Chapter 3
Natural Resources

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1.0 INTRODUCTION

Rindge is a rural community with exceptional natural resources. Significant water resources, wetlands, agricultural lands, and unfragmented blocks of land support the community's health, economy, tax base, wildlife species, recreation activities, and quality of life. The type and distribution of the town's natural resources also influences the location and type of development that can take place within the community, as some areas of the community are better suited for particular uses than others.

The information provided in this chapter will allow Rindge to consider compatible future uses for certain undeveloped and non-protected land areas and significant resource areas. Rindge, just like its natural resources, does not exist in isolation. It is hoped that this chapter will alert residents of Rindge to the importance of the integrity of natural systems for the entire region. At the end of each section within this chapter, land use implications have been identified, and suggested municipal policy actions have been suggested. The policy actions will be incorporated into the Implementation Chapter of the Master Plan so as to provide a work program for the town upon completion of the Master Plan. Rindge has already completed several initiatives and reports focused on its natural resources. These will be summarized to some degree in this chapter, and then be included as Appendix items for the Master Plan.

In 1999 residents participated in a Community Profile process with UNH Cooperative extension, and the following statement was drafted:

> "Natural resources are materials from nature that maintain and enhance the community. This includes food, fuel, and materials used in everyday life. A sustainable community attempts to balance the rate at which renewable resources are consumed with the rate at which they are renewed. Dependence upon nonrenewable resources is minimized as much as is feasible. A sustainable community also attempts to reduce the amount of waste and emissions produced by increasing energy efficiency, and tries to minimize the effect of wastes that are created."

2.0 CLIMATE

Typical of Northern New England, the primary characteristic of Rindge's climate is the ability for conditions to change very quickly. A large range of temperatures and conditions can be experienced in a single day, and are guaranteed over the course of a year. The area also experiences great differences between the same seasons from year to year. The average annual temperature in Rindge is 44 degrees Fahrenheit. However, it can dip well below zero for periods of time during the winter, and exceed 100 degrees Fahrenheit at times in the summer months.

During the warmer half of the year, precipitation comes predominantly from showers and thunderstorms. Frontal precipitation in the colder season is occasionally supplemented by coastal "Northeasters" which can bring a strong wind and heavy snowfall, and on occasion, rain or sleet. Rindge receives an average of 45 inches of precipitation annually. The average annual snowfall amount for Rindge is 74 inches. These figures are significant because they represent the town's only source of water. This precipitation recharges the groundwater being used as the local drinking water source.

Rindge is located on a regional watershed divide and is the headwaters for three major river systems, the Contoocook, the Ashuelot, and the Miller's. All precipitation either directly recharges our groundwater resources or flows overland through streams and wetlands, ultimately discharging to one of these river systems. All of our land use activities have a direct impact on the quality and quantity of available water resources here in Town and to our neighbors downstream.

Additional climate data is available at: http://www.erh.noaa.gov/er/gyx/climate_f6.shtml

2.1 Land Use Implications

Rindge's climate has a direct impact on the landscape. Here are a few summary points to consider related to the climate in Rindge.

1. With precipitation distributed evenly throughout the year Rindge has the ability to replenish its many ponds, streams, and aquifers. This sustains the health of the surface waters and recharges groundwater reserves.

2. Seasonal changes contribute to the character of the region, and the variety of recreational and economic activities available. Air pollution from vehicles, homes, and commercial and industrial facilities threatens the character of our seasons, and the quality of our water. Recognition of the role local activities have on the global problem of climate change will help to preserve these distinct seasons and the industries and character they support.

3. Snow storage or "dumping" in sensitive areas can have a negative impact on the natural systems in Rindge.

4. Road salt use and storage can negatively impact natural resources in Rindge and beyond.

2.2 Actions

There is an array of possible actions the Town may consider pursuing as it evaluates the impact of the climate on Rindge and the land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

1. Snow removed from streets and parking areas should be stored away from wetlands and water bodies. This will allow for a higher rate of filtering of pollutants and infiltration of polluted runoff as it melts.

2. Calcium-based road salts should be used by the town for environmental protection. Road salts should be stored in a covered facility in accordance with the U.S. Environmental Protection Agency guidelines with adequate protection against their unguarded movement into the environment.

3. Pursue the use of alternative fuels in town vehicles and the school bus fleet. The NH Office of Energy & Planning can guide the community through such a transition. The City of Keene could also serve as a local model for such initiatives.

4. Encourage carpooling and alternative modes of transportation (biking, walking, public transportation) to reduce automobile emissions in the region. Provide alternative modes of transportation within and between commercial districts in Rindge.

5. Work with local business and industries in the region to promote alternative modes of transportation to reduce emissions.

6. Encourage the use of renewable energy sources for domestic and municipal purposes.

3.0 TOPOGRAPHY

Map 3, Topography, describes surface features of the land in terms of shape, relief and the relative positions of natural features. Topography is usually expressed as elevation (height above mean sea level) and slope (change in vertical distance over horizontal distance). Topography affects several natural processes, such as climate, drainage, erosion, wind patterns and vegetative growth, in turn affecting man's activities.

The topography in Rindge is more of a rolling terrain characterized by broader and more gradual slopes than the steeper slopes found in neighboring Jaffrey and New Ipswich. The overall change in topography ranges from a low, of approximately 900 feet in the extreme southwest corner near the Fitzwilliam/Rindge/Massachusetts border, to high, approximately 1,500 feet in the extreme southeast corner adjacent of the New Ipswich town line.

High points in Rindge are Todd Hill (elevation 1,406) Thrasher Hill (elev. 1,382 ft.) and Griswold Hill (elev. 1,371 ft.). However, the general terrain ranges mostly in the 1,000-1,200 foot elevations. The Topography Map shows that numerous hills called drumlins dot the Town's landscape. In many cases one side of these hills exceed a 15 percent slope, and thus present significant development problems.

Inspection of the Town's development pattern and comparison with the general landscape reveals that most of the existing development is located on slopes of less than 15 percent and in most cases slopes of less than 10 percent.

3.1 Land Use Implications

Rindge's topography plays a major role in the location and impact of future development in town. Here are a few summary points to consider related to Rindge's topography.

1) River valleys and lowlands are often under pressure for development. However, these areas contain the floodplain areas, most of the surface water bodies, and critical wetlands. Minimizing the impact of development in these areas is critical to the quality of both surface and sub-surface waters.

2) Development at higher elevations on the high ridges and lower hills in Rindge presents a different set of challenges and impacts. Without thoughtful site design, these areas can greatly impact the scenic character of the community and disrupt scenic views. Access to these areas also provides an opportunity for increased environmental impacts: erosion, increased runoff rates, longer roadways, and fragmentation of habitat, to name a few.

3) The variety of topography within Rindge contributes to wildlife habitat and diversity, and recreational opportunities. Ensuring connections between these distinct areas will ensure continued biodiversity.

3.2 Actions

There are an array of actions the Town may want to consider pursuing as it evaluates the topography in Rindge and its land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

1) Consider a ridgeline development ordinance to limit the impact of developments at higher elevations.

2) Designate topographically-defined viewshed areas of high value, and make open space subdivision mandatory in those areas.

3) Pursue land protection opportunities that create corridors of contiguous open space between the currently protected lands.

4.0 SLOPE

Slope is the amount of rise or fall in feet for a given horizontal distance and is expressed in percentages. A six-percent slope means that for a 100-foot horizontal distance the rise or fall in height is six feet. The slope of the land can have a great affect on development, and percentage of slope can greatly impact the economic and physical feasibility of development. The steeper the slope, the more it will cost for septic systems, driveways, foundations, etc. Additionally, as the slope increases so does the potential for an increase in erosion, accelerated stormwater runoff, and nutrient movement. Frequently these factors lead to very high road maintenance costs. Poor soil conditions combined with steep slopes can present significant development constraints. See **Map 4**, Steep Slopes, for an analysis of slope in Rindge.

Slope is a major consideration when examining the community with respect to future development. Land that exceeds 15 percent slope is scattered throughout the town. A majority

of the steeper slopes are located on either side of Todd Hill Road, and to the south of Hunt Hill Road.

When observing soil symbols on a soils map the soil number is followed by the letters B, C, D, or E. These letters represent the approximate slope of the land in that general area. The following table shows the relationship between the soil letter identifier and the percentage of slope it represents. The table also shows the relationship between the degree of slope and development capability.

