conservationists* feel that the most valuable resources should be protected, but managed for and maintained for multiple uses (e.g., passive recreation, hunting, farming, forestry). Land is usually purchased and managed by government entities, hunting groups, foresters, farmers and other organizations for a specific use. For instance, land set aside for active recreation may require the development of a trail system or similar recreational amenities, or the construction of infrastructure such as utilities, irrigation system, and restrooms.

There are also those that feel land ownership and landowner rights are protected by the Fifth Amendment of the Constitution of the United States. Therefore, once land is purchased, many feel that the landowner should be able to develop that property based on his/her wishes, and that any reduction of economic return due to the imposition of development restrictions should be viewed as a “taking”. Most municipal officials are aware that the takings clause has provided a fruitful ground for litigation. Therefore, municipalities usually diligently attempt to balance land development with the protection of the health and welfare of the citizenry. The following section of the Readington ERI provides a broad overview of preservation, conservation, and management goals for Township consideration.

It is strongly recommended that as more funding becomes available, additional resource data and GIS overlay analyses be conducted. The garnered information will help pto provide the technical data needed to create and support policies and specific actions (e.g., zoning and land development amendments, educational programs, and more aggressive land purchase/conservation easement programs) designed to protect the Township's resources.

*Resource Preservation Recommendations ~*

**Master Plan Amendment (1998) Goal:** Protect environmentally sensitive areas, and preserve the natural environment.

**Biological Principle (ERI, 2001) Goals:**

- Maintain large, intact patches of native vegetation, in particular grassland habitat, riparian corridors and successional forests, and prevent the fragmentation of these resources by land development activity.
- Establish and implement priorities for species and habitat protection, especially those habitats critical for State listed, threatened and endangered species.
- Maintain connections among habitat types (e.g, upland, wetland and aquatic) by protecting greenways and similar corridors critical for the movement and migration of wildlife.
- Maintain those conditions needed to sustain significant ecological processes in protected areas.
- Contribute to the regional persistence of rare and threatened and endangered species by protecting their habitat locally.

**Master Plan Amendment (1998) Recommendations:**

- Maximize buffer areas along river and stream corridors, including the Lamington River, the Rockaway Creek, Chambers Brook, Holland's Brook, the Pleasant Run, and the South Branch of the Raritan River.
- Preserve historic districts and villages in the Township, including East Whitehouse, Readington, Stanton, Three Bridges and the Pleasant Run Historic District. Ensure the integrity of these areas through green belting.

**ERI (2002) Recommendations:**

- Obtain additional funding to purchase and maintain open space areas identified as valuable habitat (Map 11) and those areas addressing the biological principles stated above.
- Preservation and protection of sensitive wetland and aquatic site features.

*Resource Conservation Recommendations ~*

**Master Plan Amendment (1998) Farmland Conservation Goal:** Conserve farmlands and encourage their continued use recognizing that farming is an important component of the economy of the Township, the region, that state, and that *agricultural lands are an irreplaceable natural resource* and a key element of the Township's rural character.

**Master Plan Amendment (1998) Natural Resource Conservation Goal:** Ensure a compatible balance between economic and environmental interests.

**Master Plan Amendment (1998) Recommendations:**

- Opportunities to preserve diminishing farmland should continue to be actively pursued.
- Involvement in county easement purchase program, state fee simple program, and Township easement purchase/option program should continue.
- Consider use of transfer of development rights between non-contiguous parcels.

**ERI (2002) Recommendations:**

- Balance the opportunity for public recreation with the habitat needs of wildlife.
- Consider potential opportunities for habitat restoration activities on existing Township recreational lands.
- Implement a habitat conservation education program linking farmers with habitat restoration funding programs.
- Develop riparian corridor greenways, fostering conservation of riparian buffers and passive recreation and implementing programs recommended by the Readington Township Greenways Work Group.

- Work with developers, homeowners, and others to maximize buffer areas along wetland, river and stream corridors.
- Utilize funding from governments and private foundations to continue preserving historic districts and villages in the Township, including East Whitehouse, Readington, Stanton, Three Bridges and the Pleasant Run Historic District. Ensure the integrity of these areas through the creation of green belts and the control of suburban infill development.
- Continue to obtain additional funding to purchase and maintain open space areas identified as valuable habitat and those areas addressing the biological principles stated above.
- Consideration should be given to implementing a wetland buffer protection education program.
- Develop a better base flow and low flow database for the Township's streams.
- Minimize development related impacts to terrestrial, wetland, riparian and aquatic resources through the implementation of conservation and preservation measures.

*Land Management Recommendations ~*

**Master Plan Amendment (1998) Recommendations:**

- Development in areas with excessive slopes, particularly those above 15% should be limited.
- To the extent possible, steeply sloping land should be left in its natural condition or maintained in grass or tree cover.
- Proper steps should be taken to ensure that residential or commercial development does not jeopardize the recharge of aquifers or the potable water supplies of the Township.
- Future developments should ensure that groundwater supplies are not subject to degradation due to failing or improperly designed on-lot wastewater treatment and disposal systems.
- To protect groundwater quality in non-sewered areas, minimum residential lot sizes or maximum permitted density should be set appropriately.
- All wetlands should be delineated as part of the development review process.

- Development standards should be set to restrict and eliminate disturbance in all delineated critical areas.
- Increase minimum residential lot size in order to bring the Township's zoning into closer conformance with the carrying capacity of the soils in the AR zone.

**ERI (2002) Recommendations:**

- More vigorously enforce the 100 foot riparian buffer area currently required by the Zoning Ordinance.
- Environmental Impact Assessments should be completed for development proposals, particularly those located in the vulnerable areas noted in the ERI..
- Consideration should be given to implementing a wetland buffer protection education program.
- Best management practices should be required for all development proposals including stormwater quality treatment, increased stormwater recharge, and the elimination of in-stream stormwater discharge.
- Proposed golf course developments, whether or not associated with residential units, should be required as part of the Environmental Impact Statement preparation process to examine and comment on potential impacts to surface and groundwater quality and groundwater supply. Specifically, this should entail the development of a surface water and ground water quality monitoring program developed as per the recommendations presented in NJDEP's Guidance for the Siting of Golf Courses in New Jersey. This entails the establishment of sampling wells and/or surface stations, and the monitoring of specific water quality parameters and biological indicators before, during and after construction and operation of the golf course. In addition, proposed and existing golf courses should develop environmentally and economically sound management plans/programs, that include integrated pest management (IPM) programs, drought management plans, buffer zone development/maintenance plans, soil testing programs to minimize unnecessary phosphorus fertilizer applications, no-mow zones near surface waters, and chemical (pesticide/fertilizer) application plans that do not allow the application of turf care products in advance of anticipated precipitation events. Finally, all golf courses should be required to file for a Water Allocation Permit (WAP) with the Bureau of Water Allocation, NJDEP as part of the development process.

- The Township should implement recent revisions to water quality management rules in order to protect surface and groundwater resources.
- Revisions to the zoning ordinance, particularly less intensity of development in business zones and residential office zones should be considered.
- More restrictions to the amount and location of impervious surfaces should be considered in light of the established direct and indirect impacts associated with increasing amounts of impervious surface cover. Although, overall the percentage of imperviousness township wide is relatively low (2%) there are areas adjacent to critical resources that are well in excess of 10% impervious and other areas that will likely be subject to a rapid, significant increase in impervious cover. This increase, and the need to manage impervious surfaces results from documented negative impacts on groundwater infiltration and recharge, increases in pollutant loading and increases in the scour, erosion and destabilization of stream and riparian corridors.
- Additional open space set asides should be considered, particularly in vulnerable areas noted in the ERI (Map 17).
- Increased capital should be set aside and grants obtained to complete additional analysis and to revise current regulations to be more protective of valuable natural resources.
- Opportunities to preserve diminishing farmland should continue to be actively pursued.
- Involvement in county easement purchase program, state fee simple program, and Township easement purchase/option program should continue.
- The Township should consider use of transfer of development rights between non-contiguous parcels.
- The Township should consider additional development standards to restrict and eliminate disturbance in all critical/vulnerable areas (e.g., most erosive soils, steepest slopes, state designated grassland, wetland, and forest habitats).
- Revisions to the zoning ordinance, particularly less intensity of development in business zones and residential office zones should be considered.
- Minimization of disturbance and use of alternative landscaping

- Reduce the generation of chloride related contaminants and their subsequent impacts to the biota and quality of the Township's streams through the implementation of roadway de-icing/salt management reduction.
- Implementing simple source prohibition practice.
- Township should prepare and enforce appropriate maintenance measures for all drainage and pollution control structures and BMPs.
- This ERI should be used as a tool to review all development proposals considered by Readington Township.

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## **APPENDIX A**

### **Natural Heritage Database Search**



Princeton Hydro, LLC  
1108 Old York Road  
Suite 1, P.O. Box 720  
Ringoes, NJ 08551

July 30, 2002

Office of Natural Lands Management  
Natural Heritage Program  
P.O. Box 404  
Trenton, NJ 08625-0404

Re: Request for Natural Heritage Database Search  
Readington Township, Hunterdon County, NJ

Dear Sir/Madam:

I am requesting a Natural Heritage Database search for the above-referenced Township for the following information:

- Listed Federal Endangered Species
- Listed State Endangered Plant Species
- Listed State Endangered Wildlife
- Additional Plant Species of Concern
- Additional Nongame Animal Species
- Rare and Exemplary Natural Communities

I am working with the Readington Township Environmental Commission to complete an update to the Readington Township Natural Resource Inventory. If possible, also provide the information on a Township-wide and watershed/sub-watershed basis.

Enclosed with this letter is a site location map and the relevant portion of the USGS Topo Quad showing study area boundaries. Also enclosed is a completed Natural Heritage Data Request Form. Please call me at 908-237-5660 if you have any questions pertaining to this request. Thank you for your time.

Sincerely,

A handwritten signature in cursive script, appearing to read 'J DiMauro'.

Jessica DiMauro, M.A.  
Project Scientist



State of New Jersey  
Department of Environmental Protection

James E. McGreevey  
Governor

Bradley M. Campbell  
Commissioner

Division of Parks and Forestry  
Office of Natural Lands Management  
Natural Heritage Program  
P.O. Box 404  
Trenton, NJ 08625-0404  
Tel. #609-984-1339  
Fax. #609-984-1427

August 19, 2002

Jessica DiMauro  
Princeton Hydro, LLC  
1108 Old York Road, Suite 1  
P.O. Box 720  
Ringoos, NJ 08551

Re: Readington Township Natural Resource Inventory

Dear Ms. DiMauro:

Thank you for your data request regarding rare species information for Readington Township, Hunterdon County.

Enclosed are lists of rare species and natural communities documented from Readington Township, based on the Natural Heritage Data Base and the Landscape Project (Version 1.0). Also enclosed is a list of rare species and natural communities that have been documented from Hunterdon County. This county list can be used as a master species list for directing further inventory work. If suitable habitat is present within the study area, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

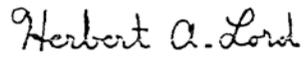
The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and natural communities. One of these sites is located within or near the areas you have outlined. Please refer to the enclosed Natural Heritage Priority Site Map for the location and boundary of this site. On the back of each Priority Site Map is a report describing the significance of the site.

In order to red flag the general locations of documented occurrences of rare and endangered plant species and natural communities, we have prepared computer generated Natural Heritage Index Maps. Enclosed please find these maps for the Flemington and Raritan USGS quadrangles. If individual projects are to be located in the areas of these maps that contain letter codes, the Natural Heritage Program can be contacted for additional information.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,



Herbert A. Lord  
Data Request Specialist

cc: Thomas F. Breden  
Lawrence Niles  
NHP File No. 02-4007457

## CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

**This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.**



NJ Department of Environmental Protection  
Division of Parks and Forestry

Natural Lands Management

14 AUG 2002

IN READINGTON TOWNSHIP  
 BASED ON SEARCH OF LANDSCAPE PROJECT  
 RARE ANIMAL SPECIES PRESENTLY RECORDED IN  
 THE NEW JERSEY NATURAL HERITAGE DATABASE

COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL GRANK	SRANK	DATE OBSERVED	IDENT.
COOPER'S HAWK		T/T	G5	S3B, S4N	1991-07-26	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1985-SUMMR	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1996-07-18	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1985-SUMMR	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1987-05-28	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1996-06-29	Y
GRASSHOPPER SPARROW		T/S	G5	S2B	1996-06-29	Y
WOOD TURTLE		T	G4	S3	1990-10-12	Y
WOOD TURTLE		T	G4	S3	1990-08-13	Y
WOOD TURTLE		T	G4	S3	1999-06-25	Y
WOOD TURTLE		T	G4	S3	2000-10-08	Y
BOG TURTLE	LT	E	G3	S2	1998-04-??	Y
BOBOLINK		T/T	G5	S2B	1987-SUMMR	Y
BOBOLINK		T/T	G5	S2B	1996-06-29	Y
BOBOLINK		T/T	G5	S2B	1987-06-??	Y
BOBOLINK		T/T	G5	S2B	1996-06-29	Y
BOBOLINK		T/T	G5	S2B	1996-06-29	Y
BOBOLINK		T/T	G5	S2B	1985-SUMMR	Y
BOBOLINK		T/T	G5	S2B	1996-07-18	Y
BALD EAGLE	LT	E	G4	S1B, S2N	2002-04-30	Y
BALD EAGLE	LT	E	G4	S1B, S2N	2002-04-30	Y
BALD EAGLE	LT	E	G4	S1B, S2N	1995	Y
BOBCAT		E	G5	S3	1994-04-04	Y
SAVANNAH SPARROW		T/T	G5	S2B, S4N	1996-06-29	Y
SAVANNAH SPARROW		T/T	G5	S2B, S4N	1996-07-18	Y
SAVANNAH SPARROW		T/T	G5	S2B, S4N	1996-06-29	Y
SAVANNAH SPARROW		T/T	G5	S2B, S4N	1996-06-22	Y
VESPER SPARROW		E	G5	S1B, S2N	1987-06-28	Y

