Chapter VII
NATURAL RESOURCES

INTRODUCTION

With a variety of forestry, farm, and soils types, numerous plants and wildlife species, and three of the five major rivers in the Central New Hampshire Region forming its borders, Pembroke's 14,528 acres of land is rich in natural resources. Currently, there are 285.85 acres of land in conservation and approximately 9,000 acres of land in current use. Wetlands are found scattered throughout the town, and many tracts of land remain undeveloped. Two hills exist in the Town, and three types of bedrock geology underlay Pembroke. The presence of the Merrimack River along its western border with Bow and the Suncook River along its southeastern border with Allenstown has helped shape the Town's development patterns. This rich diversity is one of the reasons people have been attracted to Pembroke throughout its history.

The Natural Resource section of the 1993 Master Plan, amended in 1998, addressed basic data about the town's resources. It included information about water features, topography, agriculture, soils and restrictive development constraints associated with the presence of certain natural resources. Some of the key natural resource goals of the 1993 Master Plan were to discourage growth in environmentally sensitive areas, explore innovative land use controls to maintain an appropriate level of open space and to identify and conserve areas of agricultural or natural significance. In 2001, the Town of Pembroke worked with Central New Hampshire Regional Planning Commission to develop an Open Space Trails System Plan. This plan, briefly discussed in this Chapter, further addresses some of the goals set forth in the 1993 Master Plan.

The March 2003 Community Survey indicates that the people of Pembroke view local natural resources as playing an important role in the town's quality of life with over 73% of responding residents indicating that the town's rural character, in which natural resources plays a role in defining, is an important contributing factor for living in Pembroke. Approximately 75% of survey respondents considered agriculture and forestry land uses to be important objectives of the Master Plan and 50% of the respondents wanted to discourage development along rivers. Taken as a whole, these survey results suggest that the need for the Planning Board to identify and to then to carry out strategies to appropriately conserve the town's key natural resources.

OBJECTIVES OF THE CHAPTER AND RECOMMENDATIONS

These Objectives were developed as a result of Subcommittee analysis and interpretation of the data contained within the following Chapter and from concerns raised from concerns raised from Pembroke residents and landowners in the Community Survey. They are listed in the beginning to give the reader the opportunity to view the results without reading through the entire Chapter. The following Objectives protect and enhance environmentally sensitive and important natural resources and natural areas within the Town.

- To preserve a variety of natural areas within the Town.

    - Identify all natural resources/areas in Town, according to their type (i.e. Conservation lands, forest types, recreation areas). Also, identify the issues that could threaten or enhance each area.

- To identify land parcels for future conservation-related acquisitions or easements.

    - Develop and implement a classification system to rank parcels for future land acquisition, including steps to acquire lands of importance.

- To identify and protect surface (ponds, rivers, streams) and subsurface (aquifers) water resources.

    - Accurately map aquifers as a beginning point in developing measures to assure adequate protection of this resource.

    - Examine the provisions of the Aquifer Conservation District for potential changes that would enhance the effectiveness of this District.

- To identify and mitigate both point and non-point pollution sources and other threats to the Town's water resources.

    - Continue to provide the Town with "Hazardous Waste Disposal" opportunities.

    - Work in conjunction with the NH Department of Environmental Services to locate and monitor known and potential sources of point source pollution.

    - Examine existing land uses to identify known and potential point and non-point source pollution.

    - Develop a water quality monitoring program to test water throughout the Town of Pembroke.

- To identify and classify wetland areas by their ecological significance so that they may be generally protected and so that the most important, or prime, wetlands and their riparian buffer areas may be targeted for heightened conservation.

    - Explore minimum setback regulations from wetlands and follow through with appropriate measures.

    - Explore the range of existing wetlands to determine whether any wetland areas should designated as "prime wetlands".

- To develop alliances and provide educational opportunities which protect the town's natural resources and promote a heightened awareness of their important values.

    - Promote alliances with a variety of public and private groups (i.e. Boy Scouts, ATV user groups, local schools, etc.) to assist the town in carrying out environ-mentally related educational activities.

    - Establish a practical interpretive signage educational program which promotes an understanding of the town's most noteworthy natural resource sites.

    - Establish, maintain and publicize a "clean-up program" to keep roadsides, trails and river banks free from refuse.

- To provide long-term protection to the town's core rural areas by identifying and safeguarding the town's prime forestlands and agricultural areas.

    - Update the zoning ordinance to more strongly protect, promote and enhance the town's long-established timber conservation and silviculture areas by establish-ing large minimum lot-size standards within one or more appropriately situated newly created Timber Conservation Districts.

    - Update the zoning ordinance to more strongly protect, promote and enhance the town's traditional agricultural areas by establishing large minimum lot-size standards within appropriately situated newly created Agricultural Conservation Districts.

- To identify and analyze wildlife habitat throughout the town to understand which environments are most valuable and/or at-risk, and establish a preservation/conservation program for those habitat areas deemed most in need of protection.

    - Establish criteria and procedures for identifying the town's most important wildlife habitat areas and habitat-connective corridors and, for study and educational purposes, show these areas on appropriate maps.

    - Develop a mitigation strategy using best management practices to protect those wildlife habitats and connective corridors deemed most "at risk".

- To identify existing and former sand and gravel excavation sites as well as all areas in town containing stratified drift earth materials with the aim of defining a smaller, more appropriately sized, earth excavation zone than currently exists.

    - Map existing stratified drift earth material areas.

    - Develop one or more appropriately sized earth excavation zoning districts.

    - Carry out and enforce current reclamation regulations.

- To identify the Town's scenic resources such as scenic roads, vistas and other viewscapes.

    - Locate and map existing scenic resources for study and educational purposes.

    - Develop a program to enhance existing scenic areas throughout the town.

COMMUNITY SURVEY RESULTS

The March 2003 Community Survey yielded 780 replies from 2956 surveys distributed, which equals a 26.4% return rate. The following questions were pertinent to the **NATURAL RESOURCES CHAPTER**. The full survey results are displayed in the **APPENDIX CHAPTER**.

What do you consider the desirable features of the Town of Pembroke?
Approximately 73% of respondents considered the rural atmosphere of the town to be a desirable feature. Location was considered desirable by 74.5% of the respondents. Conservation of natural resources was considered to be a "low" desired feature by just over 16 % of the respondents, indicating that approximately 84% of the respondents may feel that conservation of natural resources was a desired feature.

Please indicate which of the following recreational opportunities you would like the Town to develop and/or improve.
Approximately 50% of respondents want to see walking trails on Town property developed or improved, while 42.3% of the respondents want bike paths within the town developed and improved.

Should development along rivers be encouraged or discouraged?
51% of respondents discouraged development along rivers while 25½% wanted to promote development in this area.

Are agriculture and forestry land uses important objective of the Master Plan?
Approximately 75% of respondents considered agriculture and forestry land uses to be important objectives to the Master Plan.

Should the Town acquire undeveloped land for protection?
58% of respondents felt that the Town should work at acquiring undeveloped lands for preservation.

If Pembroke were to expand trails, how would this be done?
34.3% of respondents felt that this should be accomplished through landowner permission to use the land. Town purchase of land, transfer of development rights, Town purchase of easements, subdivision requirements and private organization purchase of land were all ranked favorably by 9%-19% of survey respondents.

Please indicate which of the following you would like the Town to develop and/or improve?
Protection of groundwater and surface water ranked highest with 70.3% of respondents indicating that this was a high priority of for development or improvement. Also ranking high are protection of forests at 59.6%, protection of wetlands at 53.3% and protection of wildlife habitat at 50.8%.

INVENTORY OF NATURAL RESOURCES

A mapped inventory of many of Pembroke's natural features was performed as part of this Master Plan Chapter in order to allow the Planning Board to identify and manage the town's varied natural resources. A majority of the resource information came from the 1999 Central New Hampshire Regional Planning Commission *Natural, Cultural and Historical Resources Inventory* and the *2001, Town of Pembroke Open Space Trail System Plan*. Additional information was also gathered from the Pembroke Conservation Commission, Town of Pembroke maps and records, and other mapping sources.

Geological Resources

Surficial and Bedrock Geology

United States Geological Services (USGS) is responsible for identifying and mapping the types and location of bedrock in the United States. Bedrock is defined as the solid rock that is found underneath the loose rock, soil, and vegetation. The ***Geological Resources Map*** shows the types and locations of the bedrock found in the Town of Pembroke. Descriptions of the types of bedrock found in Pembroke are provided below:

- "Dc1m" Concord Granite (Late Devonian) – Gray two – mica granite, locally grading to tonalite. Dc1m underlays 2477.9 acres (16.98%) of Pembroke's land area, the largest area of which occurs along the Merrimack River on the town's western border with Bow. Another small area occurs to the east along the Suncook River.