Table 3.1 Soils by Slope

SYMBOL	% SLOPE	DEVELOPMENT CAPABILITY
	0 -3%	High density/High potential
B	3- 8%	High density/High potential
C	8 -15%	Moderate potential
D	15 -25%	Limited potential
E	Over 25%	Should not be developed

Generally, slopes over 25 percent are considered undevelopable. Slopes between 15 and 25 percent are difficult and costly to develop. Slopes under 15 percent are generally considered the upper limits for practical development.

4.1 Land Use Implications

Slopes within Rindge also play a major role in the location and impact of future development in town. Here are a few summary points to consider related to slopes in Rindge.

1) A significant amount of the remaining land in Rindge is covered in slopes of more than 15 percent. This will have an effect on the future development pattern of the community because large areas of the community may be fairly difficult to develop in the future.

2) As steeper slopes are developed, costs increase for both the property owner and the community. Construction and maintenance of roads becomes more costly on steeper slopes. Problems with erosion, stormwater runoff, and non-point pollution are also increased.

3) There is a disproportionate impact when slopes near surface waters are developed due to ongoing erosion and sedimentation, and nutrient loading.

4.2 Actions

There are an array of actions the Town may want to consider pursuing as it evaluates the topography in Rindge and its land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

1) Adopt and enforce Steep Slope Development Standards that include design guidelines, and reduce the impact of development on steep slopes and provides protection for down-gradient water resources.

2) Rindge's regulations, relative to erosion and sediment control, should be revisited to ensure that they are following the most current "best management practices" (BMPs).

5.0 GEOLOGY

The geologic history of any area is the basis for many of its natural characteristics such as topography, groundwater systems, drainage patterns, mineral resources, and origin of the soil. New Hampshire's geologic history has formed a variety of land features and mineral resources. Plate tectonics contributed to the formation of granite bedrock. Long periods of erosion shaped the hills and mountains. Most recently, repeated glacial activity provided some finishing touches to a land that had been evolving for perhaps 400 million years. Current landscape features remind us of this rich geologic history. Eskers, drumlins, kettlehholes, and many other features found in Rindge are evidence of glaciation.

Bedrock Geology

As the name implies, bedrock geology is concerned with the underlying rock or ledge. Formed hundreds of millions of years ago, Rindge's bedrock is composed mostly of igneous rocks such as granite, and metamorphic rock such as schist. The metamorphic rock was formed under heat and pressure from many layers of mud, sand, and silt. It was later uplifted by the earth's tectonic forces.

Surficial Geology

Surficial geology includes all of the deposits above bedrock. The surface layer of weathered material (i.e. soil) is not included in the study of surficial geology (for information on soils in Rindge see Section 6.0 of this chapter). Surface deposits are unconsolidated, loose conglomerations of rock fragments. These surface deposits in Rindge are the result of glaciation. As the glaciers advanced the bedrock was scraped and gouged, and this material was picked up and carried along in the glacial ice. This glacial advance, or scraping, did not drastically alter the topography of the area. The profiles of the mountains appear much as they did before the Ice Age. However, the glaciers did have an impact on the valleys.

As the climate warmed and the ice retreated, it deposited two major types of material—till and glacial outwash deposits. Till is composed of a mixture of soil and rock fragments that were scoured loose by the moving ice, carried for a distance, and then deposited directly as the melting ice released its unsorted contents. It is generally highly compacted and contains many large angular stones and boulders. Glacial melt waters also deposited material, but the moving waters actually sorted the material and deposited like sizes together along glacial streams or in glacial pools and lakes. These are outwash deposits. They are the stratified sand and gravel deposits that line the rivers. Outwash deposits are important economically for mining purposes, but they also serve as major groundwater-recharge areas. Examples of this are the large stratified drift aquifers that exist around Poole Pond Contoocook Lake, Converse Meadow and Lake Monomonac. Glacial drumlins and eskers are common in this part of the state, giving this region its rolling topography.

Construction Materials
The geological deposits in Rindge were studied in 2001 for the preparation of a Construction Materials Chapter of the Master Plan (Chapter 10).

The following descriptions of construction materials in Rindge do not include topsoil, as no significant amount of this material was identified in the soil survey. Note that the acreage calculations for these materials do not denote the amount of the resource in the ground - only the surface area.

ROADFILL
Roadfill is defined as soil material that is excavated in one place and used in road embankments in another place. According to the soil units found in Rindge that constitute roadfill, Rindge has 14,714 acres of roadfill; 4,381 acres are considered "fair", and 10,288 acres "good" Roadfill soils are distributed throughout most of Rindge, with no particular pattern to the dispersal.

SAND
Sandy soils in Rindge account for about 9,538 acres. These deposits are distributed throughout most of the Town, with concentrations indicated to the west of Route 202 and in the northeastern corner around Annett State Forest and Hubbard Pond; another pocket appears in East Rindge and Conversville.

GRAVEL
Gravel deposits in Rindge are distributed in much the same pattern as sand, although to a slightly lesser degree. Overall, the probable resource amounts to about 8,000 acres. The soil survey locations of both sand and gravel soils are consistent with known sites of sand and gravel excavations in Town.

The percentage of the total land area in Rindge accounted for by each of the construction materials is presented below in Table 3.2. Note that the individual percentages surpass 100, since several of the soil types overlap. This information indicates that the good roadfill accounts for the largest amount of construction materials in Rindge. Sand and gravel are about equal in their presence in town, their combined total surpassing the congregate roadfill soils.

TABLE 3.2 LAND ACREAGE BY CONSTRUCTION MATERIAL

Construction Material	Acres	% of Total Land Area
Roadfill, Fair	4,381.1	17.1%
Roadfill, Good	10,287.9	40.2%
Sand, Probable	9,537.7	37.2%
Gravel, Probable	8,370.1	32.7%

SOURCE: SOIL SURVEY OF CHESHIRE COUNTY, NEW HAMPSHIRE, SCS 1984

5.1 Land Use Implications

Rindge's geology has an effect on land use decisions and impacts future development in the community. Here are a few summary points to consider related to the geology in Rindge.

1) The use of outwash deposits in commercial sand and gravel operations could alter the performance of these areas as groundwater recharge areas. As material is removed and the geology is altered, water will not be filtered and stored in the same manner. This could result either in a reduction in the amount of water available to future generations or its quality as less filtering is available.

2) It is important to carefully regulate the type and intensity of future uses wishing to locate on previously mined sites. This is due to the increased potential to negatively impact the ground water resources below.

3) The impacts of sand and gravel operations are often cited as concerns. Increased truck traffic, noise, erosion, and airborne particles can create problems for abutters, and should be mitigated.

5.2 Actions

There is an array of possible actions the Town may want to consider pursuing as it evaluates the geology in Rindge and its land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan

1) The Town should revisit the Earth Excavation Regulations to ensure they protect natural resources more effectively.

6.0 SOILS

Soil is the portion of the surface of the earth that supports plants, animals, and humans. There are over 1,000 different soils in the Northeast with 131 of them represented in Rindge. Soils information is an intricate part of a natural resources analysis because it provides a wealth of data concerning the capability of land to support various land uses. Soils differ from one another in their physical, chemical and biological properties. Soil properties which affect its capacity to support development include depth, permeability, wetness, slope, susceptibility to erosion, flood hazard, stoniness, among others.

Rindge's development is limited by the large percentage of wetland soils. **Map 5** depicts Wetland Soils. The Town's present wetland ordinance is strictly enforced when considering new development proposals. The soils best suited for development in Rindge are the Monadnock, Colton, and Berkshire soils. Most of these soils are on 8 - 15 percent slopes and would need erosion and sedimentation control plans when development is proposed on these soils. There is a high permeability rate in the Colton soils and groundwater quality should be a concern for development.

Many of the other soil units in Rindge are rated medium to high for development potential, but many of these soils pose severe restrictions for septic systems due to a restrictive hardpan layer that commonly occurs in glacially deposited soils. The problem these soils pose is that septic

system effluent may flow along the restrictive hardpan (dense clay) layer instead of filtering through it into a more receptive and suitable soil. Thus, the effluent may surface downslope, usually in low, wet areas or along roadside ditches. Fortunately new State standards for septic system design have significantly reduced this occurrence. New systems now typically involve the construction of upper layers of material, and this is where the treatment occurs.

