

RINGWOOD BOROUGH

2007 CONSERVATION PLAN ELEMENT



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**Prepared by the
Ringwood Borough Planning Board**

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*We do not inherit the earth from our ancestors,
we borrow it from our children*

-Native American Proverb

Executive Summary

Clean water, the primary focus of Highlands protection efforts, is a central element of Ringwood's landscape. An expansive deciduous forest, which covers 2/3 of the Borough, provides the ideal buffer to protect the vast potable water resources that originate in and/or flow through Ringwood. The forest canopy slows the arrival of precipitation on the ground and the forest floor acts as a vast sponge that soaks up rainwater and snowmelt and slowly releases this water to streams and underground aquifers, retarding peak flows during flood periods. The forest and its wetlands act to protect and purify the pristine headwaters that flow through them and into the reservoirs.

The natural features and critical environmental resources that combine to form a landscape unique to Ringwood also continue to attract residential and other development. Industrial developments, desired by some for their perceived beneficial effect on homeowner property taxes, often utilize clearcutting and mass grading and can produce significant detrimental environmental effects that have public costs that are not part of the ratable balance sheet. Residential homesites, whether concentrated in a series of lake communities or increasingly spread out along local roads, exploit this scenic beauty and recreational setting, and also impose a variety of anthropogenic, or man-made, impacts on this landscape.

Trees have been removed and replaced with rooftops, asphalt-paved driveways and lawns, which increases the speed and amount of runoff carrying fertilizer, pesticides, road salts and petroleum hydrocarbons. Septic systems improperly installed or poorly maintained have continuing impacts on groundwater and nearby lakes and streams.

Nonetheless, the vast reservoirs and lakes in the Borough, covering over 2,200 acres, combine with nearly 12,000 acres of forest to maintain a wooded, rural character throughout fully three-quarters of the Borough. Ringwood's geology, typical of the Highlands region, poses significant limitations to residential development with rock outcroppings, moderately high bedrock and a high water table, and soils that are not suitable or poorly suitable for septic systems in a wide portion of the Borough.

The headwater tributaries and streams draining the Borough contribute high quality water to the Wanaque River, and the Wanaque and Monksville Reservoirs, which provide valuable drinking water and recreational uses. Many of the streams in the Borough are classified as Category 1 (C-1), and support trout production and trout maintenance, an important indication of ecosystem health.

The Borough also provides large contiguous areas of critical habitat, which is becoming increasingly rare in New Jersey. Many endangered species, such as the Northern Goshawk and Barred Owl, require maintenance of these large contiguous areas to forage and breed. In addition, the Timber Rattlesnake, also a State endangered species has been identified within the Borough and has apparently been disturbed by past development, likely resulting in its recent appearance in established residential areas. As the quality of the environment is degraded and these species relocate or are lost, it is important to recognize that humans are also affected by ecological degradation. Like the canaries used by miners to signal when the air in the mine was no longer safe to breathe, the fate of threatened and endangered species today should serve as an indicator of our future health and quality of life.

Ringwood is synonymous with the Highlands. This Conservation Plan proposes policies and strategies to balance the effects of development with the need to preserve the natural resource base, enhance the quality of life for Borough residents and protect the future health of the Highlands regional ecosystem.

Statutory Authorization and Intent

The Municipal Land Use Law (MLUL) (NJSA 40:55D-1 et seq.) authorizes municipalities to plan and zone to promote the general welfare. The 15 purposes of the MLUL (NJSA 40:55D-2) explain the State legislature's rationale for the statutory authorization for municipal land use planning and regulation. More than half of these purposes highlight the importance of conserving natural resources and a clean healthy environment. The public health and safety (subsection "a") bear a direct relationship to the use and management of New Jersey's land and water resources. Securing safety from floods and other natural and manmade disasters (subsection "b") and providing adequate light, air and open space (subsection "c") are similarly directed at conserving natural resources. "Preservation of the environment", in part through planning for "appropriate population densities and concentrations" (subsection "e"), is a key underpinning of local land use policy.

"Providing sufficient space in appropriate locations" for a variety of land uses, "according to their respective environmental requirements", is intended "to meet the needs of all New Jersey citizens" (subsection "g") for a healthy environment. The statute also seeks to promote the conservation of "open space, energy resources and valuable natural resources in the State and to prevent urban sprawl and degradation of the environment through improper use of land" (subsection "j"). The conservation of energy is cited in subsection "n" ("promote utilization of renewable energy sources") and subsection "o" ("promote the maximum practicable recovery and recycling of recyclable materials").

Preventing urban sprawl has long been an objective of New Jersey's planning and zoning law, which is supported by the related objectives of protecting the natural environment and preventing its degradation.