- "Sru" Upper part of Rangeley Formation – Rusty-weathering, pelitic schist, metasandstone and local course-grained metasandstone lentils; calc-silicate pods common; minor coticule. Probably equivalent to member C of Rangeley Formation of Maine. Sru accounts for the highest percentage of underlying acres in Pembroke at 74.9%. This bedrock type occurs in a large contiguous tract, from north to south, running down the middle of the town.

- "Srl" Lower part of Rangeley Formation – Gray, thinly laminated (5-25 mm) metapelite containing local lentils of turbidites and thin quartz conglomerates in western New Hampshire. Sparce calc-silicate pods and coticule. Probably equivalent to member B of Rangeley Formation of Maine. Srl accounts for 8.1% of the town's underlying bedrock geology and the only area this is located is the eastern border of Pembroke along the Chichester town line.

While the United States Geological Survey (USGS) continues to research and map bedrock geology to better understand the impact of bedrock on all other natural resources, several issues have already been identified. One of the greatest impacts of bedrock geology is reflected in the overall layout of the land. The locations of many natural resources such as aquifers, ponds, hills, mountains and sand deposits are directly linked to the types and locations of bedrock that are found in a given area. In addition, bedrock can impact water quality (i.e. radon contamination), surface and sub-surface water flow, and can dictate the locations for public and private wells as a result of groundwater's tendency to collect in the fractures found in the underlying bedrock.

Hills and Mountains

Except for riparian and relatively flat plains areas which are situated in the immediate vicinity of several of Pembroke's major rivers and streams, the town's topology (or "lay of the land") is primarily characterized by the presence of a series of moderately sloping small-to-mid sized ridge areas which are arranged primarily in a north-south direction throughout the central and western areas of the town. With its low-laying peak situated on the Pembroke/Chichester Town boundary, the 1,000 feet elevation (above sea level) of Plausawa Hill is the town's highest point of land. Pembroke Hill, which is found near the top of Brickett Hill Road, is the town's second tallest hill reaching an elevation of 680 feet.

Steep Slopes

Steep slopes greater than 15% can be found at any elevation in all parts of town. These areas are known to hinder development because they are notably more susceptible to erosion and instability than more moderately sloped areas. Most commonly, they are associated with hills and mountains, found along roadways and surrounding water bodies. The majority of steep slopes in Pembroke are found along the banks of the Merrimack River and Soucook River. Another sizeable area of steep slopes occurs in the north part of town in the vicinity around Plausawa Hill.

Excavation Materials

As they are listed in the following Table, Pembroke currently has eight active gravel excavation operations accounting for approximately 550 acres of land. All of the excavation sites occur along the Soucook River over the main aquifer for the Town. The location of the excavation sites can be seen on the ***Potential Threats to Water Resources Map***. A table of the excavation sites is provided below.

Table VII-1
Excavation Operations

Name	Status	Map and Lot	Location	Description
Concord Sand & Gravel	Grandfathered	Map 256 Lot 22	Ricker Road	Operating conditions from Special Exception granted in 1986
Concord Sand & Gravel	Grandfathered; may need a permit	Map 256 Lot 25	Ricker Road	Subject to 1986 operating conditions
Concord Sand & Gravel	Grandfathered	Map 256 Lots,22-3, 22-1, and 26-2	Ricker Road	Subject to 1986 operating conditions; Reclaimed; Asphalt plant permitted in 1999
Concord Sand & Gravel	Permit granted in 1985	Map 559 Lot 6	North Pembroke Road	Permit issued by Special Exception and Site Plan
Silver Hill Development Corp	Grandfathered	Map 559, Lot 12	North Pembroke Road	3 acres (total w/Silver Hill) excavated as of 7/91; excavation began in 1930s
Manchester Sand & Gravel	Grandfathered	Map 634, Lot 41	West side of Route 3, Pembroke Street, ¼ mi south of Rte 106 intersection	Excavation began in 1940s
D'Agnese & Keeler	Permitted	Map 634 Lot 43-2	West side of Route 3 adjacent to Manchester Sand & Gravel pit	26 acre excavation began 1996; reclamation scheduled for fall 2003
Plourde Sand and Gravel / Plausawa Valley Country Club Pit	Grandfathered	Map 634, Lot 2	Along Soucook River south of the ninth hole	Excavation began in 1963; gravel rights expired May 14, 2003; rights renewed

Sources: 1993 Master Plan; 2002 Digital tax maps; Subcommittee Input

Water Resources

The ***Water Resources Map*** depicts the location of the most known water features within the Town. Included on this map are ponds, rivers, streams, wetlands, water supplies and water-bearing sand and gravel aquifers. A detailed description of each resource type follows.

Water Supply

Pembroke contains many private well sites along with several public water supply sites. These locations can be seen on the ***Water Resources Map***. Presently, Pembroke has a total of 10 public water supply sites serving the Towns of Allenstown and Pembroke as well as the City of Concord. As defined by NH Department of Environmental Services, public water systems "are systems that serve at least 25 people or 15 service connections for at least 60 days each year". Pembroke's public water supply system is fed through five well sites; three of these wells are located in close proximity to the Soucook River and two are sited near the Suncook River. The wells located near the Soucook River each pump approximately 600 gallons per minute while the wells located near the Suncook River each pump approximately 300 gallons per minute. These five public water wells serve the downtown area, Buck Street and properties along Route 3 and Route 106.

Currently, approximately 6,000 Pembroke residents are connected to the public water system (this figure does not include residents served in Allenstown or Concord). Table VII-2 provides a list of public water supply sites in Pembroke.

Table VII-2
Public Water Supply Sites

Map Index	Name	Address	Map-Lot	Owner
1	Concord Dept/Water Resources	125 Hall Street	559-8	Concord
2	Concord Dept/Water Resources	125 Hall Street	559-8	Concord
3	Concord Dept/Water Resources	125 Hall Street	559-8	Concord
4	Concord Dept/Water Resources	125 Hall Street	559-8	Concord
5	Pembroke Well	Route 106	632-17	Pembroke
6	Pembroke Water Works	Route 3	632-3	Pembroke
7	Pembroke Water Works	Route 3	632-3	Pembroke
8	Meeting House Water Company	Woodlawn Ridge Road	634-14	Pembroke
9	Maple Grove Park	Rte 28	870-20	Pembroke
10	Plausawa Valley Club House	Whittemore Road	634-23	Pembroke

Source: NH DES Public Water Supplies GIS Layer supplied to NH GRANIT, 1998

The remainder of the Town is served by private wells. From 1984 to 2002, the NH Department of Environmental Services has issued approximately 95 permits for installment of private wells in Pembroke. Table VII-3 shows an approximate break-down of these private water wells as they occur along particular Pembroke roadways. It is important to note that this list of private wells is not 100% complete in that a few private well installations may not have been reported to the NH Department of Environmental Services as is required, and data for wells installed before 1984 were not collected by state or local agencies.

Table VII-3
New Residential Wells Installed
By Road Occurrence, 1984-2002

Road Name	# Wells 1984-2002
Beacon Road	10
Belfry Court	1
Bombay Bridge Road	1
Borough Road	5
Brickett Hill Road	2
Buck Street	1
Church Road	9
Cross Country Road	18
Deer Path Lane	3
East Meadow Lane	1
8th Range Road	1
4th Range Road	15
North Pembroke Road	7
Pembroke Hill Road	2
Pheasant Run Road	1
Plausawa Hill Road	2
Rosedale Lane	7
Route 106	1
Route 28	2
Route 9	1
6th Range Road	1
3rd Range Road	4
Total	95

Sources: NH DES Well Inventory, 2003

Wellhead Protection Areas

In order to minimize potential opportunities for contamination of public water supplies, the NH Department of Environmental Services has implemented a regulatory strategy of limiting the types of land use activities which can occur in the vicinity of wellhead locations. This geographic area of limited land uses is known as a wellhead protection area. A typical wellhead protection area in New Hampshire is normally denoted by a 4000 foot radius around a public well location although it is not unusual for a wellhead protection area to have variable radii to suitably cover site specific local conditions. As may be seen on the ***Potential Threats to Water Resources Map***, for example, most of the state-assigned protection areas for wells located in Pembroke have variable radii.

Ponds and Lakes

The 5-acre Bragfield Pond is the one named pond that exists in the Town of Pembroke. Located between Brickett Hill and Beacon Hill Roads, the land around this water body is owned by the Town and managed by the Conservation Commission. In addition to Bragfield Pond, several smaller unnamed ponds can be found in other areas of Pembroke. Several of these appear to have been caused by beavers resulting in "beaver ponds."

Rivers

Pembroke is bordered by three rivers that travel through the Central New Hampshire Region. Much of the development in the Town has occurred along these river corridors. This is in part due to the historical dependence on the rivers for drinking water, their use as irrigation for farmland and as travel ways. A brief description of the three rivers bordering Pembroke follows.

The Soucook River acts as Pembroke's western border with the City of Concord. Though its banks are largely undeveloped, most of the land bordering the Soucook is currently zoned for commercial use and it is estimated that significant areas of this commercially zoned land will face development pressure in the near future.