6.1 Important Farmland Soils

The Natural Resource Conservation Service (NRCS) has identified a subset of the soils in Cheshire County that are best suited for farming. Prime farmland soils are those soils that the NRCS has determined will produce the highest yields at the lowest cost, these are shown on **Map 6**. According to NRCS, prime farmland soil:

> *"....has the best combination of physical and chemical characteristics for food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.*
>
> *In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood or are protected from flooding."*

In addition to prime farmlands, the NRCS has designated Farmland Soils of Statewide Importance and Farmland Soils of Local Importance. Farmland Soils of Statewide Importance are defined as:

> *"...land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable."*

Farmland Soils of Local Importance are defined as:

> *"...additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned."*

The characteristics of prime farmland make it particularly susceptible to development pressures. While the cost of producing a crop is low, so is the cost of developing these soils for residential

or other nonagricultural uses. The need to conserve this soil resource is critical to the future of agriculture in Rindge. The economic viability of farming large contiguous tracts of prime farmland soils is degraded when these tracts are fragmented by development. Farming is recognized as an important part of the local and regional economy as well as part of the heritage of Rindge. The Farmland Soils Map identifies the important farmland soils in Rindge and their current use. See Section 10 for a discussion of the importance of retaining the option to raise local produce.

6.2 Soils with Major Limitations

Soils found in Rindge that have major limitations for development are as follows:

Steep Soils

These soils are found on the sides of hills, along ridge tops, and as rocky outcrops void of soil cover.

Table 3.3 Steep Soils

Symbol	Soil Type	Characteristics
57D	Becket	Stony fine sandy loam, 15-25% slope
60D	Turnbridge-Berkshire	Stony fine sandy loam, 15-25% slope
61D	Turnbridge-Lyman	Rock outcrop complex, 15-25-% slope
77D	Marlow	Stony fine sandy loam, 15-25% slope
77E	Marlow	Stony fine sandy loam, 25-50% slope

Wetland Soils

Muck is a dark colored, well decomposed organic matter characteristic of many of these soils. Not all wetland soils have muck. Some are poorly drained fine sands such as the 414 Moosilauke fine sandy loam.

Table 3.4 Wetland Soils

Symbol	Soil Type	Characteristics
5	Pippowan	Fine sand loam
15	Searsport	Mucky peat
197	Borohemists	Ponded
214	Naumburg	Loamy fine sand
295	Greenwood	Mucky peat
347	Lyme Moosilauke	Very stony
395	Chocorua	Mucky peat
414	Moosilauke	Fine sandy loam
495	Ossipee	Mucky peat
547B	Lyme	Stony fine sandy loam
646B	Pillsbury	Fine sandy loam
6476	Pillsbury	Stony fine sandy loam

6.3 Soils Best Suited for Development

These soils are best suited for development and have the least restrictive features. Some have slopes as steep as 15% but if the slope is the only limitation present, low density residential development following best management practices can be an option.

Very High Potential for Development - Virtually no limitations occur with these soils and the land will support most types of development.

72B	Berkshire, fine sandy loam found on gentle slopes. It is also an important farmland soil.
73C	Berkshire fine sandy loam found on 8 - 15% slopes and very stony. It is also an important farmland soil.
142B, C	Monadnock, fine sandy loam found on 3 - 15% slopes. Slope can be a limitation when developing these sites. This soil occurs commonly on side slopes of the uplands.
413B, C	Monadnock, fine sand loam found on 3 - 15% slopes and very stony.

High Potential for Development - Soils with this rating may have some limitation but they are not costly to overcome and do not involve extensive, on-site engineering.

22B, C	Colton, loamy fine sand 3 - 15% slope. This soil is found on the terrace side slopes and outwash plains. The sandiness of this soil makes it rapidly permeable and leach fields can be a potential source of pollution to groundwater if they are not properly designed.
57C	Becket, fine sandy, loam but very stony. It is found on upland plains. It is an important farmland soils. A hardpan layer is present and septic tanks and leach fields should be designed to overcome this soil limitation.
73D	Berkshire, fine sandy, loam but very stony. This soil is found on very steep slopes from 15 - 25%**.** The slope limitation can be overcome but these sites should be examined for land use and development on slopes this steep.
77B, C	Marlow fine sandy loam, 3 - 15% slopes and very stony. This soil is found on ridgetops and on side slopes of drumlins. A hardpan layer is present and septic systems will have to be engineered for the site.
559B	Skerry, fine sandy loam, very stony, found on slopes of 3 - 8%. This soil is found on ridgetops and site slopes of upland areas.

6.4 Land Use Implications

The soils within Rindge play a major role in the location and impact of future development in the community. Here are a few summary points to consider related to soils in Rindge.

1) Soil characteristics such as depth, permeability, wetness, and slope can be used to evaluate land to determine development suitability and dwelling unit densities.

2) Farmland soils are a precious resource with great value to the community and the region. See Section 10 in this Chapter for additional information on this resource.

3) Locating new development in areas without water and sewer infrastructure requires taking a much closer look at the ability of the soils on the lot to handle a well and septic system discharge. Soil information should be used as a determinant of what constitutes an environmentally sound building lot to prevent degradation of the environment and negative impacts on abutting property owners.

6.5 Actions

There are an array of actions the Town may want to consider pursuing as it evaluates the soils in Rindge and their land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

1) Base lot sizes on soil suitability for septic treatment. A flexible, soil based lot-size ordinance could be adopted using the Society of Soil Scientists of Northern New England publication "Soil Based Lot Sizing – Environmental Planning for On-Site Wastewater Treatment in New Hampshire", September 2003.

2) Maintain and encourage the use of an Open Space or Conservation Design Development Regulation that facilitates the protection of valuable farm and forest soils existing on the site by clustering the structures on other portions of the property that are more appropriate for development.

7.0 WETLANDS

One of the most important environmentally-sensitive natural resources in Rindge is wetlands. There are many reasons why wetlands are valuable to the community, flood control, erosion control, pollution filtration, water supply, wildlife habitat, environmental health and diversity, recreation, and aesthetics. These are but a few of the important functions wetlands perform in helping protect the quality of water, land, and the community.

Wetlands perform all of these functions at no cost to society. Dams, tertiary sewage treatment plants, water purification plants, dikes, and other sophisticated and expensive man-made water control measures are but copies what wetlands do naturally. Each acre of existing wetland provides significant benefits to Rindge. See **Map 7**, Wetlands and Surface Waters.

Wetlands, for regulatory purposes in Rindge, are defined as:

> *"those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances*

do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

7.3 Prime Wetlands

The State of New Hampshire allows communities to designate "Prime Wetlands." This designation means that the NH Wetlands Bureau, when receiving applications for dredging or filling wetlands, will apply an extra layer of rules defined by state law to applications involving wetlands designated by the town as "prime." The first step in the designation process is an inventory and assessment of the town's wetlands using the "NH Method."

Submitting wetlands to the NH Wetlands Bureau for Prime Wetland status requires preparing a map of the wetland area, a vote at a town meeting, and submitting a prime wetlands application to the NH Wetlands Bureau for approval. A Wetlands Study, using the NH method of evaluation was conducted in Rindge in 1993, but only included about 30 percent of the community. No proposals have been made before Town Meeting since, so Rindge has no Prime Wetlands designated at this time.

7.4 Wetland Permitting

Projects which impact wetlands in Rindge are regulated by federal, state, and local regulations. The most comprehensive regulatory program is that of the NH Wetlands Bureau (NHWB). NH RSA 482-A authorizes the Department of Environmental Services (DES) to protect the State's wetlands and surface waters by requiring a permit for dredging, filling or construction of structures in wetlands or other waters of the state. RSA-482-A and the rules promulgated under that law require that projects be designed to avoid and minimize impacts to wetlands and other state jurisdictional areas. The impacts that are proposed must be only those that are unavoidable. It is the responsibility of the applicant to document these considerations in the application for a permit.

According to DES rules, each project that requires a wetlands permit is classified in one of three categories according to the type and potential square footage impact of the project: minimum, minor, or major. Some of the projects qualify for processing with the Minimum Impact Expedited application may include repair and maintenance of a dock, installation of a culvert for driveway access to a single family house, or maintenance dredging of an existing pond.

