

Natural Resources Inventory

Town of Stratham, NH

October 2011

**Prepared by the Town of Stratham Conservation
Commission with support from the Rockingham
Planning Commission and grant funds from the
New Hampshire Coastal Program**

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A. Introduction

I. Purpose of the Natural Resources Inventory

The Town of Stratham is fortunate to have a diverse natural environment and a community that is willing to support its preservation. The Stratham Conservation Commission is committed to environmental education of the community, protection and management of natural resources, and to the preservation of open space. The rural agricultural character of the Town is an attribute identified by residents and Town officials as critical in supporting the highest quality of life to its citizens.

The greatest threat to this character is the over-development and over-use of Stratham's natural resources. An adequate base of agricultural resources and natural communities is necessary to preserve clean water, prime soils and diverse habitats for flora and fauna from which we all benefit.

This Natural Resources Inventory (NRI), created in cooperation with the Rockingham County Conservation District, was created to serve as a point of reference to identify areas of high ecological value. The NRI will allow the Conservation Commission to provide focused recommendations regarding the best ways to preserve natural resources to other agencies and boards, while allowing for a reasonable Town development strategy.

The purpose of this Natural Resources Inventory (NRI) is to:

- Map and describe significant natural resources in Stratham;
- Identify areas of high ecological value at the local, regional, and state level;
- Recommend options for the protection and management of natural resources in Stratham;
- Incorporate relevant reports and studies regarding natural resources in Stratham into one document.

Growth and development are critical issues facing Stratham. Due to its location in the fringe of the Boston metropolitan area, and proximity to the coast, Portland, ME, and the White Mountains, Stratham is an ideal location for access to all these popular areas. The conversion of farm and forestland to residential and commercial use has been a long-term trend. This transformation from a predominantly rural community to a suburban one is taking place across New Hampshire. It is anticipated that the State's population will increase more than 20% between 2000 and 2025, with most of the growth occurring in southeastern New Hampshire. The US Census Bureau showed Stratham's population grew from 6,355 in 2000 to 7,255 in 2010. It was only one of 10 communities in Rockingham County to see an increase in the under 18 years of age population, which increased 3.7%. Given this, Stratham is faced with the challenge of finding a balance between growth and the protection of the significant natural resources in the community. The rural and historic character of Stratham in combination with

the Great Bay estuary, rivers, salt marshes, forests, and farms provides a high quality of life for residents and an excellent habitat for native plants and animals.

Many communities, including the residents of Stratham, have acknowledged the impacts posed by growth and development and the need to conserve land for open space, food supply, recreation, wildlife habitat, and the protection of surface and groundwater quality and quantity. One example of this acknowledgement can be found in the 1998 Stratham Master Plan, which begins with the following Vision Statement:

“The Town of Stratham desires to maintain a well planned community with a rural residential and agricultural character, affordable housing, diversified but limited commercial and economic development, quality education, and protected natural and historic resources.”

The Master Plan goes on to make several other statements regarding natural resource protection, including:

- It is the policy of the Town of Stratham to protect Stratham’s natural resources, agricultural land and other open spaces by securing the development rights to important open space and conservation lands;
- The protection of open space in Stratham is necessary and desirable for a variety of reasons:
 - ✓ To help preserve the rural and residential character and overall quality of life in Stratham.
 - ✓ To help maintain a stable tax base by keeping a balance of residential and non-residential development as well as developed and undeveloped areas.
 - ✓ To protect the ecological health and diversity of the environment.
 - ✓ To protect groundwater recharge areas over identified aquifers.
 - ✓ To ensure that an adequate base of agricultural and forested land exists to support farm and forest uses.
 - ✓ To support outdoor recreation opportunities.
 - ✓ To complement regional open space plans.

In addition to stating support for natural resource protection in the Master Plan, Stratham residents voted at 2002 March Town Meeting to establish a \$5M bond for the purpose of purchasing conservation easements or open space land.

Given these statements of support for natural resource protection by Stratham residents, the Conservation Commission has developed this Natural Resource Inventory to guide and support natural resource protection in Town.

II. Description of Land Use in the Town of Stratham

The Town of Stratham is located in Rockingham County and encompasses 9,909 acres, of which approximately 254 acres is water. The New Hampshire Office of Energy and Planning (OEP) estimated the 2010 population to be 7,390.

Table 1
Stratham Population and Population Projections
1960 – 2030

Year	1960	1970	1980	1990	2000	2010	2020	2030
Population	1,033	1,512	2,507	4,955	6,355	7,255	8,020	8,580

* 1970 – 2010 figures from US Census Bureau; 2020 -2030 figures are projections from NH Office of Energy and Planning

Table 2 illustrates land use in Stratham in 2005. Despite the rapid growth and development experienced in Town in the 1980's, one third of Stratham remains forested, providing critical wildlife habitat as well as protection of water quality and quantity.

Table 2
Stratham Land Use 2005

Land Use	Acres	% of Town
Forested	3,060	30.9
Residential	2,415	24.4
Wetlands	1,643	16.6
Agricultural	934	9.4
Brush/transitional woodland	621	6.3
Transportation/communications	427	4.3
Water	254	2.6
Commercial	182	1.8
Outdoor	120	1.2
Industrial	113	1.1
Other agricultural land	89	.9
Disturbed	36	.4
Vacant	6	.1
TOTAL	9,909 acres	100%

B. Natural Resource Features

I. Topography

Topography in Stratham does not vary greatly, with the highest elevation of 290 feet found at Jewett Hill. There are four other hills above 200 feet in elevation: Stratham Hill, Long Hill, Bunker Hill and Rollins Hill. This type of topography is common in southeastern New Hampshire, where the hills are low and their sides generally not steep and the valleys are flat and often wetland. Like the rest of New England, Stratham was shaped by the movement of glaciers more than 10,000 years ago. The motion of the glaciers moved large amounts of rock and soil materials and smoothed the surface giving a more rounded appearance to the land. However, the glacier also left us with coarse, stony and often infertile soils.

By combining knowledge of the physical environment with what is known of the distribution of plants and animals, the U.S. Forest Service has divided New Hampshire into the following three principal biophysical or ecological regions or sections:

- Southern New England Coastal Plain and Hills Section (southeastern part of NH)
- Vermont-New Hampshire Upland Section (southwestern part of NH)
- White Mountain Section (Northern part of NH)

Stratham is located in the Southern New England Coastal Plain and Hills Section which can be further divided into three subsections:

- Gulf of Maine Coastal Lowland (immediate coastal region)
- Gulf of Maine Coastal Plain (southern portion)
- Sebago-Ossipee Hills and Plain (northern portion)

Stratham is in the Gulf of Maine Coastal Lowland, a subsection characterized by broad, hilly plateaus and drumlins leading to the coastal zone.

II. Soils

Understanding the nature and properties of soils is critical to managing and conserving our natural resources. Through its Soil Survey Program, the Natural Resources Conservation Service (NRCS) studies and inventories soil resources across the country. Soil scientists make this study in order to determine what soils are present, where they are located and how they can be used. Soil surveys contain information in the form of detailed soils maps, data tables and text narratives that can be used in order to determine appropriate uses for the land. Soil surveys also contain predictions of soil behavior for selected land uses and highlight limitations and hazards inherent in the soil and the impact of selected land uses on the environment. The

latter is especially important in Stratham because all development relies on on-site wells and septic disposal.

It is important to note that these soil survey maps are designed for general planning purposes and are not at a scale appropriate for site specific use. A site specific soils map should be done by a licensed professional soil scientist wherever there are concerns about the capability of the land for development.

The most recently published edition of the Rockingham County Soil Survey was issued in 1994. This information has been digitized into a GIS map by the Rockingham Planning Commission.

- Prime Farmland Soils – These are soils defined by the US Department of Agriculture as having the best combinations of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops, and are also available for these uses (the land could be cropland, pastureland, forest land, or other land, but not urban built up land or water). Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment. There are 2,671.7 acres of prime farmland in Stratham, 26% of the total acreage.
- Soils of Statewide Importance – This is land, in addition to prime farmland that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Criteria for defining and delineating this land are determined by the NH Department of Agriculture. Generally, these soils are nearly prime farmland that can economically produce high yields of crops when treated and managed according to acceptable farming methods. There are 1,903.3 acres of soils of statewide importance in Stratham, 19% of the total acreage.
- Wetlands Soils - These soils include Very Poorly (Hydric A) and Poorly Drained (Hydric B) soils. The areas are wet, since water moves through the soil so slowly that the water table remains at or near the surface of the ground for the greater part of the year. The reference to “very poorly” and “poorly” refers in part, but not exclusively to, the amount of time water remains at or near the surface. Very poorly drained soils generally occupy level or depressed sites, are frequently ponded, and commonly have soils with a thick dark colored surface layer and gray subsoil. Poorly drained soils occupy nearly-level to sloping sites, are ponded for short periods, have a dark colored surface layer with grayish, mottled subsoil. There are 636.6 acres (6%) of very poorly drained soils (Hydric A) soil, and 2,486.7 acres (25%) of poorly drained (Hydric B) soils in Stratham. Wetlands are discussed in greater detail in the Water Resources section of the NRI.

Recommendations for Protecting Soil Resources:

Soil types determine how land should and should not be used. It is important that land use decisions be based, in part, on accurate soils information.

- Identify and map prime wetland soils to protect the highest functioning wetlands in Stratham from development and disturbance.
- Identify and map all prime agricultural soils and soils of statewide importance.

III. Watersheds

A watershed is the geographic area of land that drains surface waters to the lowest point, such as a river or lake. The network of rivers, streams, and other tributaries is collectively known as the drainage system of a watershed.

Stratham is part of three regional watersheds, the Great Bay watershed, the tidal Squamscott River watershed, and the Coastal Watershed. The first two watersheds are part of the larger Piscataqua River Basin, while the Coastal Watershed is part of the larger Coastal River Basin.

- **Great Bay Watershed** – The Great Bay Watershed is approximately 117 square miles, covering portions of Stratham and eleven other communities. Stratham’s portion of the watershed is approximately 2,760 acres, which includes land in the Winnicut River sub-watershed. The Great Bay Watershed’s drainage system is formed by the convergence of seven major rivers - Salmon Falls, Cocheco, Bellamy, Oyster, Lamprey, Squamscott and Winnicut. At the heart of the watershed is the Great Bay Estuary. The estuary is considered to be the one of the largest and most productive estuaries along the east coast. Stratham has several watercourses draining into Great Bay: the Winnicut River, Foss Brook, Thompson Brook, Willow Brook, Brackett Brook, Winniconic Brook, Marsh Brook, and three unnamed streams labeled in the Master Plan as I, J, and K. Waterbodies within the watershed include Winnicut Mills Pond and Unnamed Ponds 1 and 2.
- **Squamscott River Watershed** - The Squamscott River Watershed is approximately 19 square miles, and includes portions of Stratham, Exeter, Newfields, and Newmarket. Stratham’s portion of the watershed consists of approximately 6,300 acres, which includes land in the Dearborn Brook sub-watershed. Significant watercourses in the watershed include the Squamscott River, Wheelwright Creek, Dearborn Brook, Parkman Brook, Winding Brook, Mill Brook, Jewell Hill Brook, and several streams. Waterbodies include Mill Pond and Unnamed Ponds 3 through 6.

- Coastal Watershed – The receiving waters of this watershed are the Piscataqua River and the Atlantic Ocean. The watershed consists of approximately 74 square miles in Stratham and nine other communities. Stratham’s portion of the watershed is approximately 92 acres. There are no significant watercourses or waterbodies within Stratham’s portion of the watershed.

It is important to note that with the support of Stratham residents and local officials that the Squamscott River was recently enrolled in the State of New Hampshire’s Rivers Management and Protection Program. This program provides Stratham residents with an opportunity to join residents of the eleven upstream communities on a local advisory committee. The committee is called the Exeter-Squamscott River Local Advisory Committee. For more information, contact the Rockingham Planning Commission at 778-0885.

In addition to these regional watersheds, Stratham is comprised of two smaller sub-watersheds. The first is the Dearborn Brook Sub-watershed which forms a portion of the Squamscott River watershed. The second is the Winnicut River Sub-Watershed which forms a portion of the Great Bay watershed.

- Dearborn Brook Sub-watershed – This sub-watershed encompasses approximately 776 acres within the Squamscott River Watershed, with Stratham’s portion consisting of approximately 510 acres. The sub-watershed is shared with Exeter, and Exeter relies on Dearborn Brook to feed the Town’s municipal water supply reservoir off Portsmouth Avenue. Other than Dearborn Brook and Wheelwright Creek, there are no other significant waterbodies or watercourses within this sub-watershed.
- Winnicut River Sub-watershed - This sub-watershed covers roughly half of the larger Great Bay Watershed. Stratham’s portion consists of approximately 2,070 acres. Streams in the sub-watershed flow into the Winnicut River, which flows on into Great Bay. Significant streams include the Winnicut River, Thompson Brook, Willow Brook, Winniconic Brook, Marsh Brook, and three unnamed streams. Significant waterbodies include Winnicut Mills Pond and two unnamed ponds.

