

City of Dover, N.H. Master Plan



Natural and Historic Resources

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CITY OF DOVER MASTER PLAN
NATURAL AND HISTORIC RESOURCES CHAPTER
2000

The City of Dover gratefully acknowledges the contribution of the following citizens who volunteered to serve on the Master Plan Committees. Their time and effort was crucial to the planning process.

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Natural and Historic Resources Goals and Objectives

Goal 1. Protect and enhance environmentally sensitive natural resources areas in order to maintain their ecological integrity and/or to promote public health and safety.

Objective 1: Ensure a safe and adequate water supply for all citizens through proper management of the use of land adjacent to the City's existing and potential, to the extent possible, water supply wells and potentially valuable aquifer recharge areas.

Objective 2: Protect and maintain the valuable functions of wetlands by minimizing the impact of development and allowing appropriate multiple use of these resources for recreation, wildlife habitat and limited timber harvest.

Objective 3: Encourage only those uses of the 100-year floodplain that are enhanced or unharmed by flooding.

Objective 4: Protect surface water resources by minimizing non-point source pollution storm water discharge.

Objective 5: Protect unique or unusual natural resource features or communities.

Goal 2: Maintain the quality of Dover's living environment by encouraging the appropriate balance between protection and active use of the city's natural, cultural and historical resources.

Objective 1: Protect significant higher elevations for their visual value.

Objective 2: Protect, promote and maintain the quality of Dover's cultural and historic resources.

Objective 3: Increase public awareness of Dover's unusual and rare plant and animal species.

Objective 4: Encourage the maintenance and proper management of the City's agriculture and forestry resources.

Natural Resources

Introduction

Dover's natural resources are a critical consideration in establishing a proper approach for land management. Understanding natural resource values provides a rational basis for determining which areas of the City are more appropriate for protection and open space and which areas are more suitable for development. Natural resources such as slope, soils, vegetation, wildlife and water resources add to Dover's character, provide recreational opportunities and contribute to the quality of life for Dover residents. These natural resources also provide both opportunities and constraints for growth. Steep slopes and wetlands, for example, are less suitable for development, while better drained, flatter areas are more suitable. On the other hand, these well-drained areas may be associated with groundwater areas that require protection. Thus, the natural resource base of Dover provides an important factor as the basis for local land use decisions. The following is a description and analysis of Dover's natural resource base.

Topography and Geology

Dover lies wholly within the Seaboard Lowland Section of the New England physiographic region that lies between the Atlantic shoreline west to a line along Route 125 in Barrington and Rochester. Elevations range from sea level along the City's tide water shorelines that extend up the Cochecho and Bellamy Rivers to the dams in downtown Dover to approximately 280 feet at the top of Garrison Hill near Wentworth-Douglas Hospital and the border with Rollinsford. The gently rolling topography generally increases in relief from southeast to west. Other prominent hills include Huckleberry (120 ft.) along Dover Point, Mount Pleasant (180 ft.) near Henry Law Avenue, Pudding Hill (194 ft.) along Mast Road, Long Hill (200 ft.), and Blackwater (236 ft.) near Blackwater Road and the Spaulding Turnpike.

Although Dover's topography generally reflects the underlying bedrock, many areas conform to deep surface deposits that formed during the period of glaciation many thousands of years ago. The area along Dover Point and Pudding Hill and also near Willand Pond are good examples. Garrison Hill, on the other hand, was formed by a geological deposit of glacial till known as a drumlin. There are five major subdivisions of geologic deposits that influence Dover's topography. These are listed below in reverse order of deposition (starting with the uppermost and therefore youngest of the deposits):

- *River Alluvium and Swamp Deposits* occur in low, poorly drained areas of Dover and cover approximately 30% of Dover's land area. In freshwater areas, these deposits typically contain high water tables and may have water seasonally ponded at the surface. In tidal areas, these deposits are characterized by mudflats and vegetation adapted to diurnal submergence by saltwater. The City's freshwater and tidal wetland resources are usually associated with these deposits and are contained within the hydric soil group discussed below.
- *Marine Deposits* cover much of Dover's land surface. These deposits originated immediately following the melting of glacial ice approximately 12,000 to 14,000 years ago. The weight of the ice temporally depressed the land surface of Dover below what was sea level at that time. The melting of glacial ice to the northwest of Dover provided sediment to the ocean bottom. Stratified clay deposits were formed in deeper water. As the land surface slowly rose, the ancient shoreline gradually migrated toward the southeast depositing a veneer of sand over much of the previously deposited marine clay and other glacial deposits.