The Suncook River forms Pembroke's southeastern boundary with Allenstown. In the *History of Barnstead* (Jewett, 1872), an early writer observed that the Suncook River had drainage so complete that it left no bogs or meadows along its banks and, perceiving the early settlement uses of the land, concluded that the environs of the Suncook River were a wonderful location for community-building and development. Because the river's significant fall in elevation in the vicinity of Suncook Village produced great water generated power, that area of Town saw the development of important commercial and industrial activities throughout the settlement period through the 1800's such as saw and grist mills, and cotton and wool spinning mills. Historically important to the Town of Pembroke, the presence of the Suncook River is central to the development and identity of Suncook Village, an unincorporated area uniquely shared by Pembroke and Allenstown. Jewett (1872) notes that the word "Suncook" is believed to be a Native American word meaning "the place where the wild goose rested."

Forming Pembroke's southwestern border with Bow, the Merrimack River acts to drain the entire central and south areas of the State of New Hampshire. Both the Soucook and Suncook Rivers empty into the Merrimack River.

Brooks

The 5.8 mile long *Ames Brook* begins its flow on the southeastern flank of Plausawa Hill in the northeast corner of Pembroke and is ultimately joined by four intermittent tributary streams before it empties into the Suncook River. Leaving the area south of Plausawa Hill Road, the brook shortly passes beneath North Pembroke Road and flows about 0.9 before it crosses beneath Cross Country Road. In another 1.2 miles it passes below Hardy Road. Continuing southeasterly in the low area between North Pembroke and Seventh Range Roads, Ames Brook passes through a small portion of the neighboring town of Epsom before coursing beneath Route 28 about 3.2. miles from Hardy Road. Shortly thereafter, the brook enters the Suncook River just south of the intersection of North Pembroke Road and Buck Street Extension (Old Route 28) dropping about 400 feet in elevation from its origin.

Pettingill Brook is composed of nine tributary streams which enter the main branch at regularly interspersed intervals along its 6.8 mile length. Pettingill Brook initially flows in a south direction starting about 0.3 miles west of Cross Country Road between the Sixth and Seventh Range Roads. About 0.3 miles to the southeast of this point, it crosses beneath Sixth Range Road and meanders to the southwest for about 1.3 miles until its passes beneath Kimball Road between Sixth and Seventh Range Roads. Continuing in the same general southeasterly direction, Pettingill Brook crosses beneath Sixth Range Road about 1.0 further downstream. In another 0.5 miles, it flows below Buck Street just to the north of Ryan Drive and shortly thereafter veers in a southwesterly direction after which it soon flows beneath Ryan Drive and enters the Suncook River about 0.7 miles south of Buck Street.

Hartford Brook begins in the environs of Pembroke Hill and Fourth Range Roads where two unnamed intermittent tributary streams unite to form the Hartford Brook mainstem. The 2.9 mile long Hartford Brook flows southeasterly beneath Church Road and Academy Road, ultimately crossing beneath Buck Street between Academy and Dearborn Roads, before entering the Suncook River shortly thereafter.

The 3.0 mile long *French's Brook* originates from the intermingling of two unnamed intermittent streams which flow a short distance westerly off the lower southern flank of Plausawa Hill in the vicinity between North Pembroke and Seventh Range Roads. A short distance further west, French's Brook picks up the flow of two more unnamed intermittent streams which originate on the west side of Plausawa Hill and eventually enter the north side of French's Brook to the east of Borough Road. French's Brook continues meandering westerly near the south side of North Pembroke Road for another 1.6 miles until it enters the Soucook River below Route 106 just south of Concord's Steeplegate Mall.

The 1.8 mile *Meetinghouse Brook* begins in the boggy wetland area surrounding Church Road between Pembroke Street and Cross Road. It is fed by several intermittent tributary streams as it flows generally northwesterly before reaching Pembroke Street (just south of Bow Lane). The brook thereafter continues in a westerly direction through the gully which is situated between Bow Lane and Donna Drive after which it flows beneath Nadine Road (just south of Donna Drive) before emptying into the Merrimack River just south of White Sands Recreation Area.

Watersheds

Pembroke is made up of three minor watersheds which are all contained within the larger Merrimack River Watershed. The eastern half of the town is located in the Lower Suncook River Watershed, accounting for approximately 7,365 acres of Pembroke's total land area. The Lower Suncook River Watershed encompasses the Suncook River and some of its tributaries such as Hartford Brook, Pettingill Brook and Ames Brook. The Soucook River Watershed accounts for 5,120 acres and is situated in the northwestern portion of Pembroke. Included in this watershed is French's Brook. A small area located in the southwestern area of town drains into the Merrimack River. This area is known as the Concord Tributaries Watershed and it accounts for 2,113 acres of land. Meetinghouse Brook is included in this watershed.

Because all surface water within a particular watershed drains as a unified hydrolic system, separate from any other neighboring watershed area, knowledge of watershed locations and how their drainage system works, combined with knowledge about under-lying water-bearing aquifers, plays a big role in helping town planners locate and protect town wells and regulate those surface land uses which could contaminate water resources.

Aquifers

The ***Water Resources Map*** shows the location of Pembroke's three stratified drift aquifers (or sand and gravel deposits which hold significant amounts of water) as identified by the United State Geological Service. All three local aquifers are directly linked to the three rivers that border the Town. As may be seen on the map, the largest aquifer occurs along the Soucook River. These aquifers provide a valuable resource as sources for public and private drinking water. In addition, most of the excavation of sand and gravel occurs in the stratified drift aggregate deposits which are located directly over the aquifers. These sand and gravel aggregate deposits are known to play an important role in filtering rain water as it passes through to the aquifer deposit below.

Wetlands

The National Wetlands Inventory (or NWI), performed by the United States Fish and Wildlife Service between 1986 and 1990, identified prime wetlands in the State of New Hampshire. The ***Topography and Wetlands Map*** shows the location of these wetlands in Pembroke. The highest concentration of wetlands occurs in the northeast section of town along Sixth Range Road and Borough Road.

Wetlands serve many ecological and environmental roles such as a source of wildlife habitat, recharge areas for aquifers, water purification and act as natural buffers for lakes and ponds. Due to the many benefits of wetlands this natural feature is viewed as a sensitive natural resource. The classification used by the National Wetlands Inventory is based on soil type, vegetative cover, and soil saturation and, taken together they form about 3.7% of all land cover in Pembroke. The NWI wetland categories are as follows:

Lacustrine
This is any lake or pond that exceeds twenty acres in size, or has a water depth of greater than 6.6 ft at its low water level. No lacustrine wetlands occur in Pembroke.

Palustrine
This category includes most vegetated wetlands. This includes all wetlands with a total area that is vegetated at a percentage greater to or equal to 30%. Palustrine wetlands account for approximately 72%, or 391.37 acres, of the total wetland area in the Town.

Riverine
This category includes all rivers, and streams and their associated saturated soils. Pembroke contains 150.53 acres of riverine wetlands.

Table VII-4
Wetland Acreage by Type

Type of Wetland	Acres
Palustrine	391.4
Riverine	150.5
Total	541.9

Source: National Wetlands Inventory

Hydric Soils
According to the draft *2003 Merrimack County Soils Survey* conducted by Natural Resource Conservation Services (NRCS), 12.3% (1791.15 acres) of Pembroke's total land area is comprised of hydric soils. The ***Water Resources Map*** shows the location of the hydric soils for Pembroke. As may be seen, these soils are closely tied to the brooks and streams that run through the Town. The hydric soils-based wetland categories are as follows:

Table VII-5
Hydric Soil Type by Acreage in Pembroke

Soil Type	Hydric	Acreage	Soil Type	Hydric	Acreage
Chocorua Mucky Peat	A	351.31	Pipestone Sand	B	119.502
Greenwood Mucky Peat	A	11.159	Ridgebury Fine Sandy Loam	B	169.685
Ossipee Mucky Peat	A	12.494	Ridgebury Very Fine Sandy Loam	B	186.238
Saco Mucky Silt Loam	A	76.306	Rippowam Fine Sandy Loam	B	77.356
Scarboro Muck	A	110.209	Walpole Very Fine Sandy Loam	B	593.282
Greenwood And Ossipee Soils	A	68.716	Lyme And Moosilauke Soils	B	14.891
Subtotal		*630.194*	*Subtotal*		*1160.95*
Total Acreage of Hydric Soil			1791.15		

Source: Natural Resource Conservation Services

Very Poorly Drained Soils (Hydric A)
Hydric A soils are those soil types in which water percolates downward so slowly that the water table remains at or on the ground surface for the greater part of the surface for the greater part of the time (9-10 months of the year). Very poorly drained soils occupy level or depressed sites, are frequently ponded, commonly have a thick, dark colored surface layer and have gray subsoil. Very poorly drained soils are comprised of muck, peat and ponded borohemists.