Table 3
Waterbodies in the Town of Stratham
Ponds, Rivers and Streams

Pond	Surface Area (Acres)	Watershed	Impounded (dammed) or Free flowing
Mill Pond	3.0	Squamscott River	Impounded
Peat Pond	12.0	Squamscott River	Free flowing
Winnicut Mill	3.0	Great Bay	Impounded
Unnamed Pond #1	3.0	Great Bay	Impounded

Unnamed Pond #2	2.0	Great Bay	Free flowing
Unnamed Pond #3	6.0	Squamscott River	Free flowing
Unnamed Pond #4	3.0	Squamscott River	Free flowing
Unnamed Pond #5	2.0	Squamscott River	Free flowing
Rivers and Streams	Length (Miles)	Watershed	Impounded (dammed) or Free flowing
Squamscott River	5.2	Squamscott River	Free flowing
Jewett Hill Brook	2.2	Squamscott River	Free flowing
Wheelwright Creek	0.1	Squamscott River	Free flowing
Mill Brook	3.6	Squamscott River	Impounded
Parkman Brook	2.2	Squamscott River	Free flowing
Winding Brook	0.9	Squamscott River	Impounded
Winnicut River	1.0	Winnicut River	Free flowing
Thompson Brook	0.6	Winnicut River	Free flowing
Willowbrook	0.7	Winnicut River	Free flowing
Marsh Brook	0.8	Winnicut River	Free flowing
Foss Brook	0.2	Great Bay	Free flowing
Brackett Brook	0.1	Great Bay	Free flowing
Dearborn Brook	0.5	Dearborn Brook	Impounded

IV. Salt Water Resources

Great Bay Estuary - The Great Bay Estuary is Stratham's most significant salt water resource. Covering 17 square miles with nearly 150 miles of tidal shoreline, Great Bay is unusual because of its inland location, more than five miles up the Piscataqua River from the Atlantic Ocean. Oysters, clams, and lobsters are harvested from these waters, as well as striped bass, bluefish, herring and smelt. Ducks, geese and bald eagles spend the winter on the Bay's open waters.

Great Bay is part of the National Estuarine Research Reserve System (NERRS), a nation-wide network of state owned and managed coastal protected areas. The sites represent the diverse estuarine and estuarine-like systems of America's coasts, setting them aside for long-term research and management based on biogeographic regions. The mission of NERRS is to promote informed management through linked programs of stewardship, public education, and scientific understanding.

Designated in 1989, Great Bay Reserve's primary purpose is to promote the wise use and management of the Great Bay Estuary. Encompassing over 25,000 acres of tidal waters and uplands, the Reserve is part of the Atlantic flyway and located in the Arcadian bioregion.

Growth and development in Stratham and other communities in the watershed have greatly impacted the Estuary's ecosystem. Impervious surfaces such as roads, parking lots, rooftops and structures and development along the shoreline have increased the amounts of sediments

and pollutants entering the Bay. Land use decisions made in Stratham and watershed communities can help restore and maintain the many benefits derived from the Great Bay Estuary.

The Piscataqua Region Estuaries Partnership (PREP) is actively monitoring water quality in the Great Bay Estuary. PREP is part of the US EPA's National Estuary Program, which is a joint local/state/federal program established under the Clean Water Act with the goal of protecting and enhancing nationally significant estuarine resources. PREP receives funding from EPA and philanthropic sources and is administered by the University of New Hampshire. Every three years, PREP produces a State of the Estuaries report, with the most recent report released in 2009. The report highlights the status and trends of several key environmental indicators for the coastal watershed, Great Bay estuary, and Hampton/Seabrook harbor. The 2009 Report states the environmental quality of Great Bay is declining, with eleven of twelve environmental indicators showing negative or cautionary trends, including an increase of 42% in the nitrogen load to the Great Bay in between 2004 and 2009. The most recent report may be viewed at: http://www.prep.unh.edu/resources/pdf/2009_state_of_the-prep-09.pdf.

Water quality monitoring along the Winnicut River in Stratham and other rivers entering Great Bay is conducted by the NH Department of Environmental Services in partnership with the Winnicut River Watershed Coalition. On-going sampling of water quality is conducted to understand trends in river quality. The sampling site on the Winnicut River is at the bridge on Route 33.

Salt Marsh Natural Communities – Salt marshes are naturally occurring wetlands found within estuarine intertidal zones along the coast where there is shelter from high-energy ocean wave action, such as the southern shore of Great Bay in Stratham. Together with the estuaries they occur in, salt marshes are among the most biologically productive systems on earth and support a vast array of plants and animals, including many species of migratory birds.

An estimated 30-50% of New Hampshire's original salt marsh habitats have been lost to development. In the early 1900s, the majority of coastal salt marshes in New England were ditched as part of an aggressive mosquito control program. In an attempt to eradicate mosquito-breeding habitat, the ditches drained the open water necessary for a healthy salt marsh. The absence of mosquito-eating fish on the salt marsh surface allows high numbers of mosquitoes to breed and hatch, which necessitates spraying throughout the summer to control mosquito populations. The elimination of open water by ditching has also resulted in the disappearance of critical habitat necessary for black ducks, wading birds, shorebirds, shellfish, and fish.

- **Stuart Farm Salt Marsh** – In the early 1960's, a wooden bridge along the Stuart Farm access road was replaced with an 18" tide-gated culvert, restricting natural tidal flow to a 12 acre salt marsh and drastically altering the vegetation and habitat. In 1993, the landowners worked with the Natural Resources Conservation Service and other partners to install a large metal arch culvert to restore tidal flow to the marsh, resulting in the

return of salt marsh vegetation and anadromous fish habitat. The metal culvert has since failed to function properly and an effort to install a new HDPW culvert has been completed.

- **Wiggin Salt Marsh** – The Town of Stratham permanently protected this 31 acre tidal salt marsh hay farm in 2005. The salt marsh along the Squamscott River can be viewed from Squamscott Road.

Recommendations for Protecting Salt Water Resources:

- Educate shoreland residents about the State’s Comprehensive Shoreland Protection Act and the land use restrictions required by the Act, which are designed to protect water quality and its dependent estuarine ecosystem. Information for homeowners on the Shoreland Protection Act may be found at the following website:
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/cspa_brochure.pdf
- Educate all residents about the Great Bay estuary and the critical and unique wildlife habitat it provides. Information on Great Bay may be found at the following website:
<http://www.greatbay.org/>
- Educate residents about sources of nitrogen in the watershed and the negative impacts of nitrogen on the ecosystem health of the Squamscott River and Great Bay.
- Continue to partner with land conservation organizations in the region to protect critical areas in Stratham identified in the Land Conservation Plan for New Hampshire’s Coastal Watershed. Information on the Land Conservation Plan may be found at the following website:
<http://www.rpc-nh.org/coastal-conservation.htm>
- Actively participate on the Squamscott/Exeter River Local Advisory Committee by designating an individual to represent the Conservation Commission.

V. Freshwater Resources

Stratham’s fresh water resources consist of a hydrologically connected system of rivers, streams, brooks, small ponds, wetlands, and groundwater. The Town’s surface and groundwaters are intricately interconnected. In some locations and under some conditions, the surface waters recharge the groundwater and in other locations and conditions, the groundwaters feed our rivers, ponds, wetlands and streams and keep surface waters flowing even during droughts. The quality and quantity of one can significantly affect the other.

Buffers, land alongside rivers, streams and ponds, should be left in a naturally vegetated state to protect water quality and wildlife habitat. Vegetation growing along the shore filter pollutants from runoff, promoting groundwater infiltrations, and stabilizing stream banks to control erosion.

Table 4
Riparian Buffer Requirements
Source: Center for Watershed Protection

Function	Minimum Buffer Width
Bank stabilization	50 feet
Sediment control	150 feet
Flood control	200 feet
Wildlife habitat	300 feet

It is important to note that the buffer should be wider if the adjacent land is sloped, if the land use is intensive, if the soils are erodible, if the land is a floodplain and if the stream or river naturally meanders.

The quality of water and habitat in rivers and streams depends upon surrounding land uses and management practices. Sediment from erosion destroys spawning habitat and fills stream beds. Removal of trees and other streamside vegetation raises water temperatures and can destroy habitat for trout and many other species upon which fish depend.

Recommendations for Protecting Surface Freshwater Resources:

- Protect riparian corridors, especially vegetated buffers, to maintain water quality and wildlife habitat.
- Educate the public about non-point pollution from road salt, pesticides, fertilizers, pet waste, animal waste, automotive oils and fuels, sediment and other pollutants which contaminate stormwater runoff.
- Educate residents about sources of nitrogen and the impacts rising nitrogen levels are having on Great Bay.
- Protect undeveloped areas of river and stream frontage.
- Partner with land conservation organizations in the region to protect critical areas identified in the Land Conservation Plan for New Hampshire's Coastal Watersheds.

- Partner with the Winnicut River Watershed Coalition to on water quality monitoring, public education programs, and other efforts designed to raise understanding of issues impacting this primary tributary to Great Bay.
- Prevent the spread of invasive exotic aquatic plants such as milfoil, fanwort, water chestnut and purple loosestrife to uninfected lakes and ponds through education and by monitoring at boat launches, and provide residents with educational programs on how to safely remove invasive plants that have already taken hold. Information on invasive plant species in New Hampshire may be found at the following website:
<http://extension.unh.edu/Forestry/Docs/invasive.pdf>

VI. Vernal Pools

Vernal pools are temporary bodies of water created by melting snow and spring rains. Vernal pools may vary in size from a few square feet in area to over a number of acres and may be located in a number of different sites – woods, floodplains or gravel pits—they do have certain features in common. Although they appear in the same place year after year they are defined as a temporary bodies of water because most dry up in hot weather or times of drought. All of them are contained bodies of water without any permanent outflow. They do not support fish and are therefore excellent breeding grounds for species whose eggs would provide an excellent food source were fish present. Some species are so dependent on vernal pools for their survival that their very presence is taken to establish that a particular basin of water is indeed a vernal pool. Not surprisingly, these are known as indicator species.

An essential inhabitant of vernal pools is the fairy shrimp. These are tiny crustaceans that are found throughout the country. They are the earliest creatures to be seen in the spring, often appearing in March when their early mating leaves eggs on the floor of the pool. These are designed to survive drying out, intense heat, freezing, and even being eaten by birds and, despite everything, will hatch the following spring when the pool is once again filled with water. Should there be a dry spell that prevents this from occurring, the eggs are prepared to wait out the weather.

Some amphibians are also indicator species of vernal pools. Indicator species in New Hampshire are the spotted salamander and the wood frog. Wood frogs are one of the earliest creatures to be seen in the spring, often appearing in March, when their early mating makes it possible for the eggs to develop before the pool dries up. The wood frog call sounds very much like the quacking of ducks and is an early sign of spring. This frog is brown with a black mask, and is often seen in the woods during the summer.

Spotted salamanders lay their eggs in vernal pools as well and migrations of salamanders to breeding areas usually take place after the first heavy rain in early spring. Although both the spotted salamander and the wood frog may be found mating in more permanent waters, eggs

laid in vernal pools have the best chance of surviving. The spotted salamander will often lay her eggs in October and, if the pool is still dry, will stay with them keeping guard until Fall rains arrive.

Many other species use vernal pools although they do not have the same dependency upon them. Among the amphibians the species are four-toed salamander, Eastern newt, spring peeper, American toad, the gray tree frog, and the green frog. Among the invertebrates, there are clam shrimp, fingernail clams, and amphibious snails, caddis flies and other aquatic insects. Although no reptile is among the indicator species, the spotted turtle, the earliest turtle to appear in the spring, sometimes moving about in March, often uses such pools as a source of food and a place for courtship and mating. Blanding's turtles have been known to overwinter in vernal pools, and have been identified in Stratham Hill Park. Both of these species are endangered in New Hampshire and their appearance is of special interest to the Non-Game and Endangered Species Division of New Hampshire Fish & Game. Information on reporting reptiles and amphibians observed in the wild may be found at the following website:
http://www.wildlife.state.nh.us/Wildlife/Nongame/reptiles_amphibians.htm

Recommendations for Protecting Vernal Pools:

Vernal pools provide a unique type of wildlife habitat and are crucial breeding grounds for a number of amphibians. As such, efforts should be made to protect this habitat and the species that it supports. Some methods to accomplish this goal include:

- Identify and map vernal pools on subdivision plans and site plans in order to provide an opportunity to mitigate the impacts to these sensitive areas.
- Education, including a brochure for residents about Stratham's land use regulations and conservation policies.
- Keep log landings, roads and trails out of vernal pools and the area adjacent to them. Busy roads near a vernal pool can lead to massive annual mortality and local extinctions.
- Maintain shade around a vernal pool in order to keep it from drying up too quickly and to maintain water temperatures.
- Keep slash out of a vernal pool during forestry operations and during development.
- Maintain the upland (non-wetland) habitat where many vernal pool dependent species spend most of their life cycle.

VII. Groundwater Resources

Stratham residents receive their drinking water almost entirely from groundwater sources. Aquarion Water Company also withdraws groundwater for the Town of Hampton from a well site in Stratham and relies on Stratham's water sources to recharge its water systems. Aquifers are concentrations of groundwater and those having medium to high potential to yield groundwater occur in the seacoast area as alluvial deposits of sand and gravel or in bedrock fractures. The sand and gravel deposits are called "stratified drift aquifers" and typically yield more groundwater than bedrock fractures. The major source of recharge to these aquifers is through precipitation filtering directly down into the aquifer. A 1992 study by the U.S. Geological Survey identified five stratified drift aquifers within Stratham.

- Stratham Hill Aquifer – is approximately 743 acres and is located in the northeastern end of Town between Stratham Lane and Winnicut Road. A small portion of the aquifer underlies Greenland. Aquifer recharge is via wetlands at the surface and precipitation.
- Bunker Hill Aquifer – is approximately 873 acres and is located entirely in Stratham along Bunker Hill Avenue. Aquifer recharge is via wetlands at the surface and precipitation.
- Winnicut River Aquifer – is approximately 397 acres and underlies Stratham, Greenland and North Hampton. Aquifer recharge is via wetlands at the surface, precipitation, and the Winnicut River.
- Skinner Springs Aquifer – is approximately 40 acres and is located in Stratham and Exeter between Portsmouth Avenue and Stratham Heights Road. Aquifer recharge is via wetlands at the surface, precipitation, and Skinner Springs.
- Guinea Road Aquifer – is less than 40 acres and is located in Stratham and Exeter, just southeast of Guinea Road. Aquifer recharge is via wetlands at the surface and precipitation.