## \*\*\* Vertebrates

ACCIPITER COOPERII

AMMODRAMUS SAVANNARUM

AMMODRAMUS SAVANNARUM

AMMODRAMUS SAVANNARUM

AMMODRAMUS SAVANNARUM

AMMODRAMUS SAVANNARUM

AMMODRAMUS SAVANNARUM

CLEMMYS INSCULPTA

CLEMMYS INSCULPTA

CLEMMYS INSCULPTA

CLEMMYS INSCULPTA

CLEMMYS MUHLBERGII

DOLICHONYX ORYZIVORUS

HALIAETUS LEUCOCEPHALUS

HALIAETUS LEUCOCEPHALUS

HALIAETUS LEUCOCEPHALUS

LYNX RUFUS

PASSERCULUS SANDWICHENSIS

PASSERCULUS SANDWICHENSIS

PASSERCULUS SANDWICHENSIS

PASSERCULUS SANDWICHENSIS

POOECETES GRAMINEUS

POOECETES GRAMINEUS

16 AUG 2002

READING TOWNSHIP, HUNTERDON COUNTY  
 RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
 THE NEW JERSEY NATURAL HERITAGE DATABASE  
 EXCLUDING RECORDS USED FOR THE LANDSCAPE PROJECT

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL GRANK	SRANK	DATE OBSERVED	IDENT.	WATERSHED
*** Vertebrates								
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER	E	E	G5	S1B	1982-??-??	Y	268
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER	E	E	G5	S1B	1950-??-??	Y	305
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW	T/T		G5	S2B,S4N	1982-??-??	Y	288
POECEETES GRAMINEUS	VESPER SPARROW	E	E	G5	S1B,S2N	1982-??-??	Y	288
POECEETES GRAMINEUS	VESPER SPARROW	E	E	G5	S1B,S2N	1981-??-??	Y	288
*** Vascular plants								
TRIOSTEUM ANGSTIFOLIUM	NARROW-LEAF HORSE-GENTIAN	E	E	G5	S1	1937-08-26	Y	305
6 Records Processed								
WATERSHED DEPHUC14 CODE								
268	WATERSHED	SUB-WATERSHED						
	LAMINGTON RIVER	LAMINGTON RIVER (BELOW HALLS BRIDGE ROAD)						
288	RARITAN RIVER SB (NB TO THREE BRIDGES)	HOLLAND BROOK						
305	RARITAN RIVER SB (NB TO THREE BRIDGES)	RARITAN RIVER SB (PLEASANT RUN - THREE BRIDGES)						

## EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

### FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

- LE Taxa formally listed as endangered.
- LT Taxa formally listed as threatened.
- PE Taxa already proposed to be formally listed as endangered.
- PT Taxa already proposed to be formally listed as threatened.
- C Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
- S/A Similarity of appearance species.

### STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (N.J.S.A. 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

- D Declining species—a species which has exhibited a continued decline in population numbers over the years.
- E Endangered species—an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors – a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
- EX Extirpated species—a species that formerly occurred in New Jersey, but is not now known to exist within the state.
- I Introduced species—a species not native to New Jersey that could not have established itself here without the assistance of man.
- INC Increasing species—a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
- T Threatened species—a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
- P Peripheral species—a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
- S Stable species—a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
- U Undetermined species—a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

- S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.
- S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.
- S4 Apparently secure in state, with many occurrences.
- S5 Demonstrably secure in state and essentially ineradicable under present conditions.
- SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.
- SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).
- SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.
- SP Element has potential to occur in New Jersey, but no occurrences have been reported.
- SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.
- SRF Elements erroneously reported from New Jersey, but this error persists in the literature.
- SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.
- SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.
- SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.
- SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state – for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

27 JUN 2002

HUNTERDON COUNTY  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B,S4N
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ASIO OTUS	LONG-EARED OWL		T/T		G5	S2B,S2N
BATRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B,S2N
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5	S1B,S3N
CISTOTHORUS FLATENSIS	SEDGE WREN		E		G5	S1B
CLEMmys INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMmys MUELENBERGII	BOG TURTLE	LT	E		G3	S2
CROTALMUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
EURYCEA LONGICAUDA LONGICAUDA	LONGTAIL SALAMANDER		T		G5T5	S2
GRASTEMYS GEOGRAPHICA	COMMON MAP TURTLE		U		G5	S3
HALIAETUS LEUCOCEPHALUS	BALD EAGLE		E		G4	S1B,S2N
LYNX RUFUS	BOBCAT	LT	E		G5	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B,S2N
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B,S4N
PETROCHELIDON PYRRHONOTA	CLIFF SWALLOW		S/S		G5	S2B
POECETES GRAMINEUS	VESPER SPARROW		E		G5	S1B,S2N
STRIX VARIA	BARRED OWL		T/T		G5	S3B
CAVE AQUATIC COMMUNITY	CAVE AQUATIC COMMUNITY				G4?	S2
CAVE TERRESTRIAL COMMUNITY	CAVE TERRESTRIAL COMMUNITY				G4?	S3
SHALE CLIFF/ROCK OUTCROP COMMUNITY	SHALE CLIFF/ROCK OUTCROP COMMUNITY				G3	S2?

\*\*\* Vertebrates

\*\*\* Ecosystems

\*\*\* Invertebrates

HUNTERDON COUNTY  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
CAREX HITCHCOCKIANA	HITCHCOCK'S SEDGE				G5	S2
CAREX JAMESII	JAMES' SEDGE		E		G5	S1
CAREX LEPTONERVIA	FINE-NERVE SEDGE		E		G4	S1
CAREX MEADII	MEAD'S SEDGE				G4G5	SX.1
CAREX OLIGOCARPA	FEW-FRUIT SEDGE		E		G4	S1
CAREX PALLESCENS	PALE SEDGE				G5	S2
CAREX WILDENOWII VAR WILDENOWII	WILDENOW'S SEDGE				G5T5	S2
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5	S2
CERCIS CANADENSIS	REDBUD		E		G5T5	S1
CHEILANTHES LANOSA	HAIRY LIPFERN				G5	S2
CHENOPodium SIMPLEX	MAPLE-LEAF GOOSEFOOT				G5	S2
CRATAEGUS CALPODENDRON	PEAR HAWTHORN		E		G5	S1
CRATAEGUS DODGEI	DODGE'S HAWTHORN				G4	S2
CRATAEGUS HOLMESIANA	HOLMES' HAWTHORN				G5	S1
CRATAEGUS SUCCULENTA	FLESHY HAWTHORN		E		G5	S1
CUSCUTA CEPHALANTHI	BUTTONBUSH DODDER		E		G5	S1
CYNOGLOSSUM VIRGINIANUM VAR VIRGINIANUM	WILD COMFREY				G5T5	S2
CYSTOPTERIS PROTRUSA	LOWLAND FRAGILE FERN				G5	S2
DESMODIUM HUMIFUSUM	TRAILING TICK-TREFOIL		E		G1G2Q	SH
DICENTRA CANADENSIS	SQUIRREL-CORN		E		G5	S1
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
DRABA REPTANS	CAROLINA WHITLOW-GRASS		E		G5	SH
ELLISIA NYCTELEA	AUNT LUCY		E		G5	S1
ERAGROSTIS FRANKII	FRANK'S LOVE GRASS				G5	S2
HYBANTHUS CONCOLOR	GREEN VIOLET		E		G5	S1
HYDROPHYLLUM CANADENSE	BROAD-LEAF WATERLEAF		E		G5	S1
HYPERICUM PYRAMIDATUM	GREAT ST. JOHN'S-WORT				G4	S3
ISOTRIA MEDEFOLOIDES	SMALL WHORLED POGONIA		E	LT	G2	S1

27 JUN 2002

HUNTERDON COUNTY  
 RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
 THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
STACHYS TENUIFOLIA	SMOOTH HEDGE-NETTLE				G5	S3
STELLARIA PUBERA	STAR CHICKWEED		E		G5	SH
TRIOSTEUM ANGUSTIFOLIUM	NARROW-LEAF HORSE-GENTIAN		E		G5	S1
VALERIANELLA RADIATA	BEAKED CORNSALAD		E		G5	S1
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5	S1
VICIA CAROLINIANA	CAROLINA WOOD VETCH		R		G5	S1
VIOLA CANADENSIS	CANADIAN VIOLET		E		G5T?	S1

## NJ Endangered and Nongame Species Program

### Special Concern – Species Status Listing

#### **Status Definitions:**

**Endangered:** Applies to a species whose prospects for survival within the state are in immediate danger due to one or several factors, such as loss or degradation of habitat, over-exploitation, predation, competition, disease or environmental pollution, etc. An endangered species likely requires immediate action to avoid extinction within NJ.

**Threatened:** Applies to species that may become Endangered if conditions surrounding it begin to or continue to deteriorate. Thus, a Threatened species is one that is already vulnerable as a result of, for example, small population size, restricted range, narrow habitat affinities, significant population decline, etc.

**Special Concern:** Applies to species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming Threatened. This category would also be applied to species that meet the foregoing criteria and for which there is little understanding of their current population status in the state.

**Stable (or increasing):** Applies to species that appear to be secure in NJ and not in danger of falling into any of the preceding the categories in the near future.

**Undertermined:** A species about which there is not enough information available to determine the status.

\* **Recommended status listing, pending official adoption.**

## Special Concern species listing

### Birds

Species	Breeding Status	Non-breeding Status
Pied-billed Grebe ( <i>Podilymbus podiceps</i> )	Endangered	Special Concern
Least Bittern ( <i>Ixobrychus exilis</i> )	Special Concern	Stable
American Bittern ( <i>Botaurus lentiginosus</i> )	Endangered	Special Concern
Tricolor Heron ( <i>Egretta tricolor</i> )	Special Concern	Stable
Little Blue Heron ( <i>Egretta caerulea</i> )	Special Concern	Special Concern
Great Blue Heron ( <i>Ardea herodias</i> )	Special Concern	Stable
King Rail ( <i>Rallus elegans</i> )	Special Concern	Undetermined
Whimbrel ( <i>Numenius phaeopus</i> )	None	Special Concern
Spotted Sandpiper ( <i>Actitis macularia</i> )	Special Concern	Stable
Sanderling ( <i>Calidris alba</i> )	None	Special Concern
Common Tern ( <i>Sterna hirundo</i> )	Special Concern	Stable
Black Tern ( <i>Chlidonias niger</i> )	None	Special Concern
Caspian Tern ( <i>Sterna caspia</i> )	Special Concern	Stable
Northern Harrier ( <i>Circus cyaneus</i> )	Endangered	Special Concern
Sharp-shinned Hawk ( <i>Accipiter striatus</i> )	Special Concern	Special Concern
Broad-winged Hawk ( <i>Buteo platypterus</i> )	Special Concern	Stable
American Kestrel ( <i>Falco sparverius</i> )	Special Concern	Undetermined
Common Barn Owl ( <i>Tyto alba</i> )	Special Concern	Special Concern
Short-eared Owl ( <i>Asio flammeus</i> )	Endangered	Special Concern
Common Nighthawk ( <i>Chordeiles minor</i> )	Special Concern	Stable
Least Flycatcher ( <i>Empidonax minimus</i> )	Special Concern	Stable
Horned Lark ( <i>Eremophila alpestris</i> )	Special Concern	Stable
Cliff Swallow ( <i>Petrochelidon pyrrhonota</i> )	Special Concern	Stable
Winter Wren ( <i>Troglodytes troglodytes</i> )	Special Concern	Stable
Veery ( <i>Catharus fuscescens</i> )	Special Concern	Stable
Gray-cheeked Thrush ( <i>Catharus minimus</i> )	None	Special Concern
Solitary Vireo ( <i>Vireo solitarius</i> )	Special Concern	Stable
Golden-winged Warbler ( <i>Vermivora chrysoptera</i> )	Special Concern	Special Concern
Nothorn Parula ( <i>Parula americana</i> )	Special Concern	Stable
Cerulean Warbler ( <i>Dendroica cerulea</i> )	Special Concern	Special Concern
Black-throated Green Warbler ( <i>Dendroica virens</i> )	Special Concern	Stable
Kentucky Warbler ( <i>Oporornis formosus</i> )	Special Concern	Special Concern
Canada Warbler ( <i>Wilsonia canadensis</i> )	Special Concern	Stable
Yellow-breasted Chat ( <i>Icteria virens</i> )	Special Concern	Special Concern
Grasshopper Sparrow ( <i>Ammodramus savannarum</i> )	Threatened	Special Concern
Eastern Meadowlark ( <i>Sturnella magna</i> )	Special Concern	Stable

## Special Concern species listing – continued

### Invertebrates

Dotted Skipper (butterfly), *Hesperia attalus slossonae*  
Georgia [Lakehurst] Satyr (butterfly), *Neonympha areolatus septentrionalis*  
Harris Checkerspot (butterfly), *Chlosyne harrisii*  
Hessel's Hairstreak (butterfly), *Callophrys hesseli*  
Hoary Elfin (butterfly), *Callophrys polios*  
Northern Metalmark (butterfly), *Calephelis borealis*  
Two-spotted Skipper (butterfly), *Euphyes bimacula*  
Creeper (mussel), *Strophitus undulatus*

### Herps

Marbled Salamander (*Ambystoma opacum*)  
Jefferson Salamander (*Ambystoma jeffersonianum*)  
Northern Spring Salamander (*Gyrinophilus p. porphyriticus*)  
Carpenter Frog (*Rana virgatipes*)  
Spotted Turtle (*Clemmys guttata*)  
Eastern Box Turtle (*Terrapene c. carolina*)  
Northern Diamondback Terrapin (*Malaclemys t. terrapin*)  
Eastern Kingsnake (*Lampropeltis g. getulus*)  
Northern Copperhead (*Agkistrodon contortrix mokasen*)  
Coastal Plains Milk Snake integrate (*Lampropeltis triangulum triangulum* x *L. t. elapsoides*)  
Fowlers Toad (*Bufo woodhousii fowlen*)

**APPENDIX B**

**Threatened and Endangered Wildlife in  
Readington Township**

## Threatened and Endangered Wildlife in Readington Township:

### Emergent Wetlands:

#### Bald Eagle:

As a winter resident, Bald Eagles concentrate along the Upper Delaware River. Their breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, or other bodies of water. Preferentially roosts in conifers or other sheltered sites in winter. Nests are either in discontinuous forest (80%) or salt marsh (20%). All nests were in proximity to water and were sheltered or removed from disturbance from September to April. Reproductive activity occurs from late April to mid-June. Bald Eagles feed on fishes, injured waterfowl and seabirds, various mammals, and carrion. Hunts live prey, scavenges and pirates food from other birds. Clutch size is 1-3 (usually 2). Incubations lasts about 5 weeks, by both sexes. Young first fly at 10-12.5 weeks and are cared for by adults. Egg laying occurs in late April, incubation lasts into early to mid-June. A 1 km radius around each active bald eagle nest is designated as critical habitat in order to protect it from disturbance. All appropriate habitat patches that intersect with this buffer are designated critical. For foraging, a radius around the nest site is incrementally increased, one cell (30m) at a time, until an area of 660 ha of foraging habitat has been identified. Foraging habitat is defined as all open water bodies greater than 10 ha. A 90-meter buffer is applied to the identified foraging habitat to protect perching sites. All suitable habitat patches that intersect with the foraging habitat and 90 m buffer are designated critical.