Poorly Drained Soils (Hydric B)
Hydric B soils are those soil types in which water percolates down-ward so slowly that the water table remains at or near the ground surface for a large part of the time (6-9 months of the year). These soils occupy nearly level to sloping sites, are ponded for short periods in some places, have a dark colored surface layer and have grayish colored subsoil which is mottled in most places. In Pembroke, different types of loams comprise the poorly drained soils.

Dams
There are 15 dams found in Pembroke according to the NH Department of Environmental Services. Table VII-6 provides a list of the dams found in Pembroke. The hazard classification shows the safety level for each of the dams listed. The classification is as follows:

Class AA
Failure would not threaten life or property. There are seven dams classified in this category.

Class A
Failure would result in a low hazard potential. There three dams classified in this category.

Class B
Failure would result in a significant hazard potential. There is one dam in this category the Webster Mill Dam.

Table VII-6
Dams in Pembroke

Map Index	Hazard Class	Name	River	Type	Status	Ownership
A		Suncook River Dam	Soucook River	Stone/earth	Ruins	Private
B	AA	Recreation Pond Dam	Unnamed Brook	Earth	Active	Private
C		Rousseau Dam	Unnamed Stream	Earth	Exempt	Private
D	AA	Farm Pond	State Game Farm Pond	Earth	Active	Private
E	AA	Plausawa Country Club Pond	Natural Swale	Earth	Active	Private
F	A	Buck Street West Dam	Suncook River	Earth	Active	State
G	AA	Wildlife Pond Dam	Hartford Brook	Concrete	Active	Private
H		Farm Pond Dam	Unnamed Brook	Earth	Exempt	Private
I	AA	Wildlife Pond Dam	Unnamed Brook	Earth	Active	Private
J		Farm Pond Dam	Unnamed Brook	Earth	Not Built	Private
K	AA	Rugged Acres Detention Pond	Runoff	Earth	Active	Town
L	AA	Sawmill Dam	Suncook River	Concrete	Active	Private
M	A	Pembroke Dam	Suncook River	Concrete	Active	Private
N	A	China Mill Dam	Suncook River	Concrete	Active	Private
O	B	Webster Mill Dam	Suncook River	Concrete	Active	Private

Source: NH Department of Environmental Services, 2003

Potential Threats to Water Resources

Because a large portion of Pembroke receives water from public water supplies the need to identify and mitigate potential threats to these water resources is very important. As discussed elsewhere in this Chapter, Pembroke's public water supply is drawn from aquifers underlying the town's land surface (see Table VII-2), while non-public water users make use of private wells (see Table VII-3). Also, surface water is used for a wide variety of recreational purposes and also provides habitat and a drinking water supply for natural fauna and is an important food supply for plant and vegetative life.

Threats to water supplies may stem from many different potential contaminant sources and each pollutant threat may affect water at a different stage of its movement from being water vapor in the atmosphere to being liquid groundwater. Simply put, water is not static or stays in a single place; it collects in the atmosphere and may be released to the ground as rain or fog after which it is either absorbed into the ground, collected by plants or begins to move across the ground surface until it is collected into a water body.

Ultimately, water flowing across the earth's surface becomes absorbed into underground aquifers or settles into rivers, streams and ponds where, if it is not impounded for a local purpose, will continue downstream eventually winding up in the ocean. Rainwater which reaches underground aquifer catchment areas may be pumped to the surface by public or private wells for use as a public water supply resource. Surface water may also be converted back to water vapor either by a process of evaporation or released from plants by a process of plant transpiration. In this way, through these "evapotranspiration" processes, ground water is returned to the atmosphere.

Water in the atmosphere or collected on the earth's surface often has many opportunities to encounter a large variety of potential contamination sources which could dramatically affect its quality. Mercury and other air-borne pollutants emitted into the atmosphere by coal-fired power plants may affect water vapor collected in clouds and be widely scattered, fertilizer runoff from agricultural fields can run into nearby streams, fecal material released from nonfunctional septic systems and gasoline or other chemicals spilled from commercial and industrial sites can leach into aquifer recharge and filtration areas and eventually reach and contaminate ground water. Thus, there is a essential need to identify, analyze, monitor and appropriately control potential point and non-point water pollution sources throughout the Town of Pembroke. Part of this identification and control process is currently being carried out by the New Hampshire Department of Environmental Services (NHDES) who are presently responsible for monitoring all public water supplies. There are, however, no regulations which scrutinize private water wells or the quality private well water. Thus, this chapter was developed in part to provide guidance so that the Town may have an accurate record of where local water resources are located, how these resources may be threatened, and what actions and programs should be put into place which will remove or mitigate the perceived sources of pollution.

Protection from Point Pollution Sources

A point pollution source is one where a particular pollutant is emitted into the atmosphere from a single, narrowly defined, place or point. Examples of point pollution sources may include sewer overflow pipes, leaking underground fuel tanks, above ground storage tanks, junkyards and hazardous spills. Also, if they are not properly maintained, public sewer or septic systems have the potential to become sources of point pollution.

Obviously, identification and control of point pollution sources is important in maintain-ing overall water quality for both surface water and ground water. Continued efforts should be made to identify and correct potential point source pollution generators in Pembroke. At the present time, NHDES has identified a list of 20 potential or known point pollution sites within Pembroke. They include above ground storage tanks, excavation sites, leaking underground storage tanks, and hazardous spills. Table VII-7 shows a list of the sites that have been documented and these points have been mapped and may be seen on the ***Potential Threats to Water Resources Map***. It is important to note that there is potential for undocumented sites to exist within Pembroke.

Table VII-7
Known Locations of Point Source Pollution

Hazard Type	Location
Above Ground Storage Tank	Rymes Heating Oils, Inc.
Above Ground Storage Tank	Pleasant View Gardens
Above Ground Storage Tank	Plourde Sand And Gravel
Exiting Landfill or Landfill Closure	Pembroke Landfill
Initial Response Spill	Donald Phipps
Isolated Groundwater Sample	Town Of Pembroke Water Works
Leaking Undergound Storage Tank	Kimballs Country Store
Leaking Undergound Storage Tank	S&B Auto. Serv.Inc./Pembroke Power Test
Leaking Undergound Storage Tank	Pembroke Highway Garage
Leaking Undergound Storage Tank	Gap Auto Parts
Oil Spills or Releases	Webster Mills Condominiums
On-Premise Use Facility Containing Fuel Oil	Pembroke Congregational Church
On-Premise Use Facility Containing Fuel Oil	Tirrell(Federal Home Loan Corp)
On-Premise Use Facility Containing Fuel Oil	Lemieux Residence
Underground Injection Control	Penn-Hampshire Lubricants
Underground Injection Control	Halvorsen Kennels
Underground Injection Control	P H Precision Products Corp
Underground Injection Control	Hyster New England Inc.
Underground Injection Control	The Kennel At Hemlock Hill Farms
Underground Injection Control	S&B Auto. Serv.Inc./Pembroke Power Test
Underground Storage Tank	Hyster New England Inc.

Source: NH Department of Environmental Services

Protection from Non-Point Pollution Sources

Because of an inability to identify the source of a contaminant, non-point pollution events are typically more difficult to control than point pollution sources. Non-point pollution usually occurs when water running over the ground surface becomes contaminated after picking up various pollutants. Sources of non-point contamination tend to be related to human activities such as farming, forestry and development that results in the creation of impervious surfaces such as paved roads and parking lots. One of the greatest known sources of non-point pollution is improper application of road salt. In most instances, potential non-point pollution sources may be mitigated by preventing the contaminated water source from being more widely dispersed. By controlling the location and amount of salt placed on the roads, for example, the potential for salt contamination can be minimized. And earthen berms erected between fertilized agricultural fields and abutting surface water resources such as rivers and streams may significantly lessen the potential of pollutants from entering the water supply.

Land Resources

Recent calculations indicate that, despite the fact that Pembroke has several highly visible and densely developed areas such as the Suncook Village district and its surrounding neighborhoods – which stretch out to the vicinity of Dearborn and Academy Roads – and the Route 3 (Pembroke Street) and Route 106 transportation corridors, approximately 41% of Pembroke's land still remains significantly undeveloped. These undeveloped rural areas, which are located away from the built-up sections of town where community infrastructure is located, are, for the most part, geographically situated within the central, north and northeastern parts of town which are surrounded by the perimeter Range Road system – a significantly intact rural environment typified by sparsely settled forested areas which contain many large-sized (50 acre+) parcels of land. Significantly, only 2% of Pembroke's undeveloped land has been permanently conserved.

One conclusion which can be drawn from this reality is that Pembroke's long-term plan to concentrate its primary community infrastructure (major roadways, water and sewer lines, police, fire, schools, etc.) along the Route 3 and Route 106 transportation corridors has succeeded as an inducement or stimulus in attracting into its immediate vicinity much of the town's recent commercial and residential development activity – thus keeping a significant amount of that development expansion from locating in the more rural areas of Pembroke where it would fragment the landscape and fill in the existing open spaces.