Groundwater quality can be impaired by a variety of materials. Sources of groundwater contamination include landfills, commercial and industrial wastes, agricultural fertilizer, failing septic systems, and road salt. Groundwater quantity can be reduced by contamination of groundwater supplies, over-pumping in the aquifer zone, and increasing impervious surfaces such as roof tops, roads, and parking lots. These surfaces prevent the infiltration of precipitation into the ground.

Impervious Surfaces - When a watershed is increasingly covered with pavement, buildings, and other compacted surfaces that are impervious to water, significant changes in water quality and quantity result. When rain falls on impervious surfaces, it runs off faster into surface waters, carrying with it sediment and pollutants from road surfaces, lawns, construction sites, and parking lots. Flooding, warming water temperature, and channelization of streams are the

result. Infiltration of rainfall into the ground to replenish groundwater is reduced, reducing the quantity of groundwater available for withdrawals for drinking water.

This type of run-off, called “non-point source pollution”, is now the most serious threat to water quality for New Hampshire and for Stratham. Low impact construction and site designs that promote retention and infiltration of rainwater and runoff, narrower streets and driveways when possible, shrub and tree buffers to waterways, and more compact development patterns can protect Stratham’s water quality and quantity as the Town grows.

Studies conducted in the northeast have documented that by converting as little as 10% of a watershed to impervious surfaces, stream water quality and organisms begin to deteriorate. Above 25% impervious surface, water quality is seriously degraded.

The Piscataqua Region Estuaries Partnership (PREP) and UNH Complex Systems Research Center studied the degree of impervious surface cover in the coastal watersheds over the period 1990 - 2005. These analyses showed that the average impervious surface cover in Stratham was 6.5% in 1990, 10.1% in 2000, and 12.5% in 2005.

Numerous agencies are currently studying groundwater resources in Southeastern New Hampshire. The New Hampshire Coastal Program, New Hampshire Department of Environmental Services, New Hampshire Geological Survey and the U.S. Geological Survey are researching the availability of groundwater resources in Stratham and surrounding communities. Population increase and associated development have resulted in an estimated 50% increase in the use of groundwater and surface water resources for drinking water as well as industrial and other uses. To gain a better understanding of how much groundwater is available in the region, researchers are quantifying water storage and water movement in groundwater and surface water systems. Results from the study should be available in 2009 and will provide Stratham with site specific information on groundwater resources as well as groundwater use.

Stormwater - Stormwater is a term used to describe water that originates during precipitation events. It may also be used to apply to water that originates with snowmelt or rain. Stormwater that does not soak into the ground becomes surface runoff, which either flows into surface waterways or is channeled into storm sewers. The US EPA established the National Pollutant Discharge Elimination System (NPDES) to identify sources of stormwater pollution and other contaminating discharges.

Stormwater is of concern for two reasons, flooding and pollution. The volume and timing of runoff can impact flood storage and control, and stormwater runoff can also flush potential contaminants from roads and parking lots into surface waters.

The treatment and management of stormwater becomes increasingly important with the increasing amounts of impervious surface cover in Stratham and surrounding communities. Two important resources exist for aiding in stormwater management: the US EPA, which

established the National Pollutant Discharge Elimination System (NPDES) to identify sources of stormwater pollution and other contaminating discharges, and the University of New Hampshire Stormwater Center, which serves as a local resource to communities on stormwater management.

- **NPDES Program** - Polluted stormwater runoff is commonly transported through Municipal Separate Storm Sewer Systems (MS4s), from which it is often discharged untreated into local waterbodies. To prevent harmful pollutants from being washed or dumped into an MS4, the EPA requires operators or municipalities to obtain a NPDES permit and develop a stormwater management program.

U.S. Towns and cities fall under one of two permit categories in this program: Large MS4 Individual Permit (municipalities with populations over 100,000) and Small MS4 General Permit (municipalities under 100,000). The Town of Stratham is enrolled in the Small MS4 General Permit program. Under this permit Stratham strives to fulfill the suggested Best Management Practices (BMP) for six required minimum control measures. These six measures include: Public Education and Outreach; Public Participation and Involvement; Illicit Discharge Detection and Elimination; Construction Site Runoff Control; Post Construction Runoff Control; and, lastly, Pollution Prevention/Good Housekeeping.

Recommendations for Protecting Groundwater Resources:

- Require that stormwater and meltwater be retained and treated on site when land is developed.
- Raise public awareness on reducing non-point source pollution from pet waste, fertilizers, pesticides, gasoline, automotive oil, antifreeze, and other hazardous wastes. The public should also understand the importance of aquifer recharge.
- Modify the Stratham Zoning Ordinance to prohibit or restrict new potential contamination sources from locating in a wellhead protection area.
- Continue to hold but more widely advertise an annual household hazardous waste collection program for residents; add options for convenient disposal at Transfer Station for used oil and mercury products.
- Continue land conservation and protection efforts along rivers and streams, including reviewing land use ordinances, monitoring of storm drain markers, maintenance of signs, updating of stormwater sewer maps, and continue screening outfalls for illicit discharges.

VIII. Wetlands

Wetlands, as defined by the Environmental Protection Agency, the NH Department of Environmental Services and the Stratham Zoning Ordinance are those areas that are inundated or saturated by surface or groundwaters at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation adapted for life in saturated soil conditions. Thus a wetland is defined by the presence of all three “H’s”: hydrophytes or wetland vegetation, hydrology and hydric soils.

Wetlands are an integral part of Stratham’s natural resources. They are important for removing excess nutrients and sediment from the water, slowing and storing floodwaters, promoting groundwater infiltration, and providing habitat for a variety of vegetation and animal life. In addition, wetlands provide recreational, educational and research opportunities. They add to the visual resources of the Town, especially in the fall when the red maples turn scarlet. Wetlands are most often found along streams and adjacent to ponds and lakes. They can be found in clustered complexes that are of great value. Vernal pools are a special type of wetland that dry out completely in the summer and have no fish population.

There is a diversity of wetland types in Stratham, including areas of open water with emergent vegetation such as cattails, forested wetlands, and scrub-shrub wetlands. The principal types of wetlands with standing water in the spring have been mapped from aerial photos by the National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service. The NWI wetlands do not include all wetlands, particularly those that do not typically have standing water in the spring. Therefore, this is an underestimate of the amount of wetlands. The more significant, wetlands, however, are included in the NWI.

The NWI classification codes for Stratham describe the dominant vegetation type as well as the hydrology of each wetland. For the purposes of this map, these codes were categorized by the dominant vegetation type.

- **Emergent wetlands** are those wetlands with non-woody vegetation that grows above the land and/or water surface. Cattail marshes are one example of emergent wetlands.
- **Forested – deciduous wetlands** are wetlands with deciduous trees as the dominant vegetation type. Red maple swamps are one example of forested – deciduous wetlands.
- **Forested – evergreen wetlands** are wetlands with evergreen trees as the dominant vegetation type. Hemlock, balsam fir and white cedar are examples of evergreen trees that might be dominant in a forested – evergreen wetland.
- **Forested – dead wetlands** are wetlands where a once forested wetland has been flooded (usually by a beaver impoundment) and the standing trees are dead. These wetland types often become nesting areas for great blue herons until the trees fall down and the impounded water becomes densely vegetated.

- **Deciduous – shrub wetlands** are wetlands where the dominant form of vegetation is deciduous shrubs. Highbush blueberry, silky dogwood, sweet gale and winterberry are common deciduous shrubs in Stratham wetlands.
- **Evergreen – shrub wetlands** are relatively uncommon. These wetland types are dominated by shrubs that do not lose their leaves. Leatherleaf and labrador tea are broadleaf evergreen shrubs. Other evergreen shrubs might be balsam fir, black spruce and other evergreen trees that have not yet reached tree size.
- **Unconsolidated bottom wetlands** are those wetlands with open water over most of the surface area of the wetland. Vegetation may grow in these wetlands below the surface of the water and/or may float on the water but is typically not visible early in the growing season when the aerial photography used to classify wetland types is taken.

The areas and number of each wetland type in Stratham are shown below in Table 5. The wetlands count does not reflect separate wetlands, but patches of wetlands classified as a particular type. The total area for NWI wetlands in Stratham is 140,107 acres or 14.1 % of the Town's surface area.

Table 5
2001 National Wetland Inventory of Wetlands in Stratham

Wetland Type	Acres
Estuarine	420.02
Emergent (e.g. cattails)	51.63
Forested - Deciduous	648.60
Forested - Evergreen	103.76
Forested - Dead/Beaver Impoundment	0
Deciduous - Shrub	123.61
Evergreen - Shrub	0
Unconsolidated Bottom	53.45
Total NWI Wetlands	1401.07

The Stratham Conservation Commission worked with the New Hampshire Estuaries Project and West Environmental in 2004 to inventory freshwater wetlands in Town of 30 acres or more. Six sites were identified and all were recommended for protection from development. The wetland complexes range in size from 90 acres to 180 acres. The freshwater wetland sites identified in the inventory are described below.

- Parkman Brook, off Route 101 and Middle Road – 160 acres, 1.75 miles of stream corridor. A relatively undisturbed wildlife corridor.

- Jewell Hill Brook Corridor, northeast of Greenwood Cemetery – 150 acres, 1.5 miles of stream corridor with well defined floodplain. Existing pond has high value habitat.
- Mid-Winnicut River Swamps, off Winnicut Road – 90 acres, report recommends preservation of stream corridor.
- Mill Brook Corridor, Routes 108 and 33 – 180 acres, report recommends protection of approximately 1 mile of Mill Brook. The system is fragmented by Stratham Circle, but the upstream portion is intact and has high value wetlands.
- Southern New England Seepage Forest, off High Street – 135 acres, high value protection area with Southern New England rare plant communities and species.
- Dearborn Brook Headwaters, south of Rollins Hill – 120 acres, high value habitat for wildlife, headwater for Exeter’s water supply.

Wetland Buffers - In addition to retaining the wetland itself, the undeveloped uplands surrounding the wetland are also essential for a healthy wetland. Maintaining a buffer of a naturally vegetated upland area adjacent to wetlands and surface waters is important to reduce the adverse effects of human activity on these water resources. Vegetation in buffers intercepts rainfall, slows meltwater and promotes infiltration. In addition, a vegetated buffer provides habitat for species dependant on the wetland system and travel corridors for larger mammals. A minimum upland buffer width around wetlands and other shorelines of 100 feet is recommended and 300 feet is desirable to maintain good habitat.

The first step to protecting wetlands and the functions they provide is protecting the land surrounding them. A look at current zoning regulations in Stratham shows a limited amount of protection to buffers compared to recommendations from “Buffers for Wetlands and Surface Waters”, A Guidebook for New Hampshire Municipalities published in 1997 by the NH Department of Environmental Services. The guidebook states that “100 feet is recommended as a reasonable minimum buffer width under most circumstances.” It explains that research has shown that 100 feet will generally provide a 60% or higher removal rate of pollutants. Because of the impacts to human health of tainted water supplies, buffers larger than 100 feet may be prescribed around existing or potential water supplies. Buffers of 100 feet protect wildlife species that are aquatic or that stay very close to the wetland edge, but would provide little or no life support for others. Water quality in wetlands and surface waters is important for all wildlife, not just aquatic.

Current Stratham zoning regulations state that no sewage disposal system shall be constructed within 75 feet of any poorly drained soil (type Hydric A) or within 50 feet of any poorly drained soil (type Hydric B). In addition, no sewage disposal system shall be located closer than 75 feet from a well or 100 feet from a water body. Land within 150 feet horizontal distance of the

upland extent of any tidal marsh adjacent to the Squamscott River and Great Bay is included in Stratham's Shoreline Protection District.

The Complex Systems Research Center (CSRC) at the University of New Hampshire conducted a characterization of the buffers around 2nd order and higher streams within the Piscataqua/Coastal Basin of New Hampshire. GIS and remote sensing data archived in the NH GRANIT database were used to map land use, impervious surface coverage, and transportation infrastructure within standard buffers around each stream segment. These factors were then analyzed to produce a categorical indicator representing the status of each stream. The results are presented on community-based maps displaying stream characterizations and the corresponding acreage tables. The map for Stratham may be found at: www.prep.unh.edu/resources/buffers.

The State of New Hampshire's Comprehensive Shoreland Protection Act protects surface water resources by regulating buildings, docks, and septic systems along the shoreland, including Great Bay. All primary structures must be set back at least 50 feet from the high water or high tide mark. Natural vegetation must also be maintained along the shoreline. For more information on the Comprehensive Shoreland Protection Act, visit the NH DES website, www.des.nh.gov/organization/divisions/water/wetlands/cspa/index.htm

Recommendations for Protecting Wetland Resources:

- Continue to work with the Wetlands Bureau of NHDES to enforce State laws and rules.
- Educate the public as to what they can do to protect wetlands and vegetative buffers around wetlands. This should include the importance of reducing non-point source pollution from sedimentation, fertilizers, pesticides, and hazardous wastes.
- Increase the setback for septic systems to 100' from wetland soils.

IX. Potential Threats to Water Resources

There are two general types of pollution threats to surface and groundwater resources: nonpoint and point. Nonpoint pollution sources are diffuse and may discharge pollutants over a broad area. Examples include stormwater runoff from parking lots and roads, erosion and sediment from land development, and leachate from failed septic systems. Point sources of pollution are discernible as the sources can be identified, typically pipes, ditches, and channels.

Potential Nonpoint Pollution Sources in Stratham include:

- Salt Piles and Snow Dumps – There is one Town-owned salt pile located along Bunker Hill Avenue at the site of the Town Garage. This facility stores approximately 150 tons

of road salt at any given time. The salt is stored in an enclosed area with a concrete floor underneath.