In furtherance of these conservation objectives, the MLUL provides for preparation and adoption of a Conservation Plan Element (NJSA 40:55D-28b.8.) which reads as follows:

“Conservation plan element, providing for the preservation, conservation and utilization of natural resources, including, to the extent appropriate, energy, open space, water supply, forests, soil, marshes, wetlands, harbors, rivers and other waters, fisheries, endangered or threatened species, wildlife and other resources, and which systematically analyzes the impact of each other component and element of the Master Plan on the present and future preservation, conservation and utilization of those resources;”

The statutory intent and directives are clear. Our natural resource base is a treasure to be carefully guarded for the benefit of current and future residents, human and otherwise.

Sustainability and Stewardship – Core Conservation Concepts

Sustainability is a widely-referenced term that merits a precise definition, since it is guiding public policy. In 1987, the World Commission on Environment and Development developed a definition of sustainability that was included in its findings, which became known as the Brundtland Report. It stated that:

Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.

Although this definition has become widely publicized, the full meaning of sustainability is somewhat broader, and relates to the health of the planet. The 1992 Rio Earth Summit and subsequent G7/G8 conferences promoted living, working and ordering society in ways that are environmentally "sustainable", by reducing waste and pollution, re-using resources, promoting biodiversity, etc. In nature conservation terms, sustainability means using natural resources in a manner and to an extent that they can be renewed, and the environment's natural qualities can be maintained for the long term.

Stewardship embodies the concept of land as a resource, and recognizes our responsibility to wisely manage that resource for the benefit of current and future generations. In New Jersey's Highlands region, sustainability and stewardship take on a special meaning. Potable water resources, critical to the expanding human population of northern New Jersey, are also crucial to maintaining the natural ecology.

Construction of new homes or businesses increases the demands on this water supply and runoff from these impervious surfaces degrades pristine waters. And when these demands exceed the supply capabilities, the results can be disastrous for people, as well as the environment. Potable water wells have been depleted by new water users, and homeowners may not be able to replace this supply by drilling deeper into the dense rock formations that store very little water. Similarly, new water withdrawals can lower the

local water table, reducing water volume in streams that rely on groundwater discharge for base flow to the point of drying up these watercourses during drought periods.

Public discourse over land use policy frequently pits the fate of wildlife, including threatened or endangered species, against the human needs for water, shelter, recreation and other activities. This contrast is poorly drawn, since rare species are indicators of high environmental quality that has value for all living things. Similarly, like the canaries on the miners' helmets, when these species can no longer survive because of degraded environmental conditions, their extirpation, or disappearance is a warning to man. Accordingly, a loss in species and/or biodiversity is often the first sign of a threat to potable water degradation and other human needs being threatened.

Economic exploitation by a few can substantially affect the common good. Effective land stewardship will respect the finite limits of land and water resources, promote the conservation of exceptional resource values and remediate the damages of past man-made activities.

Introduction

This Conservation Plan outlines Ringwood Borough's strategies to meet the statutory mandate to protect the environment. While it is designed to function in concert with the other plan elements, the most important linkage will be between the Land Use Plan and the Conservation Plan. Together, these plan elements propose the location, scale and intensity of new development and the resource management strategies needed to protect the environment.

A "business as usual" approach will not meet the conservation objectives of the MLUL. Typical suburban residential development and high intensity industrial uses can overtax the natural environment, resulting in substantial degradation of surface water and groundwater quality, and permanent destruction of important forest areas. The principles of sustainable development demand that resource commitments made during this generation will be sustainable—that is, able to be continued for the benefit of future generations and the ecosystem.

The most effective way to protect natural resource assets is to buy the land or the development rights. This approach permanently preserves these valuable features, and is most effective at limiting the effects of development. The continuing commitment of New Jersey for open space preservation bodes well for such acquisitions. However, hundreds or even thousands of acres of undeveloped and "underdeveloped" land will remain beyond the reach of publicly-funded acquisitions. Thus, local and regional land use regulations will continue to play a controlling role in how the environment is managed, during and after development. Air, water and soil are the essential resources which support a healthy biota.

Fragmentation and degradation of vegetation, land and water resources has been a byproduct of human activity. Woodlands have given way to residential neighborhoods

and water quality has been progressively altered and impacted by human activity. The quality of the air we breathe and the water we drink determines the health of the human organism and all life forms. This Conservation Plan seeks to minimize further degradation of these resources and establish an arsenal of environmental health-building tools for the 21st century and beyond. This calls for a systems approach to natural resource conservation, where interconnected natural systems are viewed as a collective resource, not a series of separate features.

The variety of biological species is an indicator of the health of an ecosystem. Maintaining biological diversity requires protection of critical habitat areas. While habitats of endangered or threatened plant or animal species are of special importance, threatened or endangered status may be transient. For instance, the great blue heron and bald eagle have been removed from the protected list, yet their critical habitats remain essential to their continued survival. Additionally, the extirpation of rare species removes elements from the food chain that help maintain ecological balance. The explosive deer population in New Jersey is but one example of the damage that can be wrought when this natural balance is lost and one species becomes a dominant factor in the health and well being of the overall ecosystem by removing native species and their habitat.