A second conclusion which can be drawn is that, because the Zoning Ordinance allows relatively small 1.8-acre minimum lot sizes in the R-3 district which comprises the rural areas of Pembroke, and because only a tiny portion (2%) of Pembroke's undeveloped land is protected from development, it is only a matter of time before subdivision of the town's many large-sized rural parcels takes place. This assessment is based on the know-ledge that the recent heavy influx of population into the southern New Hampshire and Greater Concord area, which has been well noted to have contributed greatly to land fragmentation and loss of undeveloped open spaces throughout the region via the suburban sprawl process, will not likely bypass Pembroke if current zoning rules are maintained. This looming suburbanization threat to Pembroke's largely undeveloped rural areas is being taken seriously by local planners who understand that the town's rural character and nature is being threatened; at present, however, Pembroke remains, geographically speaking, an essentially rural town containing significant amounts of undeveloped, wooded, open spaces where typical lot sizes are quite large.

Conservation Lands

The ***Conservation and Public Lands Map*** shows the location of all known conservation lands in Pembroke which, when combined together, have a total of 285.8 acres of land in permanent conservation. As noted above, this amounts to 2% of Pembroke's total land mass. A list of these parcels can be seen in Table VII-8.

Table VII-8
Conservation Lands in Pembroke

Name	Type	Map Lot #	Acres	Management	Public Uses
Belfry Court Conservation Easement	Conservation Easement	264-37-2	4.33	Town of Pembroke	Passive
Trebor Conservation Easement	Conservation Easement	565-257-4	3.5	Town of Pembroke	None
Scripture Easement	Conservation Easement	260-33	10	Town of Pembroke	None
Bragfield Pond Conservation Area	Conservation Easement	563-22	26.62	Town of Pembroke	Camping
Butterfield Tract	Conservation Easement	563-94	28.48	Town of Pembroke	General
Suncook River Property	Conservation Easement	266-171	0.24	Town of Pembroke	General
Schuett Conservation Area	Conservation Easement	264-32-1	7.29	Town of Pembroke	General
Town of Pembroke Conservation Parcels	Conservation Easement	567-1-1	2.95	Town of Pembroke	Subject to Town Restriction
White Sands Conservation Area	Conservation Easement	565-81-A	0.64	Town of Pembroke	Subject to Town Restriction
White Sands Conservation Area	Conservation Easement	565-81-B	32.5	Town of Pembroke	Subject to Town Restriction
White Sands Conservation Area	Conservation Easement	565-81-C	34.3	Town of Pembroke	Subject to Town Restriction
Whittemore Conservation and Recreation Area	Conservation Easement	939-67	135	Town of Pembroke	Subject to Town Restriction
Total Acres			285.9		

Source: 2001 Open Space Trail System Plan for the Town of Pembroke

Lands Of Additional Importance

In addition to parcels which are permanently designated for conservation, Pembroke has an additional 772.2 acres of land which, because of their nature and use, provides open space and recreational opportunities to the town even though they are not permanently designated as conservation lands. This list includes all parcels locally owned by the federal and state governments as well as the Town of Pembroke. Also included in this list are a few parcels owned by utility companies and private entities (see Table VII-9). In addition to these lands there are other undeveloped parcels in Pembroke which are not listed in Table VII-9 which may provide temporary conservation benefits; an example of this last type would be lands enrolled in the current use program.

Utility Parcels
These parcels are used for providing services to a town and they include power line corridors, public water supply sites and public sewer sites. Though these lands may be developed, they are often limited to confined areas where they may provide opportunities for the maintenance of open space. In some cases, the town may be able to utilize these lands for recreational purposes. Ownership of these parcels includes Public Service Company of New Hampshire (PSNH), the Pembroke Water Commission, Pembroke Hydro, and the City of Concord.

Private Owned Lands
There are several privately-owned parcels of land which have a history of maintaining open space and may provide recreational opportunities the most significant of these privately-owned lands is the Plausawa Valley Country Club, an 18-hole golf course which provides a combination of forested and open areas for wildlife.

State Owned Lands
The State owns eleven parcels of land in Pembroke many of which are utilized for varying purposes. These parcels range from .23 acres to 4.97 acres in size.

Town Owned Lands
The Town of Pembroke owns a number of parcels of land which are mostly small in size and developed. However, it does own a few larger sized parcels which, though partially developed, do contain open spaces. Included in this last category are the school lands and Memorial Field.

Table VII-9
Lands of Additional Importance

Name	Type	Map-Lot	Acres	Management	Public Uses
Concord Wellfield	Utility Parcel	559-8	50.00	City of Concord	None
Pembroke Water Commission	Utility Parcel	632-3	11.00	Town of Pembroke	None
Pembroke Water Commission	Utility Parcel	632-18	14.94	Town of Pembroke	None
Pembroke Water Commission	Utility Parcel	563-39	0.92	Town of Pembroke	None
PSNH Parcel	Utility Parcel	632-1	2.50	PSNH	None
PSNH Parcel	Utility Parcel	567-2	3.50	PSNH	None
PSNH Parcel	Utility Parcel	632-2	8.00	PSNH	None
PSNH Parcel	Utility Parcel	632-2	10.40	PSNH	None
PSNH Parcel	Utility Parcel	634-24	0.46	PSNH	None
PSNH Parcel	Utility Parcel	565-59	0.60	PSNH	None
Pembroke Hydro/Algonquin Power	Utility Parcel	VE-179	0.06	Pembroke Hydro	None
Pembroke Hydro/Algonquin Power	Utility Parcel	VE-185	1.06	Pembroke Hydro	None
Pembroke Hydro/Algonquin Power	Utility Parcel	VW-242	1.11	Pembroke Hydro	None
Pembroke Hydro/Algonquin Power	Utility Parcel	VW-243	0.19	Pembroke Hydro	None
Plausawa Valley Country Club	Private	634-2	141.80	Country Club	None
Plausawa Valley Country Club	Private	634-23	73.00	Country Club	None
Plourde Sand & Gravel	Private	634-3	12.50	Plourde Sand & Gravel	None
Plourde Sand & Gravel	Private	634-41	54.04	Plourde Sand & Gravel	None
Outdoor World	Private	632-8	20.00	Outdorr World	None
Suncook River Access	State of NH	870-19	2.00	NH Fish & Game	Unknown
State of NH Parcel	State of NH	256-16	4.04	State of NH	Unknown
State of NH Parcel	State of NH	256-17	0.72	State of NH	Unknown
State of NH Parcel	State of NH	256-18	0.35	State of NH	Unknown
State of NH Parcel	State of NH	256-19	4.97	State of NH	Unknown
State of NH Parcel	State of NH	256-20	1.86	State of NH	Unknown
State of NH Parcel	State of NH	256-26	0.35	State of NH	Unknown
State of NH Parcel	State of NH	563-5	0.34	State of NH	Unknown
State of NH Parcel	State of NH	563-99	0.00	State of NH	Unknown
State of NH Parcel	State of NH	870-15	0.23	State of NH	Unknown
State of NH Parcel	State of NH	870-17	2.00	State of NH	Unknown
State of NH Parcel	State of NH	870-23	1.80	State of NH	Unknown
Town of Pembroke Parcel	Town of Pembroke	262-23	17.50	Town of Pembroke	Unknown
Pembroke Academy	Town of Pembroke	264-46	42.00	Town of Pembroke	High School
Pembroke Hill School	Town of Pembroke	264-69	41.00	Town of Pembroke	Elementary School
Pembroke School District Land	Town of Pembroke	266-42	25.00	Town of Pembroke	Athletic Fields
Town of Pembroke Parcel	Town of Pembroke	559-13	4.00	Town of Pembroke	Open Space
Town of Pembroke Parcel	Town of Pembroke	561-34	9.00	Town of Pembroke	Unknown
Pembroke Grange Hall	Town of Pembroke	565-2	0.31	Town of Pembroke	Unknown
Town Hall	Town of Pembroke	565-256	2.99	Town of Pembroke	Town Offices
Lamiette Park	Town of Pembroke	VE-1	0.12	Town of Pembroke	Park
Pembroke Village School	Town of Pembroke	VW-187	10.12	Town of Pembroke	Pembroke Village School
Memorial Field	Town of Pembroke	VW-188	197.70	Town of Pembroke	Recreation Fields
Pembroke Town Garage	Town of Pembroke	VW-189	4.35	Town of Pembroke	Town Garage
Total Acres			778.83		

Source: 2001 Open Space Trail System Plan for the Town of Pembroke

Current Use

As of 2004, Pembroke private property owners have enrolled 9,022 acres – or 65% of all land in town– into the "current use" system, a property tax reduction program which allows owners of large lots (10+ acres in size) to significantly reduce their property taxes by shifting their the assessed valuation of their land from its "highest and best (or current market) value" to its "current use value". This "current use value" is the assessed valuation per acre of open space land based upon that land's current income-producing capability. This valuation is determined by the Town's assessor in accordance with the range of values established by the state Current Use Board and in agreement with the class, type, grade and location of a particular piece of land. The following types of private property are eligible for entry into the current use program:

"Farm land" – which means any cleared land which is devoted to, or which is capable of, agricultural or horticultural use as determined and classified by criteria developed by the Commissioner of Agriculture, Markets and Food and adopted by the Current Use Board.