- Salted Road – All the paved roads in Stratham receive some degree of salting during the winter months. The salt shed meets all State of New Hampshire requirements for permanent salt storage. The Town has been proactive in addressing the issue of road salt usage, sending its highway staff to yearly training sessions on maintenance of equipment and the impacts of excessive use of salt. While salting is currently the most appropriate use in the northern New England climate, the environmental impacts need to be addressed to the extent possible.
- Municipal Landfill – There is a closed municipal landfill along the western side of Union Road. Use of the landfill was discontinued in 1980, after thirty years of operation. The landfill is unlined, however the site has been capped with clay, loamed and seeded. The landfill currently serves as a transfer station for resident disposal of bulky items, metals, and brush. There are four monitoring wells located on the site and no significant water quality problems have been detected in the past five years. If significant water quality problems are detected, they will be addressed by the Town in a timely manner.
- Active Cemeteries – There are five cemeteries at two locations in Stratham which receive internments. The first site is a parcel of land along Emery Lane which is home to the Harmony Hill, Maple Lane, Congregational Society, and Congregational cemeteries. The second site is a parcel of land located along Union Road which is home to the Greenwood cemetery.
- Gas Stations, Engine Repair, and Automotive Shops – Sullivan Tire (tire sales, auto repair), Undercar Specialist (auto repair), Gill's car dealership (car sales, auto repair), the Honda Barn (car sales, auto repair), Mobil (gasoline sales), Irving (gasoline sales), VIP Auto (tire sales, auto repair), Phillips 66 (gasoline sales), Gibbs Oil (gasoline sales), Shell (gasoline sales), Holloway BMW (car sales, auto repair), Subaru (car sales, auto repair), Monroe Muffler (tire sales, auto repair), Porsche Audi (auto repair), Stratham Village Market (gasoline sales).
- Pesticide Application Sites, Farms, and Agricultural Uses – There are several active farms in Stratham which may use fertilizers and pesticides as a part of normal agricultural practice. The New Hampshire Department of Agriculture, Markets, and Food promotes the use of Best Management Practices to reduce the threat of pollution from agricultural operations.
- Impervious Surfaces, Urban Runoff and Storm Drains – Storm drains and catch basins have been installed throughout Stratham to capture runoff from rain and snow melt from impervious surfaces such as roads, parking lots, and roof tops. The majority of these structures are affiliated with commercial activity along Portsmouth Avenue.

- Medical Offices – There are two sites in Stratham where medical offices are located. Offices affiliated with Exeter Hospital dispose of medical wastes at the hospital's incinerator, otherwise offices must make their own waste disposal arrangements.
- Veterinary Clinics and Kennels – There are two such operations in Stratham. The NHSPCA has a kennel along Portsmouth Avenue. The Exeter Veterinary Hospital is located along Stratham Heights Road.
- Beauty Salons – Beauty salons often use chemicals which, if disposed of improperly, could pose a threat to groundwater resources. Salons in Town include Salon 72, Wingate Spa, and Hair Excitement.
- Industrial and Manufacturing Activity – There are several commercial, industrial, and manufacturing businesses in Stratham which use regulated substances as defined by the NH Groundwater Protection Act (NH RSA 485-C). The Town's primary industrial area is the Stratham Industrial Park located in the southern corner of Town.
- Septic Systems and Leaching Fields – Generally speaking, septic systems are considered nonpoint source pollution because of their discharge of effluent into the ground. The threat presented by such systems increases when a system fails and the wastewater is not treated sufficiently. All wastewater produced in Stratham is treated by septic systems. There are several residential development in Stratham that are served by large septic systems requiring Groundwater Discharge Permits from the State of New Hampshire. There are several other large wastewater discharges in Stratham which were installed prior to the creation of the State's Groundwater Discharge Permit system.

Potential Point Source Pollution Discharges in Stratham include:

- Underground Fuel Storage Tanks – Underground Storage Tanks (UST) are a potential threat to water resources in that leaking can occur due to defects in tank construction, improper installation, and corrosion of older tanks. New Hampshire requires all tanks with a capacity of 1,100 gallons or more to be registered and the use reported to the NH DES Waste Management Division.

X. Existing Local Policies to Protect Water Resources

Stratham has taken a very pro-active approach to the protection of water resources, including the adoption of the following regulations:

- Aquifer Protection District – Impervious lot coverage is limited to 20% within this district to permit groundwater recharge; land uses involving onsite disposal, storage or

processing of hazardous materials, underground storage tanks, and a variety of high-risk commercial, industrial and utility uses are prohibited.

- Wellhead Protection Program – Stratham participates in this DES program designed to enhance protection of groundwater through the implementation of “best management practices” on the part of landowners and through active monitoring by the Town.
- Wetland Conservation District – The intent of the District is to protect important wetlands and their valuable natural functions.
- Shoreland Protection District – The type and extent of development within 50 feet of tidal waters and within 100 feet of perennial streams is limited in this District to protect sensitive shorelands.
- Floodplain Management District – This District, required for the Town’s participation in the Federal Flood Insurance Program, ensures that septic systems are not sited in flood prone areas and that any structures constructed in the District are flood proofed and not cause an increase in flood hazards downstream.
- Cluster Development – Stratham allows cluster development to protect natural resources by encouraging the placement of buildings, roads, and septic systems in a tighter configuration in order to leave large blocks of undeveloped land.
- Soil Based Lot Sizing – Stratham requires lot sizing based on soil type to determine development density and the soil’s capacity to assimilate septic system waste.
- Erosion Control/Stormwater Management – Stratham requires erosion control plans whenever an area greater than 20,000 sq. ft. will be disturbed or when the construction of a road is proposed. Stormwater management plans are required to ensure that runoff from developed areas will be treated to remove sediment prior to entering surface waters.
- Excavation Regulations – These regulations require the reclamation of excavation sites, require buffer strips around sites and prohibit excavations that would damage aquifers.

XI. Agricultural and Farmland Resources

Agricultural land is valued in Stratham for the food that its farmers produce, some of which is locally available. It is also valued for its scenic beauty and diverse habitat. Stratham’s farmers and farm families help other residents connect with the Town’s rural heritage and promote better land management. In addition, Stratham’s farmers are stewards of significant natural resources in the community. Much of the character of the Town we owe to those who have

sustained their farms and agricultural lands for generations. Table 6 describes active farms in Stratham.

Aside from its obvious importance for growing food, agricultural land has value as a scenic resource, as wildlife habitat, and as a groundwater recharge area. Farming also provides economic benefits, especially to the local and regional economy. The loss of farmland has a direct impact on the landscape as well as an indirect impact on the local tax rate. The indirect economic benefit of farming relates to the real estate value of the farmland itself compared to the cost of providing public services to residents once the land is converted to residences. As demonstrated in the Cost of Community Services study conducted by the UNH Cooperative Extension Service in 1995, residential subdivisions cost the Town more in terms of providing municipal services than is received in increased property tax revenue, whereas farmland and other open land produce more in revenues than they consume in services, even when enrolled in the Current Use program. While Stratham has lost a number of farms to residential development, it still retains a number of prominent working farms such as the Stuart Farm, Scamman Farm, Barker Farm, and others. Although most of the farms are smaller in size than in the past, these remaining farms have a very significant impact on the scenic and rural qualities of the community. Farming in Stratham is defined as any agricultural activity in which land is used for the purpose of producing any cultivated commodity, livestock or poultry.

Table 6
Active Farms in Stratham

Farm Name and Location	Products	Acres (Approximate)
Scamman Farm, Portsmouth Avenue	hay, crops	200
Stuart Farm, College Road	dairy	270
Gifford Farm, Jack Rabbit Lane	hay, corn	129
Mill Valley Farm, Winnicut Road	hay, vegetables	100
Barker Farm, Portsmouth Avenue	vegetables, fruit, flowers	100
Majestic Meadows, Frying Pan Lane	horse	30
Wake Robin Farm, Union Road	vegetables, fruit, flowers	11
French/Rauch Farm	hay	100
Berry Hill Farm, Stratham Heights Road	vegetables, berries	24
Salt Box Farm, Portsmouth Avenue	vegetables, fruit	130
Rawson Farm, College Road	vegetables, fruit	5
Blueberry Bay Farm, Depot Road	vegetables, fruit, flowers	12
Kirk Scamman, Portsmouth Avenue	hay, corn, pumpkins	50
Jones, Winnicut Road	hay	41
Winnicut River Farm, Barker Lane	vegetables, fruit	60
Moriarty's Greenhouse, Winnicut Road	greenhouse plants	2

Agricultural Soils - New Hampshire is losing its most productive farmland. Between 1982 and 2000, nearly 18,000 acres of prime farmland became unavailable for production of crops, feed, forage or fiber. Most was lost to urban and rural development. Only 2% of New Hampshire soils classify as prime farmland. (Prime Farmland: land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is also available for these uses.) Cropland, usually the most productive agricultural land, has declined 30% statewide from 1974 to 2000. Discussions with residents indicate a growing concern with the future of Stratham's rural heritage. Increasing expenses and lower profits from farming are factors. The pressure from escalating development and rapidly increasing land loss through subdivisions is a major concern.

An analysis of 2001 landcover data shows that 120.82 acres of the Town was in orchard, 53.26 acres was in row crops and 1,200.97 acres was in hay or pasture. Hay is grown on a commercial basis by several farms, as listed in Table 6. There are other Stratham residents who hay or have their fields hayed but are not commercial operations. There are numerous other residents unknown to us who have horses, sheep, chickens and other livestock. In addition, many people raise vegetables, fruit and herbs for their own consumption and to share with their neighbors.

In order to get a more accurate understanding of the value of agriculture to Stratham, the Town could complete an Agricultural Profile. A copy of the fact sheet *Developing an Agricultural Profile for Your Town* is available from the UNH Cooperative Extension.

Recommendations for Protecting Agricultural Resources:

Agriculture is important to Stratham in many ways. The commercial farms contribute to the Town economically and the Town's residents are fortunate to enjoy locally grown produce. The open fields and farm structures are a part of the rural character that is so important to the Town. This is an important resource to be protected.

Recommendations to help sustain economically viable agriculture in Stratham are:

- Educate the public that once important farmland soils are developed they are lost forever.
- Support Eat Local campaigns and encourage residents to buy locally grown food.
- Protect the Important Farmland soils that are necessary for economically viable agricultural activities.
- Identify and map prime farmland soils and soils of statewide importance.
- Reduce conflict between agricultural and residential uses by requiring a buffer when land is developed adjacent to a farm.

- Continue to educate farmland owners about the benefits of conservation easements on their property.
- Encourage farmers to follow “Best Management Practices” to protect water quality.

XII. Forest Resources

Stratham’s forests provide valuable habitat for plant and animal populations. The forests absorb rainwater, increase groundwater infiltration, and buffer surface waters from sedimentation and contamination. Near roads and homes, trees cool summer temperatures by 10 degrees or more, break winter winds, and filter dust and pollutants from the air. Forests host scenic recreational trails and hunting grounds. Our tourist industry and seasonal residents are attracted by healthy forests. In addition, well-managed forests provide a sustainable supply of maple syrup, home firewood and commercial wood products and jobs needed by New Hampshire residents.

Forest Cover - A forest is comprised of several forest types. Forest types are distinctive associations or communities of trees, shrubs, and herbaceous plants. They are named for the predominant tree species occurring in the type. Common forest types in Stratham include White Pine; Northern Hardwood (sugar maple, beech, yellow birch, red maple, white ash and smaller amounts of other species); Spruce-Fir, Red Oak, Hemlock, and Aspen-Birch. A forest type may be dominated by a single tree species or it may be dominated by several species growing together.

Stratham’s forests provide us with wood and food products, wildlife, scenic beauty, a modified microclimate, stabilization of steep slopes and snowpacks, the control of water flows, the creation and maintenance of stream habitat for aquatic animals, and recreation. In addition, forests constitute a major storage of carbon not only in the trees themselves, but in the forest soils as well. Most importantly, forests provide us with biodiversity.

New Hampshire is the second most forested state in the US trailing Maine. Stratham is approximately 31% forested; the state average is approximately 85%. Many of Stratham’s forests have grown from abandoned agricultural land and are now mature. However, due to increased development, the area of Stratham’s forests is decreasing.

Gordon Barker Town Forest

The Town Forest was established in 1994 and is located off Jack Rabbit Lane adjacent to Stratham Hill Park. The forest is 84.5 acres and includes a diversity of soils and vegetation, including an Atlantic White Cedar swamp and an oak-white pine forest with large specimen trees. The forest is a popular recreation area for residents. A tree thinning was conducted in 2007 on 14.5 acres located in the south end of the forest.

A Forest Management Plan for the property was completed in 2007 by licensed forester Stan Knowles. The Plan highlights management objectives identified and ranked by the Conservation Commission in order of highest to lowest priority: wildlife habitat, recreation, water quality, timber production. The forest has a number of trails that are used throughout the year. The Stratham Memorial also abuts the forest and teachers use the land as an outdoor classroom. The Plan notes the need for trail maintenance to protect water quality, stop soil erosion, and to reduce damage to tree roots from soil compaction caused by foot traffic.

Recommendations for Protecting Forest Resources:

- Identify forestland abutting rivers and streams for conservation as these forests play an important role in protecting water quality and quantity, and wildlife habitat.
- Planting/transplanting native species.
- Adopt tree clearing regulations to minimize soil erosion, preserve wildlife habitat, and protect water resources.
- Partner with land conservation organizations and surrounding municipalities in the region to protect critical areas identified in the Land Conservation Plan for New Hampshire's Coastal Watersheds.

XIII. Natural Communities

The July 2010 report from the NH Natural Heritage Bureau entitled, *Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns*, describes natural communities as different types of forests, wetlands, and grasslands. Most of New Hampshire is covered by relatively common natural community types. Scattered throughout the state, however, and usually in predictable areas, are distinctive communities found in few other places. The Natural Heritage Bureau tracks exemplary natural communities. To qualify as exemplary, a natural community must be of a rare type or must be a very old occurrence of common community in good condition.

Stratham's natural communities serve not only a practical and essential role in keeping our soil, water and air healthy, a concept known as ecological services, but they provide us with diverse physical landscapes and scenic beauty.