Another type of project common to New Hampshire's wetland impacts is logging. Logging projects are permitted through a notification process that must be filed at the same time as the "Intent To Cut" forms, provided the operation is conducted in accordance with the publication, "Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire."

Historically, Rindge has had a good record of wetland protection due to the efforts to identify, purchase, and protect some of the key wetlands in the community. There have been some issues related to lack of enforcement for wetland violations. These impacts are slowly eroding the lands' ability to filter toxins, support important wildlife, absorb high flood waters, and allow gradual recharging of underlying aquifers.

7.5 Land Use Implications

The wetland resources within Rindge play a major role in the location and impact of future development in the community. Here are a few summary points to consider related to wetlands in Rindge.

1) The health of Rindge's wetlands is critical to the function of natural systems within the community.

2) It is important to point out that small wetlands (under three acres) are usually not shown on the USDA Natural Resource Conservation Service (NRCS) Soil Maps.

3) Vernal Pools do not always support wetland vegetation, but are critical breeding grounds for several endangered species of frogs and salamanders. Small in size, they are an important resource in the life cycle of balanced ecosystems.

7.6 Actions

There are a number actions the Town may want to consider pursuing as it evaluates the wetland areas in Rindge and their land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

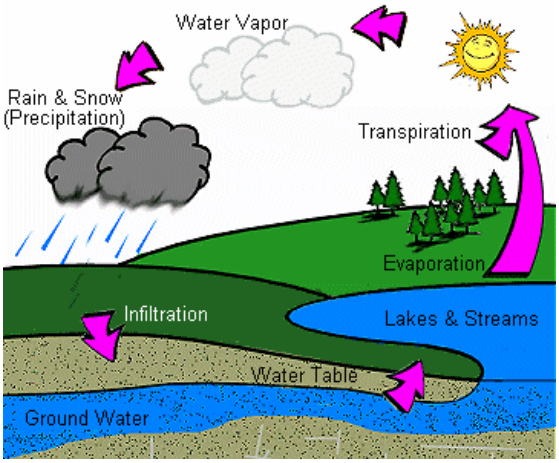
1) Enforce existing land use regulations to protect wetlands in Rindge.

2) Rindge should pursue "Class One" local designation or Prime Wetland designation for the wetlands that qualify. The initial step could involve the designation of wetlands that exist on Town controlled properties.

3) Consideration should be given to enacting some local protective regulations for vernal pools.

8.0 WATER RESOURCES

Hydrologic Cycle



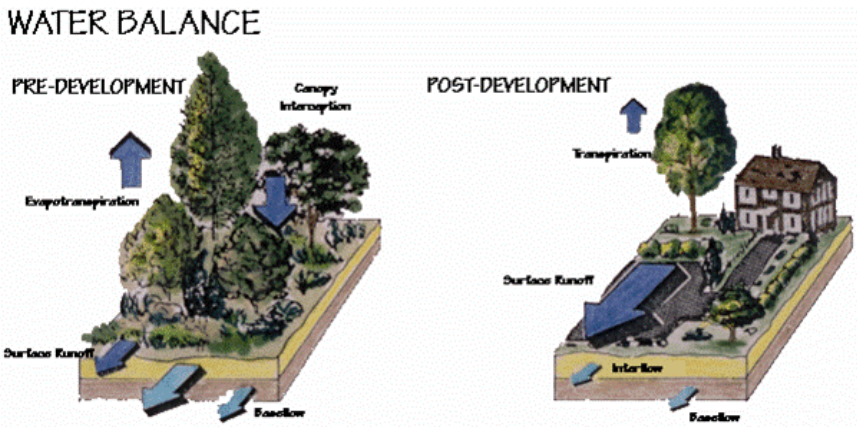
Water is our most precious natural resource. Water moves continuously in an inter-dependent fashion known as the water cycle. The Water Cycle (also known as the hydrologic cycle) is the journey water takes as it circulates from the land to the sky and back again. With increased development and human activity, the water cycle can become damaged. Humans not only take water out of the cycle (drinking water, for example), but can also put polluted water back into the cycle (such as polluted runoff). Pollutants can run off in eroded sites or sites of point-source or non-point-source runoff and cause eutrofication in our ponds, streams and wetlands. However, with good planning and conservation, plentiful clean water should be available for future uses. It is important to note that Rindge does not have municipal water and sewer infrastructure and will

not in the foreseeable future. Therefore it is extremely important that the community takes all steps necessary to ensure clean and plentiful water into the future.

In 2002 Rindge completed a Water Resources Management and Protection Plan. Data from the inventory components of the plan, and recommendations the plan makes, have been integrated into this Chapter, and the entire document has been included as a resource in the Appendix.

8.1 Watersheds

Surface water is precipitation that does not soak into the ground, but runs off into streams, ponds, lakes, and rivers. On the average, one third of the annual precipitation in Rindge is "runoff." Watersheds are the catch basins for this runoff. Rain or snow falling within the confines of a watershed's interconnected ridge crests, or high points, eventually becomes surface and groundwater. Watersheds may be divided into subwatersheds, which may be further divided down to almost any level; even vernal pools may be said to have their own watersheds.



This diagram shows how development and its corresponding increase in impervious cover disrupts the natural water balance. In the post-development setting, the amount of water running off the site is dramatically increased.

Watershed location is very important for a community to consider in its planning efforts. Quite often a particular watershed lies entirely within a single community, while larger watersheds almost never do. Water resource management in a community up-watershed may have a substantial impact on the water resources of a neighboring community down-watershed. The watershed approach to water resource planning is important because watersheds are the main units of surface and groundwater recharge. The size and physical character of the watershed has a large influence on the amount of water that ultimately will end up as surface water and groundwater. Land use within a watershed may be an important factor in water quality, therefore, it is very important for communities to work together in order to plan effectively for protection of water resources.

The land in Rindge is divided into two major watersheds: the Contoocook River Watershed, which is part of the Merrimack River Basin; and the Millers River Watershed, which is part of the Connecticut River Basin. The Contoocook River Watershed drains water to the north and east, ultimately to the Merrimack River at Concord, from 490,240 acres in 34 New Hampshire communities, ranging as far north as Danbury and as far east as Concord. The Contoocook River watershed includes about 7,450 acres in town, or about 29 percent of Rindge. The Contoocook River begins in Rindge at Contoocook Lake. The Millers River Watershed consists of

approximately 250,880 acres in portions of Rindge, Fitzwilliam, Jaffrey, New Ipswich and Richmond in New Hampshire and extends as far south as Templeton, Massachusetts. About 18,150 acres (71 percent) of Rindge drains into the Millers and ultimately the Connecticut River.

These two watersheds are further divided into twelve sub-watersheds: The Contoocook River Watershed contains the following sub-watersheds: Contoocook Lake, Hubbard Pond and Gridley River. The Millers River Watershed contains the following sub-watersheds: Sip Pond, Robbins Brook, Robbins Pond, Lake Monomonac, Converse Meadow, Binney Hill, Pearly Lake, and the Damon Reservoirs.

Lying at the headwaters of two major watersheds is a beneficial situation for water resource protection – the vast majority of water running over and through the land of Rindge falls on Rindge as rain or snow. Most of the streams in Rindge begin in Rindge. The exceptions are the headwaters of Pearly Pond and Converse Meadow watersheds, but both of these originate in remote undeveloped areas of Jaffrey and New Ipswich, providing some assurance of low risk for pollution of the water entering Rindge. All of this means that Rindge has a high degree of control over the aspects of land use management that affects water quality in Rindge.

8.2 Surface Water

Surface water systems are any type of water resource located above ground on the earth's surface. Examples of surface water systems include streams, rivers, ponds, lakes, and wetlands. Surface water systems are more dynamic than groundwater systems, in that they are influenced by the effects of wind, rain, daily and seasonal temperature change. Surface water systems can be flowing or standing (ponds, lakes, bogs). Surface water systems are also important plant and animal habitat. There are nearly 50 named and unnamed ponds and lakes in Rindge and approximately 60 perennial streams.