"Forest land" – which means any land growing trees as determined and classified by criteria developed by the State Forester and adopted by the Current Use Board. For the purposes of this paragraph, the Current Use Board recognizes the cost of responsible land stewardship in determining assessment ranges.

"Open space land" – which means any or all farm land, forest land or unproductive lands as defined by this section. However, "open space land" shall not include any property held by a city, town or district in another city or town for the purpose of a water supply or flood control and for which a payment is made in place of taxes in accordance with RSA 72:11.

"Unproductive land" – means land, including wetlands, which by its nature is incapable of producing agricultural or forest products due to poor soil or site characteristics, or the location of which renders it inaccessible or impractical to harvest agricultural or forest products, as determined and classified by criteria developed by the Current Use Board. The Board has developed only one category for all unproductive land setting its current use value equal to that of the lowest current use value established by the Current Use Board for any other category.

"Wetlands" – means those areas of farm, forest and unproductive land that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Any "current use" lands which are developed or otherwise included in calculations for determining developable lands are required by statute to be taken out of the Current Use Program, in which case the Town is allowed to assess the owner of that land a Current Use Change Tax. Under state law, this tax may be assessed at up to 10% of the fair market value for that land. Acting from a concern that more local lands need to be permanently preserved from development, the 2002 Pembroke Town Meeting voted to place all future monies collected from Current Use Change Taxes into the town's Conservation Fund where it may then be used by the Conservation Commission to acquire and preserve land for open space and conservation purposes. Since that time, the Conservation Commission has begun a Land and Easement Acquisition Program which will target the most appropriate lands for preservation. In 2002, the total amount of money collected by the Town in Current Use Change Taxes was $97,600.

In 2003, the Town's Current Use program included 8,605.49 acres of land, or 60.9% of all land in Pembroke. Data for that year's Current Use program breaks down as follows:

Table VII-10
Land Use Change Tax Collected, 2000-2003

Category	Acres
Farmland	1,103.35
Forest Land	7,355.51
Unproductive Land	136.43
Wet Land	10.2
Total	8,605.49

Table VII-10A shows the Land Use Change Tax collected for land removed from Current Use for the four year period between 2000 to 2003. Although the monies collected have not been consistent, this does provide a source of income to the Town.

Table VII-10A
Land Use Change Tax Collected, 2000-2003

Year	Land Use Change Tax
2000	$21,752
2001	$100,617
2002	$158,230
2003	$50,340

Source: Pembroke Annual Reports

Agricultural Resources

Soils which qualify as farmland soils in Merrimack County are sorted into three categories by type: prime farmland soils, soils of statewide importance and soils of local importance to Merrimack County. These soils have been geographically located and digitally rendered by scientists at the County Natural Resources Conservation Service (NRCS) and are shown on the ***Agricultural Soils Map***. The soils information has also been broadly described by type in Table VII-11.

Table VII-11
Farmland Class by Acreage

Type	Acreage
Prime Farmland	650.0
Farmland of Statewide Importance	231.8
Farmland of Local Importance	1,105.1
Total	2,046.9

Source: Natural Resources Conservation Services

The three farmland soils types are typically described as follows:

Prime Farmland Soils

These soils are considered to be the highest quality farming soils and are considered to have national importance because they have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops.

Farmland Soils of Statewide Importance

These soils have properties that exclude them from the nationally important prime farmland list. They are, however, considered to be good agricultural soils which have significant importance to the State of New Hampshire; they are known to produce fair to good crop yields when properly treated and managed. As a general rule, erosion control and irrigation practices are required for these soil types to produce high-yield crops.

Farmland Soils of Local Importance

These soils are identified by the individual County agencies within the State of New Hampshire. Like prime farmland soils and farmland soils of statewide importance, these soils support the production of food, feed, fiber, forage and oilseed crops but they only produce fair to good crops when managed properly.

The following table provides a list of active farms in Pembroke. As of 2004, Pembroke has only two known active farms. The Green Gold Farm, a relatively small dairy operation, and the Grimes Farm; they are both located on Buck Street.

Table VII-12
Active Farms in Pembroke (by parcels)

Name	Map Lot	Acreage	Use
Green Gold Farm	266-144		Crops
Green Gold Farm	941-44		Crops
Grimes Farm	939-24		Dairy
Grimes Farm	939-17		Dairy
Grimes Farm	939-17-1		Dairy

Source: Subcommittee input

Forest Resources

There are a number of factors that determine the type of tree cover which occurs through-out Pembroke's abundant forested land areas and the chief of these factors is the soil type. As they have done with respect to identifying agricultural soils, the Natural Resources Conservation Services (NRCS) has developed an interpretation-based forestry soil type classification map for the entire state of New Hampshire and the locations of these soil types, which have been combined and sorted into soil groupings, are illustrated on the ***Forestry Soils Map***. A description of each group class, as defined by NRCS, follows:

Soil Group IA

This group consists of the deeper, loamy textured, moderately well, and well-drained soils. Generally, these soils are more fertile and have the most favorable soil moisture relationships. The successional trends on these soils are toward stands of shade tolerant hardwood, i.e., beech and sugar maple. Successional stands frequently contain a variety of hardwoods such as beech, sugar maple, red maple, white birch, yellow birch, aspen, white ash and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock and occasionally white pine. Hardwood competition is severe on these soils. Softwood regeneration is usually dependent upon persistent hardwood control efforts.

Soil Group IB

The soils in this group are generally sandy or loamy over sandy textures and slightly less fertile than those in group IA. These soils are moderately well and well drained. Soil moisture is adequate for good tree growth, but may not be quite as abundant as in group IA soils. Soils in this group have successional trends toward a climax of tolerant hardwoods, predominantly beech. Successional stands, especially those which are heavily cutover, are commonly composed of a variety of hardwood species such as red maple, aspen, paper birch, yellow birch, sugar maple and beech, in combinations with red spruce, balsam fir and hemlock. Hardwood competition is moderate to severe on these soils. Successful softwood regeneration is dependent upon hardwood control.

Soil Group IC

The soils in this group are outwash sands and gravels. Soil drainage is somewhat excessively to excessively drained and moderately well drained. Soil moisture is adequate for good softwood growth, but is limited for hardwoods. Successional trends on these coarse textured, somewhat droughty and less fertile, soils are toward stands of shade tolerant softwoods, i.e., red spruce and hemlock. Balsam fir is a persistent component in many stands, but is shorter lived than red spruce and hemlock. White pine, red maple, aspen, and paper birch are common in early and mid-successional stands and hardwood competition is moderate to slight on these soils. Due to less hardwood competition, these soils are ideally suited for softwood production and, with modest levels of management, white pine can be well maintained and reproduced. Because they are highly responsive to softwood production, especially white pine, these soils are ideally suited for forest management.

Soil Group IIA

This diverse group includes many of the same soils as in groups IA and IB. However, these mapping units have been separated because of physical limitations which make forest management more difficult and costly, i.e., steep slopes, bedrock outcrops, erosive textures, surface boulders and extreme rockiness. Usually, productivity of these soils is not greatly affected by their physical limitations. However, management activities such as tree planting, thinning and harvesting are more difficult and more costly. Due to the diverse nature of this group, it is not possible to generalize about successional trends or to identify special management opportunities.

Soil Group IIB

The soils in this group are poorly drained with the seasonal high water table generally within 12 inches of the surface. Productivity of these poorly drained soils is generally less than soils in other groups. Successional trends are toward climax stands of shade tolerant softwoods, i.e., spruce in the north and hemlock further south. Balsam fir is a persistent component in stands in northern New Hampshire and red maple is common on these soils further south. Due to abundant natural reproduction in northern New Hampshire, these soils are generally desirable for production of spruce and balsam fir, especially pulpwood. Red maple cordwood stands or slow-growing hemlock saw timbers are common in more southerly areas. However, due to poor soil drainage, forest management is somewhat limited. Severe wind throw hazard limits partial cutting, frost action threatens survival of planted seedlings, and harvesting is generally restricted to periods when the ground is frozen.

Town Forests

Pembroke has a number of parcels of Town owned land, some of which are used to house or otherwise accommodate various community facilities and schools. Additional Town-owned lands have been set aside for conservation purposes or for recreational and forestry uses. Although many parcels in the latter category are utilized for timber harvesting practices, the assessors' database only lists one Town forest in Pembroke, the Butterfield Tract, which accounts for 28.48 acres of land. Other forestlands owned by the Town include the Bragfield Pond Conservation Area, the Whittemore Conservation and Recreation Area and the White Sands Recreational Area which are not officially considered Town forests though there is potential for the Town to use them as such. The White Sands Recreational Area, for example, was subjected in 2003 to a selected timber cut.