- *Ice-Contact Stratified Drift* is composed of fine to medium sands and gravel deposited in proximity to glacial ice. The majority of these deposits are generally associated with an ancient buried valley in the western area of Dover that extends from Pudding Hill to Rochester and Farmington where it becomes associated with the Cochecho River. There are also significant deposits of stratified drift along Dover Point and associated with Willand Pond. Much of the municipal water supply is drawn from these deposits and there are a number of gravel pits associated with these deposits. On the other hand, wastewater from septic systems may not be retained in the soil long enough to ensure proper treatment.
- *Unstratified Drift* or *Glacial Till* is composed of an unsorted mix of sand, silt, clay, gravel and boulders that overlies much of the bedrock in Dover. These deposits are formed in association with moving glacial ice. Thick accumulations of glacial till are often streamlined in the direction of ice movement into landforms known as drumlins. Garrison Hill and Mount Pleasant represent drumlins. These generally poorly permeable glacial deposits may limit percolation for proper siting of septic systems and do not generally hold sizable supplies of groundwater.
- *Bedrock outcrops* in Dover are composed of both igneous and metamorphic rocks. Bedrock or ledge outcrops usually present a constraint to development, primarily where septic systems or foundations are required. Blasting may be necessary for structural foundations and footings.

Soils

The soils in Dover have developed over time from the interaction of climate, vegetation, topography and surficial materials. Since much of the surface materials of Dover are underlain by marine clays and glacial till, many of the soils tend to be moist and/or stony with areas of high water table, shallow ledge or ledge outcroppings. Where there is stratified drift, the soils tend to be more sandy and gravely and better drained. Hydric soils tend to be found in low spots associated with surface water features or in areas underlain by silt and clay deposits throughout the City. Soil types are derived from the *Strafford County Soil Survey* produced by the US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) in 1975.

Soil Conditions.

The following is a description of Dover's soils based upon soil conditions that are grouped into five (5) broad categories for planning purposes:

Wetland (Hydric) Soils

These include all poorly and very poorly drained soils often associated with marine silts and clays including muck, peat, swamps and marshes as defined by the NRCS for the State of New Hampshire. They include such soil types as the Biddeford, Rumney and Scantic groups. The water table is at or near the surface 5 to 9 months of the year. Wetland soils are associated with low lying areas in Dover, such as the Mallego Plains and along watercourses such as the Cochecho and Bellamy Rivers.

These areas are best suited to natural open space or limited development because wetland soils provide several natural functions that are beneficial to the community. These functions include: absorbing excess flood waters preventing downstream flooding; providing valuable habitat for fish and wildlife; providing groundwater recharge to local aquifers; and trapping sediment and other pollutants, thus acting as a surface water filter. City-wide these soils comprise approximately 4,192 acres or 24.5% of Dover.

Hydric soils are a class of soils as defined by the NRCS. These soils are similar to, but may not be precisely the same as, wetlands as defined by the US Army Corps of Engineers under section 404 of the Federal Clean Water Act. Army Corps wetlands are also referred to as “Federal Jurisdictional Wetlands”. For regulatory purposes both the NH Wetlands Bureau and the Corps employ the Corps definition. Further discussion of the City’s wetland resources is located in the Water Resources section.

Seasonally Wet Soils

These soils are somewhat better drained than the wetland soils, but typically have a seasonal water table within 2 1/2 to 3 feet of the surface, a perched water table or slowly permeable sub-layer during the wet season. They tend to be located on the lower slopes of hills and on low knolls associated with the Bellamy and Cochecho Rivers and their tributaries. This soil grouping includes such map units as Buxton and Sutton. The City should encourage low density uses and those that are not likely to pollute the groundwater. Flooded basements and submerged leach fields can be expected. City-wide these soils comprise approximately 3,952 acres or slightly more than 23% of Dover.

Shallow to Bedrock Soils

This soil group tends to be located on low, knobby hills and ridges that typically have bedrock within 1-3 feet of the surface. They tend to be concentrated in the southern part of Dover in the Piscataqua Road area and also in the northern part of the City generally along a north/south line from the Old Rochester Road to Tolend Road. These soils comprise 1,804 acres or 10.5% of Dover’s land area. This soil group is made up of the Hollis-Charlton complex. While this group tends to have a shallow to bedrock characteristic, there will be some areas that do have deeper soils.