Major water bodies in Rindge include Bullet Pond, Contoocook Lake, Lake Monomonac, Pearly Lake, Crowcroft Pond, Poole Pond, Rugg Pond, Hubbard Pond, Grassy Pond, Emerson Pond, and several smaller and unnamed bodies of water, see Table 3.5. Streams are classified by the State using the Strahler method, where the highest year round streams in a watershed are first order streams, their juncture yields a second order stream, the juncture of two second order streams yield a third order and the junction of third order streams yield a fourth order. There is one fourth-order river in Rindge, the Contoocook River, this river system and the major water bodies that are listed above are subject to the New Hampshire Shoreland Protection Act.

Lake/Pond	Area (acres)
Bullet Pond	19.5
Contoocook Lake	153.78
Crowcroft Pond	22.46
Emerson Pond	45.81
Grassy Pond	40.02
Hubbard Pond	75.84
Lake Monomonac	287.78
Pearly Pond	57.55
Pool Pond	48.16

Another major river in Rindge worthy of noting is the Miller's River.

Table 3.5 Lakes and Ponds

Surface Water Quality

Each of New Hampshire's lakes, ponds and rivers is assigned a legislative water quality classification as follows:

• Class A – The highest quality and potentially acceptable as public water supply sources after disinfection. No sewage or wastes shall be discharged into these waters.

• Class B – The second highest quality and no objectionable physical characteristics. No sewage or waste shall be discharged in to these waters unless it has been treated. Acceptable for bathing and other recreational purposes and, after adequate treatment, for use a public water sources.

• Class C – Acceptable for boating, fishing, or for industrial water supply. These waters cannot be used as a public water supply source.

Currently, the Town's only Class A waterbody is Bullet Pond, which is a municipal water supply source for Jaffrey. The Town's remaining surface water areas are considered Class B Waters. New Hampshire Department of Environmental Services conducts a Volunteer Lakes Monitoring Program (VLAP) which provides training, equipment (on loan), and laboratory testing at a cost for standard water quality parameters of samples collected by volunteer groups – often private lake associations or Conservation Commissions. The Contoocook North Branch River Advisory Committee conducts a Volunteer River Assessment Monitoring (VRAP) program and uses their own equipment.

Franklin Pierce College (FPC) operated a satellite lab for VLAP and VRAP at one time, but that is no longer available. Now all lab work is completed in Concord. Re-establishing a relationship with the lab at FPC, or looking for another opportunity locally is important and could result in more frequent testing. Four water bodies in Rindge have been monitored through VLAP: Contoocook Lake, Pearly Pond, Pecker Pond, and Poole Pond. A River Management Plan was created in 1994 for the Contoocook River, but it is in need of updating. A River Management Plan should also be created for the Millers River.

8.3 Floodplains

Floods are a natural and normal occurrence in an area of high rainfall. During normal stream flow, water is carried in a river channel. But in times of high runoff, water rises over the banks and flows onto the floodplain. Floods only become a problem when man competes with nature for use of the land.

Areas susceptible to flooding present obvious hazards to life and property, and the continued protection of these areas from development is an important responsibility. Rindge participates in the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA). FEMA conducted a flood hazarded study for Rindge in 1997 and flood hazard areas were identified in the Pool Pond, Contoocook Lake area as well as areas along the Millers River and Lake Monomonac. Flood Insurance Rate Map (FIRM) and Flood Hazard Boundary Maps were prepared by FEMA and are available for review at the Rindge Planning Board office.

Many areas including wetlands and stream corridors in Rindge are not identified on the FIRMs but provide flood storage during some storm events. The Biodiversity Study identified the Tarbell Brook Wetland Complexes as having additional value as a floodplain area within Rindge.

8.4 Water Supply

All water supplies, private and public, in Rindge are groundwater wells. There are public water supplies. A public water supply is any source that provides water to 15 permanent connections or 254 people 60 or more days a year. Public water supplies are regulated by the State, as required by the US EPA. This definition captures municipal and private wells, such as, schools, campgrounds, restaurants, large employers, village systems. Also, since 1984, water well drillers are required to report the location and basic information (depth to water table, pump test results, etc.) for new or re-drilled wells of any kind in New Hampshire. While there remain hundreds of private residential and commercial wells in Rindge that are not identified in any data base, it is safe to assume that every home and business has a well for drinking water.

The community is considering the reclassification of its groundwater resources town-wide as a drinking water supply. This would allow for more frequent monitoring, and protection of this critical resource, preventing the necessity of incurring the cost of a future municipal water supply.

Another level of state regulation is involved when water withdrawals by a single user exceed 20,000 gallons per day. Such users are required to be registered with the NH DES Water Supply Engineering Bureau. There are two registered water users in Rindge: Franklin Pierce College with four wells and the Town of Jaffrey's well near Black Reservoir.

Groundwater

Groundwater is a concentration of water in soils and rock formations. It is re-supplied through precipitation. Rain water and melting snow infiltrates into the ground. Water that is not taken up by plant roots or trapped as soil moisture will continue downward. As water passes through soil, impurities can be removed through chemical reactions with soil particles and microbes. Infiltrating water eventually accumulates on top of an impervious layer below ground, e.g. clay or bedrock, and fills the spaces between grains of sand, gravel or soil particles above that barrier. The top of this saturated zone is the water table.

It is very important that the surface of the earth is not altered to prevent water from infiltrating to groundwater. Paving, buildings, compacted dirt, and any other changes in the surface that will increase runoff during storms and snow melt (including deforestation) all decrease the amount of water that can infiltrate to groundwater.

Aquifers

Aquifers are geologic formations, either bedrock or sand and gravel deposits, which can store and transmit sufficient quantities of groundwater to support residential or community water supplies. Glacial deposits of sand and gravel and bedrock fractures in Southwest New Hampshire are known to have medium to high potential as aquifers.

<u>Bedrock and Glacial Till Aquifers</u>

Bedrock fractures can be very productive water sources, especially if the fractures are connected to sand and gravel over the bedrock. This allows recharge to occur directly from above. Bedrock fractures are usually adequate for domestic wells and can sometimes support community

systems. There is very little known about the location or qualities of bedrock fractures in New Hampshire that might provide water.

In contrast, the mixture of "dirt" and stones that covers most of the bedrock in central New England's uplands is a poor aquifer. This mixture is known as glacial till – that resulted from mixing of material picked up by the glaciers as they flowed many miles from the north. As the glaciers melted the mixture was laid down in-place unless carried away by running water. Till is a mix of clay, silt, sand, gravel, and boulders which tends to be very compact due to the variety of soil particle sizes. While till can hold a tremendous amount of water, extraction of the water is very difficult due to the small, even microscopic spaces between soil particles.

Stratified Drift Aquifers

Sand and gravel deposits, also called stratified drift deposits, are typically layers of gravel, sand, silt and/or clay that were sorted and deposited by running water from the melting glaciers 15,000 - 20,000 years ago. They are found primarily along valley bottoms. Stratified drift can have abundant space between same-sized gravel or sand where water can accumulate and flow freely (much like a the space in a jar filled with marbles). The space can be more than 30% of the deposit's total volume. Consequently, stratified deposits of sand and gravel are often very good aquifers.

The U.S. Geologic Survey (USGS) completed descriptive studies of the stratified drift aquifers in the Connecticut and Merrimack River basins in the mid-1990's. Data from those studies are used to depict the extent and some characteristics of the stratified drift aquifers in and around Rindge shown in the map found in the Water Plan.

Three basic characteristics are used to understand stratified drift aquifers: material, saturated thickness and transmissivity. The material is the kind of geologic material, whether it's sand or gravel, the size of the sand grains or gravel, etc. All of the stratified drift deposits in Rindge are thought to consist of material ranging from medium-sized sand grains to gravel, possibly with interspersed deposits of fine sand. While stratified drift may be layered with fine sediments that can inhibit the flow of water, e.g. the clay found in lake bottoms, none of the deposits in Rindge are thought to contain these.

The saturated thickness of a stratified drift deposit is the vertical distance from the water table in the aquifer to the bottom of the aquifer, typically bedrock. The saturated thickness of the deposits in Rindge, measured in 40-foot intervals, range from less that 40 feet to more than 80 feet. Most of the deposits are less than 40 feet. The greatest saturated thickness is found in the Lake Monomonac and Hubbard Pond aquifers.