Protecting biodiversity requires the protection of terrestrial and aquatic habitats that are highly susceptible to degradation. Pristine waters cannot be maintained without protection of their watershed areas. Freshwater wetlands play an important role in filtering contaminants from the surface water and groundwater regime and, while protected by state statutes, are not immune from impacts that occur beyond the regulated areas. Similarly, prime forested areas, including mature stands of native species, are easily lost or damaged through fragmentation, a manmade impact that reduces biodiversity.

The scenic wonder of ridgelines, slopes and ravines is only one aspect of the value of these natural features, without which certain species will not remain. Similarly, grassland habitats are essential to the nesting, feeding and breeding of a variety of grassland bird species, yet such areas are frequently lost to development. The effects of suburban development have isolated woodland segments, and eliminated or prevented the interconnection of the remaining woodlands. The background studies identify woodland areas by forest cover type, as well as critical wetland, water and grassland habitats. Land development should be arranged to maximize the conservation of substantial masses of critical habitat areas, by limiting the aerial extent of development and promoting conservation techniques targeted to these resources.

Carrying capacity is a planning technique used to establish the maximum population level of a species based on the availability of natural resources. Carrying capacity had its genesis in ecological studies, used to manage wildlife habitat rangeland for grazing. In the context of land use planning, carrying capacity has been defined as the ability of natural and man-made systems to support a level of population growth and ancillary development while maintaining established standards of performance. When applied to regulating land use, an assessment of carrying capacity is useful in establishing maximum densities or intensities of

development. However, sustainability requires that we provide a margin of safety, and not plan for the maximum development that can currently be supported.

The policies and strategies of this Conservation Plan seek to limit the impacts of development and retain the natural terrain and features to the greatest extent practicable. This plan also promotes the restoration of natural systems that have been degraded by past activities. As new regulatory tools or techniques become available, they should be evaluated for their ability to promote the Conservation Plan objectives and adopted where appropriate. Additionally, open space acquisition priorities should be established to address the goals of the Conservation Plan.

Energy and Air Quality

Protection of the Borough's air quality is largely dependent on regional, state, national, and even international factors. Similarly, energy conservation and utilization is shaped by a host of factors. However, local land use regulations determine future land use patterns, which have a direct effect on air quality and energy use. Management approaches that the Borough can initiate to mitigate air pollution and promote energy conservation include the following:

- a. Promote alternative means of transit by providing opportunities and access for alternative transportation systems (buses, car and van pooling, bicycling, and walking).
- b. Adopt development regulations that retain existing wooded areas and large contiguous open land areas.
- c. Reduce the need for vehicular trips by facilitating better interconnections among residential, commercial, office, and recreational uses.
- d. Encourage energy conservation through subdivision design, building design, building orientation, and the evaluation of microclimate conditions such as solar access and wind direction.
- e. Recommend landscaping standards that provide buildings with maximum solar access, shading, and wind protection while minimizing water consumption and run off.
- f. Encourage the maximum recovery of recyclable materials and the use of renewable energy sources.
- g. Design bikeways, pedestrian walkways and other routes to maximize opportunities for non-motorized travel in existing and new development.

Forest Resources and Native Vegetation

Woodlands and other native vegetation perform a series of important functions related to the ecological balance. Forests produce oxygen, giving them intrinsic value. They reduce soil erosion and surface runoff and promote aquifer recharge, because of the high moisture holding capacity of the forest soils and tree canopy. Forests provide habitats for plant and animals and provide open space and recreation lands. They enhance the visual character of scenic corridors, create a feeling of privacy and seclusion and reduce noise impacts. And they affect local climatic conditions near or within their boundaries, such as the cooling effect on trout streams. Woodlands and other native vegetation also provide visual diversity in the terrain, enhancing the value of property. Removal of trees and other vegetation can result in ecological, hydrological, and economic impacts.

The following approaches are recommended to preserve, protect and improve the forest resources in the Borough.

- a. A woodland conservation program, including identification of the floodplain, and upland forest stands on the tract should be required as part of any application for development.
- b. Performance standards should be established limiting the extent of forest removal, based on the quality of the forest type. Priority wooded areas for preservation include unique forest types, woodlands adjacent to public water supply tributaries, habitats critical for endangered and threatened species, 100-year floodplains, wetlands, stream corridors, and slopes of 15% or greater.
- c. Performance standards should encourage the preservation of habitat areas that are as large as possible, gradual and undulating at the edges and connected by wildlife corridors wide enough to maintain interior conditions. Development activities in forested areas should minimize disturbance to important woodlands.
- d. Hedgerows and forest areas along traveled roadways and established property boundaries should be retained and enhanced, where appropriate.
- e. Woodland areas along open space corridors should be preserved and interconnections among existing woodlands should be promoted.
- f. Open spaces resulting from cluster designs, should be required to enhance habitat, promote groundwater recharge and reduce surface runoff, erosion and flooding.
- g. Reductions in residential density and commercial/industrial impervious coverage standards should be considered to promote the retention of forests in Ringwood Borough.