#### Wood Turtle:

Has been reported from the Delaware Water Gap, the Pine Barrens and from undeveloped sites in north and central New Jersey. Lives along permanent streams much of the year, but in summer may roam widely over land and is found in a variety of terrestrial habitats adjacent to streams, from deciduous woods, cultivated fields, and woodland bogs to marshy pastures. Occur in wetland and riverine habitats associated with mixed forests. Also found in uplands such as fields and wooded areas near water resources and in floodplain areas. Omnivores with preference for vegetable matter, including fruits, berries, tender leaves, and mushrooms. Copulates in spring or fall; usually October-November in New Jersey. In NJ, lay eggs from June 12 to July 7. Clutch size averages 6-8. Incubation period averages 63 days.

#### Bog Turtle:

Found in slow, shallow, muck-bottomed rivulets of sphagnum bogs, calcareous fens, marshy/sedge-tussock meadows, spring seeps, wet cow pastures, and shrub swamps. Burrows during periods of inactivity in summer. Nests in open and elevated ground in areas of moss, grassy tussocks, or moist earth. Digs shallow nest or lays eggs in the top of a tussock. Lives in clean, unpolluted, spring-fed streams that pass through open meadows and boggy areas. Feeds on insects, worms, slugs, crayfish, snails and other small invertebrates; also fruits and amphibian larvae. Diet is dominated by insects. Mating occurs from late April to early June. Lays clutch of 1-6. Eggs hatch in about 6-9 weeks. Sexually mature in about 5-8 years. Species breeds in May-

June; eggs are laid in June, and hatch in late July or August. Incubation ranges from 48-60 days. Intensive research has occurred in the past several years. This has resulted in a very strong data set for wetland polygons where bog turtles are known to occur, and suitable habitat exists, even if presence has not been determined. Population Analysis Sites (PAS's) are a single site or multiple sites within the same stream drainage where turtles can potentially move between sites that are not isolated by major roads, water bodies, large streams, etc. Bog turtle habitat is defined as follows:

1. all wetland polygons where turtles have been found within the last 15 years
2. potentially suitable habitats within PAS's that have known occurrences

### **Forest and Wetland Forest:**

Wood turtle and bald eagle foraging habitat are found in forest and wetland forest as well as emergent wetlands. As can be noted from the description above, bald eagle breeding habitat commonly includes bodies of water, and nests are in proximity to water while being sheltered in discontinuous forest. For this reason, bald eagles are listed in several different habitat types in Readington Township. Wood turtle spend most of their lives in permanent streams, but can be found in terrestrial habitats, deciduous woods and mixed forests. They may also be listed in several habitat types in the Township.

### Cooper's Hawk:

Occurs throughout New Jersey in the winter. Reports indicate the species has expanded its range throughout the State and currently occurs in many counties that contain suitable habitat. Primarily mature forest, also open woodland and forest edge. Nests in both pine and hardwood groves. Occurrences have been reported for mixed oak forest, edge of wooded wetlands and a fallow field. Eats medium sized birds, sometimes small birds, and some up to size of an adult Ruffed Grouse. Also eats small mammals, occasionally reptiles and amphibians. Typically hunts from a perch or uses a longer searching flight. Clutch size is usually 4-5. Incubation lasts about 5 weeks, mostly by female. Young leave the nest at 4-5 weeks and are independent at about 8 weeks. The breeding season begins in March/April. Clutch size averages 4, but 5 or 6 are not uncommon.

### **Grassland:**

As described above, wood turtles can be found in fields and pastures and are therefore listed in Readington Township grassland habitat as well. Grasslands are also listed, not as bald eagle foraging habitat, but as nest buffer area. The grasslands in the Township are part of the 90-meter buffer that is applied to the identified foraging habitat to protect perching sites. Along with bald eagle and wood turtle, the listed grassland species include: vesper sparrow, bobolink, grasshopper sparrow, savannah sparrow and, upland sandpiper.

### Vesper Sparrow:

Live in plains, prairie, dry scrub-lands, savannah, weedy pastures, fields, sagebrush, arid scrub

and woodland clearings. Nests on the ground, often in a small depression near a clump of grass. Breeds in grasslands and croplands. Prefers large, well-drained open tracts. Feeds on seeds, waste grain and insects. Forages on the ground, sometimes taking food items from low foliage. Clutch size usually 3-5, sometimes 6. Both sexes may incubate eggs for 11-13 days. Young leave nest 7-12 days after hatching. Individual females generally produce 2-3 broods per year. Breeding period is May-July. Egg dates are May 2 to July 14.

#### Bobolink:

Tall grass areas, flooded meadows, prairie, deep cultivated grains and hayfields. Nests on ground in small hollow in area of concealing herbaceous vegetation. Most often found in hay, grassy and fallow fields. Eats insects, seeds, grain, mainly seeds. Clutch size is 4-7 (usually 5-6). Incubation, by female, lasts 11-13 days. Young are tended by both parents, leave nest at 10-14 days. Breeding period given as May-June. Egg dates of May 3 to July 22 have been reported.

#### Grasshopper Sparrow:

Prairies, old fields, open grasslands, cultivated fields and savannah. Territories may include patches of bare ground and very short vegetation, posts, fence lines, and occasionally trees. Found in pasture areas and fields of hay, corn, grass, and strawberries. Eats insects, other small invertebrates, grain, and seeds. Picks up food items from the ground surface. Clutch size is 3-6 (commonly 4-5). Usually two broods per year. Incubation (by female) lasts 11-13 days. Young are tended by female.

#### Savannah Sparrow:

Habitat varies geographically, includes open areas, especially grasslands, tundra, meadows, bogs, farmlands, grasslands, tundra, meadows, bogs, farmlands, grassy areas with scattered bushes and marshes. Nests on the ground in a natural depression. Large fields with short or sparse grass or weeds. North Jersey sites are hayfields on well-drained soils. During summer eats insects, spiders and snails. Feeds on seeds of primarily herbaceous plants at other times of year. Adults feed arthropods to young. Range-wide, breeds in spring and early summer. Clutch size is 3-6 (usually 4-5). Both sexes, in turn, incubate 12 days. Young are tended by both sexes and leave the nest about 14 days after hatching. Breeding occurs from May into July. Egg dates are May 1 to July 14.

#### Upland Sandpiper:

The upland sandpiper lives in extensive open grassland, especially prairies, dry meadows, pastures, short-grass, and plowed fields. Preferred habitat includes large areas of short-grass for feeding and courtship with taller grasses for nesting and brood cover. Favors open grassy areas. Eats mostly insects and other small terrestrial invertebrates; also seeds and grains. Lays clutch of usually 4 eggs, mostly from May-June. Incubation lasts 21-28 days, by both sexes. Young are tended by both parents, leave nest within 24 hours of hatching and fly at 30-34 days. Breeding period given as May-July.

**APPENDIX C**

**The Birds of Hunterdon County**

Common Name	Sp	Su	F	W
*Field Sparrow	C	C	C	U
*Vesper Sparrow	R	R	R	VR
*Savannah Sparrow	C	R	C	U
*Grasshopper Sparrow	U	U	R	
<i>Henslow's Sparrow</i>	AC	AC	AC	
Nelson's Sharp-tailed Sparrow				AC
Fox Sparrow	C		C	R
*Song Sparrow	AB	AB	AB	C
Lincoln's Sparrow	R		U	
*Swamp Sparrow	U	R	C	U
White-throated Sparrow	AB		AB	AB
White-crowned Sparrow	U		U	R
Dark-eyed Junco	C		C	AB
Lapland Longspur			VR	VR
Snow Bunting	R		U	R
*Northern Cardinal	AB	AB	AB	AB
*Rose-breasted Grosbeak	C	C	C	
Blue Grosbeak	AC			
*Indigo Bunting	C	C	C	
?Dickcissel	VR	VR	R	
*Bobolink	U	U	U	
*Red-winged Blackbird	AB	AB	AB	U
*Eastern Meadowlark	U	U	U	R
Yellow-headed Blackbird				AC
Rusty Blackbird	U		U	VR
Brewer's Blackbird				AC
*Common Grackle	AB	AB	AB	U
Brown-headed Cowbird	AB	AB	AB	U
*Orchard Oriole	C	C	C	
*Baltimore Oriole	C	C	C	
Purple Finch	U		U	U
*House Finch	AB	AB	AB	AB
Red Crossbill	R		R	R
White-winged Crossbill	R		R	R
Common Redpoll	R		R	R
Pine Siskin	R		U	R
*American Goldfinch	C	C	C	C
Evening Grosbeak	R		R	R
*House Sparrow	C	C	C	C

Other species:


[Checklist compiled by Don Freiday, Aug. 2001. Printed on recycled paper.]

Common Name	Sp	Su	F	W
Snow Goose	U	VR	C	U
*Canada Goose	AB	AB	AB	AB
Brant	R		U	
Mute Swan	R	R	R	R
Tundra Swan	VR		U	U
*Wood Duck	C	U	C	VR
Gadwall	U		C	C
Eurasian Wigeon	AC		AC	AC
American Wigeon	U		U	U
*American Black Duck	C	VR	C	C
*Mallard	AB	C	AB	C
Blue-winged Teal	U		U	
Northern Shoveler	U		U	VR
Northern Pintail	C		U	R
Green-winged Teal	C		C	R
Canvasback	U		U	VR
Redhead	U		U	VR
Ring-necked Duck	C		C	U
Greater Scaup	U		U	R
Lesser Scaup	U		U	R
Surf Scoter	R		R	R
White-winged Scoter	R		R	R
Black Scoter	R		R	R
Long-tailed Duck	U		U	R
Bufflehead	C		C	C
Common Goldeneye	U		U	U
Hooded Merganser	U		U	R
Red-breasted Merganser	U		U	R
*Common Merganser	C	U	C	U
Ruddy Duck	U		U	U
*Osprey	C	U	C	AC
Swallow-tailed Kite	AC			
Mississippi Kite	AC			
*Bald Eagle	R	R	U	R
?Northern Harrier	U	VR	U	U
*Sharp-shinned Hawk	C	R	C	C
*Cooper's Hawk	C	C	C	C
*Northern Goshawk	R	R	R	R
<i>Red-shouldered Hawk</i>	U	VR	U	VR
*Broad-winged Hawk	C	U	C	
Swainson's Hawk			AC	
*Red-tailed Hawk	C	C	C	C
Rough-legged Hawk	R		R	R
Golden Eagle			R	VR
*American Kestrel	C	U	C	U

**APPENDIX D**

**Vernal Habitat Protocol & Flemington  
New Jersey Quad Map**



# State of New Jersey

Department of Environmental Protection  
Land Use Regulation Program  
P O Box 439  
Trenton, NJ 08625-0439  
Fax: (609) 292-8115  
www.state.nj.us/dep/landuse

James E. McGreevey  
Governor

Bradley M. Campbell  
Commissioner

## Land Use Regulation Program Freshwater Wetlands Vernal Habitat Protocol (updated: 05/17/02)

**Purpose:** .....1

Item 1: "Occurs in a confined basin depression without a permanent flowing outlet" ..... 2

Item 2: "Features evidence of breeding by one or more species of fauna adapted to reproduce in ephemeral aquatic conditions" ..... 2

Item 3: "Maintains ponded water for at least two continuous months between March and September of a normal rainfall year" ..... 2

Item 4: "Is free of fish throughout the year, or dries up at some time during the year" ..... 3

Required Field Observations for Certifying a Vernal Habitat ..... 3

Documenting The Location Of A Vernal Habitat..... 4

Use Of This Protocol In The Freshwater Wetlands Permit Program: ..... 5

### Purpose:

This protocol will be used by the Land Use Regulation Program to determine whether an area meets the definition of a "vernal habitat" in N.J.A.C. 7:7A-1.4. If the application of this protocol results in a Department determination that an area meets the definition of a vernal habitat, the area will be placed on the list of certified vernal habitats, maintained by the Department. The Department will also develop digital mapping to show the locations of certified vernal habitats.