Transmissivity is a measure of the rate at which water can move through the material, using a usual unit of measure: "feet squared per day". Transmissivity takes into account the size of the spaces between sand grains or gravel and the saturated thickness. Transmissivity is reported by the USGS in 1,000 ft2/d intervals. Transmissivity of less than 1,000 are generally considered inconsequential for large water supply wells, but, are excellent aquifers for individual wells serving homes or businesses. Transmissivity of aquifers in Rindge range from less than 1,000 to

over 8,000. Again, the Lake Monomonac and Hubbard Pond aquifers have the greatest potential for high yield wells due to high saturated thickness and high transmissivity.

8.6 Land Use Implications

The water resources within Rindge are abundant. Deliberate steps must be taken if Rindge is to retain a healthy supply of potable water, healthy fisheries, recreation opportunities, and other benefits. Here are a few summary points to consider related to water resources in Rindge.

1) There is a direct correlation between activity within the watershed and the quality of lakes and ponds that are fed by those watersheds. All of the activities taking place on land will eventually impact both surface and ground water. This refers to both quality and quantity of groundwater. Mismanagement in the watershed will adversely affect the water bodies down-slope and downstream.

2) Minimizing the amount of pollutants entering Rindge's waters will help avoid expensive future expenditures to treat and clean these waters.

3) Minimizing impervious surfaces in groundwater recharge areas will preserve the volume of the local water supply being stored as groundwater and in surface water bodies.

8.7 Actions

There are many actions the Town may want to consider pursuing as it evaluates the water resources in Rindge and their land use implications. This section will be used to identify the specific actions for Rindge to take upon completion of the Master Plan.

1) Pursue easements for buffers along the Contoocook and Millers Rivers.

2) Reclassify the groundwater resources town-wide as a drinking water supply and implement a wellhead protection program.

3) Update the River Management Plan for the Contoocook River, and complete a River Management Plan for the Millers River.

4) Prepare an ordinance for third order streams, or create a riparian ordinance for Rindge.

5) Consider the regional impact statute (NH RSA 36:54-58) when reviewing development proposals that may impact shared watersheds, and continue to work proactively with neighboring communities.

6) Continue to routinely monitor the quality of existing water resources in Rindge with volunteer assistance.

7) Improve the quality of stormwater being discharged into surface waters through treatment, or stormwater detention.

8) Promote the use of permeable surfaces, and other Low Impact Development (LID) techniques that promote infiltration in the site plan review process.

9.0 POINT AND NON-POINT SOURCE POLLUTION

Within every watershed, the uses of the land and of the water have the potential to impact water quality. Water pollution can occur from two major sources: point and non-point. Point source pollution is one that can be linked to a specific pollutant or discharge point that can be identified and physically located. Non-point sources are more difficult to document, trace, or identify since there is generally not a specific point of discharge. The NH Department of Environmental Services should be contacted relative to the current status of individual sites.

The need to protect waterbodies from the danger of accelerated eutrophication and other forms of pollution was recognized by the New Hampshire Legislature in 1991 with the passage of the Comprehensive Shoreland Protection Act (RSA 483-B). Eutrophication is the natural, gradual nutrification, oxygen deprivation, and warming of a waterbody that changes the biological make-up of the waterbody. Eutrophication can be dramatically accelerated by pollution leading to a lake dying or a pond having algal blooms and other problems. The final implementation of the Comprehensive Shoreland Protection Act was put into effect on July 1, 1994. This act creates a protected shoreline for public waters, but states:

> *"Municipalities may adopt land use control ordinances relative to all protected shorelands which are more stringent than the minimum standards contained in [the Comprehensive Shoreland Protection Act]..." RSA 483-B:8, I.*
>
> *"Municipalities are encouraged to adopt land use control ordinances for shorelands of waterbodies and watercourses other than public waters." RSA 483-B:8, II.*

9.1 Point Sources

A pipe discharging waste into a stream is an example of a point pollution source. Since the Clean Water Act of 1971, most discharges have to be treated prior to discharge and all discharges require a National Pollution Discharge Elimination System (NPDES) permit. DES issues NPDES permits after review and approval. Franklin Pierce College currently has a small wastewater treatment plant which discharges wastewater into a tributary (identified within the Plan as Stream C) of Pearly Lake. The College is currently preparing engineering plans and design for a rapid infiltration system to treat the effluent from the wastewater treatment plan, thus allowing the discontinuance of the direct discharge to the wetlands

9.2 Potential Non-Point Pollution Sources

General and specific land use practices that are widespread throughout Rindge and surrounding communities can impact water quality. Some potential sources are the result of temporary or short-term land uses that require disturbing the soil, such as logging, construction, road maintenance, or agriculture operations. Others, such as stormwater runoff may be short in duration, but are continuous in nature. Non-point sources are more difficult to quantify than point sources because they impact water quality through unmonitored, intermittent, or incremental contamination and their impacts may be felt only over a long period of time. Other

sources include waste disposal facilities (septic systems, landfills, junkyards, etc.), highway maintenance (sand, salt, and snow dumping), and hazardous waste.

NH DES reports a total of 115 potential or known sources of groundwater contamination in Rindge, and over the contiguous stratified drift deposits in the neighboring towns. Ninety-two of these are within Rindge's boundaries. Details related to these sites can be found in Table 3 in the Rindge Water Resources Management and Protection Plan. Each of the four watersheds with stratified drift deposits also have potential pollution sources and all but Hubbard Pond have pesticide application permitees within their boundaries.

Individual septic systems are also of concern regarding surface water and groundwater protection. Failing or substandard systems can release pathogens, nutrients and chemicals from households to groundwater and surface water. The villages of East Rindge and West Rindge and communities on the shores of Lake Monomonac and Contoocook Lake are the most vulnerable to system failure or cumulative effects of decades of high density on-site septic disposal – much of which was designed and operated prior to the establishment of State-level standards. The community should consider implementing an inspection and maintenance program that would including the logging of maintenance and repair records for existing septic systems.

Buffer strips along ponds and streams intercept and store surface runoff, allowing it to infiltrate rather than continue off site as runoff. This can reduce impacts from a variety of pollutants including phosphorus, sediment, pathogens, nitrates, and pesticides. A buffer's capacity to tie up pollutants depends on its width, Vegetation type, slope, and soil type. Studies have shown that the comprehensive evaluation of these factors is usually beyond the ability of communities without relying on expensive studies. Instead, authorities have determined that a realistic rule of thumb is to assume that the wider a buffer is, the more removal of pollutants occurs. A 100-foot buffer is recommended for infiltration.

9.3 Land Use Implications

Point and non-point pollution sources have an adverse effect on the community. Their presence threatens both the immediate and long term health of the community. Here are a few summary points to consider related to pollution in Rindge.

1) Pollution contaminates soils and impacts water quality in the community. This results in damage to the environment and the need to engage in expensive treatment processes.

2) The value of Rindge's natural resources is directly linked to their health and the absence of pollutants.

3) There is a direct correlation between impervious surfaces and increased non-point source pollution. Reducing impervious surfaces will reduce runoff rates and increase filtering.

9.4 Actions

There are many possible actions the Town may want to consider pursuing as it evaluates the existing and potential threat from pollution sources in Rindge and their land use implications. This section will be used to identify the specific actions for Rindge to take upon completion.

1) Adopt impervious surface limits in the site plan review regulations, and encourage the use of pervious structures for areas like overflow parking lots.

2) Reduce the required road widths for new development.

3) Promote the use of Low Impact Development (LID) regulations that help manage non-point pollution and stormwater drainage.

4) Promote Best Management Practices (BMPs) to reduce nonpoint pollutants from industrial, commercial, agricultural, and residential developments.

5) Require maintenance plans for industrial, commercial and residential developments.

6) Develop an inspection and maintenance program for septic systems that would include the logging of maintenance and repair records for all existing systems.

7) Apply Best Management Practices (BMPs) for the maintenance of dirt roads, and for areas adjacent to all roadways.

8) Continue to monitor and document all underground storage tanks in Rindge.