Natural communities are defined by three characteristics:

- The plant species present;
- The physical structure of the vegetation (short grasses vs. tall trees);

- The physical environment, which consists of the physical setting (pond shore or hillside), the water and nutrients present and the climate.

Natural communities are made up of living components that are closely interrelated and interact with one another and the environment. Humans are also a part of the living landscape and have a tremendous influence. Human disturbance of the natural environment is occurring at a faster pace than the natural communities can adapt to. It is vital we become aware of the natural communities we have in Stratham in order to protect them.

The NH Natural Heritage Bureau has identified the following Exemplary Natural Communities in Stratham:

- Dry Appalachian oak forest**
- Mesic Appalachian oak-hickory forest
- Atlantic white cedar-yellow birch-peppercorn swamp**
- Buttonbush shrubland**
- Red maple – black ash swamp**
- Brackish marsh**
- High brackish riverbank marsh**
- High salt marsh**
- Intertidal flat**
- Low brackish riverbank marsh**
- Low salt marsh**
- Marsh elder swampland*

** = community flagged by Natural Heritage Bureau as “very high importance”

* = community flagged by Natural Heritage Bureau as “high importance”

These flags are based on a combination of how rare the species or community is and how large or healthy its examples are in a Town.

Table 7 highlights rare plant and animal species identified in Stratham. It is important to note that the number of observations listed below reflects records maintained by the NH Natural Heritage Bureau and it is likely the number of observations for certain species is higher.

Table 7
Rare Plant Species and Rare Animal Species in Stratham
Source: NH Natural Heritage Bureau, July 2010

Latin Plant Name	Common Plant Name	# Observed Last 20 Years in Town	# Observed Last 20 Years in State	State Status
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<i>Isoetes engelmannii</i>	Engelmann's Quillwort	Historical	15	Endangered
<i>Carex granularis</i>	Granular Sedge	Historical	6	Endangered
<i>Zannichellia palustris</i>	Horned Pondweed	Historical	6	Endangered
<i>Sparaganium eurycarpum</i>	Large Bur-reed	1	19	Threatened**
<i>Symphyotrichum tenuifolium</i>	Large Salt Marsh Aster	1	5	Endangered**
<i>Iva frutescens</i>	Marsh Elder	1	11	Threatened**
<i>Sphagnum contortum</i>	Peat moss	1	10	Threatened**
<i>Polygonum ramosissimum</i> spp. <i>prolificum</i>	Prolific Knotweed	Historical	9	Endangered
<i>Suaeda maritima</i> ssp. <i>richii</i>	Rich's Seabite	1	1	Endangered***
<i>Eleocharis uniglumis</i>	Salt-loving Spike-rush	1	12	Threatened**
<i>Agalinis maritima</i>	Salt-marsh Gerardia	Historical	9	Endangered
Latin Plant Name	Common Plant Name	# Observed Last 20 Years in Town	# Observed Last 20 Years in State	State Status
<i>Glyceria acutiflora</i>	Sharp-flowered Mannagrass	Historical	9	Endangered
<i>Eleocharis parvula</i>	Small Spike-rush	1	22	Threatened***
<i>Lemma trisulca</i>	Star Duckweed	1	5	Endangered**
<i>Lysimachia thyrsiflora</i>	Tufted Loosestrife	1	10	Threatened**
<i>Puccinellia pumila</i>	Tundra Alkali Grass	1	7	Endangered**
Latin Bird Name	Common Bird Name	# Observed Last 20 Years in Town	# Observed Last 20 Years in State	State Status
<i>Gallinula chloropus</i>	Common Moorhen	1	5	Special Concern**
<i>Ixobrychus exilis</i>	Least Bittern	1	4	Special Concern**
<i>Ammondramus nelsoni</i>	Nelson's Sharp-tailed Sparrow	1	2	Special Concern**
<i>Panion haliaetus</i>	Osprey	1	89	Special Concern**
<i>Ammondramus caudacutus</i>	Saltmarsh Sharp-tailed Sparrow	1	8	Special Concern**

<i>Porzana carolina</i>	Sora	Historical	2	Special Concern
Latin Reptile Name	Common Reptile Name	# Observed Last 20 Years in Town	# Observed Last 20 Years in State	State Status
<i>Emydoidea blandingii</i>	Blanding's Turtle	1	156	Endangered*

*** = community flagged by Natural Heritage Bureau as "extremely high importance"

** = community flagged by Natural Heritage Bureau as "very high importance"

* = community flagged by Natural Heritage Bureau as "high importance"

These flags are based on a combination of how rare the species or community is and how large or healthy its examples are in a Town.

Protecting our natural communities is necessary to preserve the biological diversity of our community and of New Hampshire. Biological Diversity, or **biodiversity**, is the variety and variability of all living organisms. This variety includes the diversity of plants, animals, fungi, algae, bacteria, and other microorganisms, their genetic variability, the natural communities in which they live, and the processes and interactions that weave the biological and physical elements of the planet into a complex web.

XIV. Plant Communities

Endangered/Threatened Species

In 1987, the New Hampshire state legislature passed the Native Plant Protection Act (NH RSA 217-A) and formally recognized that "for human needs and enjoyment, the interests of science, and the economy of the state, native plants throughout this state should be protected and conserved; and their numbers should be maintained and enhanced to insure their perpetuation as viable components of their ecosystems for the benefit of the people of New Hampshire." Currently, there are 288 species listed as endangered or threatened under the Native Plant Protection Act and that are tracked by the NH Natural Heritage Bureau.

The Stratham Conservation Commission encourages input from residents should they find an unusual plant species or a unique natural community. The Commission may be reached by calling the Town Office at 603-772-4741.

Endangered and threatened are defined under the NH Native Plant Protection Act as: **Endangered species** are those ceasing to exist locally or in the state; **Threatened species** face the possibility of becoming "endangered".

Plants Listed as Special Concern - In addition to recognizing Endangered and Threatened plant species, the NH Native Plant Protection Act identifies 11 plants as Special Concern. These

species are somewhat uncommon in New Hampshire, and are at risk of decline due to over-collection.

The NH Natural Heritage Bureau does not track these species:

- | | |
|-------------------------|--|
| • Narrow-leaf wild leek | <i>Allium tricoccum</i> var. <i>burdickii</i> |
| • Wild leek | <i>Allium tricoccum</i> var. <i>tricoccum</i> |
| • Wild ginger | <i>Asarum canadense</i> |
| • Giant blue cohosh | <i>Caulophyllum giganteum</i> |
| • Blue cohosh | <i>Caulophyllum thalictroides</i> |
| • Sea lavender | <i>Limonium carolinianum</i> |
| • Ostrich fern | <i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i> |
| • Canadian burnet | <i>Sanguisorba Canadensis</i> |
| • Slippery elm | <i>Ulmus rubra</i> |

These species are not rare in New Hampshire, but their showy nature makes them vulnerable to over-collection. Although the listing does not give the plants any legal protection, it does give the landowner recourse if someone digs it up without the landowner's permission.

Invasive Species - It is important that those of us who reside in Stratham be informed and aware of invasive species (plants, insects and fungal species) that have the potential to destroy and displace those natural resources that are vital to our biodiversity. According to the New England Wildflower Society, nearly 1/5th of New England's 3,000 plant species are in danger of disappearing from our region. In addition, invasive species are degrading public natural areas at an estimated rate of 4,600 acres per day. The Nature Conservancy estimates that 42% of all species on the Federal Endangered Species Lists are listed partly due to the effects of invasive species (and for 18%, invasive species are the sole reason for their listing). According to the US Department of Agriculture website, (www.usna.usda.gov/gardens/invasives.html), over \$100 million dollars a year is spent in the United States combating invasive plants in wetlands alone. Rich, diverse plant communities can become barren, inhospitable expanses of invasive plants with little value to wildlife. Invasive plants may even deplete groundwater. The public must be educated to buy plants wisely and to control existing invasive plants.

What is an Invasive Species? An Invasive Species is a plant, insect, and/or fungal species that is not naturally native to a particular region and has the ability to thrive and spread aggressively outside its natural range. The Invasive Species thrives and spreads in a new habitat due to the fact it has no natural predators (insects, diseases and/or foraging animals) that naturally keep its growth under control as they would in their own native habitat. Invasive plant species commonly found in Stratham include Phragmites, Purple Loosestrife, Glossy Buckthorn, Barberry, Burning Bush, Multiflora Rose, and Japanese Knotweed. All these plant species are common landscape plants that migrate into open and undeveloped areas.

Many of the landscape plants that were promoted by the NH Department of Environmental Services prior to 2000, such as barberry, burning bush, autumn olive, and others, have since been added to the invasive species list. Consequently, many landowners have invasive plants on their property that they may not realize are considered invasive.

Why and Where are Invasive Species a problem? Without any natural predators to prevent its spread, the invasive species, particularly in the case of plants, will put extreme pressure on native plants and animals. Ultimately the invasive plant will alter native habitats and reduce biodiversity by choking out native vegetation, threatening rare and endangered species and degrading wildlife habitat. With the loss of native vegetation and wildlife habitat also comes the loss of a number of our native animal, bird and insect species that depend on the native habitats to survive. Invasive species present the worst threat in wetlands, sand dunes, fire prone areas, and serpentine barrens where rare native plants are found. Invasive plants:

- Produce large numbers of new plants each season;
- Tolerate many soil types and weather conditions;
- Spread easily and efficiently, usually by wind, water, or animals;
- Grow rapidly, allowing them to displace slower growing plants;
- Spread rampantly when they are free of the natural checks and balances found in their native range.

In 2000, the State of New Hampshire enacted legislation under House Bill 1258-FN which "requires the Commissioner of Agriculture, Markets, and Food to conduct research and educational activities which address the effects of invasive plant, insect and fungal species upon the state". As a result of this legislation, the New Hampshire Invasive Species Committee was formed.

Table 8
Prohibited Plant Species in New Hampshire

Tree of Heaven (<i>Ailanthus altissima</i>)	Fanwort (<i>Cabomba caroliniana</i>)
Garlic Mustard (<i>Alliaria petiolata</i>)	Oriental Bittersweet (<i>Celastrus orbiculatus</i>)
European Barberry (<i>Berberis vulgaris</i>)	Black Swallow-wort (<i>Cynanchum nigrum</i>)
Flowering Bush (<i>Butomous umbellate</i>)	Purple Loosestrife (<i>Lythrum salicaria</i>)
Pale Swallow-wort (<i>Cynanchum rossicum</i>)	Parrot Feather (<i>Myriophyllum aquaticum</i>)
Brazilian elodea (<i>Egeria densa</i>)	Variable Milfoil (<i>Myriophyllum heterophyllum</i>)
Autumn Olive (<i>Elaeagnus umbellate</i>)	Europ. Water-Milfoil (<i>Myriophyllum spicatum</i>)
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	European Naiad (<i>Najas minor</i>)
Hydrilla (<i>Hydrilla verticillata</i>)	Yellow Floating Heart (<i>Nymphoides peltata</i>)
European Frogbit (<i>Hydrocharis morus-ranae</i>)	Common Reed (<i>Phragmites australis</i>)
Water-flag (<i>Iris psuedacorus</i>)	Japanese Knotweed (<i>Polygonum cuspidatum</i>)
Blunt-leaved Privet (<i>Ligustrum obtusifolium</i>)	Curly-leaf Pondweed (<i>Potamogeton crispus</i>)
Showy Bush Honeysuckle (<i>Lonicera x bella</i>)	Common Buckthorn (<i>Rhamnus cathartica</i>)
Japanese Honeysuckle (<i>Lonicera japonica</i>)	Glossy Buckthorn (<i>Rhamnus frangula</i>)

Morrow's Honeysuckle (<i>Lonicera morrowii</i>)	Multiflora Rose (<i>Rosa multiflora</i>)
Tartarian Honeysuckle (<i>Lonicera tatarica</i>)	Water Chestnut (<i>Trapa nutans</i>)
Burning Bush (<i>Euonymus alatus</i>)	Japanese Barberry (<i>Berberis thunbergii</i>)
Norway Maple (<i>Acer platanoides</i>)	

More information on prohibited plant species may be found at the following website:

http://www.nh.gov/agric/divisions/plant_industry/

Table 9
Prohibited Insect Species in New Hampshire

Honeybee Tracheal Mite (<i>Acarapis woodi</i>)	Asian Longhorned Beetle (<i>Anoplophora glabripennis</i>)
Hemlock Woolly Adelgid (<i>Adelges tsugae</i>)	Cedar Longhorned Beetle (<i>Callidellum rufipenne</i>)
City Longhorned Beetle (<i>Aeolesthes sarta</i>)	Japanese Beetle (<i>Popillia japonica</i>)
Siberian Silk Moth (<i>Dendrolimus sibiricus</i>)	Viburnum Leaf Beetle (<i>Pyrrhalta viburni</i>)
Elongated Hemlock Scale (<i>Fiorinia externa</i>)	European Chafer (<i>Rhizotrogus majalis</i>)
Redhaired Bark Beetle (<i>Hylurgus ligniperda</i>)	Nun Moth (<i>Symantria monacha</i>)
European Spruce Bark Beetle (<i>Ips typographus</i>)	Brown Spruce Longhorn Beetle (<i>Tetropium fuscum</i>)
Asian Gypsy Moth (<i>Lymantria dispar</i>)	Varroa Mite (<i>Varroa destructor</i>)

XV. Beneficial Insects

Beneficial insects are a natural way to fight insect pests and protect our environment. When we encourage beneficial insects we are increasing our biodiversity and decreasing our dependency on poisonous chemical controls. Not only are we creating a more beautiful environment, but a safer one as well.

There are two categories of insects considered beneficials, predators and parasites. Predators are organisms that kill and feed on their prey outright. They are generally larger than their prey and must eat lots of prey to complete their development. Parasites are usually smaller and often weaker than their prey. They lay eggs on or within a host insect. The immature larvae use the host for food over time. A parasite will use only one or a few insects for food.