The definition of a vernal habitat includes four criteria that must be satisfied. Item 1 requires that the area occur in a confined basin depression without a permanently flowing outlet. Item 2 requires the documentation of obligate or facultative vernal habitat species (these species are identified in N.J.A.C. 7:7A, Appendix 1). Item 3 requires that the area maintain ponded water for at least two continuous months between March and September of a normal rainfall year. Item 4 requires that the area is free of fish populations throughout the year, or dries up at some time during a normal rainfall year. The elements required to satisfy each item are discussed below.

**Item 1: "Occurs in a confined basin depression without a permanent flowing outlet"**

The area must be a depression in the surrounding ground, confined by areas of higher upland or wetland ground. It must not have a permanently flowing outlet but may have a periodic outlet through which water flows during periods of heavy rain events, flooding or seasonally high water tables.

**Item 2: "Features evidence of breeding by one or more species of fauna adapted to reproduce in ephemeral aquatic conditions"**

The area must feature evidence of breeding by vernal habitat species. These species are listed in N.J.A.C. 7:7A, Appendix 1, and are divided into obligate and facultative species. An obligate vernal habitat species is one for which vernal habitats are the only type of habitat used for breeding. A facultative species will use vernal habitat for various activities, for example breeding or foraging, but can also use other types of habitats.

Obligate species: For the purposes of item 2 of the definition of vernal habitat, the following will constitute evidence of breeding by a species listed as an obligate species at N.J.A.C. 7:7A, Appendix 1:

- a. The following types of evidence of breeding adults:
  - i. Frog breeding chorus;
  - ii. Mated pairs of frogs;
  - iii. Salamander courting individuals; and/or
  - iv. Salamander spermatophores;
- b. Two or more egg masses of any obligate species;
- c. Frog tadpoles;
- d. Mole salamander larvae; and/or
- e. The following types of evidence of transforming juveniles:
  - i. Wood frogs with tail stubs evident; and/or
  - ii. Salamanders with gill remnants evident.

Facultative species: For the purposes of item 2 of the definition of vernal habitat, evidence of the presence of one or more members of the species within the area of the habitat listed as facultative species at N.J.A.C. 7:7A, Appendix 1 shall constitute evidence of breeding or foraging by that species.

**Item 3: "Maintains ponded water for at least two continuous months between March and September of a normal rainfall year"**

If an area satisfies item 2 by showing evidence of breeding by obligate species, the criteria in items 3 and 4 are presumed to be satisfied. (See flow chart below for an illustration of this.) This presumption does not apply if an area satisfies item 2 solely by showing evidence of breeding by facultative species. This application of the presumption reflects the fact that the species listed as obligate

depend almost exclusively on vernal habitat for breeding, and cannot breed in other types of habitat. They must breed in an area that maintains water for certain time periods, and in which there are no fish to eat their eggs. Obligate species also tend to be site tenacious, meaning that succeeding generations of the species frequently return to their natal pond for breeding purposes. Therefore, if an area shows evidence of breeding by an obligate species, the area must meet the criteria in items 3 and 4.

However, the species listed as facultative do not depend exclusively on vernal habitat, although they do regularly use vernal habitats. These species also use other similar types of habitat that would not meet the definition of a vernal habitat. Therefore, the presumption that an area is ponded for at least two months and is free of fish populations (i.e., that the criteria in items 3 and 4 are met) does not apply where only facultative species have been found. In those cases, the ponding of water (Item 3) and the drying up or lack of fish populations (Item 4) must be independently demonstrated in accordance with this protocol.

To satisfy Item 3, an area that is not subject to the presumption discussed above (i.e., an area with evidence of facultative species only) must maintain ponded water continuously for at least two contiguous months (60 days) between March 1<sup>st</sup> and September 30<sup>th</sup> of a normal rainfall year.

#### **Item 4: "Is free of fish throughout the year, or dries up at some time during the year"**

As discussed above under Item 3, if an area satisfies item 2 by showing evidence of breeding by obligate species, the criteria in items 3 and 4 are presumed to be satisfied. (See flow chart below for an illustration of this.)

To satisfy Item 4, an area that is not subject to the presumption discussed above (i.e., an area with evidence of facultative species only) must be free of fish populations throughout the year, or dry up at some time during the year. Meeting either one of these criteria is sufficient to satisfy Item 4.

### **Required Field Observations for Certifying a Vernal Habitat**

- A. Item 1: Clear photographs are required to document that an area is a confined basin depression without a permanent flowing outlet. The photographs must be taken from several angles, and must be sufficient to clearly display the area's complete or intermittent hydric isolation.
- B. Item 2: At least one of the following types of evidence is required to document each observation of a vernal habitat species:

1. Photograph(s). This is the preferred method. Prints, slides, or digital photographs are acceptable. The location, date of observation, and observer's name must be provided;
  2. Videotape recording. The location, date, and recorder's name must be provided;
  3. Taped audio recording of a frog breeding chorus. The location, date, and recorder's name must be provided; and/or
  4. Detailed written description(s) of species observed, including a discussion of the criteria that were used to identify the species involved. Field notes, and/or a drawing of the animal, may be submitted as part of the description. It is preferred that the description and field notes be prepared by a biologist competent in animal identification.
- C. Item 3: The following evidence is required to support observations that an area maintains ponded water for at least two contiguous months between March and September:
1. A logbook containing a record of observations, made approximately weekly, of the presence or absence of standing water in the area. For each observation date, the logbook shall state the approximate depth and dimensions of the area covered by standing water; and/or
  2. A list of one or more amphibian and reptile species that were observed using the area for breeding purposes (including dates).
- D. Item 4: At least one of the following types of evidence is required to demonstrate that an area is free of fish populations throughout the year, or dries up at some time during the year:
1. Clear photograph(s) and/or statement of direct observation, including date of observation, showing the area to be dried up; or
  2. Scientific evidence sufficient to conclude that the area is free of fish populations.

### **Documenting The Location Of A Vernal Habitat**

The following documentation is required to identify the location of a vernal habitat:

1. One or more of the items at i through iii below:
  - i. Metes and bounds description. Compass bearings and measured distances (the distances should be 1000 feet or less) of the habitat from at least two permanent landmarks, and the locations of landmarks. The compass bearings must account for the appropriate declination. The locations of the landmarks and the vernal habitat must be shown on the municipal tax map required in 2 below;
  - ii. Aerial photographs. The vernal habitat must be clearly visible on the aerial photograph; or
  - iii. Professional survey or GPS coordinates; and
2. A photocopy of an 8.5" by 11" section of the appropriate United States Geological Survey quadrangle map with the approximate site of the vernal habitat clearly marked should also be included (USGS quad maps are available from the Department's Office of Maps and Publications at (609) 777-1038); and
3. It is recommended that a sketch map and/or detailed description of features in the immediate vicinity (within 1000 feet) of the vernal habitat also be provided.

## **Use Of This Protocol In The Freshwater Wetlands Permit Program:**

1. The Department will develop a list of certified vernal habitats. After the list is developed, the Department will develop digital GIS maps showing the locations of certified vernal habitats.
2. When an application for a freshwater wetlands permit is submitted, the Department will review the list of certified vernal habitats to determine if the site may contain a vernal habitat.
3. If the site contains a certified vernal habitat, the Department will inform the applicant of this fact.
4. For each permit application, LUR accepts public comment during the period of application review, in accordance with N.J.A.C. 7:7A-12.3. If the Department receives information indicating that an area may be a vernal habitat during the public comment period (whether the information is submitted by the public, discovered by staff during a site investigation, or obtained in some other way), the Department will evaluate this information. If the information is sufficient to certify the area as a vernal habitat in accordance with this protocol, the Department will do so. Alternatively, the Department may delay a final decision on the application in order to obtain further information. The Department's action in these cases will vary on a case by case basis depending upon the quality of information available to the Department and/or the credentials of the person providing the information.
5. If the Department does not receive or discover any information indicating that an area is a vernal habitat prior to the Department's final decision on the application, the area shall not be considered a vernal habitat for purposes of the final decision on that application.
6. An applicant may contest the certification of an area as a vernal habitat. In order to contest a certification, an applicant must demonstrate that the area no longer meets the criteria in items 1, 2, 3, or 4 of the definition of vernal habitat. If such a demonstration includes a survey for vernal habitat species, the survey must be conducted over a minimum of two normal rainfall years, and must show no evidence of the presence of any vernal habitat species during the survey period.



**VERNAL POOL DATA SHEET**  
*New Jersey Division of Fish and Wildlife*  
*Endangered and Nongame Species Program*

**GENERAL INFO**

SITE NAME: \_\_\_\_\_ OBSERVER: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_ DATE: \_\_\_\_\_ COUNTY: \_\_\_\_\_

MUNICIPALITY: \_\_\_\_\_ TOPO QUAD: \_\_\_\_\_

DIRECTIONS TO SITE: \_\_\_\_\_

**POOL CHARACTERISTICS**

POOL TYPE (check):  natural swale/depression  excavated pit/ditch  impoundment

WATER LEVEL (check):  full  >50%full  <50%full  dry

POOL DIMENSIONS (at max capacity): \_\_\_\_\_m x \_\_\_\_\_m

WATER QUALITY (check):  clear  tea-colored  algae-green

STRUCTURE OF VEGETATION WITHIN/OVERHANGING POOL (ESTIMATE % COVER):

trees  scrub/shrub  floating vegetation  emergent vegetation

DOMINANT PLANT SPECIES WITHIN/OVERHANGING POOL (optional): \_\_\_\_\_

LANDSCAPE CONTEXT (check all that apply):  upland forest  forested wetlands

emergent/scrub-shrub wetland  agricultural field/grassland  suburban

STRUCTURE OF HABITAT WITHIN 100m OF POOL: \_\_\_\_\_

GENERAL NOTES/COMMENTS: \_\_\_\_\_

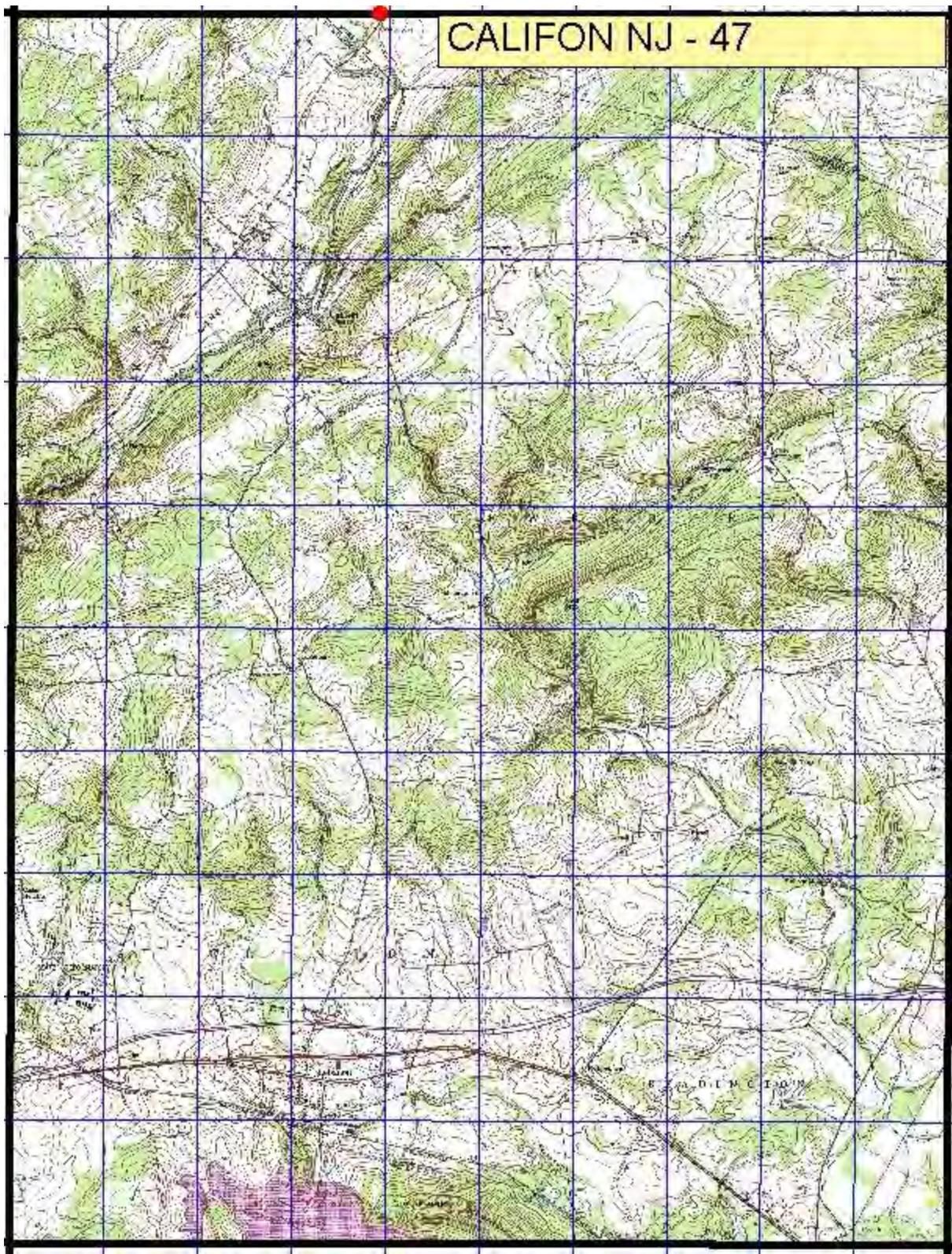
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	Please check appropriate box				
	STATUS	ADULT	JUVENILE/LARVA	VOCALIZATION	EGG MASS
<b>OBLIGATE VERNAL POOL HERPETOFAUNA</b>					
1) spotted salamander ( <i>Ambystoma maculatum</i> )	stable				
2) eastern tiger salamander ( <i>Ambystoma t. tigrinum</i> )	<b>endangered</b>				
3) marbled salamander ( <i>Ambystoma opacum</i> )	special concern				
4) Jefferson salamander ( <i>Ambystoma jeffersonianum</i> )	special concern				
5) blue-spotted salamander ( <i>Ambystoma laterale</i> )	<b>endangered</b>				
6) Jefferson x blue-spotted salamander ( <i>Ambystoma jeffersonianum</i> x <i>laterale</i> )	<i>no status</i>				
7) wood frog ( <i>Rana sylvatica</i> )	stable				
8) eastern spadefoot toad ( <i>Scaphiopus holbrookii</i> )	unknown				
<b>FACULTATIVE VERNAL POOL HERPETOFAUNA</b>					
1) long-tailed salamander ( <i>Eurycea l. longicauda</i> )	<b>threatened</b>				
2) red-spotted newt ( <i>Notophthalmus v. viridescens</i> )	stable				
3) four-toed salamander ( <i>Hemidactylium scutatum</i> )	unknown				
4) northern spring peeper ( <i>Pseudacris crucifer</i> )	stable				
5) New Jersey chorus frog ( <i>Pseudacris triseriata kalmii</i> )	unknown				
6) upland chorus frog ( <i>Pseudacris triseriata ferarium</i> )	unknown				
7) northern cricket frog ( <i>Acris c. crepitans</i> )	stable				
8) northern gray treefrog ( <i>Hyla versicolor</i> )	stable				
9) southern gray treefrog ( <i>Hyla chrysoscelis</i> )	<b>endangered</b>				
10) pine barrens treefrog ( <i>Hyla andersonii</i> )	<b>threatened</b>				
11) american toad ( <i>Bufo americanus</i> )	stable				
12) fowlers toad ( <i>Bufo woodhousii fowleri</i> )	special concern				
13) green frog ( <i>Rana clamitans melanota</i> )	stable				
14) bullfrog ( <i>Rana catesbeiana</i> )	stable				
15) carpenter frog ( <i>Rana virgatipes</i> )	special concern				
16) pickerel frog ( <i>Rana palustris</i> )	stable				
17) southern leopard frog ( <i>Rana utricularia</i> )	stable				
18) spotted turtle ( <i>Clemmys guttata</i> )	special concern				
19) wood turtle ( <i>Clemmys insculpta</i> )	<b>threatened</b>				
20) eastern painted turtle ( <i>Chrysemys p. picta</i> )	stable				
21) eastern mud turtle ( <i>Kinosternon subrubrum</i> )	stable				
22) common snapping turtle ( <i>Chelydra serpentina</i> )	stable				