10.0 FOREST & AGRICULTURE LAND USE

10.1 History of Agricultural Lands in New Hampshire

In 1880, 64 percent of New Hampshire's land was in agriculture. Today less than 15 percent remains in farming. Traditional agricultural activity in New Hampshire is at its lowest level in recorded history. New Hampshire ranks 49 out of 50 in the level of agricultural production in the U.S. One reason for this is that land suitable for agriculture is also excellent for development. Agricultural land is gently sloping, open, and scenic. The agricultural land that remains undeveloped adds a special rural character to the town while at the same time providing habitat for local wildlife. According to the New Hampshire Department of Agriculture the face of agricultural operations in New Hampshire is changing quickly. Niche markets including specialty crops and herds, customized farm products, and small scale operations are redefining agriculture.

In short, traditional agriculture and agricultural land uses in New Hampshire and Cheshire County have declined substantially over the years. Land once used by small, non-mechanized farms has reverted back to forest land or has been developed. Miles of stonewalls in mature forest stands are testimony to an agricultural heritage in New Hampshire that has been lost over the past several decades. Rindge has certainly been part of that trend, and that makes the protection of the remaining productive agricultural land even more important.

10.2 Existing Agricultural Land Use in Rindge

Agricultural land use in Rindge is still somewhat evident today. There are a number of small but possibly significant pockets throughout the town. See **Map 6** for prime Agricultural soils. The remaining Rindge farms are Ware Farm, Jones Farm, The Meeting School, and Several Farm-Centered Businesses. Some of the agricultural land in Rindge is open fields that may be "idle", meaning kept open by "brush hogging" or mowing every year or two, but not producing a crop. A variety of niche market agricultural operations exists for Rindge. These are small scale specialty operations producing and selling things like honey, berries, and other products. There is an opportunity to encourage growth in this small, but critical land use as a technique for preserving agricultural lands and the community's character.

Some of the active farms in town include the Ware Farm, Jones Farm, the Meeting School, several tree farms and sugar houses, as well as small farms delivering produce, meat and nursery and craft items.

10.3 Land Use Implications

Rindge's agricultural resources and activities have an effect on land use decisions and impact the character of the community. Here are a few summary points to consider related to agriculture in Rindge.

1) Preserving the possibility of farming in the future adds to the sustainability and diversity of the community. If agricultural resources are converted to residential and business uses they will not be viable options for producing goods locally.

2) There is an economic benefit when produce and products are generated locally, and the land does not require the high level of town services that development demands.

3) Agricultural lands add to the visual and habitat diversity of the landscape, and contribute to the character of the community. This landscape creates a "sense of place" that is specific to Rindge and cannot be recreated. **All in all, this increases the asset value of both the land and the homes throughout the community.**

10.4 Actions

There are an array of possible actions the Town may want to consider pursuing as it evaluates the status of agriculture in Rindge and the associated land use implications. This section will be used to identify the specific actions for Rindge to take upon completion.

1) Pursue protection of the limited agricultural land that remains through outright purchase, purchase of easements/development rights, municipal bonding, and donations.

2) Require open space developments in areas involving agricultural land. Concentrate all the development on the non-agricultural land areas.

3) Make all of Rindge's land use regulations "farm friendly" and support non-traditional agricultural operations (small scale, seasonal, organic, specialty or "niche markets").

4) Establish a Town Agricultural Commission that includes local farmers to promote local products, farmers markets, and farm friendly regulations.

5) Promote the use of Best Management Practices to reduce non-point source pollution.

10.5 Forest Lands

Timber harvesting is the most obvious use of forest lands, but other uses and functions include recreation, wildlife habitat, water quality protection, open space, scenic enhancement, etc. These are all important uses for the people of Rindge, both from a quality of life and economic standpoint.

From a planning perspective, woodlands are not just a source of wood products, and tax revenue. The forest industry also provides many area jobs. They play a role in the water quality of Rindge's ponds and streams. All of these uses are sustainable, and each can co-exist. Timber harvesting, while having dramatic visual impacts in some cases, is rather short-term. However, subdividing large woodland parcels into small lots for development can have a long term, nearly irreversible impact.

Considerable care should be taken during both commercial timber cuts and cuts to create open space for development to ensure the conservation of soils by mitigating erosion. Because large forested tracts are another aspect of the rural character of the community, visible clear cuts, either for commercial harvests or for development, should be carefully avoided or buffered. "Viewsheds," the views available to residents and tourists while driving, hiking, etc, and the impact of large clearcut areas on a viewshed are an important consideration when the stated goal of the community is to maintain the rural character. The maintenance of important forested and agricultural views should be encouraged, by encouraging selective cuts, or smaller clearcuts with active replanting.

"New Hampshire's Vanishing Forests" (2001) found that, while New Hampshire remains predominately forested, the amount of forest cover will decline to 80 percent statewide within the next 20 years, and of that, less and less will be committed to long term forest management in large tracts. Additionally, most landowners no longer rank timber production as the main reason they own the land. Only 10 percent of the landowners include timber production as the primary reason, with aesthetic enjoyment now more than 50 percent of the landowners' reason for owning the land.

It was found that parcels of land 500 acres or more are the most common for long term forest management due to economies of scale. With regard to the short-term impacts of logging, the town has a built-in mechanism to monitor logging operations – the notice of 'Intent to Cut.' Once an 'Intent to Cut' is filed, it is reviewed to determine if the logging operation is going to impact sensitive or critical natural resource areas, such as wetlands, deer yards, fragile biotic communities, etc. Landowners and foresters could be educated to the need to carry out logging operations in a manner sensitive to important natural resources. It could also help to identify logging operations that are planned on areas used for recreation such as paths and trails. Steps could then be taken to work with landowners and foresters to temporarily close or re-route trails during the logging operations.

10.7 Land Use Implications

Rindge's forest resources have an effect on land use decisions and impact the character of the community. Here are a few summary points to consider related to forest lands in Rindge.

1) Forest resources provide habitat, erosion control, water filtering, improved air quality, and temperature regulation. These resources also pay their own way in terms of town services because of the little they demand.

2) Responsible harvesting of forest resources supports the local economy and provides access to local forest products. The working landscape contributes to the character of the community.

3) Clear cutting and disregard of BMPs can result in erosion and non-point source pollution that creates problems for abutters and the community.

10.8 Actions

There are many actions the Town may want to consider pursuing as it evaluates the status of forestry in Rindge and the associated land use implications. This section will be used to identify the specific actions for Rindge to take upon completion.

1) Rindge should consider having a licensed forester inspect all logging jobs to insure compliance with wetland and erosion and sediment control regulations. The forester could also inspect the sites relative to the amount of timber harvested. This may increase the amount of tax revenue from logging in Rindge, and provide an opportunity to educate loggers on Best Management Practices (BMPs) to use on site.

2) The minimum lot size in zones with valuable forest resources should be examined. Subdivision of land into small units makes logging difficult.

11.0 CONSERVATION LANDS

Conservation areas are those lands protected for the foreseeable future through outright preservation by governmental or conservation organizations, or through conservation easements. Map 8 depicts current conservation and town owned property in Rindge. According to the 2005 Report of the Community Facilities and Open Space Plan Committee (available in the Appendix), Rindge has 3,350 acres of land that have been set aside as conservation land. Table 3.6 shows the acreage amounts for these lands which cover 14 percent of the total land area in Rindge.

Table 3.6 Protected Lands Within Rindge (Acreage does not include water bodies >10 acres)

Parcel Name	Land Acres	Primary Protection Agency	Type of Protection
Annett State Forest	1109	NH DRED	Fee Ownership
Betsy Fosket Wildlife Sanctuary	35	NH Audubon	Fee Ownership
Beulah Land	51	Forest Society	Fee Ownership
Bullet Pond Reservoir	170	Town of Jaffrey	Fee Ownership
Camp Wildwood	171	MA Audubon	Fee Ownership

Parcel Name	Land Acres	Primary Protection Agency	Type of Protection
Contoocook Marsh	5	Town of Rindge	Fee Ownership
Converse Meadow	208	Town of Rindge	Fee Ownership
Goundry Property	153	Forest Society	Conservation Easement
Grummon Tract	17	Forest Society	Conservation Easement
Hogan (Night Flight/Ware)	164	Monadnock Conservancy	Conservation Easement
Hunt Forest	29	Town of Rindge	Fee Ownership
Johnson Land	13	Forest Society	Conservation Easement
Lowe Property	643	Forest Society	Conservation Easement
Nottingham Tree Farm	69	Forest Society	Conservation Easement
Perry Forest	72	Forest Society	Fee Ownership
Perry Reservation	129	Forest Society	Fee Ownership
Robbins Pond Wildlife Sanctuary	193	Fred Dodd	Deed Restriction
Stearns - Lamont Forest	123	Forest Society	Fee Ownership
Tetreault Park	39	Town of Rindge	Fee Ownership
Town Forest	116	Town of Rindge	Fee Ownership
Weinberg	7	Town of Rindge	Conservation Easement
Wolterbeek/Towne Hill	303	Monadnock Conservancy	Conservation Easement
Total Acreage Protected	**3819**		

***Note: Some of the acreage reported includes land in neighboring towns**

Table 3.7shows the current state of land in Rindge. The number of acres protected in Rindge now equals approximately 16 percent of the community as a whole, but significant unfragmented areas and sensitive natural resources remain unprotected throughout the community.