You can entice beneficial insects to your yard and garden by providing them with the three basic necessities: water, food and shelter. In addition, you should avoid using and/or spraying broad-spectrum insecticides. The broad-spectrum insecticides are not selective in that they will kill not only the pest but the beneficial as well. Even the organic pesticides will kill the beneficial insects.

Table 10
Beneficial Insects

Beneficial Insects	Pests They Prey On
Aphid Midge	60 species of aphids (on vegetables, flowers, fruit and shade trees)
Assasin Bug	Many insects including, aphids, Japanese beetles, leaf hoppers, fly larvae, tomato hornworms
Big-eyed Bug	Eggs and small larvae of armyworms, hornworms, loopers, corn earworms, spider mites, aphids, leafhoppers, flea beetles, mealybugs and thrips. One big-eyed bug can eat 12 small caterpillars or leafhoppers per day.
Braconid Wasp	Tomato hornworm, armyworm, cabbageworm, gypsy moth, other caterpillars, beetle larvae, flies, aphids and other insects
Bumblebees, including the Orchard Mason Bee	Extremely important wild pollinators for a variety of fruit and seed crops.
Centipedes	Predators of soil-dwelling pests and insects including slugs, worms and fly pupae. They may also feed on earthworms, but are considered beneficials.
Damsel bugs	Aphids, thrips, leafhoppers, caterpillars, plant bugs and tree hoppers
Damselflies, Darners & Dragonflies	Mosquitoes and small flying insects
Firefly	Many species of pest insects
Ground Beetle	Most species prey on slugs, snails, cutworms and cabbage-root maggots in soil; some pursue prey on plants or trees, such as Colorado potato beetle larvae, gypsy moth and tent caterpillars.
Hoverflies (Flower flies)	Many species of aphids
Honeybee	Extremely important pollinators of fruit, vegetables and agricultural crops. It is estimated that over 80 percent of pollination is done by domestic honeybees. ¹
Ichneumon Wasp	They lay their eggs inside other host insects such as caterpillars, sawfly, beetle larvae and other pests then parasitizes and kills the host.
Lacewing	Soft-bodied insects including aphids, thrips, mealybugs, some scales, moth eggs, small caterpillars and mites.
Lady Beetle (Ladybugs)	Aphids, thrips, mealybugs, mites or soft scales.
Mealybug Destroyer	Mealybugs, scale insects, aphids.
Millipedes	Feed on decaying plant material and are beneficial in breaking down

¹ Rodale's Successful Organic Gardening – Controlling Pests and Diseases, 1994

	organic matter. May occasionally feed on plant material laying on ground, like strawberries and tomatoes. Also predator of slugs and fly pupae.
Minute Pirate Bug	Will eat anything, but prefer thrips, spider mites, eggs of many insects, small caterpillars, leafhopper nymphs, corn earworms.
Praying Mantis	Almost anything, including other beneficial insects.
Predatory Mite	Spider mites
Predatory Thrip	Eggs and larvae of spider mites, aphids, other thrips, codling moth, Oriental fruit moth, bud moth, peach twig borer, alfalfa weevil, whitefly, leafminer flies and scales.
Rove Beetle	Many are predators of aphids, springtails, nematodes, fly eggs and maggots in the soil; some are parasitic on cabbage-root maggots and larvae of other flies. Many species are scavengers on decaying material.
Spiders	All spiders are predators. Wolf spiders are particularly beneficial to farmers and gardeners because they attack many common garden pests.
Spider Mite Destroyer	Many species of spider mites, especially in unsprayed raspberry patches.
Spined Soldier Bug	Many species of hairless caterpillars and beetle larvae including fall armyworm, sawfly larvae, Colorado potato beetle and Mexican bean beetle larvae.
Tachinid flies	Many species of caterpillars, including cutworms, armyworms, tent caterpillars, cabbage looper, gypsy moth; some attack sawflies, Japanese beetle, May beetle, squash bugs, green stink bugs and sowbugs.
Tiger beetles	Both adults and larvae prey on a wide variety of insects, but are considered mostly beneficial.
Trichogramma Wasps	Eggs of over 200 species of moths, including spruce budworm, tomato hornworm, corn earworm, corn borers and codling moth.
Water Boatmen	Mosquito larvae underwater
Water Strider	Mosquitoes at water's surface
Yellow Jackets	Adults seize large numbers of caterpillars, flies, beetle grubs and other insects to feed their young.

Recommendations for Protecting Natural Resources:

- Control invasive species that are prevalent in both public and private areas and encourage planting of native species.
- Identify and protect endangered species of flora and fauna.

- Identify sensitive habitats on properties being developed and recommend to the Planning Board that the Town require a complete wildlife impact assessment and natural resource inventory over several seasons on any properties being developed, using not only general guidelines of plant life, but visual assessments as well over a period of time.
- Promote recycling.

XVI. Wildlife Habitat

Stratham's forests, grasslands, farmland, saltmarsh, and rivers provide rich and diverse habitat for numerous animal species. An on the ground inventory of animals for Stratham has never been conducted, so the true extent of special habitats, rare species and common species is unknown. However, the 2006 New Hampshire Fish and Game Wildlife Action Plan provides a snapshot of Stratham's wildlife habitat. These special habitats and unfragmented natural lands need to be conserved in order to prevent common species from becoming rare and rare species from being extirpated from New Hampshire.

The New Hampshire Fish and Game Wildlife Action Plan may be found at the following website: http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm

Unfragmented Open Space - Large blocks of forest, wetlands and farmland that are unfragmented by development or public roads are valuable for many reasons, including:

- Provide essential forest interior habitat for species such as some songbirds that need to be distanced from human activity, pets, and the forest edge in order to survive.
- Provide habitat for mammals that have large home ranges and prefer to avoid human contact, such as bobcat, otter, and moose.
- Enable owners of large parcels of forestland to conduct timber harvests that are economically viable.
- Minimize conflicts that can arise when managed forests and farms are surrounded and interspersed with development.
- Offer opportunities for remote recreation, including hunting, hiking and snowmobiling, where landowners allow.

Larger fragments are more likely to support viable populations of species and therefore act as a source of individuals that can then move to another fragment. Small fragments may be unable

to support breeding populations. Persistent fragmentation may also lead to genetic changes and a loss of genetic diversity as populations are subdivided into small locally breeding populations.

Table 11 lists the types of habitat found in Stratham as determined by the NH Fish and Game as part of the 2006 Wildlife Action Plan.

Table 11
Habitat Acres, Acres Conserved and Percent Conserved
Source: NH Fish and Game Wildlife Action Plan, 2006

Habitat Type	Acres	Acres Conserved	Percent Conserved
Appalachian Oak-Pine	6324	669	10.6
Hemlock-Hardwood Pine	893	88	9.8
Grasslands over 25 acres	2685	437	16.3
Floodplain Forest	647	142	21.9
Wet Meadow/Shrub Wetland	199	35	17.4
Peatland	217	44	20.2
Salt Marsh	294	102	34.6

Conserving these large blocks and connections between other significant habitat areas is important if residents want to retain the species that need larger and diverse home ranges and territories. Some areas should be studied further because the extent of unfragmented lands extends significantly into an adjacent Town making that block more important.

Grasslands - Grasslands are an ever diminishing and crucial requirement for many birds, including meadowlarks, bobolinks, woodcock, and killdeer which are under increasing pressure from loss of habitat. The 2006 NH Fish and Game Wildlife Action Plan estimates there are 2,685 acres of grasslands in Stratham, with 16% of these lands protected from development through conservation easements.

Table 12
Bird Species Observed in Stratham
Source: NH Audubon Seacoast Chapter

American Black Duck	Downy Woodpecker	Pileated Woodpecker
American Crow	Eastern Bluebird	Pine Grosbeak
American Goldfinch	Eastern Screech-Owl (red morph)	Pine Siskin
American Robin	Eastern Wood-Pewee	Purple Finch

American Kestrel	European Starling	Red-breasted Merganser
American Tree Sparrow	Evening Grosbeak	Red-breasted Nuthatch
Bald Eagle	Fox Sparrow	Red-eyed Vireo
Baltimore Oriole	Gold-crowned Kinglet	Red-shouldered Hawk
Barn Swallow	Gray Catbird	Red-tailed Hawk
Barred Owl	Great Black-backed Gull	Red-winged Blackbird
Belted Kingfisher	Great Blue Heron	Ring-billed Gull
Black-and-white Warbler	Great Horned Owl	Rose-breasted Grosbeak
Black-capped Chickadee	Great-crested Flycatcher	Ruby-throated Hummingbird
Black-throated Green Warbler	Greater Yellowlegs	Rufous-sided Towhee
Blackburnian Warbler	Hairy Woodpecker	Scarlet Tanager
Blackpoll Warbler	Hermit Thrush	Sharp-shinned Hawk
Blue Jay	Herring Gull	Song Sparrow
Bobolink	Hooded Merganser	Tree Swallow
Broad-winged Hawk	Eastern Kingbird	Tufted Titmouse
Brown Creeper	Eastern Phoebe	Turkey Vulture
Brown Thrasher	House Finch	Veery
Brown-headed Cowbird	House Sparrow	Purple Martin
Bufflehead	House Wren	Red-bellied Woodpecker
Canada Goose	Indigo Bunting	White-breasted Nuthatch
Canada Warbler	Least Flycatcher	White-crowned Sparrow
Cedar Waxwing	Killdeer	White-throated Sparrow
Chestnut-sided Warbler	Lesser Yellowlegs	Wild Turkey
Chipping Sparrow	Loon	Wood Thrush
Common Flicker	Mallard Duck	Wood Duck
Common Goldeneye	Mourning Dove	Yellow-bellied Sapsucker
Common Grackle	Mute Swan	Yellow Warbler
Common Merganser	Northern Cardinal	
Common Raven	Northern Harrier	
Common Redpoll	Northern Flicker	
Common Yellowthroat	Northern Mockingbird	
Cooper's Hawk	Osprey	
Dark-eyed Junco	Olive-sided Flycatcher	
Double-crested Cormorant	Pheasant	

Table 13
Mammal Species Observed in Stratham
Source: NH Fish and Game

American Beaver	Eastern Cottontail	Red Squirrel
Big Brown Bat	Eastern Gray Squirrel	River Otter
Black Bear	Eastern Pipistrel Bat	Short-tail Weasel
Brown Rat	Fisher	Southern Flying Squirrel
Common Gray Fox	Hairytail Mole	Starnose Mole
Common Muskrat	Little Brown Myotis (Bat)	Striped Skunk
Common Porcupine	Long-tailed Jumping Mouse	Virginia Opossum
Common Raccoon	Meadow Vole	White-footed Mouse
Coyote	Mink	White-tailed Deer
Eastern Chipmunk	Red Fox	Woodchuck

Table 14
Amphibians & Reptile Species Observed in Stratham
Source: NH Fish and Game

Eastern Newt (Red-spotted)	Gray Tree Frog	Common Snapping Turtle
Eastern Red-backed Salamander	Green Frog	Spotted Turtle
Spotted Salamander	Wood Frog	Wood Turtle
American Toad	Eastern Painted Turtle	Eastern Ribbon Snake
Spring Peeper	Blanding's Turtle	Common Garter Snake
Milk Snake		

Significant Habitats

All wildlife needs food, shelter, water and space to survive. These life requirements are defined as an animal's habitat. Animals use a variety of strategies to find food, water and shelter in the environment and it is these strategies that determine the habitat needs for each species. Habitat is everywhere, yet some habitat is more important to wildlife than others. Habitat is more significant when it supports a rare species, represents a smaller percentage of the landscape, provides an abundance of food or other resources, provides a buffer for wildlife against the effects of development, and supports several types of habitat.

The following habitat types are considered to be significant in New Hampshire:

- ***Habitat of Rare Wildlife Species*** – examples include bald eagle wintering areas, peregrine nesting cliffs, common loon nesting areas and Great Blue Heron rookeries.

- ***Unfragmented Lands*** – Large tracts of contiguous habitat that include a mix of forests, wetlands, riparian areas or other habitat which support wide-ranging mammals and forest interior birds.
- ***Riparian Areas and Large Wetlands*** – Riparian areas along water courses, especially those areas that connect river corridors, wetlands and unfragmented lands. Large wetlands or wetland complexes that support a variety of wetland dependent wildlife.
- ***Agricultural and Other Open Land*** – Large fields and shrub lands that support species dependent on this open land type. This habitat has been disappearing in Stratham as farmland is converted to development or reverts back to forest.
- ***Other Unique or Critical Habitats*** - This habitat type is divided into the following groups:
 - Habitat that is rare statewide, for example pine barrens.
 - Habitat that is rare in a particular geographic area, for example mountains in southern New Hampshire.
 - Uncommon land features which provide unique conditions for certain species, for example denning sites in rock piles.
 - Habitat critical to certain species during a particular phase of their life cycle or a particular time of the year. Examples include vernal pools, waterfowl migration stop-over sites and deer wintering areas, all of which are found in Stratham. Large wetlands are valuable stop-over sites for migrating waterfowl in the spring and fall. Canada and Brant geese, mergansers, pied-billed grebes, mallards, and many other species rest and feed here. Migrating geese also feed in the stubble of Stratham cornfields in the late fall. Seeps or seepage wetlands are generally small areas (less than ¼ acre) that occur where groundwater comes to the surface. These sites are the first to green-up in the spring and are frequented by a variety of wildlife for that reason. Dependent species include bear, deer, moose, turkey, salamanders, migrating birds and woodcock.

XVII. Fisheries

Fishing is a popular hobby and Stratham's fisheries are an important natural resource. It is important to keep in mind that many of our fish have been contaminated by mercury and other pollutants. Before eating any fish, consult with the most recent advisories as to what is a safe consumption level.