Groundwater

The groundwater resources of the Borough provide potable water supplies to much of the Borough. In addition, groundwater provides the base flow to rivers and streams during low flow periods, and sensitive plant and animal communities are dependent upon this surface hydrology. The following activities are recommended to protect and maintain this critical resource:

- a. A public education program should be established to provide information to septic system owners concerning the proper maintenance of these facilities. An improved septic testing ordinance should also be developed to facilitate better operation of septic systems.
- b. Ongoing public education should be directed at preventing the discharge of toxic and hazardous pollutants to groundwater.
- c. The Environmental Commission, in conjunction with the Health Department and Borough funding, should conduct an environmental inventory of groundwater quality, including an analysis of existing groundwater samples and an identification of existing facilities which could adversely impact groundwater. Among the facilities that should be mapped and inventoried are the following:
 1. Underground storage tanks.
 2. Gas, fuel, and sewer line locations.
 3. Large septic systems for commercial/industrial users.
 4. Permitted community septic systems.
 5. Hazardous substance storage areas and facilities.
 6. Permitted NJPDES groundwater or surface discharge facilities.
- d. The Borough should establish a wellhead protection program.
- e. Landscaping standards should require the use of native and locally adapted plants, and designs which minimize irrigation, maintenance and turf areas and require mulches to preserve soil moisture.
- f. The Borough's aquifer testing ordinance should be monitored and periodically reviewed to ensure that it accomplishes the goal of assuring adequate water supply.
- g. Reductions in residential density and commercial/industrial impervious coverage standards will serve to protect the availability and potability of groundwater.

Scenic Resources

Scenic character is an important element in the general perception of the quality of life in Ringwood Borough. The protection of scenic vistas, particularly those seen from public rights-of-way, will serve to maintain the Borough's rural character. Since the local development review process plays a primary role in shaping new land use patterns, local review agencies are the appropriate administrative authority to encourage conservation of scenic characteristics. The following activities are recommended:

- a. Scenic roads and corridors should be identified and categorized in terms of the scenic elements that contribute to their quality.
- b. Design standards should be developed to guide the location and configuration of development, in order to protect the various categories of attractive views, including enclosed roadside views, extended roadside views, and distance views.

Steep Slopes

Development of steep slopes produces a variety of environmental impacts, including increased soil erosion and sedimentation, decreased surface water quality, decreased soil fertility, increased overland flow, decreased groundwater recharge, and altered natural drainage patterns. In order to reduce the potential for these negative impacts, the Borough should:

- a. Review and revise, if necessary, standards that relate the intensity of development to the slope gradient.
- b. Develop standards that limit tree removal and soil disturbance on steep slopes.

Stream Corridors

The Borough is laced with a network of headwater tributaries to the Wanaque River and Ringwood Creek, along with several Category 1 streams, such as West Brook, Blue Mine and Burnt Meadow Brook which flow directly into the Wanaque Reservoir. West Brook is one of two streams in the State of New Jersey that is designated as "Wild Trout". "Wild Trout" streams support their own species of native trout. In order to protect stream corridors from development impacts, it is recommended that the Borough consider the following management approaches:

- a. Woodlands and other vegetated buffers should be maintained or established along all stream corridors.

- b. Where past land use practices have resulted in the removal of trees along stream corridors, management practices should include the reestablishment of the tree cover.
- c. A stream corridor protection ordinance which seeks to protect the stream corridor and adjacent wetlands, floodplains, and contributory uplands with steep slopes, should be implemented.
- d. Management and monitoring strategies should be developed for stream corridor areas.

Surface Water

Surface water is impacted by both point and non-point source pollution. Non-point source pollution, which has become a major concern, can be mitigated by local land use strategies and management approaches. Non-point source pollutants include septic system effluent, stormwater runoff, and construction activities. In order to mitigate potential impacts to the Borough's surface waters, the following management approaches are recommended:

- a. Water quality best management practices should be adopted or refined, to protect the quality of surface waters and promote maximum habitat values. These include:
 - Buffer strips and techniques to maximize overland flow, such as grassed swales and filter strips
 - Regional stormwater management approaches and extended detention facilities
 - Wet ponds (retention basins) and wetland or marsh creation
 - Detain runoff using infiltration practices, including trenches, basins, drywells and other structural solutions
 - Water quality inlets and oil/grit separators
- b. Reductions in residential density and implementation of impervious coverage standards can reduce run off and reduce the potential impact to surface waters from non-point pollution.

Threatened and Endangered Plant and Animal Species

Threatened and endangered plant and animal species are indicators of ecological diversity and environmental quality. Like the canaries in the coal mine, they warn us when we are spoiling the quality of the environment beyond natural tolerances. The presence of rare

species as well as large animals such as bear in the Borough is a testament to the historical emphasis on land stewardship. In order to protect and maintain these species, the Borough should:

- a. Conduct an ongoing inventory of threatened and endangered species.
- b. Design development so that it will not result in adverse impacts on the survival of threatened and endangered species.
- c. Develop a list of habitat requirements for endangered species.
- d. Map and preserve critical habitats, either through the open space acquisition or the development review process.
- e. Riparian wildlife corridors should be preserved, expanded or established.
- f. Preserve significant uplands areas where unique associations of habitats (some rare, some not) combine to promote biodiversity.
- g. Preserve nodes of biodiversity wherever they occur.
- h. Reductions in permitted residential density can also promote the preservation of critical habitats.
- i. Educate the residents of Ringwood on living with the various species located within the Borough.