**VERNAL POOL INVERTEBRATES (Please check appropriate line)**

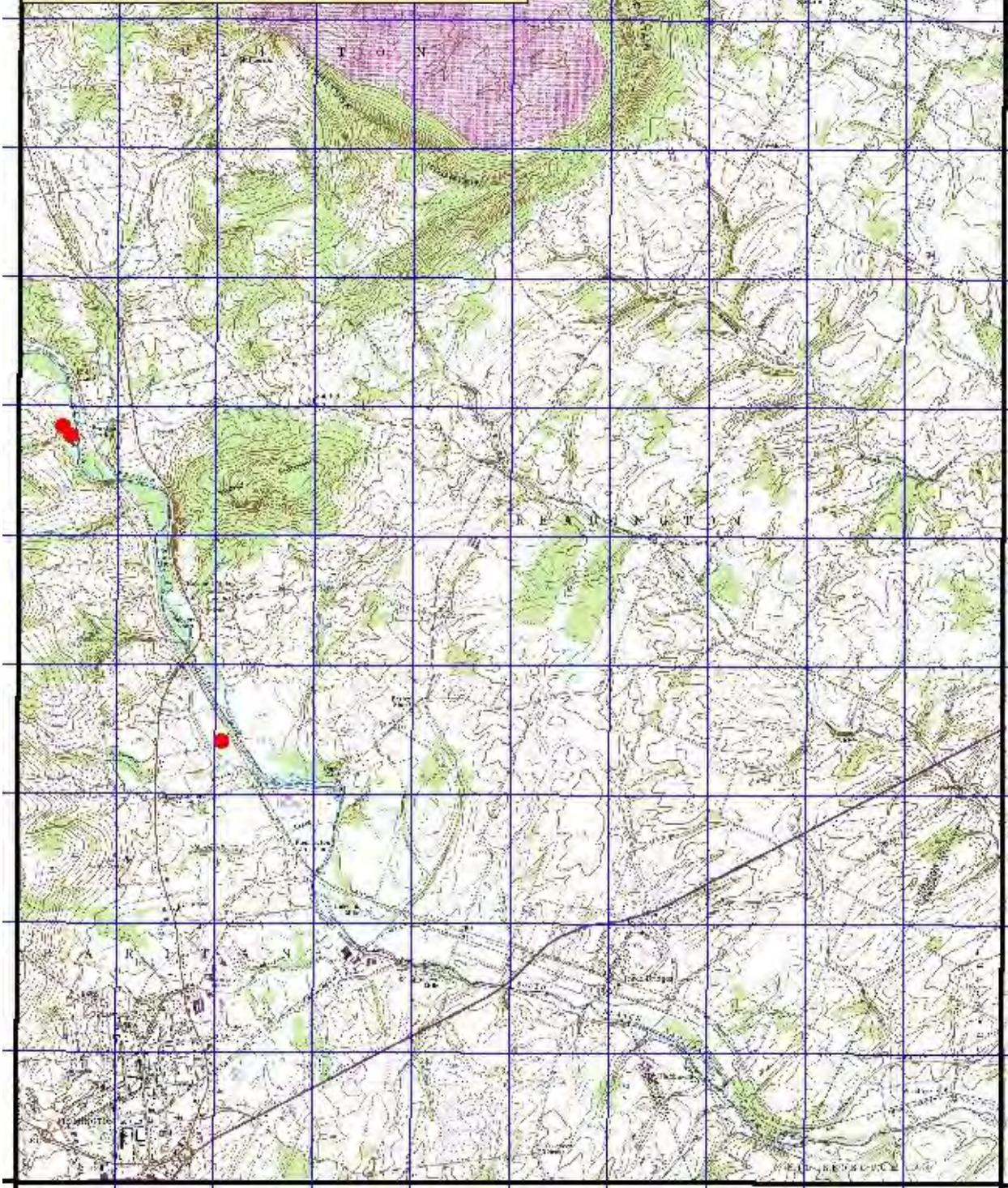
mosquito \_\_\_ fairy shrimp \_\_\_ caddisfly \_\_\_ predaceous diving beetle \_\_\_ crawling water beetle \_\_\_ water scavenger beetle \_\_\_  
whirligig beetle \_\_\_ damselfly \_\_\_ dragonfly \_\_\_ backswimmer \_\_\_ water boatman \_\_\_ water scorpion \_\_\_ giant water bug \_\_\_ water strider \_\_\_  
fishfly \_\_\_ mayfly \_\_\_ chironomid midge \_\_\_ phantom midge \_\_\_ springtail \_\_\_ water mites \_\_\_ amphipod \_\_\_ isopod \_\_\_  
clam shrimp \_\_\_ ostracod \_\_\_ daphnia \_\_\_ copepod \_\_\_ snail \_\_\_ fingernail clam \_\_\_ horsehair worm \_\_\_ planaria \_\_\_ leech \_\_\_  
aquatic oligochaete worms \_\_\_

Last Revised: 11/14/01

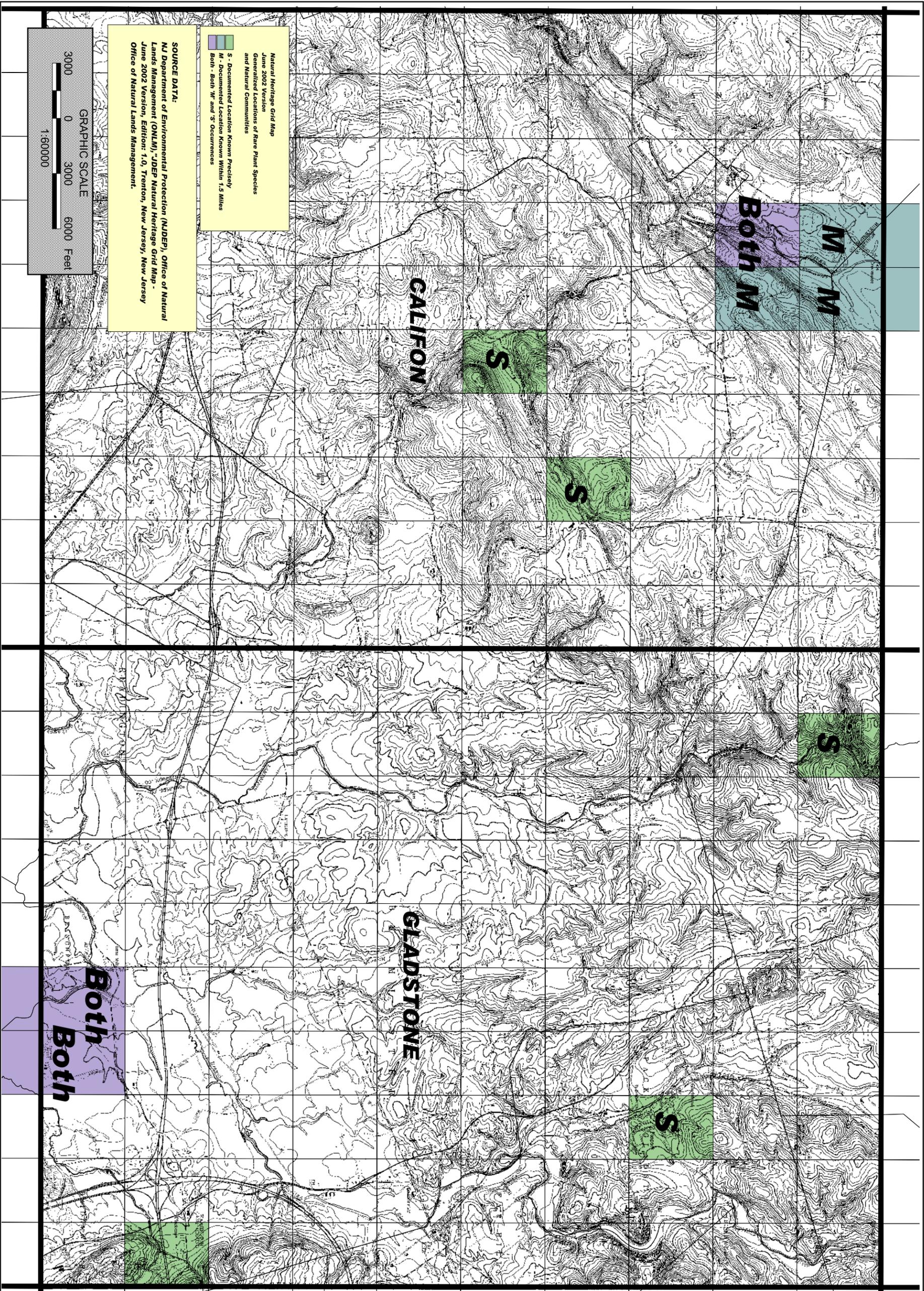


From: <http://www.state.nj.us/dep/landuse/fwv/vernal/images/047.jpg>

FLEMINGTON NJ - 58  
Updated - 10/04/01



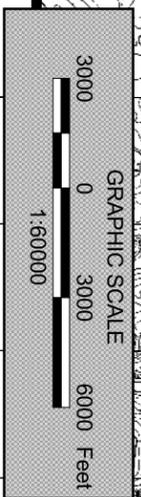
From: <http://www.state.nj.us/dep/landuse/fww/vernal/images/058.jpg>



**Natural Heritage Grid Map**  
 June 2003 Version  
 Generalized Locations of Rare Plant Species  
 and Natural Communities

S - Documented Location Known Precisely  
 M - Documented Location Known Within 1.5 Miles  
 Both - Both 'M' and 'S' Occurrences

**SOURCE DATA:**  
 NJ Department of Environmental Protection (NJDEP), Office of Natural  
 Lands Management (ONLM), "NJDEP Natural Heritage Grid Map -  
 June 2002 Version, Edition: 1.0, Trenton, New Jersey, New Jersey  
 Office of Natural Lands Management."



READINGTON TOWNSHIP E.R.I., PHASE II	NOTES: 1. DATA ACCURACIES ARE LIMITED TO THE ACCURACY AND SCALE OF THE ORIGINAL DATA SOURCES. 2. THESE MAPS ARE PART OF A WATERSHED PLAN AND SHOULD BE USED IN CONJUNCTION WITH THE COMPILED TEXT. 3. DIGITAL MAPS ARE PERIODICALLY UPDATED AND THE USER IS RESPONSIBLE FOR VERIFYING AND OBTAINING THE LATEST VERSION OF THE DATA.		APPENDIX: <b>3</b> <b>Natural Heritage Mapping</b>
	FILE:	REVISIONS	DATE: 11/18/02 DRAWN BY: KIM CHECKED BY: AS, SS REVISION NO.: 001.01 REVISION DATE: N/A
PRINCETON HYDRO, LLC 1108 OLD YORK ROAD SUITE 1, P.O. BOX 720 RINGOES, NJ 08551 PH: (908) 237.5660 FAX: (908) 237.5666	DATE:	REVISIONS:	DATE: 11/18/02 DRAWN BY: KIM CHECKED BY: AS, SS REVISION NO.: 001.01 REVISION DATE: N/A

**APPENDIX E**

**South Branch Rockaway Creek Petition for  
Redesignation and Press Release**

# RUTGERS ENVIRONMENTAL LAW CLINIC

123 Washington Street  
Newark, NJ 07102-3094  
Phone: (973) 353-5695

Rutgers, The State University of New Jersey  
School of Law - Newark  
Fax: (973) 353-5537

January 25, 2002

Bradley M. Campbell  
Commissioner-designate  
New Jersey Department of Environmental Protection  
P.O. Box 402  
Trenton, NJ 08625-0402

Re: Petition for Rulemaking - February 13, 2001  
N.J.A.C. 7:9B, Surface Water Quality Standards  
Petitioner: Clinton Township Community Coalition

Petition for Rulemaking - March 16, 2001  
N.J.A.C. 7:9B, Surface Water Quality Standards  
Petitioner: Wendy Kelman Neu and John L. Neu

Dear Commissioner Campbell:

Kindly accept this letter on behalf of our clients the Clinton Township Community Coalition ("CTCC") and Wendy and John Neu. To begin with, please accept our congratulations on your recent appointment. We here at the Rutgers Environmental Law Clinic are excited by the leadership and experience you are bringing to NJDEP and are very much looking forward to working with you.