Timber Harvesting

Timber harvesting occurs throughout the Town, although primarily this practice occurs in the large unfragmented tracts of land to the north, around the Range Roads, and along the Soucook River. Though the Timber Tax Revenue varies greatly from year to year, as seen in Table VII-13, this income can be beneficial to the Town as a source of income. In addition, when harvesting of timber is done correctly, the practice can continue without negative effects on the forest ecosystem.

Table VII-13
Timber Tax Revenue 1996 – 2003

Year	Timber (Yield) Tax Collected
1996	$9,431
1997	$11,575
1998	$7,532
1999	$11,906
2000	$9,684
2001	$2,622
2002	$22,792
2003	NA

Source: Pembroke Town Reports

Tree Farms

One method that has been implemented to assure good timber management practice is the development of the Tree Farm Program. The American Tree Farm System® (ATFS) is a program of the American Forest Society aimed at educating landowners how to manage their forests for multiple uses. Since 1941, members of the Tree Farm program have been educated on topics such as wildlife habitat, watersheds, soil conservation, and forest resources.

The ATFS indicates that to qualify for the program, landowners must:

- Dedicate at least 10 acres to growing and harvesting forest products;
- Have a written plan for the future management of their forest;
- Follow management recommendations prescribed by a licensed forester; and
- Demonstrate a commitment to stewardship of their forest for multiple values.

Though not mandatory, programs like this one may assure continued conservation of Pembroke's forests while providing for a consistent source of revenue.

Ecological Resources

Wildlife Corridors

Wildlife corridors, which play an important role in the conservation and preservation of wildlife species, are normally made up of unfragmented or minimally developed stretches of land which serve to provide animal species with safe travel and sustenance as they move from one location to another. Quite often, such a corridor will be water based such as when wildlife uses the riparian edge of a river or stream as a passage for travel. Though never surveyed as such, it is fair to say that Pembroke has many miles of flowing water resources whose immediate environs have the natural capacity to be used as a dependable travel corridor by a wide range of indigenous wildlife.

With respect to their long-term conservation, these water-based wildlife corridors face a wide variety of threats which are primarily related to disruptive land-development activities. We would note that these corridors may be preserved for the long term if the town considers adopting strategies to mitigate the established threats to these corridors. This could be possibly find broad community favor given that approximately 50% of community attitude survey respondents indicating their preference to discourage development along rivers.

In addition to undeveloped land and water-based wildlife corridors, Pembroke also has several human-made corridors which can be used for animal movement. Perhaps the most noted of these human-constructed passageways are the town's various power line and utility right-of-ways which can often provide a safe travel corridor for many animal species. The minimal development allowed within many of these normally narrow protected areas often provide good refuge for migrating wildlife.

Exemplary Natural Communities

The Natural Heritage Inventory identifies a single natural community within the Town of Pembroke – a "Terrestrial Community" which is made up of New England Pine Pitch and Scrub Oak Barrens. Other unexplored or defined areas may exist in the Town but they have yet to be identified.

Plant and Wildlife Species

Pembroke contains a rich diversity of plant and wildlife species which, in order to thrive, rely upon the amount, and number of different types, of available habitat in a given area. As a rule, a large-sized undeveloped and unstressed environment will attract and foster a wider and richer range of plant and wildlife species than will a developed, fragmented environment. Large tracts of open spaces are especially important for the proliferation of large wildlife species such as deer and black bear. Such tracts in Pembroke are primarily located in the central, northern and eastern sections of town.

Natural Heritage Inventory

Native species of flora and fauna have gradually decreased their numbers in the face of ever escalating development pressure which threatens their traditional habitat. Concerned about this situation, Pembroke's town planners regularly consider whether there are any threatened or endangered species or other natural communities present on or near an affected site whenever they review proposals to develop land. To acquire this information, they turn to *The New Hampshire Natural Heritage Bureau*, which is part of the State of New Hampshire Division of Forests & Lands. *The New Hampshire Natural Heritage Bureau* is responsible for finding, tracking and recording the rare plants, animals and natural communities in New Hampshire. To accomplish this, the *Bureau* works in conjunction with the New Hampshire Fish & Game Department's Nongame & Endangered Wildlife Program. The result of this state-level collaboration is the establishment of a document entitled the Natural Heritage Inventory, which is a list of all the rare plant, natural communities and rare wildlife species which are found in the State of New Hampshire. This list was last updated in June of 2003.

Table VII-14 identifies all flora and fauna identified by the Natural Heritage Inventory for the Town of Pembroke. As may be seen, each listed species is given a rank of importance which is based upon the distribution of that species within New Hampshire and within the entirety of its known range outside the state. The less frequent the species, the higher ranking that is given. The classifications are as follows: Highest Importance (HI) indicates species that are rare to nonexistent in New Hampshire and within its known range. Extremely High Importance (EH) are species that are rare in New Hampshire and in its entire range, though they are slightly more numerous than those in the HI category. Very High Importance (VH) species are rare within New Hampshire but may be more common throughout the entirety of its range. High Importance (H) species are rare to infrequent within the state though they may be somewhat more numerous outside the state in other areas of its range. The No Importance category indicates that although the species may be listed as endangered within New Hampshire, the species is not so threatened in other areas of its known range.

The Natural Heritage Inventory presently identifies only two endangered plants that, until a few years ago, were found in Pembroke though only one of these plant species, the Wild Lupine, is still known to exist in town. With respect to endangered wildlife, the Inventory lists eleven animal species as existing within the Town, of which three have been classified as "Threatened" within the State of New Hampshire. They include the Grasshopper Sparrow, the Pine Barrens Zanclognatha Moth and the Eastern Hognose Snake. One of the animal species, the Bald Eagle, is listed as Endangered at both the State and federal level. Of the fourteen listings of endangered species in Pembroke only one relates to a Natural Community – more specifically, the terrestrial natural community. This is the New England Pine Pitch/Scrub Oak Barrens which is ranked in the Highest Importance category. In all, ten of the fourteen Natural Heritage Inventory listings for Pembroke are considered to be of Very High Importance.

Due to their high level of sensitivity and to protect their exact location, these endangered species and natural communities are not point located on any maps provided by *The New Hampshire Natural Heritage Bureau*. What the town receives instead is a high-scale map which only approximately locates the species or community type as a broad, 1-mile wide, buffered area. Nonetheless, most of the endangered wildlife species which are listed in the Natural Heritage Inventory for Pembroke are generally found along the Route 106 corridor and further north along the western border of Pembroke.

Table VII-14
Natural Heritage Inventory, 2003

Type	Species or Community Type	Scientific Name or Community Name	Listed		# Reported in the Last 20 Years		Importance
			Federal	State	Town	State	
Plants	Wild Lupine	Lupinus perennis	-	T	5	38	VH
Plants	Golden-Heather	Hudsonia ericoides	-	T	Historical	12	
Birds	Bald Eagle	Haliaeetus leucocephalus	T	E	1	14	VH
Birds	Common Nighthawk	Chordeiles minor	-	T	1	10	VH
Birds	Grasshopper Sparrow	Ammodramus savannarum	-	T	1	10	VH
Insects	A Geometrid Moth	Eumacaria latiferrugata	-	-	2	3	VH
Insects	Apantesis carlotta	Apantesis carlotta	-	-	1	1	VH
Insects	Barrens Xylotype	Xylotype capax	-	-	1	5	VH
Insects	Pine Barrens Zanclognatha Moth	Zanclognatha martha	-	T	1	5	VH
Insects	Southern Pine Sphinx	Lapara Coniferarum	-	-	1	2	VH
Insects	A Noctuid Moth	Platyperigea meralis	-	-	1	2	
Reptiles	Eastern Hognose Snake	Heterodon platirhinos	-	T	1	15	VH
Reptiles	Spotted Turtle	Clemmys guttata	-	-	1	39	VH
Reptiles	Blanding's Turtle	Emydoidea blandingii	-	-	Historical	61	
Natural Communities	Terrestrial	New England Pine Pitch/Scrub Oak Barrens	-	-	2	16	HI
Codes: T – Threatened E – Endangered HI – Highest Importance VH – Very High Importance							

Source: NH National Heritage Bureau, July 2003

"Importance" categories:

HI = Highest Importance - species that are rare to nonexistent in New Hampshire and within its known range.
EH = Extremely High Importance – species that are rare in New Hampshire and throughout its natural range, though slightly more frequent than HI.
VH = Very High Importance – species that are rare in New Hampshire but may be more common throughout its entire range.
H = High Importance – species that are rare to infrequent in New Hampshire but which are frequent in other areas of its natural range.

No entry = No specified importance indicates that although the species is not endangered in other areas of its known range though it is considered to be endangered within the State of New Hampshire.