Wetlands

Since wetlands are regulated by the State and Federal governments, the Borough is preempted from adopting conflicting regulations. However, management of protected wetlands and transition areas remains an important issue, and site design decisions will affect wetlands ecosystems.

- a. A system to periodically monitor and enforce conservation easement restrictions should be developed.
- b. Permitted development should be arranged to avoid all significant wetlands, and when road crossings are unavoidable, they should be located at the point of minimum impact.

Relationship To Land Use Plan

The Conservation Plan identifies natural resource protection strategies which support the Land Use Plan. The resource management standards outlined in the Conservation Plan will serve to shape the development permitted by the Land Use Plan in a manner that will

preserve and protect the Borough's natural resources. In addition, the Conservation Plan is intended to involve local agencies, other than the Planning Board, in a comprehensive program to conserve critical resources.

Summary of Land Use and Natural Resource Background Information

The following is a summary of the 2005 Natural Resource Inventory which follows in Appendix 1. References to figures correspond with the Natural Resource Inventory and should be referred to when reviewing this summary.

Land Use by Property Class

Tax class is often times a good indicator of the type of use present on a property. With the availability of tax data at the municipal level, and coupled with a tax parcel coverage, a map can be composed showing various land uses and ownership categories and give a fairly accurate picture of land use patterns. However, a land use classification system by tax class assigns a single use to each lot, and thus tends to obscure more detailed information concerning woodlands and wetlands on a lot.

According to the Tax Data prepared by the Ringwood Borough Tax Assessors office, the predominant property class in the Borough is public and exempted lands at 43%. Vacant land in the Borough totals 34.6%, with residential following at 16%, agricultural at 4.5%, and commercial and industrial lands totaling 1.4%.

Given the differences in methodology and mapping conventions, it is not possible to directly compare current land use to land use summaries in past Master Plans. However, in general, residential development has resulted in a loss of forested and vacant lands, while public lands have increased as a result of open space acquisitions.

Land Use/Land Cover

A more detailed and accurate depiction of land use can be taken from the Land Use/Land Cover classification, completed by the New Jersey Department of Environmental Protection. This data was derived from the 1995 Digital Ortho Quarter-Quads, flown for the entire State. As a comparison to the Land Use by Property Class, the Land Use/Land Cover data shows what is actually on the ground. The Property Class information may show an entire property as farm assessed, giving the impression that all of its acreage is farmed. In truth, 50% of the tract may be wooded and not farmed at all. The Land Use/Land Cover is more accurate in that it will show the true land use of the property, where, for example, 5% may be residential, 50% wooded and 45% cultivated.

Generally speaking, Ringwood Borough is primarily wooded (see Figure 1). Over 65% of the land in the Borough is covered by forest, much of which represents high priority habitat for wildlife. The spine of the Borough is made up of large contiguous tracts of forest, which provide suitable habitat for a number of animal species, including some that

are endangered and threatened. A number of these contiguous forested tracts are State parkland, preserved in perpetuity.

Land Use/Land Cover designated as urban on the mapping covers land uses that range from single rural residential units to commercial and industrial uses. The general classification of urban describes areas that are developed in one fashion or another. The urban land covers approximately 16% of the Borough. Urban land uses are primarily located along the road networks in the eastern portion of the Borough, running in a north-south pattern around the Skyline Lakes, Lake Erskine and Cupsaw Lake.

Ringwood Borough contains a high percentage of land covered water. Over 12% of the land in the Borough is covered by water. This is primarily due to the presence of large man-made reservoirs including the Wanaque and Monksville Reservoirs and other man made lakes like Skyline, Erskine and Cupsaw. Wetlands play the last major contributor to environmentally sensitive lands comprising of 5% of the Borough. Geographically, most of the wetlands are found scattered throughout the Borough with a high portion found in the southwestern portion of the Borough, along Westbrook and Magee Roads, and in the northern portion near Margaret King Avenue and Morris Road. These wetlands, which are primarily forested, are a part of the overall critical habitat system and represent a symbiotic relationship.

Barren land and agricultural areas make up a very small portion of the Borough's overall land use at 0.3% and 0.2% respectively.

Forested Areas

The Borough has 12,536 acres of forest cover including wooded wetlands representing 70% of the total acreage of the Borough and a significant portion of land cover (Figure 4). Almost all of the Borough (61%) is deciduous forest, which when combined with deciduous wooded wetlands, makes over 65% of the forested areas in the Borough deciduous in nature.