Sandy and Gravelly Soils

Sandy and gravelly soils are excessively well drained Hinckley and Windsor soils that are typically associated with the stratified drift deposits from glacial outwash, such as the Hoppers and Pudding Hill areas. They comprise 4,468 acres or slightly more than 26% of Dover. These soils have excellent potential for development since there are few limitations for construction. However, these areas are often associated with significant groundwater supplies--such as the Dover municipal well system. Thus, development density must be managed to prevent groundwater pollution from effluent since these soils are very permeable.

Deep, Well-Drained Stony Soils

This group consists of well-drained loamy soils that are formed from deep, sandy, stony, glacial till. In some instances there may be clay layer at about 2 feet that restricts water movement. These include the Charlton and Gloucester soils and make up about 4,421 acres or 14% of the City’s land area. Most development is suitable in these soils, although larger stones and clay lenses may be limiting factors for foundation and septic system construction. Similar to the sandy and gravelly soils, development density must be managed to prevent groundwater pollution from effluent since these soils are rather permeable.

Another approximately 2% of Dover’s soils are not rated because they were in urban areas or were determined to be active or abandoned gravel pits.

Farmland Soils

The NRCS has identified three categories of farmland soils in New Hampshire-- prime farmland soils, soils of statewide importance and soils of local importance. This classification is based upon the productivity of the soils for food and fiber crops. Prime farmland soils have the capacity to produce sustained high yield of crops. Soils of statewide significance are deemed to be important for farming in New Hampshire, but are of less value than prime farmlands because the soils are not as fertile and require more erosion control practices. Similarly, soils of local importance may be important for farming in Dover, but are not as valuable as either the prime farmland soils or those of statewide significance. These soils are not as fertile and are usually poorly drained.

Dover has approximately 2, 494 acres that are defined as prime farmland soils. However, there is now less than 1680 acres that are still available for cultivation. In 1980 almost 2000 acres of prime farmland were available—a loss of over 300 acres. The encroachment of development on agricultural soils or lands that are currently in agricultural use is an issue of concern for the long-term use of land in Dover. Once converted to more intensive uses, these lands are usually irretrievably lost for agricultural purposes. Further discussion of these resources is in the Agricultural Resources section of this chapter.

Slope

For planning and development purposes the slope or steepness of the land is expressed as a percentage that represents the relationship of horizontal and vertical distance between two points. For example, a 20 foot rise within 100 feet is a 20% slope. As slope increases the potential for surface runoff and erosion increases. The soil depth is also thinner as slopes increase thus decreasing the capacity of the land to filter septic system effluent in areas that lack public sewer. In addition, construction costs for development also increase.

Slope was mapped by the City as part of the 1988 Master Plan. This information, mapped at a scale of 1" = 1000', is based on the 1973 Soil Survey of Strafford County by the USDA Soil Conservation Service. The soil survey breaks slope out into five categories using a letter suffix with each soil unit: A is 0-3%, B is 3-8%, C is 8-15%, D is 15-25% and E is greater than 25%. Dover aggregated these categories into three classes—0-8%; 8-15%; and greater than 15%. Most of Dover falls within the 0-8% class. Areas with the steepest slopes tend to be associated with the stream and river valleys, especially along the upper reaches of the tidal portion of the Bellamy River as well as the Cochecho River between Watson Road and Whittier Street and also between the Upper Narrows and Fresh Creek. Slopes along the western shore of Fresh Creek and the Salmon Falls and the Piscataqua Rivers have slopes greater than 15%. The Critical Natural Features Map depicts slopes greater than 15%.

Slopes from 0-12% are the most suitable for development. The flattest slopes --0-3%--are suitable for roadways as well as commercial, industrial, and recreational uses. Undulating lands up to 12% are suitable for residential uses and private roads as well as the above uses with increasing limitations as the slopes increase. Land use limitations based on slope begins when the slope is between 12 and 15%. Development on steep slopes is likely to reduce soil stability, causing erosion and sedimentation into brooks, streams and surface water bodies. Such slopes are usually best left naturally vegetated as part of a community's open space system or to satisfy subdivision open space requirements.