Your experience with water quality protection will certainly be welcome and necessary to address the above-referenced Petitions for Rulemaking. These Petitions involve a crucial policy decision for NJDEP - whether unique high quality streams that support threatened and endangered species and their habitat should be classified with a Category One ("C1") antidegradation designation.<sup>1</sup>

As you may know, C1 streams are established in New Jersey's surface water quality standards ("SWQS") and no measurable change in water quality is permitted. NJDEP just recently adopted mixing zone policies, in the SWQS, which are protective of threatened and endangered species habitat and water supply intakes. However, these policies while crucial for all of the State's waterbodies simply do not provide the necessary protection needed for certain

<sup>1</sup> NJDEP provided notice that its deliberations on these two Petitions would conclude July 31, 2001. See 33 N.J.R. 1212(a) and 33 N.J.R. 2543(a). While this date has passed, NJDEP has been properly investigating the merits of these Petitions by conducting habitat investigations. For example, NJDEP's Endanger and Nongame Species Program conducted a habitat evaluation for the state-threatened wood turtle in the South Branch Rockaway Creek (see attached memorandum dated June 8, 2001). The ENSP concluded that this portion of the creek supports "exceptional habitat for the wood turtle" and is among the best wood turtle habitats with the Raritan River watershed." The ENSP went on to recommend the reclassification "as a measure to help protect this unique wood turtle habitat."

Ann Alexander, Esq.  
Acting Director

Susan Kraham, Esq.  
Staff Attorney

Thomas Borden, Esq.  
Staff Attorney

environmentally sensitive and unique ecological areas that must be given the added protection of a C1 antidegradation designation.

In response to comments from the Sierra Club/New Jersey Chapter on the SWQS rules, NJDEP recognized its over reliance upon reproducing trout populations for C1 designations and encouraged the submission of petitions to reclassify other specific environmentally sensitive waterbodies:

The C1 antidegradation designation is not limited to waters that support naturally reproducing trout populations, although the Department recognizes the majority of C1 waters are trout waters. Petitions may be made at any time to upgrade antidegradation designations to protect public drinking water supplies, environmentally sensitive lands, critical habitat, headwaters and aquatic ecology. This is reflected in the Department's definition of Category One waters.  
(Response to Comments 337 and 338)

The environmental community has recently been calling out for NJDEP to conduct a complete assessment of the State's antidegradation designations in order to protect drinking water sources and critical habitat for threatened and endangered species. While we certainly support this effort, there is an added sense of urgency relating to the above-referenced Petitions because they both involve yet-unbuilt but proposed new sewage treatment plant discharges to exceptional habitat areas.<sup>2</sup> Accordingly, it is important for NJDEP to take action now to properly scrutinize any new point source discharges that would lower water quality and increase flow in these critical habitat areas.

The Rutgers Environmental Law Clinic maintains that NJDEP should immediately take the important step of granting these two Petitions. Such an action would set the stage for a necessary review of the State's antidegradation designations to address the statewide issue of providing C1 antidegradation protection for water supply areas and critical habitat areas.

Thank you for your time and consideration of this important matter.

Sincerely,



Thomas A. Borden, Esq.  
Rutgers Environmental Law Clinic

attachment

cc: Janis Hoagland, Office of Legal Affairs  
Daren Eppley, DAG  
Bill Wolfe, Sierra Club/New Jersey Chapter  
Joanne Gray, Esq.  
Paul Schneider, Esq.  
Mark Straus, Esq.  
John Coley, Esq.  
Valerie Bollheimer, Esq.

<sup>2</sup> The two treatment plants that are proposed involve the potential construction of 911 homes and 292 homes respectively.



# State of New Jersey

Department of Environmental Protection

Division of Fish and Wildlife

P.O. Box 400

Trenton, NJ 08625-0400

Robert McDowell, Director

Visit our Division Website: [www.njfishandwildlife.com](http://www.njfishandwildlife.com)

RONALD T. DIFRANCESCO  
Acting Governor

Robert C. Shinn  
Commissioner

## MEMORANDUM

TO: Debra Hammond, Assistant Director  
Watershed Management Division

THROUGH: Marry McHugh, Assistant Director *MM*  
NJ Fish & Wildlife

FROM: Larry Niles, Bureau Chief *LN (J. Tesoro)*  
Endangered and Nongame Species Program

DATE: June 8, 2001

SUBJECT: Reclassification of South Branch Rockaway Creek

The Endangered and Nongame Species Program (ENSP) has reviewed Readington Township's request to reclassify the South Branch Rockaway Creek, and has performed a habitat suitability evaluation for the state-threatened wood turtle (*Clemmys insculpta*). We conclude that the stretch of the South Branch Rockaway from its headwaters to its confluence with Cushetunk Lake supports exceptional habitat for the wood turtle. The ENSP is intimately familiar with statewide wood turtle populations and considers the South Branch Rockaway to be among the best wood turtle habitats within the Raritan River watershed. While there has not been an intensive effort to assess the quality of the wood turtle population on the South Branch Rockaway, the several wood turtle sightings reported by local residents and environmental consultants working in the area, suggest that a sizeable population may exist.

Wood turtles are listed as threatened in New Jersey because of loss/fragmentation of its habitat, degradation of water quality, road mortality, predation, and over-collection from the wild. Little is known about the long-term viability of New Jersey's wood turtle populations. There is evidence indicating that many wood turtle populations are indeed functionally extinct, in which adult turtles may be present but recruitment of younger individuals is not occurring as the result of anthropogenic stresses.

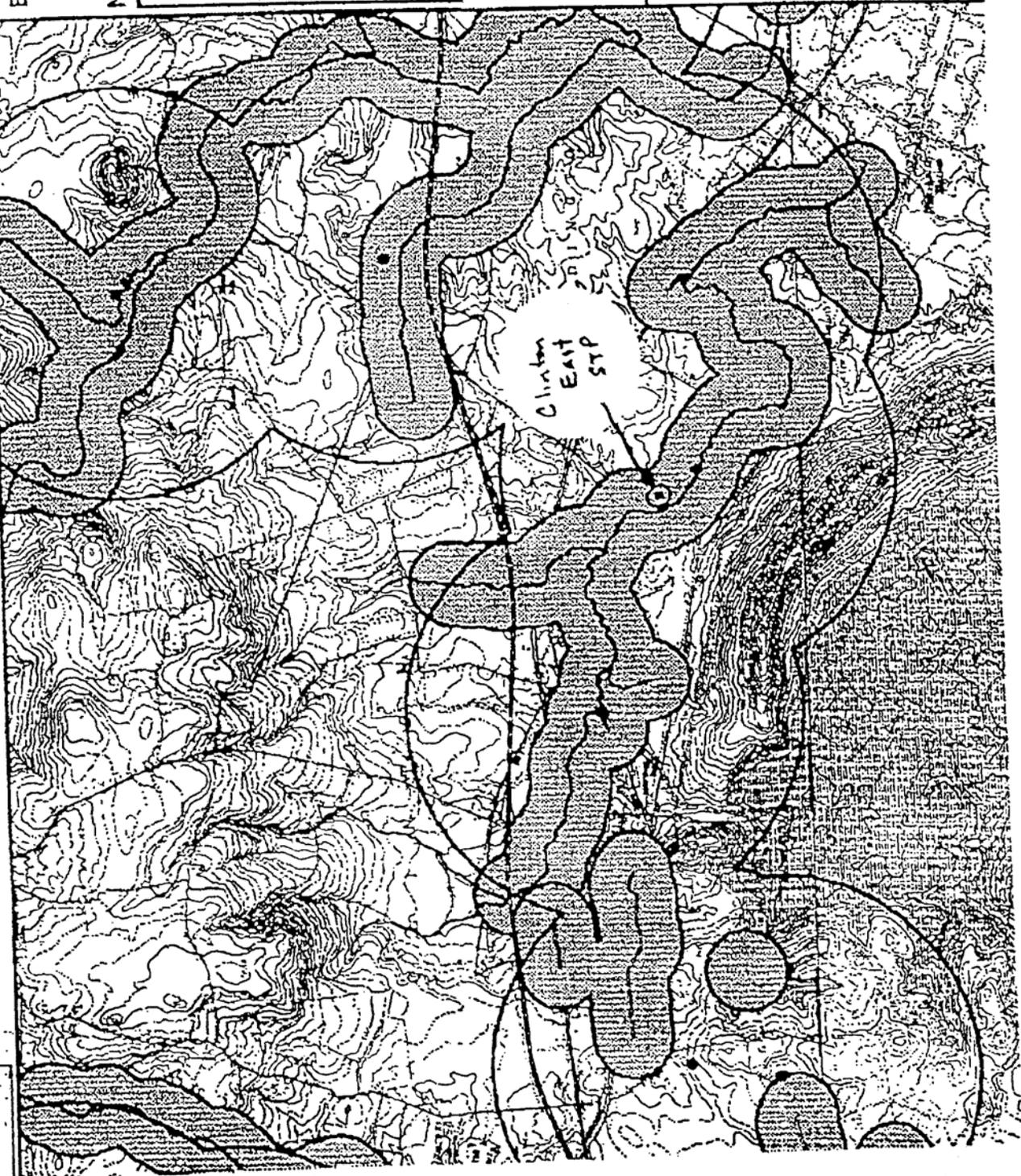
The South Branch Rockaway is one of the few drainages inhabited by wood turtles that possesses >2 miles of contiguous, undeveloped riparian, woodland, grassland habitat. The wood turtle is a species that requires a diversity of habitats to fulfill its life histories and can have home ranges exceeding several acres. The unique mix of habitats found along the South Branch Rockaway Creek promote excellent population viability. As an example, two of the best wood turtle populations in the state are located within the Delaware Water Gap National Recreation Area, the largest expanse of undeveloped habitat in the wood turtle's range.

The ENSP strongly urges the Division of Watershed Management to seriously consider reclassifying the South Branch Rockaway Creek as a measure to help protect this unique wood turtle habitat. Thank you for your cooperation.

Cc: Larry Torok, LURP

# Critical Wood Turtle Habitat

South Branch of the Rockaway River, Clinton Twp, Hunterdon Co.



Endangered and Nongame  
Species Program

NJ Division of Fish & Wildlife

## LEGEND

- Wood Turtle Sighting Points
- Core Aquatic Habitat (CAH) - Order 2 or high streams within one mile radius
- ▨ Selected order one streams within buff
- ▧ Order 2 or higher streams NOT within one mile radius
- ▩ Roads
- One mile wood turtle sighting point buffer
- ▭ Municipality Borders
- ▧ Core Terrestrial Habitat (CTH) - 0.2 Mile Buffer
- ▨ CAH Streams



First, a one mile radius was drawn around the wood turtle sighting point. Order 2 or higher streams within the radius were selected as the Core Aquatic Habitat (CAH). Then, a 0.2 mile buffer was placed around the selected streams to preserve the Core Terrestrial Habitat (CTH). If no Order 2 or higher streams were found within the radius, order one streams were selected.



SOUTH BRANCH ROCKAWAY CREEK  
REQUEST FOR UPGRADED ANTIDEGRADATION  
DESIGNATION

February 2001

The South Branch Rockaway Creek is a stream located in Hunterdon County, New Jersey, that flows from its headwaters in Clinton Township to its confluence with the North Branch Rockaway Creek near Whitehouse just north of Route 22. Currently, the South Branch Rockaway Creek is classified at N.J.A.C. 7:9B-1.15(f) as FW2-TM(C2) for its entire length.

New Jersey's Surface Water Quality Standards (SWQS) currently do not contain procedures for requesting or petitioning that the antidegradation designation for a particular waterbody be upgraded. Therefore, in this request to have the antidegradation designation of a portion of the South Branch Rockaway Creek upgraded from Category Two (C2) to Category One (C1), a procedure put forth in the SWQS for reclassifying specific segments for more restrictive uses (i.e., upgrading the surface water classification), found at N.J.A.C. 7:9B-1.11, has been followed.

Borrowing from N.J.A.C. 7:9B-1.11(f):

A reclassification for more restrictive uses may be made when:

2. It is demonstrated to the satisfaction of the Department that a more restrictive use is necessary to protect a unique ecological system or threatened/endangered species.

In this case, the upgrade from C2 to C1 is specifically requested to protect the existing use of the South Branch Rockaway Creek by the State threatened wood turtle (*Clemmys insculpta*). The current C2 antidegradation designation of the South Branch Rockaway Creek allows for degradation of water quality and changes of instream flow which would have a negative effect on the survival of this aquatically-dependent species in the watershed.

Recently, the headwater areas of South Branch Rockaway Creek watershed have been designated for a residential development known as Windy Acres. This proposed development, which is to be located in Clinton Township north of the Round Valley Reservoir and south of Route 22 (see Attachment 1), is in the immediate vicinity of documented wood turtle habitat. It is proposed to consist of approximately 958 single family homes and multifamily homes, a community recreation center, four stormwater detention basins, as well as a direct discharge to the South Branch Rockaway Creek of wastewater from a proposed sewage treatment plant. A DAC (NJPDES/DSW NJ0107565) has been issued for the proposed Clinton East Sewage Treatment Facility that will allow it to discharge up to 0.55 mgd of treated wastewater directly into the Creek.