These forests are attractive habitat for a number of different bird and animal species. Contiguous forest provides a greater diversity of territory, along with less chance of human intervention. This is an important resource that must be given priority for preservation efforts amongst State, County and local plans. The other forested areas of the Borough are made up of mixed forest (3.6% of forested areas), deciduous brush and shrub land (1%) and coniferous forest (1.1%). These categorizations together comprise only 13% of the forested area in the Borough and are not as significant in terms of habitat provision as the vast deciduous forest areas.

Geology

Ringwood Borough is located in the Highlands Physiographic Province, which is part of the larger New England Uplands and includes the Green Mountains in Vermont, extends through New Jersey and southward into Pennsylvania. In New Jersey, the Highlands

region covers 900 square miles, or 12% of the State's total land mass (Buell 1973). Their parallel narrow steep ridges often characterize the Highlands. The oldest rock formations in the State are located in the Highlands, however, they have resisted erosion do to their gneiss (very hard rock material) properties (Figure 5).

Limitations for the Onsite Disposal of Sewage Effluent

Figure 6 depicts limitations for the onsite disposal of sewage effluent. With the adoption of *N.J.A.C. 7:9A* "Standards for Individual Subsurface Sewage Disposal Systems" in 1999, the New Jersey Department of Environmental Protection (NJDEP) revised their methods for classifying soils based on their suitability to dispose of effluent via a septic system and the appropriate type of system to be used given certain limitations. The soil suitability classification consists of Roman numerals from I to III. These indicate the severity of the septic limitation using the higher numerals to indicate more severe limitation with lower numerals to indicate less severe limitations. In the absence of detailed on-site soil investigation, the Soil Survey mapping is used to determine the location of soil series, and the standards specify the types of limiting zones that may be present and the type of system to be used, if any. While this type of mapping can be used to determine general septic classification given the type of soils in the area, detailed on-site tests would need to be conducted to determine the appropriate septic system. In other words, soil type would not be the only determining factor in locating a septic system, and only an on-site analysis would determine proper septic installation.

Soils in the Borough are classified by Appendix D of *N.J.A.C. 7:9A*; Table 1, on the following page, lists the type of septic system permitted given the suitability class. Septic system types include conventional systems, soil replacement bottom-lined systems, soil replacement fill-enclosed systems, mound systems and mounded soil replacement systems.

Table 1 – N.J.A.C. 7:9A Limiting Zones

Type of Limiting Zone	Depth ² , ft.	Suitability Class	Type of Installation Permitted ³
Fracture Rock or Excessively Coarse Substrata	>5 0-5	I IISc	C, (SRB, SRE, M, MSR) SRE, M, (MSR)
Massive Rock Hydraulically Restrictive Substratum	>9 4-9 <4	I IISr IIISr	C, (SRB, SRE, M, MSR) M, (MSR) UNSUITABLE
Hydraulically Restrictive Horizon, Permeable Substratum	>9 4-9 <4	I IIHr IIIHr	C, (SRB, SRE, M, MSR) SRB, SRE, M, (MSR) SRB, SRE, (MSR)
Excessively Coarse Horizon	>5 0-5	I IIHc	C, (SRB, SRE, M, MSR) SRE, M, (MSR)
Zone of Saturation, Regional	>5 2-5 <5	I IIWr IIIW _r	C, (SRB, SRE, M, MSR) M, (MSR) UNSUITABLE
Zone of Saturation, Perched	>5 2-5 <5	I IIW _p IIIW _p	C, (SRB, SRE, M, MSR) C ⁴ , (SRB, SRE, M, MSR) C ⁴ , (SRB, SRE, M, MSR)

C = Conventional Installation

SRB = Soil Replacement, Bottom-lined Installation

SRE = Soil Replacement, Fill-enclosed Installation

M = Mound Installation

MSR = Mounded Soil Replacement Installation

(1) Mounded soil replacement systems are generally required only in cases where several limiting zones are present as, for example, in compound soil suitability classes such as IIScW_r, IIHr (IISr) or IIHr(IIW_r).

(2) Depth is measured from the existing ground surface to the top of the limiting zone. In the case of disturbed ground, the depth to the limiting zone shall be measured from the pre-existing natural ground surface, identified as prescribed in N.J.A.C. 7:9A-5.10(c), or the existing ground surface, whichever is lowest.

(3) Installations shown in parentheses are allowed but are generally not the most cost-effective type of installation for the soil suitability class unless other soil limitations are present.

(4) An interceptor drain or other means of removing the perched zone of saturation is required. Note: In soils with a compound soil suitability class, where more than one limiting zone is present in the soil, a disposal field installation shall not be approved unless the type of installation proposed is listed in Table 10.1 as an acceptable option for each of the soil suitability classes which apply.

The 1999 standards adopted by the Department indicate certain soils with limiting zones that are unsuitable for any type of septic system installation. A number of these soil types are present in the Borough, however determining septic placement would have to be conducted on a site by site basis. According to *N.J.A.C 7:9A* most of the Borough has limiting factors for septic installation, which makes placement of septic systems difficult. This is primarily due to the large portion of steep slopes and rocky soil and rock outcropping. As seen in the previous section, the characteristics of the major soil associations in the Borough pose significant development limitations due to the stony, steeply sloping nature of the soils along with the lateral movement of excess water which can impact septic systems and nearby water resources.