Table 15
Fish Species
(F) = Fresh; (S) = Salt; (D) = Diadromous (uses both water types during life cycle)
Source: NH Fish and Game

Alewife (D) – Winnicut River & Great Bay	Flounder, Summer (S) - Great Bay (more coastal)
American Eel (D) – Winnicut River & Great Bay	Flounder, Windowpane (S) - Great Bay (more coastal)
American Shad (D) - Great Bay	Flounder, Winter (S) - Great Bay
Atlantic Silverside (S) – Great Bay	Flounder, Yellowtail (S) - Great Bay (more coastal)
Banded Sunfish (F) - Winnicut River	Golden Shiner (F) – Winnicut River
Bass, Largemouth (F) – Winnicut River	Perch, White (F and/or D) – Winnicut River & Great Bay
Bass, Smallmouth (F) – Winnicut River	Perch, Yellow (F) – Winnicut River
Bass, Striped (S) - Great Bay	Pickrel, Eastern Chain (F) – Winnicut River
Blueback Herring (D) – Winnicut River & Great Bay	Pickrel, Redfin (F) – Winnicut River
Bluefish (S) - Great Bay	Pumpkin Seed (F) – Winnicut River
Bluegill (F) – Winnicut River	Smelt, Rainbow (D) –Great Bay, Winnicut River
Bullhead, Brown (F) – Winnicut River	Stickleback, 3-Spine (S and D) –Great Bay, Winnicut River
Crappie, Black (F) - Winnicut River (suspected)	Stickleback, 4-Spine (S and D) –Great Bay, Winnicut River
Common Mummichog (S) – Great Bay	Stickleback, 9-Spine (S and D) –Great Bay, Winnicut River
Common Shiner (F) – Winnicut River	Trout, Eastern Brook (F) (hatchery-raised & stocked) - Winnicut River
Common White Sucker (F) – Winnicut River	Trout, Rainbow (F) (stocked) - Winnicut River
Fall Fish (F) – Winnicut River	

The New Hampshire Fish and Game Department stocks the Winnicut River with brook trout, rainbow trout, and brown trout. The Squamscott River is stocked with river herring (alewives and bluebacks), smelts, and American shad.

Recommendations to Protect Wildlife Habitat:

Stratham's wildlife, and the habitat that it requires, is an important component of the rural character of the Town that is so important to its residents. Because the habitat maps highlight large, unfragmented blocks of land and wetlands, conserving key wildlife habitats will also work towards preserving rural character and water quality.

- Partner with land conservation organizations and surrounding municipalities in the region to protect critical areas identified in the Land Conservation Plan for New Hampshire's Coastal Watersheds.
- Support the protection of riparian corridors by enforcing wetland buffer protections in the Town's Wetland Ordinance and educating landowners about the important role riparian buffers have in the protection of water quality and wildlife habitat.
- Continue to protect large parcels of unfragmented land from development.
- Minimize impacts to significant habitat during development by continuing to require that a natural resource inventory be completed prior to subdivision or site plan approval.
- Apply principles of conservation design to minimize the impacts of development and preserve natural undeveloped lands.
- Work with surrounding communities to identify and conserve wildlife corridors.
- Identify and conserve wildlife corridors through parcels to facilitate wildlife movement across developed areas.
- Educate the public about the value of wildlife habitat.

XVIII. Regional and Statewide Natural Resource Inventories

In 2006, two important reports were released, both providing important information about Stratham's natural resources. The first report was the *New Hampshire Wildlife Action Plan* (WAP), written by the NH Fish and Game Department. The second was *The Land Conservation Plan for New Hampshire's Coastal Watershed* (Coastal Conservation Plan), developed by The NH Chapter of the Nature Conservancy, the Society for Protection of NH Forests, Rockingham Planning Commission, and Strafford Regional Planning Commission. Both of these reports are mentioned here because recommendations made in the plans can guide future land conservation and land development in Stratham.

New Hampshire Fish and Game Wildlife Action Plan (WAP) - The WAP is the most comprehensive wildlife assessment ever completed in New Hampshire, identifying 123 species and 27 habitats in greatest need of conservation. The purpose of the WAP is to provide decision makers with information that encourages sustainable development in sensitive wildlife areas, and considers proactive strategies for land protection. The WAP may be found at the following website:

http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm

Wildlife habitat is categorized in the following ways in the WAP:

- Tier 1 – Highest quality habitat in NH
- Tier 2 – Highest quality habitat in a biological region
- Tier 3 – Supporting landscapes

The amount of acres in each of these four categories was calculated for Stratham, as was the number of acres conserved in these categories. It is important to note that 18% of Stratham is classified by NH Fish and Game as Tier 1 – the highest quality habitat in the state. Table 16 lists this information.

Table 16
Summary of WAP Habitat Tiers

Tier 1	1792.9 acres 18.1% of land in Stratham
Tier 1 Acres Conserved	546.5
% of Tier 1 Acres Conserved	30.5%
Tier 2	1904.2 acres 19.23% of land in Stratham
Tier 2 Acres Conserved	133.3
% of Tier 2 Acres Conserved	12.2%
Tier 3	2427 acres 24.5% of land in Stratham
Tier 3 Acres Conserved	211.9
% of Tier 3 Acres Conserved	8.7%

Habitat Types Found in Stratham

- **Appalachian Oak-Pine Forests** – Stratham has 6,324 acres of this habitat type, which is characterized as being found mostly below 900 feet elevation in southern New Hampshire and along the Connecticut River in western New Hampshire. The nutrient-poor, dry, sandy soils and warm, dry, climate influences the typical vegetation including oak, hickory, mountain laurel, and sugar maple. Many wildlife species use these forests for part or all of their life cycle including whip-poor-wills, black bears, northern myotis, and state endangered eastern hognose snakes. Traditionally, Appalachian oak-pine forests are influenced by frequent fires, which change the age structure of the forest. The diverse age and structure of the forest help to promote wildlife diversity. Intense development pressure particularly in the southeast corner of New Hampshire has dramatically reduced naturally occurring fires and increased fragmentation of this forest type. Incorporating habitat conservation into local land use planning, protecting unfragmented blocks, and adopting sustainable forestry are a few examples of conservation strategies for Appalachian oak-pine forests.

- **Hemlock Hardwood-Pine Forests** – Stratham has 8,929 acres of this habitat type, which is comprised of mostly hemlock, white pine, beech, and oak trees. Since this is a transitional forest, it can occur at different elevations and over different types of soil and topography, so the composition of vegetation can be variable. This forest type is the most common in New Hampshire and covers nearly 50% of the state and provides habitat for numerous wildlife species such as the cerulean warbler, eastern pipistrelle, and bobcat. Many of the species that use this habitat type require large blocks of unfragmented forest such as the northern goshawk and black bear. Since this forest type is so common, it is sometimes overlooked in conservation efforts. Development and fragmentation is a huge threat to the continued existence of hemlock-hardwood-pine forest. Some conservation strategies for hemlock-hardwood-pine forests are incorporating habitat conservation into local land use planning, protecting unfragmented blocks of land, and educating landowners.
- **Grassland** – Stratham has 2,685 acres of this habitat type, which is comprised of grasses, sedges, and wildflowers with little to no shrubs and trees. The most common grassland habitats are airports, capped landfills, wet meadows, and agricultural fields such as hayfields, pastures and fallow fields. The data collected to determine this acreage may have also included large-lot lawns in the grassland classification. Pre-colonial grasslands in New Hampshire were probably only maintained by beaver and fires started by lightning and Native Americans. The numerous agricultural lands maintained by early European settlers provided ideal habitat for some wildlife species that need grassland habitat. As these agricultural lands were abandoned, these populations began to decline and are now on the state endangered list such as the eastern hognose snake, northern harrier, upland sandpiper and on the state threatened list such as the grasshopper sparrow. Other species also benefit from these open grass fields such as wood turtles and numerous species of butterflies. Development and natural forest succession have reduced grassland habitat in the state. Grasslands require maintenance and must be mowed to prevent them from becoming shrublands or forests. Only 8% of NH grasslands are currently under conservation easements. Reclaiming and maintaining grasslands are two important conservation strategies for grassland habitats. Many grassland and potential grassland habitat are on private land and landowners can help restore and conserve them.
- **Floodplain Forest** – Stratham has 647 acres of this habitat type, which occurs in valleys adjacent to river channels prone to periodic flooding. Also referred to as riparian forests, they support diverse natural communities, protect and enhance water quality by filtering and sequestering pollution, and control erosion and sediment. Many wildlife species use these forests at some point in their life cycle. It would not be uncommon to find red-shouldered hawks, veery, or chestnut-sided warblers breeding in floodplain forests. Evidence of beaver, mink, or otter can usually be found along the water's edge. Other wetlands, like swamps and vernal pools, can be found in floodplain forests and these areas are particularly important for Jefferson salamanders, northern leopard frog,

wood turtles, and state endangered Blanding's turtles. Since these species, like most wildlife species, use a variety of habitats, not only is a floodplain forest important but the adjacent upland is also crucial for these species. Floodplain forests with their rich soils have been converted to open farmland for centuries, so many floodplains are no longer forested wildlife habitat. Other human activities have threatened these habitats including residential and commercial development along rivers and the installation of dams which have altered the natural flooding regime. Floodplain habitats are particularly vulnerable to invasive plants because the frequent disturbances from flooding give aliens opportunities to establish, and because these species tend to thrive in the nutrient rich soils characteristic of floodplains. Annual flooding can control these invasives, if the natural flood regime is not altered. Some conservation strategies for maintaining this unique habitat type in the state are managing river impoundments to simulate natural water flows, removing dams where possible, and protecting the highest quality sites. Many floodplain forests are on private land and landowners can help restore and conserve them.

- **Marsh and Shrub Wetlands** – Stratham has 199 acres of this habitat type, which is characterized by a broad range of flood regimes, sometimes controlled by the presence or departure of beavers, but mostly controlled by groundwater. This system, which is an important food source for many species, is often grouped into three broad habitat categories: wet meadows, emergent marshes, and scrub-shrub wetlands. Marsh and shrub wetlands filter pollutants, preventing them from getting into local streams, and help hold water to reduce flooding. Many wildlife species use marsh and shrub wetlands including common species like red-winged blackbirds, beavers, and painted turtles. Marsh and shrub wetlands are also critically important for state endangered Blanding's turtles, New England cottontails, northern harriers, ringed boghaunters, and sedge wrens plus state threatened spotted turtles and pied billed grebes. Development is a threat to these habitats mostly from driveways and roads that fragment wetlands or change the flow of water. The loss of an upland habitat around a marsh or shrub wetland also increases the amount of pollution and sedimentation threatening the habitat. Another constant threat to marsh and shrub wetlands is invasive plants such as purple loosestrife and Japanese knotweed that compete with native vegetation. Some conservation strategies for marsh and shrub wetlands are restoration and protection of these important habitats. Many marsh and shrub wetlands are on private land and landowners can help restore and conserve them.
- **Peatlands** – Stratham has 217 acres of this habitat type. Peatland habitats are extremely important for carbon sequestration on a local and global scale. The water in peatlands has low nutrient content and typically high acidity caused by limited groundwater input and surface runoff. These environmental conditions are such that plant and animal material take a very long time to decompose. This organic material contains carbon and other nutrients, storing it away and slowly releasing it into the atmosphere. Drainage and destruction of peatlands releases this carbon into the atmosphere quicker, increasing greenhouse gases today. Conservation of the 11

different natural communities that comprise peatlands is also vital to the continued existence of many rare plant and wildlife species in New Hampshire. The state endangered ringed bog haunter uses peatlands and the surrounding uplands in the southern part of the state. The northern bog lemming inhabits burrows in the sphagnum moss and associated grasses. Typical vegetation in a peatland includes sphagnum moss, leather leaf, northern white cedar, and American larch. Threats to peatland habitats are development, altered hydrology (amount and flow of water), and unsustainable forest harvesting. Non-point source pollutants, such as road salt, lawn fertilizers, and pesticides, also threaten this habitat by altering the acidity and nutrients. Establishing buffers around this habitat is one conservation strategy that will help minimize the threats to peatland habitats.

- **Salt Marsh** – Stratham has 294 acres of this habitat type, which is characterized by grass-dominated tidal wetlands existing in the transition zone between ocean and upland. They are among the most productive ecosystems in the world and provide great habitat for many bird species including American bittern, Nelson's sharp-tailed sparrow, salt marsh sharp-tailed sparrow, seaside sparrow, and semipalmated sandpiper. Salt marsh plants are salt-tolerant and adapted to fluctuating water levels. Nutrients that stimulate marsh plant growth are carried in with the tides, and organic matter that feeds fish and other organisms is carried out by the tides. Over time, organic matter accumulates on the marsh and forms peat. By building up more peat, salt marsh elevation can keep pace with rising sea level, unless the rate of sea-level rise becomes too great, such as is predicted from climate change. Salt marshes help protect coastal areas from storm surges, but an estimated 30-50% of New Hampshire's original salt marsh habitat has been lost to development. Some of the conservation strategies for salt marshes are restoring and protecting the remaining salt marsh habitat and surrounding upland buffer habitat.

Profiles of all these habitat types may be found at the following website:

http://www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/habitat_types.htm

The Land Conservation Plan for New Hampshire's Coastal Watersheds - The overarching goal of the Land Conservation Plan for New Hampshire's Coastal Watersheds is to focus conservation on those lands and waters that are most important for conserving living resources – native plants, animals, and natural communities – and water quality in the coastal watersheds. The Plan is intended to achieve the following purposes:

- Identify and describe a portfolio of areas that represent the best remaining opportunities to conserve the critical ecological, biological, and water resources of NH's coastal watershed.
- Identify and describe a set of voluntary and regulatory land conservation strategies available for protecting the important areas.