At this time, the New Jersey Department of Environmental Protection (DEP or Department) has not developed biological criteria for the protection of the wood turtle or its habitat, nor is it known whether the promulgated surface water

quality criteria, found at N.J.A.C. 7:9B-1.14(c), are stringent enough to adequately protect the threatened turtle species. The Department cannot be certain that any water quality-based effluent limitations (WQBELs) issued, based on a C2 antidegradation designation, would be stringent enough to protect the wood turtles as these limits are not designed to protect existing water quality, but merely to meet the promulgated criteria. A C1 antidegradation designation would ensure that existing water quality in the Creek is maintained.

Wood turtles are an aquatically dependent species which hibernate instream, communally in clusters, typically using undercut banks along a deep pool on a stream as well as among the roots of live trees (Harding and Bloomer, 1979). In New Jersey, wood turtles will typically end their hibernation at the end of March, coming out of their hibernaculum to begin a period of basking in the sun on rocks and branches found instream (Tesauro, 2001). During April and early May, they begin mating instream. They remain in the water, or in the floodplain, typically until June, when they become more terrestrial. The females will lay their eggs in June in open areas along the stream banks, sand bars, or in cornfields adjacent to the riparian habitat. During the summer months the adult turtles move into fields, woodlands and other wetlands (Harding and Bloomer, 1979). By September, they head back into the creeks, often to breed again. The eggs that were laid in June will hatch in August or September, with the hatchlings usually heading immediately for the water (Tesauro, 2001).

Although the historical range and population size of wood turtles in the South Branch Rockaway Creek watershed are not completely known, the water quality and habitat present have been of sufficient quality to maintain a population of this species in the watershed. Some of the wetlands associated with South Branch Rockaway Creek have been classified by the DEP as exceptional resource value based on their providing suitable documented habitat for this threatened species. The New Jersey Natural Heritage Database indicates that wood turtles were observed in September of 1992 in the Rockaway Creek, south of Potterstown, near the Clinton-Readington Township line (see Attachment 2). This location is adjacent to, but downstream of, the proposed Windy Acres development. In June of 1999, a wood turtle was sighted east of Mountain Road and south of Route 22 foraging within the creek channel of the South Branch Rockaway Creek (see Attachment 3). This siting occurred at approximately the same location as the 1992 siting. Most recently, in May of 2000, Amy S. Greene, an environmental consultant for the developer of the Windy Acres housing development, reported two wood turtle sitings during a flora and fauna study survey of the proposed development site (Greene, 2000). The first turtle was observed on May 5th in the bed of the South Branch Rockaway Creek at the proposed Windy Acres site. The second wood turtle was observed on May 17th and was found several hundred feet away from the area of the first siting and about 50 feet from the Creek near the edge of the forested wetland.

It becomes obvious from the aforementioned sitings that the South Branch Rockaway Creek and surrounding environment provide suitable habitat for the State threatened wood turtle. Furthermore, at a November 4, 2000, Clinton Twp. Planning Board public hearing - Application for Individual Freshwater Permit and Transition Area Waiver, the following testimony was provided by Ms. Greene regarding the South Branch Rockaway Creek at the proposed Windy Acres development site:

The stream corridor here is an important habitat for wood turtle. It is important wintering habitat, feeding habitat... We found them here. It is a potential nesting habitat. (page 132, lines 15-22).

Jason Tesauro, Senior Zoologist, New Jersey Division of Fish and Wildlife, Endangered and Nongame Species Program, who is intimately familiar with the creek, echoed Ms. Greene's comments regarding the current quality of the aquatic habitat provided by the South Branch Rockaway Creek and land surrounding it in the vicinity of the proposed Windy Acres development by stating "it is some of the better quality wood turtle habitat in the State." In fact, he stated it is "exemplary habitat" (Tesauro, 2001).

Based on the recent sitings, the South Branch currently offers suitable habitat and high enough water quality to maintain a wood turtle population. However, allowing point source discharges that would lower water quality and increase flow in the creek, as well as allowing disturbances and destruction of turtle habitat due to development would devastate the wood turtles of the South Branch Rockaway Creek. Harding and Bloomer (1979) report "Habitat degradation may be as critical as habitat loss for these animals. *Clemmys insculpta* is rarely found in heavily polluted waters and can be considered a pollution intolerant species." The DEP should therefore take the appropriate step in an effort to protect this threatened species by providing a C1 antidegradation designation to the waters in which the turtles are found and require that the proposed Clinton East facility be required to meet C1 discharge requirements.

The petitioner would like to point out that the DEP routinely proposes and adopts C1 antidegradation designations for waterbodies, or portions thereof, that have been sampled and found to contain young-of-the-year trout. These FW2-TP(C1) waters are largely found throughout the northern and central portions of the State and pass through a variety of properties, including those owned by federal and State government, municipalities, counties, corporations and private individuals. In fact, numerous other streams in Hunterdon County have already been afforded the C1 antidegradation designation based on the presence of reproducing trout populations. The petitioner believes that threatened and endangered species, such as the threatened aquatically dependent wood turtle, deserve the same water quality protection that the DEP routinely affords young-of-the-year trout. Designating a stream, or portion

thereof, as C1 to protect an animal species would not be a unique occurrence as it has been done before many times by the DEP.

Because C1 waters are to be "protected from any measurable changes (including calculable or predicted changes) to the existing water quality" [emphasis added], it is believed that an upgrade from C2 to C1 would help provide the necessary protection to the wood turtles of South Branch Rockaway Creek and the aquatic habitat on which they depend. It is therefore requested that the DEP upgrade the antidegradation designation of the South Branch Rockaway Creek, from where it crosses the easternmost Lebanon Borough boundary, downstream to Cushetunk Lake, from C2 to C1.

## References

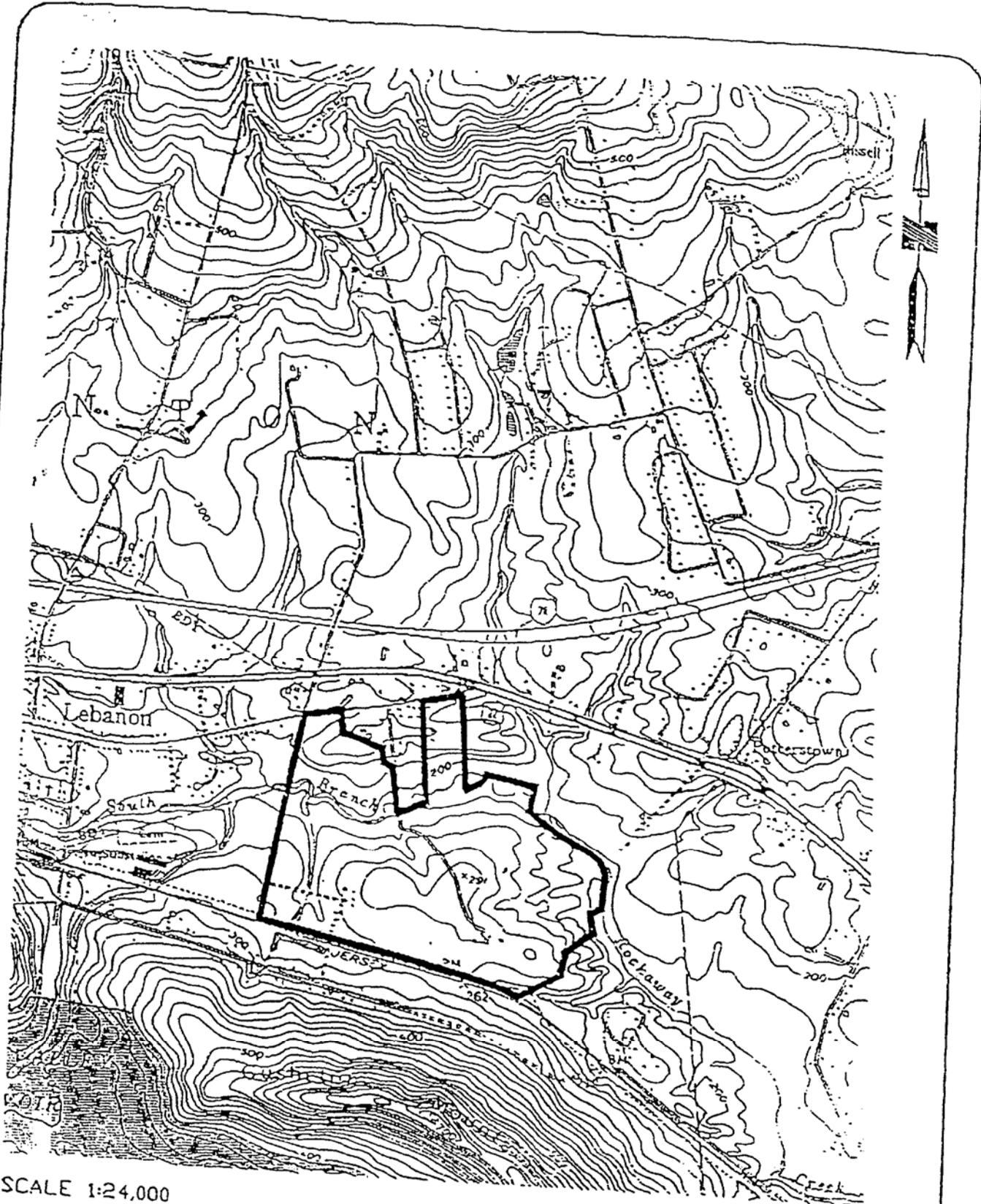
Greene, Amy S. Environmental Consultants Inc., *Flora and Fauna Study and Endangered, Threatened, and Rare Species Survey for Windy Acres, Block 7; Lots 18, 18.01, & 31, Clinton Twp., Hunterdon County, NJ*; August 25, 2000.

Harding, James H., and Tom J. Bloomer. 1979. The Wood Turtle (*Clemmys insculpta*) ... A Natural History. *Herp. Bull., New York Herpetol. Soc.* 15:9-26.

Tesauro, Jason. Senior Zoologist, Division of Fish and Wildlife, Endangered and Nongame Species Program, New Jersey Department of Environmental Protection. Telephone conversation between Jason Tesauro and Meredith H. Lavery, January 23, 2001.

Attachment 1

Site Map of Proposed Windy Acres Development



SCALE 1:24,000

FIGURE 1	WINDY ACRES CLINTON TOWNSHIP HUNTERDON COUNTY, NJ
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Attachment 2

New Jersey Natural Heritage Database



State of New Jersey

Department of Environmental Protection

Division of Parks and Forestry  
Office of Natural Lands Management

Natural Heritage Program  
PO Box 404

Tranton, NJ 08625-0404  
Tel. #609-984-1339  
Fax. #609-984-1427

Robert C. Shinn, Jr.  
Commissioner

Christine Todd Whitman  
Governor

April 26, 1999

Lloyd H. Tubman  
Greenbaum, Rowe, Smith, Ravin, Davis, & Himmel  
Metro Corporate Campus  
P.O. Box 5600  
Woodbridge, NJ 07095

Re: Windy Acres (Block 7, Lots 18 and 31)

Dear Lloyd Tubman:

Thank you for your data request regarding rare species information for the above referenced project site in Clinton Township, Hunterdon County.

The Natural Heritage Data Base has a record for a wood turtle occurrence which may be on the site. Additionally the Natural Heritage Program has a record for a bald eagle occurrence at the Round Valley Reservoir. The Division of Fish, Game and Wildlife must be contacted regarding management concerns for this species. The attached list provides more information about these occurrences. Because some species are sensitive to disturbance or sought by collectors, this information is provided to you on the condition that no specific locational data are released to the general public.

Also attached is a list of rare species and natural communities which have been documented from Hunterdon County. This county list(s) can be used as a master species list for directing further inventory work. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish, Game and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for

processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,



Thomas F. Breden  
Supervisor

cc: Lawrence Niles  
Thomas Hampton  
NHP File No. 99-4007467

# NATURAL LANDS MANAGEMENT

## CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the data base. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, CN 401, Trenton, NJ 08625-0401.

**This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.**

1  
23 APR 1999

POSSIBLY ON PROJECT SITE  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL GRAHK STATUS	GRAHK	DATE OBSERVED	IDENT.	LOCATION
*** Vertebrates CLEMmys INSULPTA	WOOD TURTLE		T	G4	S3	1992-09-77	Y	ROCKAWAY CREEK, SOUTH OF POTTERSTOWN, NEAR THE CLINTON-READINGTON TWP. LINE.
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	(P5)	E	G4	S1B, S2N	1996-06-24	Y	ROUND VALLEY RESERVOIR.