Depth to Bedrock

Depth to bedrock is the measure of the thickness of the soil above rock and fractured material. Bedrock occurring within 5' of the surface has associated with it problems of foundation placement, grading, location of utilities and lack of soil volume necessary to filter sewage effluent. These are all factors that limit, but often do not prohibit construction in areas that possess bedrock within 5' of the surface. Many times, the practice of engineering will arrive at a solution that addresses concerns associated with limiting factors and allow for development, although at a greatly increased cost. All of these factors must be considered when determining the types of development that are appropriate to various contributing factors. Figure 7 shows the location and classification for all of the soil phases found in the Borough. The majority (67%) of soils in the Borough have a depth to bedrock between 6 and 10 feet, while 18% are rock outcrops and 2.6% having depths greater than 10 feet.

Depth to Seasonal High Water

The depth to seasonal high water table (DSHW) is the distance from the ground surface to the highest level that groundwater reaches in the soil during the year. This is referred to as seasonal high water as groundwater generally reaches its highest level between December and April. The depth to seasonal high water table is an important determinant of the limitations and opportunities for development.

Shallow depths to the water table present a number of problems with development. High water table can cause frequent flooding of basements and weaken foundations, while also presenting very serious limitations for onsite disposal of septic effluent. Effluent must permeate the soil in order to be properly processed and can be blocked by a high water table. In addition, while shallow water table depths are not appropriate for development, they often support diverse vegetation and wildlife communities. Protection of soils having shallow water tables will limit the destruction of property while also promoting diversity amongst plant and animal communities.

As seen in Figure 8, the majority (65%) of the soils in the Borough have generally shallow DSHW, ranging from 0 to 2.5 feet. Of these soils, only 19.9% exhibit DSHW of 1.5 feet or less. Soil types with generally shallow DSHW are almost exclusively located

near stream corridors and along areas of rock outcrops. A number of these seasonally high water tables support wetland systems associated with river and stream systems, deciduous wooded wetlands which act as headwaters for numerous streams and diverse vernal or emergent ecosystems present in the Borough and along rivers and streams.

The remainder of soils, comprising 4.5% of the Borough, exhibit generally deep DSHW at 6 feet. These soil types are generally found along the Wanaque Reservoir. They are interlaced with soils exhibiting generally shallow DSHW, associated primarily with stream corridors and wetland areas. The soils in this category are least susceptible to potential problems related to development and any of the minor limitations that may be present can be overcome.

Water Quality

Ringwood Borough's streams discharge into several manmade water bodies including the Wanaque and Monksville Reservoirs. Ringwood Borough is in the Pompton, Pequannock, Wanaque, and Ramapo Watershed Management Area 3.

The Pompton, Pequannock, Wanaque and Ramapo watershed provides recreational and water supply opportunities which depend upon high quality river water. Water pollution sources are categorized as either point or non-point source pollutants.

A point source pollutant emanates from an identifiable source such as a wastewater treatment plant discharge pipe or an industrial plant outfall. Non-point source pollutants enter rivers and streams by non-specific means such as septic system effluent, agricultural runoff, stormwater runoff and construction activities. Both point and non-point sources of pollution affect Ringwood Borough's surface water quality.

The NJDEP has developed Water Quality Standards to replace the Water Quality Index, which were found to be archaic in its approach to water quality assessment. Water quality is evaluated with respect to Surface Water Quality Standards (SWQS) and water quality issues or concerns occur when SWQS are not met or are threatened. New Jersey's Surface Water Quality Standards (N.J.A.C.7:9B) establish the water quality goals and policies underlying the management of the state's water quality. These standards designate the use or uses of the water and establish policies and narrative and numerical criteria necessary to protect the uses.

According to the Statewide Water Quality Management Program Plan, all surface waters in Ringwood are included in the classification of FW2. This plan, prepared by NJDEP, notes that the ". . .FW2 classification is subdivided into three sub-categories: FW2-TP (trout production), FW2-TM (trout maintenance), and FW2-NT (nontrout). The water quality standards criteria for suspended solids, dissolved oxygen, temperature, and un-ionized ammonia are more stringent for FW2-TP and FW2-TM waters than they are for FW2-NT waters. In addition, the Surface Water Quality Standards identify all FW2-TP waters (and other upstream from these waters) as Category One Waters for purposes of antidegradation policy."