Forest Resources

Dover has many woodland and forested areas most of which are second growth deciduous and coniferous species. These forest resources represent a response to a relatively wet climate (42 inches of rain annually) with warm summers and cold winters. Variation in soil and slope will result in a variation in vegetation. Where soils are wet there may be a preponderance of hardwoods such as red maple and yellow birch. A mixed forest including white pine and eastern hemlock will more likely occur on drier sandy/gravelly soils.

Over time, as the City has grown, the amount of forested and wooded areas have declined. Ensuring a long-term policy toward proper management of the City's forest and tree resources has a number of values: open space and scenic enhancement, recreation, preservation of wildlife habitat, and water quality protection. At one point in the early part of the 19th century almost all of this area was logged off and in some areas up to 90 % of the land was open. Since then the forested areas recovered until the middle of the 20th century. Over the past 50 years Dover has been incrementally losing its forest resources. In 1953 38% of Dover's land area was forested. By 1982 it had dwindled to 23% of the land area, a decrease of over 2700 acres. (*Land Use Change: Strafford County, NH, 1953-1982*, UNH Agricultural Experiment Station Report #112, 1987).

A recent Natural Resource Inventory (NRI) of the Strafford Region using land cover data from 1992 and 1993 aerial photography reports that there is 7325 acres of forest cover in Dover or approximately 39%. It is likely that different criteria were used to define forest use in each of these studies. The NRI also documented valuable forest land that identified forested areas in association with soil types conducive to high timber yields. Dover has 3313 acres of such lands or approximately 18% the City.

Annual Taxable Timber Harvest

Although forests and woodlands are generally not a valuable resource from a direct economic standpoint in Dover, they are used by owners and non-owners for a variety of purposes. There is limited timber harvesting through growers that are members of the New Hampshire Tree Farm Program. In Dover there are 12 such certified tree farms that total 652 acres. Another farm of 64 acres qualifies as a certified tree farm, but is not in the program. These tree farms combined with other forest lands in Dover generate some income for the City through the state Timber Harvest Tax program. This program yields a 10% tax to the City on the value of all timber harvested. Data from the last master plan indicated that the city earned approximately \$1000 per year from this tax. The table below indicates that the City received almost \$20,000 in taxes for 1998-99, substantially more than in the 1980's.

Table 1.
Annual Timber Harvest-City of Dover
 1998-1999

<u>Wood Product</u>	<u>Yield</u>
White Pine (B.F.)	144,790
Red Pine (B.F.)	3,200
Spruce/Fir (B.F.)	1,626
White Birch (B.F.)	19
Oak (B.F.)	5,060
Ash (B.F.)	520
Pallet/Tie Logs (B.F.)	11,518
Hardwood/Aspen (cords)	262
Pine (cords)	1258
Tree Chips (cords)	4,694
Cordwood/Fuelwood (cords)	61
Total Tax	\$19,984.74

Source: Dover Tax Assessor's Records, August , 1999

City Tree Programs

The City of Dover has maintained an active tree planting and enhancement program since the early 1980's. The City's arborist is responsible for the tree management program including planting, removal and maintenance within the City's rights-of-ways. The City received its designation as a "Tree City, USA" in the late 1980's from the National Arbor Day Foundation, a distinction based upon the City's financial effort toward tree planting and maintenance. For several years the City was unable to make the necessary financial commitment to retain its certification, but as of 1998 the City has had seven successive years as a Tree City.

The City is also part of the National Tree Trust, a nonprofit organization created through the America the Beautiful Act of 1990. The Trust assists groups across the country with tree planting and education programs by providing seedlings as well as monetary and educational grants. At present Dover receives a number of seedlings each year and currently has a stock of about 300 trees. The City may need additional land as a nursery to properly maintain this stock. Annually Dover installs approximately 100 trees generally within the urban core of the City. The tree program also includes the City's cemeteries where trees are maintained and planted as these facilities expand.

In 1984 the City conducted an inventory of every street tree and publicly-owned shade tree in Dover. Almost 3000 trees were identified. An inventory has not been conducted since, but in the coming year the City plans to update the inventory and place the information in the GIS data base so that each tree will be mapped and documented.

Fish and Wildlife Resources

Dover's mixture of undisturbed habitats including forests and woodlands, open fields, wetlands surface waters and estuarine rivers provide habitat for valuable fish and wildlife resources. The following discussion briefly describes these resources.