2 Records Processed

Attachment 3

1992 Endangered and Threatened Species Reporting Form

# Endangered and Threatened Species Reporting Form

Species Wood Turtle Scientific name Clemmys insculpta  
 Directions to location where species was sighted East of Mountain Road and  
South of Route 22 (abandoned road)

(Please attach a photocopy of a map indicating the location)

Township Readington County Hunterdon  
 Topographic quad (if known) Califon NJ  
 Land ownership (if known) Private  Public   
 Date and time of sighting 25 June 1999 (AM)  
 Age of animal sighted (circle) immature  adult  unknown   
 No. of individuals each age sighted: 1  
 Behavior observed (eg. flying, perched, feeding, brooding): Foraging within creek  
channel of the South Branch Rockaway Creek  
 Length of time observed: 0.5 hours  
 How frequently has this species been observed at this location? unknown

Habitat information, if known (please check appropriate character) Is this a wetland habitat? yes  no

Forest:	Needleleaf <input type="checkbox"/>	Broadleaf <input checked="" type="checkbox"/>	Mixed <input type="checkbox"/>	Plantation <input type="checkbox"/>
Shrub:	Needleleaf <input type="checkbox"/>	Broadleaf <input checked="" type="checkbox"/>	Mixed <input type="checkbox"/>	Plantation <input type="checkbox"/>
Herbaceous:	Grasses and forbs <input checked="" type="checkbox"/>	Mixed herbaceous <input checked="" type="checkbox"/>		
Agricultural:	Sod <input type="checkbox"/>	Small grain <input type="checkbox"/>	Unknown <input type="checkbox"/>	Field <input type="checkbox"/>
	Orchard/nursery <input type="checkbox"/>	Hay <input type="checkbox"/>	Pasture <input type="checkbox"/>	Fallow (herbaceous) <input checked="" type="checkbox"/>
Barren ground:	Mudflat <input type="checkbox"/>	Clim <input type="checkbox"/>	Excavated <input type="checkbox"/>	Beach <input type="checkbox"/>
Open water:	Saltwater <input type="checkbox"/>	Lake <input type="checkbox"/>	River <input checked="" type="checkbox"/>	Estuarine <input type="checkbox"/>
Developed:	Urban <input type="checkbox"/>	Suburban <input checked="" type="checkbox"/>	Rural <input checked="" type="checkbox"/>	Transportation <input type="checkbox"/>
	Parks/rac. <input type="checkbox"/>	Cemeteries <input type="checkbox"/>		

Name of observer: Mr. George M. Christian  
 Address Norwood Inc. Associates (NA)  
3250 Schuykill Rd., Spring City, PA 19475-1124  
 Telephone (610) 948-4700

Provide background on wildlife experience or knowledge (optional)  
BS - Environmental Sci. Lehigh U., Project Biologist (NA)

Date sighting reported: 2 July 99  
 Were photographs taken? yes  
 Would you accompany a biologist to the site if needed? yes



\* Note Contact: Francis Selva, Readington Twp. Env. Comm. (908) 534-4131  
for photos of specimens observed.

# PURCELL, RIES, SHANNON, MULGAHY & O'NEILL

COUNSELLORS AT LAW

ONE PLUCKEMIN WAY  
CROSSROADS BUSINESS CENTER  
P.O. BOX 754  
BEDMINSTER, NEW JERSEY 07921

TEL: (908) 658-3800  
FAX: (908) 658-4859

12TH FLOOR, EAST TOWER  
CENTRE SQUARE  
1500 MARKET STREET  
PHILADELPHIA, PA 19102

PLEASE REPLY TO BEDMINSTER OFFICE

April 23, 2002

MARY JEAN BARNES (NJ & NY BAR)  
RITA F. BARONE  
WILLIAM T. HILLIARD  
SUSAN A. LAWLESS (NJ & NY BAR)  
CHRISTOPHER LAZAS  
MEREDITH H. MARCUS  
MICHAEL J. MCGAFFREY\* (NJ & NY BAR)  
NATALIE SHAHINIAN (NJ & NY BAR)  
DONNA M. STEPHAN-NOLAN (NJ, PA & DC BAR)

\*CERTIFIED CIVIL TRIAL ATTORNEY  
\*\*CERTIFIED CIVIL AND CRIMINAL  
TRIAL ATTORNEY

EUGENE M. PURCELL\*  
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THOMAS M. MULGAHY\*\*  
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FRANK J. KONTELY III

DAVID D. FURMAN, OF COUNSEL  
C. JUDSON HAMLIN, OF COUNSEL  
KENNETH D. MERIN, OF COUNSEL

Privileged & Confidential  
Attorney-Client Work Product

Mayor Gerard J. Shamey and Township Committee  
Readington Township Municipal Building  
509 Route 523  
Whitehouse Station, New Jersey 08889

Re: April 22, 2002 Press Release

Dear Mayor Shamey and Township Committee:

Enclosed herewith, please find a Press Release from the Governor's Office dated April 22, 2002. The Governor has announced his proposal to redesignate 15 streams, inclusive of the South Branch Rockaway Creek, as Category 1. This designation "upgrades" the current stream classification and is consistent with the petitions filed by Readington Township and by the citizens' group in Clinton Township. While the Governor's Press Release is very good news indeed, the designation can be changed only through the administrative rule-making process. The NJDEP will need first to publish a new rule proposal to designate the stream as a "Category 1", receive public comments thereon, and formally adopt the Category 1 designation as an administrative rule. The target date for the DEP rule proposal was not announced.

Once the NJDEP proposes the category redesignation as a rule, I would recommend that Readington Township send in a "comment" to the rule proposal to affirm your agreement with same. Typically, there is only a 30-day period within which to comment after a regulatory proposal is published, and therefore we should remain diligent and on the look-out to determine when the Department proposes this as a rule. By copy hereof, I would ask Dr. Souza and Mr. Holt to also watch for the rule proposal.

RECEIVED

In the event there are any questions, please feel free to contact me.

Very truly yours,

  
Valerie Kimson Bollheimer

VKB/ald  
Enclosure

cc: Sharon A. Dragan, Esq.  
Andrew S. Holt, P.E. (Township Consultant on P&H matter)  
Stephen J. Souza, Ph.D. (Township Consultant on P&H matter)



## State of New Jersey

OFFICE OF THE GOVERNOR  
125 WEST STATE STREET  
PO Box 001  
TRENTON NJ 08625-0001

JAMES E. MCGREEVEY  
Governor

FOR IMMEDIATE RELEASE  
DATE: April 22, 2002

CONTACT: Paul Arohson  
PHONE: 609-777-2600

### MCGREEVEY CELEBRATES EARTH DAY BY PROTECTING STATE'S CRITICAL RESERVOIRS AND STREAMS

*Announces Plan to Protect Key Drinking Water Sources and High Quality Waterways*

(CLINTON) – Today, on Earth Day, Governor James E. McGreevey announced a proposal to strengthen protection for nine drinking water reservoirs and six river and stream segments as the start of a broader initiative to provide New Jersey residents with clean and plentiful water

Specifically, the Governor proposed "Category 1" designations for 15 "high quality waters" covering approximately 200 stream and reservoir miles. The nine reservoirs included in today's announcement provide drinking water to approximately 3.5 million New Jersey residents.

This designation, known as "Category 1," establishes special regulatory protections against any measurable change in the existing high quality of these water bodies, thereby preventing impact from future pollution sources. Today's announcement, is the beginning of Governor McGreevey's comprehensive, long-term plan to provide strong leadership in managing and protecting the state's water.

"Now is the time to act – we must protect our state's limited and healthiest water sources for our families and future generations," said McGreevey. "We all have a responsibility to be stewards of New Jersey's drinking water sources. The current drought reminds us of the price we pay if we neglect our water resources. We must take action to ensure that our communities have clean and plentiful water supplies now and into the future."

Governor McGreevey has also directed Department Environmental Protection Commissioner Bradley Campbell to identify another round of designations within the next nine months and to set clear standards for those waters that should receive the special designation. For the first time, these standards will consider whether the waters are a source of drinking water or provide critical habitat for endangered species. Governor McGreevey additionally calls for these designation standards to be consistent with and support other federal and state clean water and safe drinking water standards.

As part of a comprehensive plan to revisit clean water rules, DEP Commissioner Bradley Campbell will be considering a range of clean water and smart-growth issues over the next year, including the state's protection of drinking water resources and endangered species habitat. As part of this process, the DEP will also be developing a new rule to replace the "septic rule" which was recently set aside by the courts due to procedural issues. "For too long, we have lacked effective leadership and commitment to manage and preserve our critical water resources, leaving us short-handed to deal with New Jersey's current drought emergency," said Commissioner Campbell. "Governor McGreevey is changing the way Trenton does business - part of that change extends to stepping up to the plate and improving the way we safeguard our resources that every family depends on for safe drinking water."

Each Category I ("C1") designation occurs through an administrative rulemaking process, affording the public an opportunity to provide comment and input to these decisions.

In addition to their significance to drinking water supplies, the waterways listed below contain other important environmental resources. Here are the water bodies outlined in the Governor's plan:

#### **RESERVOIRS:**

##### **Round Valley Reservoir - Clinton Township, in Hunterdon County**

The Round Valley Reservoir is managed by the New Jersey Water Supply Authority and provides drinking water for residents of Central New Jersey.

##### **Doughty Reservoir - Egg Harbor, Galloway, Absecon, in Atlantic County**

The Doughty Reservoir is managed by the Atlantic City Municipal Utilities Authority and provides drinking water for residents of Atlantic City.

##### **Oradell Reservoir - Harrington Park, Closter, Haworth, Emerson, Oradell, in Bergen County**

The Oradell Reservoir is managed by the Hackensack Water Company and provides drinking water for residents of Northeast New Jersey, including Bergen and Hudson counties.

##### **Charlottesburg Reservoir Rockaway, in Morris County**

The Charlottesburg Reservoir is managed by the Newark City Water District and provides drinking water for residents of Northeast New Jersey, including Morris, Union, Passaic and Essex counties.

##### **Boonton Reservoir - Boonton Township, in Morris County**

The Boonton Reservoir is managed by the Jersey City Water Department and provides drinking water for residents of Northeast New Jersey, including Essex, Passaic and Hudson counties.

##### **Swimming River Reservoir - Colts Neck, in Monmouth County**

The Swimming River Reservoir is managed by North Jersey American water company and provides drinking water for residents of Southeast New Jersey.

**Glendola Reservoir - Wan, in Monmouth County**  
The Glendola Reservoir is managed by North Jersey District Water Supply Commission and provides drinking water for residents of Southeast New Jersey.

**Manasquan Reservoir- Howell, in Monmouth County**  
The Manasquan River is managed by the New Jersey Water Supply Authority and provides drinking water for residents of Southeast New Jersey.

**Wanaque Reservoir - Ringwood Borough, Wanaque Borough, in Passaic County**  
The Wanaque Reservoir is managed by North Jersey District Water Supply Commission and provides drinking water for residents of Northeast New Jersey, including Essex, Passaic and Hudson counties.

#### **STREAMS:**

**South Branch Rockaway Creek - Clinton, Lebanon, Readington in Hunterdon County**

South Branch Rockaway Creek is located in Hunterdon County in the Raritan Watershed region. The headwaters of the creek are in Clinton Township. The creek flows in an easterly direction through Lebanon Borough and Readington Township, meeting the North Branch of the Rockaway River just north of Route 22.

**Sidney Brook - Clinton, Union, Franklin, in Hunterdon County**

Sidney Brook is located in Hunterdon County in the Raritan Watershed region. It flows through portions of Clinton, Union and Franklin townships. Sidney Brook is a headwater stream with high water quality.

**Flatbrook - Walpack, in Sussex County**

Nestled within the rural landscape of western Sussex County, the Flat Brook watershed is one of the most expansive, ecologically intact, high water quality stream systems in the state.

**Pequest Tributary - Liberty, Mansfield in Warren County**

Pequest River and Beaver Run are high quality watersheds that feature an excellent example of calcareous wetlands and important habitat.

**Assiscunk Creek - Springfield, Mansfield, in Burlington County**

Surrounded by farmland and bordered by a rich floodplain of oak and maple forested swamp, vernal pools, and marshes, the Assiscunk Creek provides high water quality and important habitat.

**Beaver Brook - Clinton, in Hunterdon County**

Beaver Brook is located in Annandale in the Raritan River watershed. The DEP will propose a C1 designation from the Beaver Avenue Bridge downstream to the lower most I-78 bridge.

## **APPENDIX F**

### **Meta Data**

## Metadata

Princeton Hydro was contracted to construct a Natural Resource Inventory for the township of Readington New Jersey. Work began in the year of 2000 and the update has continued until the year 2002. For the generation of the inventory it was necessary to compile digital data using geographical information systems (GIS) program. This data was compiled into a series of paper copy maps. A total of 17 maps were produced for the NRI.

In order to produce the maps Environmental Systems Research Institute's (ESRI) ArcView Software was used, version 3.2a, with spatial analyst, 3D analyst, and other various plug modules. In order to view the data the above mentioned software is needed along with an understanding of how the software works. The data has been compiled and copied to a compact disc, which is supplied to the township. Included on the Compact Disc are complete versions of metadata in current FGDC standard formats.

The 17 maps were printed on 11" x 17" paper at a scale of 1:55,000. Below is a list of data types used to produce the maps.

Data used on every map includes the following Base Map data:

- Municipal Boundary
- Tax Parcel Boundaries
- Main Roadways
- Streams
- Lakes

In each of the following maps this additional data was included:

- Map 1  
USGS Digital Raster Graphics of 7.5 minute Topographic Quadrangles
- Map 2  
Natural Color High Altitude Aerial Photographs (rasterized).
- Map 3  
State Planning areas of New Jersey
- Map 4  
Zoning Areas
- Map 5  
Preserved Open Space and Farmland
- Map 6  
Digital Elevation Model (DEM) data, Grid format, Calculated to determine ranges of Slopes.
- Map 7  
Surface Geology
- Map 8  
USDA SSURGO Soil Series Data

- Map 9  
USDA SSURGO Prime Agricultural and Statewide Importance soil qualities
- Map 10  
Septic Suitability
- Map 11  
State Natural Heritage Areas maps digitized into the state plane coor.  
NJDEP Landscape Habitat data
- Map 12  
Historic features produced from tax parcel data, including New Jersey office of  
Historic Preservation Site Inventory Search (2001), Hunterdon County Planning  
Board Sites (1990), and Township Historian Designated Sites (1990)
- Map 13  
FEMA Flood Hazard Areas  
Watershed Regions of New Jersey  
River Gauge Station locations  
AMNET Monitoring stations  
AMNET Biological Monitoring Stations  
Fish Index of Biotic Integrity Sampling Points  
Existing Water Quality Stations in New Jersey
- Map 14  
Wetland Inventory Countywide (not NWI)
- Map 15  
Bedrock Aquifers  
Community wells  
Township Well Data
- Map 16  
Land Use Land Cover, WMA 8
- Map 17  
Natural Vulnerability areas (produced for this study)