Water Classifications: Surface waters are grouped into classifications as follows:

- **FW1:** Fresh Water 1: Fresh surface waters that are to be maintained in their natural state and not subjected to man-made wastewater discharges or increases from runoff from anthropogenic activities.
- **FW2:** Fresh Water 2: General fresh surface water classification applied to fresh waters that are not FW1 or Pinelands Waters.
- **FW- TP:** Fresh Water - Trout Production waters are designated for trout spawning/nursery during their first year.
- **FW- TM:** Fresh Water - Trout Maintenance waters are designated for the support of trout throughout the year.
- **FW- NT:** Fresh Water - Non Trout: fresh surface waters that have not been designated TM or TP. These waters are generally unsuitable for trout because of their physical, chemical, or biological species, but are suitable for a wide variety of other fish species.
- **C1:** Category 1 waters are designated for implementation of antidegradation policies for protection from any measurable change in water quality. C1 may be applied to any surface water classification except those designated as FW1 or PL.

Table 2 identifies the rivers and streams in Ringwood that have been designated according to water quality standards established by the NJDEP (see Figure 10):

Table 2: Surface Water Classifications

Stream Name	Category
Cupsaw Brook	FW2-NT (C1)
Pompton River	FW2-TM (C1)
Ringwood Creek	FW2-TM (C1)
Burnt Meadow Brook	FW2-TP (C1)
Meadow Brook	FW2-NT
West Brook	FW2-TP (C1)
High Mountain Brook	FW2-TP (C1)
Wanaque River	FW2-TM (C1)
Erskine Brook	FW2-TM
Blue Mine Brook	FW2-TP (C1)
Beech Brook	FW2-TM

Although the surface waters in Ringwood Borough generally consist of good water quality and healthy fish communities, future growth may have deleterious effects. Thus, management strategies for existing and future land uses should be designed to maintain and to improve river water quality.

Freshwater Wetlands

The regulatory framework for the identification and protection of freshwater wetlands in New Jersey was established by the Freshwater Wetlands Protection Act (FWPA) of 1987. Among the unique values of wetlands are the purification of surface water and groundwater resources; the mitigation of flood and storm damage through the storage and absorption of water during high runoff periods; the retardation of soil erosion; the provision of essential breeding spawning, nesting and wintering habitats for the State's fish and wildlife; and, the maintenance of critical base flows to surface waters through the gradual release of stored flood waters and groundwater. The method for identifying and designating wetlands includes three parameters; hydrology, soil and vegetation. The hydrological factor relates to the degree of flooding or soil saturation found through soil borings; the soil factor relates to the presence of hydric soils; and, the vegetation factor relates to the presence of hydrophytes or plant species adapted to hydric conditions.

One of the requirements of the FWPA was that the N.J. Department of Environmental Protection (NJDEP) provide a comprehensive mapping of wetlands in the State. The attached map of Freshwater Wetlands is provided from the 1995 Land Use/Land Cover data, derived from digital aerial photography. Although the wetlands are not broken down by category on the mapping, they include the following classifications:

- Agricultural wetlands (modified)
- Artificial lakes
- Coniferous wooded wetlands
- Deciduous scrub/shrub wetlands
- Deciduous wooded wetlands
- Disturbed wetlands (modified)
- Herbaceous wetlands
- Managed wetlands (modified)
- Mixed forested wetlands (deciduous dominate)
- Natural lakes
- Streams and canals
- Wetlands rights-of-way (modified)

The greatest concentrations of wetlands occur below the ridge lines, in linked systems and in clusters. The vast majority of the wetlands feed into the stream network and are interspersed with many of the forested areas found throughout the Borough (see Figure 12). Their primary composition is deciduous wooded wetlands, making them a contributing factor to the Borough's already extensive high quality wildlife habitat.

Although the NJDEP mapping of wetlands can provide guidance as to the location of wetlands, only a field investigation can substantiate the presence or absence of wetlands. It is through this investigation that the resource value of wetlands is determined, providing for the appropriate buffers in order to aid in their continuing function.

Steep Slopes

Ringwood is situated in the Highlands region and exemplifies this unique geologic formation, ridgelines and steep slopes that characterize the Highlands. This combination of unique habitat and scenic qualities distinguish Ringwood Borough.

Steep slopes, depicted on Figure 14, represent transitional areas in the landscape from higher terrain to lower terrain and ultimately into floodplains and stream channels. The latter are often created by the erosional effects of water scouring of the landscape. The most extensive areas of steep slope are found along the western side of Wanaque Reservoir, and along the eastern boundary of the Borough. These areas represent the largest contiguous areas of slopes greater than 25%. However, a great deal of land in the Borough is classified as having slopes over 15%. This is a result of the unique geologic conditions of the Highlands region.

Ridgelines

There are a number of major ridgelines throughout the Borough (Figure 15). Ridgelines are valuable topographic features often prominent in the visual landscape. Simply defined, a ridgeline is *a horizontal line or demarcation representing the intersection of two slopes having generally opposing aspects, usually representing the highest common elevation of both*. Ridgelines may also be a demarcation line of watersheds. The prominence of ridgelines varies depending on the surrounding terrain, and a ridgeline may not be visible from the surrounding landscape if there are only moderate elevation changes. Its visual impact is therefore diminished, as in much of the Borough. The most prominent are found along the eastern boundary and in the northwest corner of the Borough. However, the entire Borough has significant ridgelines adding to the overall character of the landscape.