Viewsheds

Currently, the Town has not identified any viewsheds. However, on objective of this chapter will be to accurately identify and map these locations.

2001 Open Space Trails System Plan for the Town of Pembroke

Developed by the Pembroke Conservation Commission and the Trails Steering Commit-tee, with assistance from the Central New Hampshire Regional Planning Commission, this goal of this plan is to develop a private/public trails system for the enjoyment of residents and visitors. The plan's specific goals are as follows:

1. Inventory existing public lands, easements, rights-of-way, and trails;
2. Determine where linkages to existing public lands and trails should be obtained; and
3. Provide recommendations on (a) how to acquire or otherwise obtain the needed linkages and (b) how to maintain a public trail system.

With just under 50% of the Community Survey respondents wanting improved walking trails and 42.3% of respondents wanting improved bike trails, the development and utilization of the Open Space Trails System Plan should prove to be a valuable tool in achieving this goal.

NATURAL RESOURCE CONCERNS

Some of the most important natural resource concerns facing Pembroke involve the need to fully identify existing natural resources, developing and putting into action appropriate management plans to use or conserve those resources, and also educating the public about those resources. Many of the goals associated with this Chapter aim at satisfying these concerns.

Contamination of Water Resources

Although much of the town relies on public water supply for drinking water, there is an overall concern for maintaining high water quality throughout the town – and this concern includes private wells. A goal of this Chapter is to identify present and potential sources of pollution that may affect any surface and ground water resource in town. Though point pollution sources are easier to identify and mitigate, the desire to identify and alleviate non-point pollution source is also an important goal. Practical steps such as implementing local water testing programs, continuing hazardous waste days and "roadside" trash clean-up days as all tactics which helps to decrease potential pollution of water resources.

Development Sprawl

The concept of sprawl, as it applies to the southern New Hampshire region, refers to haphazard and widespread, automobile-dependent, low-density land development which occurs beyond the edge of traditional service and employment areas. Sprawl's noted effects on natural resources typically includes fragmentation of the landscape, increased potential for water contamination, permanent loss of traditional agricultural land and forested areas, and increased local property taxes to fund new community infrastructure which is needed to accommodate the needs of sprawl development. It is the goal of the Pembroke Planning Board to avoid this situation by channeling future development away from the town's most important rural areas where agriculture and forestry-related land uses have been deemed important and toward those areas of town which are medium to high density residential in nature and which already contain high capacity transportation corridors and a built up primary community infrastructure which is capable of handling new development.

Loss of Open Space

As discussed elsewhere in this Chapter, Pembroke's existing open spaces serve a number of important roles. For example, they act as critical wildlife habitat, they provide room for recreational fields and other leisure activities, and to the extent in which the wooded and exposed open spaces can be maintained and fostered into the future, they act to sustain the town's remaining rural character and quality of life. With this in mind, a goal of this Chapter is to identify those areas of town that are considered to have the most valuable open space resources and develop a conservation plan which would preserve into the future those open spaces that are deemed most important.

REGULATORY PRESERVATION TECHNIQUES

Pembroke currently employs many regulatory techniques that can aid in the conservation of its natural resources. By reviewing its existing regulations while also considering added regulatory measures, the Town can provide supplementary methods of natural resource conservation.

Open Space Conservation Zoning

Area: Town-wide, focused between 4th and 5th Range Roads and extending north of 4th Range Road between Flagg Road and Borough Road.

The intent of Open Space Conservation zoning would be to minimize the widespread development of new small-sized lots (2-acres or less minimum lot size) in areas of town where a traditional rural quality of life has been deemed important. Such zoning would be put into place as a response to the threat of suburban sprawl and the possible onset of large-sized "cookie cutter" subdivisions and for the purpose of maintaining Pembroke's longstanding rural character and improving the town's tax base. Areas designated for Open Space Zoning would typically feature minimum lot sizes in the range of 5-acres.

Timber and Agriculture Conservation Zoning

Area: Area surrounding Range Roads from Flagg Road to Buck Street and East of Buck Street

The purpose for Timber and Agricultural Conservation zoning would be to preserve Pembroke's last remaining agricultural fields and forested silvicultural areas from small lot-size building development through the creation of new land use zones in targeted agricultural and timber areas which would feature large-sized minimum lot sizes (between 5-50 acres).

Overlay Districts

Area: As appropriate for districts

The creation of overlay zoning districts is a technique which is already widely used by the Town of Pembroke to protect existing natural, historical and architectural resources. Typically, overlay zoning involves the targeting (or "overlaying") of certain resources in a geographical area with added land use or design protections to achieve a positive social good. An example of this would be the protection of important wetlands from destruction or the prevention of buildings and structures being constructed in known flood hazard areas).

Pembroke currently maintains the following six overlay districts:

Architectural Design District	Aquifer Conservation District
Floodplain Development District	Home Business District
Shoreland Protection District	Wetlands Protection District

Aesthetics-Based Land Use Regulations

Area: Town-wide

These types of planning regulations may be established whenever there is an important need to address aesthetic design issues within the community. Typical aesthetics-based land use policies can be used to regulate the visual look, feel and placement of new buildings and roadways, the design consequence of lot fragmentation that takes place during the subdivision process, judge the design and placement of signage and lighting, and regulate design changes which are proposed for historic residential and commercial structures. The Pembroke Planning Board currently employs a variety of aesthetics-based rules throughout its land use ordinances and regulations. In particular, aesthetically-based rules are currently found in the provisions of the Architectural Overlay District for Pembroke Street, the Cluster Subdivision Zoning provisions and the Site Plan Review regulations, all of which provide the Planning Board with the capacity to regulate appropriate aesthetic concerns.

Flexible Zoning

Area: Suncook Village Area

Flexible Zoning techniques typically provides the Planning Board with great flexibility in the application of land use and design regulations in order to assist in the positive design and building of a new development project. This type of zoning is an established feature within the zoning rules associated with the Soucook River Development District. Flexible zoning regulations should also be explored for the Suncook Village area due to the close proximity throughout that vicinity of commercial and residential land uses.

Phased Growth Plan

Area: Town-wide

New Hampshire towns may adopt phased growth-related regulations whose purpose is to control the rate at which a development project is constructed. In certain rapid growth situations, a town's capacity to slow the speed at which certain developments are constructed (by spacing, for example, the construction of a large project over a multi-year period) could provide the time needed for the town to adequately cope with the impact which that development would have on the town. Pembroke's Subdivision Regulations have provisions which allow the Planning Board to okay phased growth plans for approved subdivisions.

Growth Management Regulations - Limitations to the Number of Building Permits

Area: Town-wide

One way for a community to cope with unusual circumstances requiring prompt attention and for the purpose of developing or altering a growth management process under RSA 674:22, or a master plan or capital improvement program, is to adopt a growth management ordinance. One effect of such an ordinance could be to limit the number of new building permits that will be allowed in any given year until such a time that the goals of the ordinance are satisfied or the ordinance expires. The Town of Pembroke adopted such a plan in 2004 for the purpose of preventing large-scale subdivision activity during the period of time the Planning Board is updating its Master Plan. Typically, the number of building permits which are annually allowed under a growth management ordinance must be rationally correlated to the rate at which subdivision growth is occur-ring and building permits are being issued in the community.

NON-REGULATORY PRESERVATION TECHNIQUES

Conservation Easements

Area: Town-wide

A conservation easement is a permanent, legally binding, agreement that ensures that certain uses will never be allowed on that property. Typically conservation easements prevent development of land uses such as construction, subdivision and mining while at the same time promoting uses such as agriculture, forestry, wildlife habitat, scenic views, watershed protection and education. A conservation easement typically exists between a willing landowner and a qualified recipient, which can be the Town or State government or an appropriate conservation organization. Each such easement is tailored to the interests of the landowner, the receiving entity and the unique characteristics of the property. Land affected by a conservation easement can be sold or deeded by the original owner and subsequent owners but the easement is binding on all future owners.

Management Agreement

Area: Town-wide

Management agreements primarily focus on a particular feature of open space administration and such an agreement can be custom tailored to any specific situation, such as the following:

Right-of-Way for Trails

The Town may protect open spaces along a recreational trail corridor through the use of this type of management agreement. The right-of-way could be arranged and exist as a legal agreement between the Town or nonprofit organization and the owner(s) of the land where the trail is located.

Wildlife Corridors

Local private and public management plans which strive to protect open spaces associated with the natural movement and migration of wildlife is another practical use for management agreements. Typically, a management agreement for the protection or administration of a recognized wildlife corridor seeks to regulate how land in that corridor is used.

Buffers Between Uses

Written agreements which relate to the establishment and maintenance of buffer areas between incompatible land uses can be used to ensure that issues related to development and growth do not have a negative impact on the rural and scenic qualities that a valued by the Town.

SUMMARY

Pembroke has an abundance of natural resources deserving of preservation. Together, the Conservation Commission and Planning Board have an opportunity to conserve and manage these resources for the present and future generations of the community.