To develop the Coastal Conservation Plan, data from the WAP as well as other sources were used and resulted in 75 Conservation Focus Areas in the 46 communities in the coastal watershed. The Land Conservation Plan for New Hampshire's Coastal Watersheds may be found at the following website:

<http://www.rpc-nh.org/coastal-conservation.html>

Stratham has four of these Focus Areas, labeled Squamscott River, Winnicut River/Cornelius Brook, Upper Winnicut River, and Parkman Brook.

Squamscott River – This focus area has a core area of 2020 acres, with a supporting natural landscape of an additional 260 acres. The focus area includes the Towns of Stratham, Exeter, Greenland, Newfields, and Newmarket, and includes 12.9 miles of estuarine shoreland along the Squamscott River and Great Bay, and 409.6 acres of saltmarsh.

There are 2 plants of conservation concern – Small Spike-rush, a threatened species, and Tundra Alkali Grass, an endangered species. There are 5 animal of conservation concern – the Saltmarsh Sharp-tailed Sparrow, Nelson's Sharp-tailed sparrow, Least Bittern, Sora, and Osprey, the last being classified as threatened. Significant wildlife habitats in the focus area include floodplain forest, grassland, marsh and peatland. Exemplary natural communities and systems include brackish marsh, high brackish tidal riverbank marsh, low brackish tidal riverbank marsh, brackish subtidal channel/bay bottom, and Appalachian oak-hickory forest. The focus area includes 576.8 acres of prime farmland and 134.4 acres of farmland of statewide importance.

Winnicut River/Cornelius Brook – This focus area has a core area of 330 acres in Stratham and North Hampton, with a supporting natural landscape of 920 acres. Significant wildlife habitats include grassland, marsh and peatland. The focus area includes 55.1 acres of prime farmland and 33.6 acres of farmland of statewide importance.

Upper Winnicut River – This focus area has a core area of 250 acres in North Hampton, and 920 acres in Stratham and North Hampton, and comprises a portion (20%) of a 1330 acre block identified as a Tier 2 priority habitat in the NH Fish and Game Wildlife Action Plan. Significant wildlife habitats include marsh and peatland. The focus area includes 17.1 acres of prime farmland and 6.8 acres of farmland of statewide importance.

Parkman Brook – This focus area has a core area of 550 acres in Stratham, and includes an unfragmented forest block of 600 acres. There is one animal of conservation concern in the focus area, the Least Bittern. Significant wildlife habitats include grassland, marsh, and peatland. The focus area includes 88.9 acres of prime farmland and 61.1 acres of farmland of statewide importance.

The loss of habitat through the conversion of land from its natural state to a developed landscape represents the single greatest threat of increased human activity on native wildlife.

All animal species require certain habitat features to survive. Development typically eliminates or significantly changes many important habitat features found in the Focus Areas described above, thus reducing or eliminating the habitat value of that area.

Recommendations from the Regional and Statewide Natural Resource Inventories:

- Regulate the location, density and design of development within Focus Areas to minimize harmful impacts while allowing for a reasonable level of development.
- Preserve large and contiguous blocks of natural, undisturbed vegetation, looking for opportunities to connect to undeveloped lands on adjacent parcels.
- Conserve rare and outstanding landscape elements, such as unique features or habitats, by directing development to other areas.
- Identify and conserve wildlife corridors through the property to facilitate wildlife movement across developed areas.
- Maintain significant buffers of undeveloped land between important habitat areas and developed areas.
- Maintain or replace natural features and functions within developed areas (such as capturing rainwater).
- Conserve key wildlife habitats, which will also work towards preserving rural character and water quality.
- Educate residents about ways in which to manage land for wildlife.
- Require developers to review habitat conservation information in local and regional plans and manuals on habitat identification and protection.
- Apply principles of conservation design to minimize impacts and preserve natural undeveloped lands.
- Submit sightings of reptiles and amphibians to the NH Fish and Game Reptile and Amphibian Reporting Program

Natural Services Network - The natural world provides the foundation for human health and economic vitality. Natural systems store floodwaters, cleanse air and water, maintain productive soils for agriculture and forestry, support wildlife, recycle wastes, moderate

temperature extremes, and more. The free benefits provided by nature are called *natural services*.

The New Hampshire Natural Services Network is a GIS-based tool identifying lands that provide important ecological services that are difficult and expensive to replicate. These areas are classified as:

- Water supply lands, including aquifers and gravel well sites identified by the NH Department of Environmental Services.
- Important wildlife, as identified by the NH Fish and Game Wildlife Action Plan (WAP).
- Productive soils, including prime farmland and farmland of statewide importance identified by the Natural Resource Conservation Service.
- Flood storage, including the 100-year floodplains identified by FEMA and wetlands identified by the US Fish and Wildlife Service National Wetlands Inventory.

Loss of these services affects human health, safety, quality of life, and economic opportunity.

XIX. Conservation and Open Space Land in Stratham

A great deal of hard work has taken place in recent years to identify and protect critical natural resources in Stratham. With support from residents and elected officials, the Stratham Conservation Commission has conserved hundreds of acres, often in partnership with regional, state and national organizations. In 1999, residents voted to put tax money collected when a property is taken out of Current Use assessment into a Land Conservation Fund. In 2002, residents voted to create a \$5M bond for the purpose of acquiring conservation easements or fee interest on undeveloped land. A sub-committee of the Conservation Commission was formed to develop criteria for selecting conservation land. With input from other boards and commissions it was decided that priority conservation land included parcels located in the Aquifer Protection District, parcels with important wildlife corridors and/or scenic viewsheds, farmland, and land abutting properties already protected from development.

Table 17
Conservation Land in Stratham

Property Name	Property Owner	Conservation Easement holder	Location	Acres
Stratham Hill Park	Town of Stratham	NA	NH Rt. 33	108
Stevens Park	Town of Stratham	NA	Bunker Hill Avenue	21
Hill	Private ownership	Southeast Land Trust of New Hampshire	Doe Run Lane	16
Batchelder Farm	Private ownership	Town of Stratham	Barker Lane	58
Gunn	Private ownership	RCCD	Winnicutt Road	11
Shaw's Supermarket	Private ownership	Town of Stratham	NH. Rt. 108	26
Willow Pond	Private ownership	Town of Stratham	Union Road	8
Scamman Farm	Private ownership	Southeast Land Trust of NH	Portsmouth Avenue	256
Vineyards	Private ownership	Town of Stratham	Guinea Road	19
Stratham Memorial School	Town of Stratham	NH	Gifford Farm Road	10
Long Hill	Town of Stratham	Town of Stratham	Easton Hill Lane	56
Smith	Private ownership	Rockingham County Conservation District	High Street	9
Chisholm Farm	Private ownership	Chisholm Farm Homeowners Assoc.	Chisholm Farm Road	85
Gordon Barker Town Forest	Town of Stratham	NA	Jack Rabbit Lane	129
Town of Stratham	Town of Stratham	NA	Lovell Road	16
Boat Ramp	Town of Stratham	NA	River Road	1
Town of Stratham (Zarnowski)	Town of Stratham	NA	along Squamscott River	30
Oxbow	Town of Stratham	NA	along Squamscott River, Exeter	20

Monahan Saltmarsh	Town of Stratham	NA	Squamscott Road	10
Winterberry subdivision	Private ownership	Town of Stratham	Union Road	34
Barker Saltmarsh	NH Fish & Game	NA	Squamscott Road	5
Zarnowski	NH Fish & Game	NA	Boat Club Road	29
Cabernet	NH Fish & Game	NA	Linda Lane	19
Railroad Crossing	NH Fish & Game	NA	Depot Road	7
Harrington	Southeast Land Trust of NH	NH Fish & Game		28
A Wiggins	NH Fish & Game	NA	NH Rt. 108	2
Chapman's Landing	NH Fish & Game	NA	NH Rt. 108	7
Great Bay Community College	State of NH	NA	Portsmouth Avenue	91
Stuart Farm	Private ownership	NH Dept. of Agriculture	NH Rt. 108	218
Stevens	Private ownership	NH Fish & Game	Squamscott Road	37
Turnberry	Private ownership	Society for the Protection of NH Forests	Depot Road	61
Salt River	Private ownership	Rockingham County Conservation District	Depot Road	51
Berry Hill Farm	Private ownership	Southeast Land Trust of NH	Stratham Heights Road	50
Goodrich	Private ownership	Town of Stratham	Stratham Heights Road	50
Sanderson	Private ownership	Rockingham County Conservation District	Bunker Hill Avenue	28
Wiggin Farm	Private ownership	Town of Stratham	Union Road	12
Hanna	Private ownership	Rockingham County Conservation District	Portsmouth Avenue	36
Flossie Wiggin	Private ownership	Rockingham County Conservation District	Squamscott Road	65
Scullers Boat Club	Private ownership	Town of Stratham	Boat Club Road	4
Broderick	Private ownership	Southeast Land Trust of NH	Bunker Hill Avenue	29
Jones	Private ownership	Rockingham County Conservation District	Winnicut Road	94

Market Basket	Private ownership	Society for the Protection of NH Forests	NH Rt. 33, behind Market Basket	90
Applejack Farm	Private ownership	Rockingham County Conservation District	Willow Brook	20
Adams Farm	Private ownership	Town of Stratham	Winnicut Road	11
Saltbox Farm	Private ownership	Rockingham County Conservation District	NH Rt. 33	31
Golf Club of New England	Private ownership	Rockingham County Conservation District	Union Road	67
Cooperative Middle School	SAU 16	NA	100 Academy Way	10

Cluster Development Open Space - In 1983, the Town of Stratham adopted a cluster development provision in its Zoning Ordinance. The cluster ordinance has led to many tracts of open space being protected, in perpetuity, especially along the Squamscott River. The following table describes cluster developments which have set aside significant tracts of open space to remain undeveloped. *NOTE – Public access on this land may or may not be permitted.*

Table 18
Cluster Development Open Space Land in Stratham

Property Name	Property Owner	Location	Acres
Thornhill Condominiums	Thornhill Condominium Association	Rollins Farm Drive	35
Parkman Brook Condominiums	Parkman Brook Association	Country Farm Road	55
Vineyards	Vineyard Association	Academic Way	55
Montrose Condominiums	Montrose Condominium Association	Bunker Hill Avenue	24
Meadows Condominiums	Meadows Condominium Association	Bunker Hill Avenue	14
Sunset Woods	Sunset Woods Association	Mason Drive	16
Windy Knoll Village	Windy Knoll Association	Portsmouth Avenue	3
Bunker Hill Estates	Bunker Hill Estates	29 Bunker Hill Avenue	5
Willow Pond	Willow Pond Association	Heron Way	9
Sewall Farms	Sewall Farms Realty LLC	106 Bunker Hill Avenue	36
Kirriemuir Condominiums	Kirriemuir Homeowners Association	Bunker Hill Avenue	16

Stratham Woods Phase III	Stratham Woods Association	Butterfield Lane	28
Tricia's Way	Town of Stratham	Stephen Drive	20
Spring Creek	Spring Creek Drive Association	Spring Creek	10
Muirfield	Muirfield Homeowner's Association	Muirfield Drive	19
87 Winnicutt Road	Town of Stratham	87 Winnicutt Road	5
Chestnut Way	Town of Stratham	Chestnut Way	13
Lamington Place	Lamington Homeowner's Association	Lamington Hill Road	6
Peninsula Condominiums	Peninsula Condominium Association	Peninsula Drive	53
Wingate Court	Wingate Court Homeowner's Association	Wingate Court	10
Crockett's Farm	Crockett's Farm Association	Crockett's Way/Tansy Avenue	147
Stratham Green	Stratham Green Condominium Association	Winding Brook	66
Jewett Hill	Jewett Hill Homeowner's Association	Iris Drive	2
Aberdeen Park	Aberdeen Realty	Willowbrook Avenue	24
Balmoral Condominiums	Baltimore Condominium Association	Balmoral Drive	34
Pear Tree Association	Pear Tree Association	High Street/Bartlett Road	7
Chisholm Farm	Chisholm Farm Homeowner's Association	Chisholm Farm Road	.35
Turnberry Condominiums	Turnberry Condominium Association	Turnberry Drive	113
Alderwood Condominiums	Burnhaven Condominium Association	Alderwood Drive	25
Pheasant Run Condominiums	Pheasant Run Condominium Association	Pheasant Run Lane	38
Brookside Condominiums/Salt River	Rockingham County Conservation District	Brookside Drive	58
Dunbarton Oaks	Dunbarton Oaks Association	Dunbarton Oaks Road	13
Glengarry Condominiums	Glengarry Condominiums Association	Glengarry Road	35
Willow Pond	Willow Pond Homeowners Association	Heron Way	9

XX. Recommendations and Next Steps

The key natural features of Stratham are:

- Great Bay, including its salt marsh, estuaries and tributaries.
- The diverse range of supportive habitats.
- Stratham Hill Park and the Gordon Barker Town Forest, for the recreational open space opportunities they offer.
- Active farmlands that operate in Stratham.
- Groundwater resources that provide quality drinking water to the entire community.

The Conservation Commission strongly recommends future natural resource protection efforts include:

- Maintaining contiguous preserved land that supports wildlife corridors.
- Continuing to conserve conservation easements.
- Combating invasive species that threaten natural habitats.
- Minimizing point and non-point sources of pollution that affect both waterways and groundwater resources.
- Encouraging locally active farms to sell to local residents.

Action steps to accomplish the above include:

- Providing programs to help residents to identify invasive species and learn how to safely eliminate them.
- Supporting the protection of natural species and encourage planting of native species.
- Educating residents about the use of pesticides and fertilizers and the potential hazards to the environment that these chemicals pose.
- Promoting buying locally grown produce and other goods in order to support local farms, using the Conservation Commission website and other resources.
- Continuing to use the remainder of the conservation bond funds to conserve open space and protect water resources.
- Encouraging increased recycling efforts by residents.
- Providing educational materials and programs to help residents understand nitrogen sources and their impacts, with specific focus on caring for septic systems and the health hazards of failing systems.