Table 3.7 Relative Development/Conservation Land Analysis

Parameter	Value
Total Acres in Rindge	**25469**
Total Lake/Pond Acres in Rindge (> 10 acres)	**1570**
Total Developable Land Area in Rindge (acres)	**23899**
Total Unfragmented Lands (acres)	**18202**
Total Developed, Fragmented and Edge Effected Lands (acres)	**5697**
Total Conservation Land (acres)	**3819**
Percentage of protected developable lands	**15.9**
Developed Land/Conservation Land Ratio	**1.49/1**

11.2 Current Use

NH RSA 79A allows landowners to place certain types and sizes of land in a tax abatement program based on their current land use. Table 11-3 shows the current distribution of acreage in Rindge in current use. This acreage is approximately 35.67 percent of the total land area in Rindge.

Table 3.8 Current Ust

Current Use Category	Acreage
Farm Land	662.26
Forest Land	9,988.09
Unproductive Land	48.08
Wetland	1,329.63
Total	**12,028.06**
Percent of Total Land Area in Rindge	**35.67%**

While current use reduces the burden for landowners, land can be taken out of current use with payment of a penalty. Therefore, it does not provide absolute assurance of continued open space. The penalty is 10 percent of the assessed value of the lands. Under state law, towns can vote to have all or a portion of the money collected for taking land out of current use to be placed in a conservation fund administered by the Conservation Commission. Over 120 towns in the state have voted to do this in order to provide a source of revenue for conservation studies, and land protection efforts. Rindge collects 100 percent of the penalty each year for the conservation fund. There is no cap on the amount that can be collected annually in Rindge.

11.4 Land Use Implications

Rindge's conservation lands have an effect on land use decisions and impact the character of the community. Here are a few summary points to consider related to conservation lands in Rindge.

1) Conservation lands provide habitat, recreational opportunities, and protect critical natural resources. These resources also pay their own way in terms of Town services.

2) Conservation lands contribute to Rindge's character as a community, and support its quality of life.

11.5 Actions

There are a number of actions the Town may want to pursue as it evaluates the conservation lands in Rindge and the associated land use implications. This section will be used to identify the specific actions for Rindge to take upon completion.

1) Complete an analysis of undeveloped parcels in Rindge, and increase efforts to secure conservation easements on the parcels with significant natural resources.

2) Pursue conservation easements or other forms of protection on lands adjacent to permanently protected parcels in order to preserve contiguous corridors of undeveloped land.

3) Partner with other conservation based organizations, such as the Monadnock Conservancy, that work in the region containing Rindge to increase funds, access a wider audience, prioritize parcels for protection, and pursue land protection efforts that will benefit the community and the region.

4) Encourage the use of open space development practices that combine development and conservation initiatives on all single parcels of land.

5) Look for bond or grant money for conservation purchases.

6) Encourage private landowners to consider protective easements.

7) Identify town owned (and other) lands that would be suitable for the expansion of community facilities and place easements on town lands which are considered more environmentally sensitive, such as Converse Meadow, the Town Forest, and Tetreault Park.

8) Expand the current Recreation Department into a Parks and Recreation Department as recommended by the Community Facilities and Open Space Committee, to implement the management plan developed by the Conservation Commission for open space.

12.0 UNFRAGMENTED LANDS AND WILDLIFE

A significant aspect of the 2006 Biodiversity Study conducted by Bluepoint Ecological was the Landscape Fragmentation Analysis. The Landscape Fragmentation Analysis Map illustrates the findings of the Analysis for Rindge and the surrounding area. This analysis was conducted to illustrate the range of large blocks of unfragmented land that exist in Rindge and into adjacent communities. These areas provide critical habitat for wildlife. Preserving the largest blocks which will support larger mammals has an "umbrella effect," and also results in the preservation of critical habitat for small species. The preservation of unfragmented lands requires coordination across town and state boundaries, however it should be noted that these boundaries are non-existent to the animals that characteristically move around the region.

Table 3.9 below illustrates the classes of unfragmented land that exist in Rindge, the number of acres in each class, and the number of acres protected in each class.

Table 3.9 Conservation by Unfragmented Habitat Block Size
(Acreage does not include water bodies >10 acres)

Unfragmented Habitat Block Classes (Acres)	Total Unfragmented Acres in Rindge by Class	Total Unfragmented Acres Conserved by Class	Percent Conserved By Class
26-99	268	0	0.0
100-499	3009	182	6
500-999	3410	778	22.8
1000-3999	5501	1652	30
4000-9999	6014	864	14.4

12.1 Wildlife Resources

The 2006 Biodiversity Study resulted in the creation of a Geographic Database for the 5,200 acres surveyed during the project. This database can be used by the Town for planning purposes. It includes data on natural communities, See **Map 9**, Natural Communities Map, critical wildlife habitat, and the co-occurance of significant features and will be features later in 2007 see **Map 10**, Biodiversity Co-occurrence Analysis Map. This tool should be used during efforts to proactively protect properties with important wildlife resources, and can be used during the review of development proposals in Rindge.

12.2 Hunting and Fishing

The northeast is an excellent area for recreational hunting and fishing, and Rindge has a strong population of recreational hunters and fishermen. Rindge's natural resources support big game such as deer and moose, and smaller game such as beaver, mink, hare, grouse and woodcock.

Some areas within Rindge have been identified as deer wintering areas. These are areas that were mapped by the NH Fish and Game Department using aerial photography. They are identified as those areas having a thick evergreen cover. The mapping of these wintering areas or "deer yards" as they are sometimes called, is over 15 years old and needs updating to account for logging, development, and regrowth. Rindge's many surface water bodies also support an important fishery. While not on a major flyway for migratory birds, Rindge does offer suitable habitat for both short-term migratory waterfowl and for resident birds. The Geographic Database developed during the Biodiversity Study can be used to identify areas that provide important habitat for these and other species. Efforts to preserve land in Rindge should include access for these recreational pursuits when possible.

12.3 Land Use Implications

Rindge's unfragmented land and wildlife resources have an effect on land use decisions and are impacted by them as well. Here are a few summary points to consider related to unfragmented land and wildlife resources in Rindge.

1) Habitat is easily fragmented by new development. This disrupts the landscape and impacts wildlife movement and survival.

2) Wildlife resources are critical to many recreational activities that support open space conservation (i.e. hunting, fishing, and bird watching).

12.4 Actions

There are many actions the Town can consider pursuing as it evaluates the status of unfragmented lands and wildlife in Rindge and the associated land use implications. This section will be used to identify the specific actions for Rindge to take upon completion

1) Work with the surrounding communities to protect areas that are known to support or have the potential to support important wildlife.

2) Concentrate habitat protection efforts on preserving corridors between habitats and protected open space, particularly along waterways, to allow wildlife to avoid conflict with humans while maintaining the ability to gain access to food, shelter, water and breeding areas.

3) Provide opportunities for the public to learn about local wildlife and potentially view it.

13.0 SUMMARY

The primary focus of this Chapter is to identify the natural resources in Rindge, recognize the role they play in giving the town its character, and decide what strategies would best maintain that character while contributing to the long term sustainability of the community. All of the community's resources are interconnected, and any change to one can have a significant impact on the others. As the population increases, demands on many of these resources will increase, possibly to the point of threatening the quality and quantity of the resource. The goal of this Chapter is to help develop a balance between development and resource protection within Rindge that will guide future sustainable development of the community.