Estuarine Habitat

Dover's tidal riverine system is part of the Great and Little Bay Estuary that is a nationally recognized marine system—the Great Bay National Estuarine Research Reserve. Dedicated in 1987 as a national reserve, the estuary and its watershed represent an area dedicated to education, research and resource management.

The Cochecho, Bellamy, Salmon Falls and Piscataqua Rivers are an integral part of this system and in total provide Dover with over 50 miles of tidal river frontage. All four rivers are part of the Piscataqua River Basin which, at Dover Point, receives discharge from Great and Little Bay before emptying into the Atlantic Ocean at Portsmouth.

There have been a number of inventories of the Great Bay Estuary, including one conducted in 1981 by the New Hampshire Fish and Game Department (NH F&G), another by the University of New Hampshire on the ecology of the Bay and a recent (1999) technical characterization conducted by the New Hampshire Estuaries Project. Each of these have identified the diverse fish and shellfish habitats as well as a diverse population of birds and mammals within the Great Bay Estuary. For example, as many as 110 species birds have been identified including shore birds, sea birds and song birds.

Shellfish

In the Bellamy River there is a small oyster bed in the lower portion of the river. A larger area identified in the 1981 Fish & Game study appears to have been depleted due to sedimentation. In addition, there are scattered soft-shell beds that tend to be associated with the eastern side of the river except where the river widens out below Clements Point where there are scattered beds in Royalls Cove. **See Figure 1., Shellfish Resources.** The Cochecho River has no oyster beds and a scattering of soft-shell beds in its lower reaches just before joining the Salmon Falls River. The Salmon Falls has a small oyster bed as well as soft-shell clams just before it joins with the Cochecho. These oyster beds were not present in 1981. According to the NH Estuaries Project data there appears to be a moderate to high density of clams in this location. The Piscataqua still has one of the largest oyster beds in the estuary just south of the confluence of the Cochecho and Salmon Falls Rivers. It also has a few soft shell clam beds in the area just north of Hilton Point. At present there is not enough sampling data to determine any trends in clam populations in estuarine waters of Dover.

The river is also known to contain blue mussels, green crabs, rack crabs, lobsters, hermit crabs and horseshoe crabs. At present all of these areas are closed to recreational shell fishing due to high levels of coliform bacteria.

Finfish

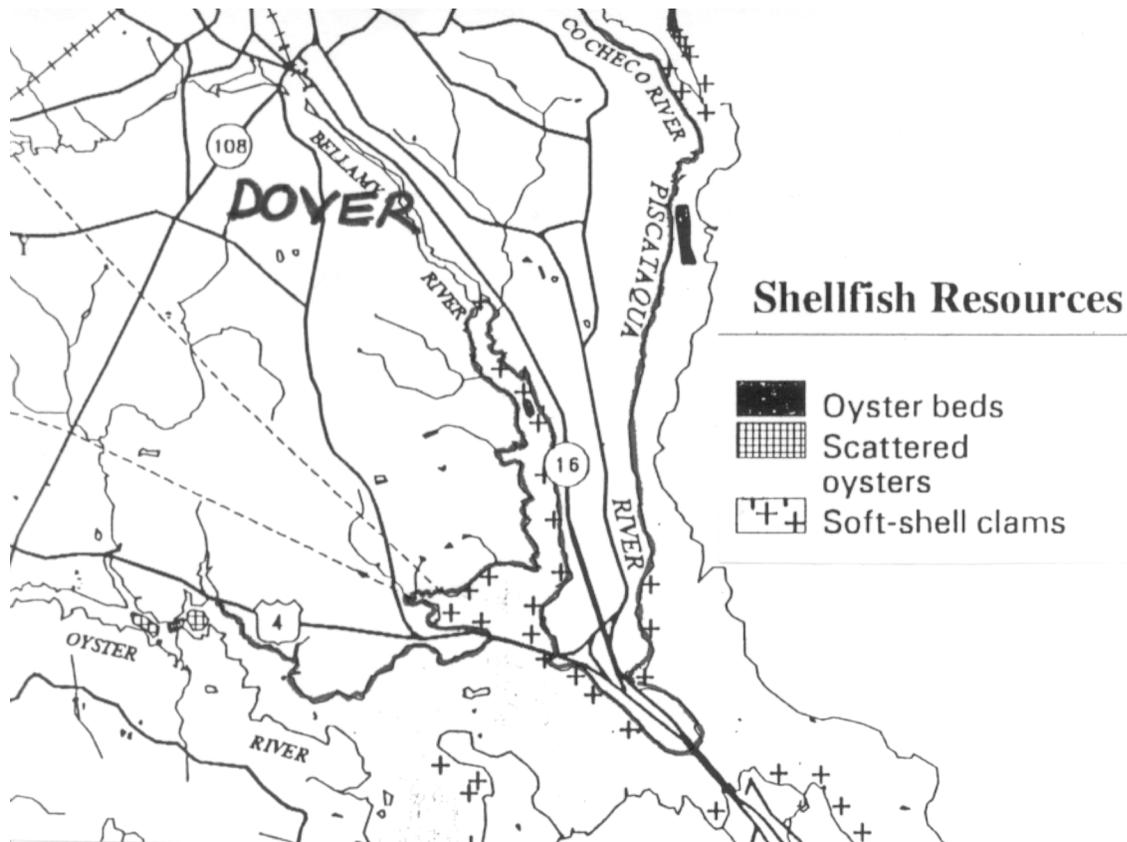
Almost all of the 52 species of finfish identified in the Great Bay estuary during the 1981 NH Fish & Game inventory were found in Dover's rivers. Recent annual surveys (1997, 1998) by NH F & G indicate that the most prevalent species include the Atlantic silversides, winter flounder, rainbow smelt and blue back herring. Other species include the common killifish, smooth flounder and white perch. The 1988 Dover Master Plan and the 1999 Technical Characterization Study identify all the species that have been

identified in the estuary. In its 1998 finfish survey report, Fish and Game noted an overall decline in the abundance of finfish and crustaceans from 1997, apparently due a decline in the numbers of the most abundant species, the Atlantic silversides.

Other species such as the blueback herring increased. In recent years the striped bass has made a comeback and is now present in the Bellamy, Cochecho and Salmon Falls Rivers according to the NH Fish & Game Department.

River herring are anadromous fish that migrate up the Cochecho to spawn in fresh water via the fish ladder at the falls in downtown Dover. Since 1988 there has been a general increase in the migration of this species as reported by the NH F&G, however there was significant decline in 1999, dipping below 20,000 returning for the first time since 1989. The Atlantic salmon, once a very abundant species, is only found as a stocked species today. Smelts have been stocked since 1989 and some adults have been stocked in recent years. The success of this program has yet to be determined. In 1987 and 1998 there were no returns; there were three returns in 1999. During the 1980's NH F&G stocked the Cochecho, Lamprey and Exeter Rivers with American shad. Only the Exeter is currently stocked with this species. Since 1988, when the stocking stopped in the Cochecho, the number of returning fish has remained low—in 1998 only 6 returned and in 1999 only 2 returned. The best returning ratio of returning to stocked fish has been the Cochecho, even though the numbers are very small.

Figure 1. Shellfish Resources



Birds

Bird are also found in great abundance and variety in the tidal portions of Dover’s rivers. Common seabirds include the great black-backed gull, and ring-billed gull. Waterfowl include Canada goose, mallard, black duck and bufflehead. Wading birds include the snowy egret and great blue heron. The Audubon Society of New Hampshire monitors birds in the Dover and Seacoast area, including marine birds. Results of these surveys are found on the following page in the Upland Habitat Section.

Mammals

Mammals common to the estuary, including Dover’s tidal rivers and nearby shore lands, include otter, mink, red fox, gray deer, white tail deer and muskrat. Harbor seals are relatively common, but occasionally a pilot whale or porpoise may frequent the rivers in search of food.

The estuarine environment incorporates a variety of plant, mammal and bird habitat that are all inter-related in a balanced food chain. Marine life such as shellfish and fin fish are susceptible to any change in the environment. Consequently, significant events such as an oil spill or even incremental changes in water quality can have devastating effects on the estuary. Appropriate land management is essential to ensure the long-term health of this environment.



Cochecho/Piscataqua Rivers – Habitat for Shellfish, Finfish and Birds

Upland and Freshwater Habitat

Dover's upland habitats range from mixed forest lands to wooded swamps to fields and meadows in varying stages of succession as well as freshwater wetlands, ponds, and rivers. This variety of habitat provides for a variety of wildlife to thrive from songbirds to mammals to fish and reptiles. In order to maintain a variety and abundance of wildlife species, maintaining a diverse habitat that is interconnected is necessary. Fields and forests provide habitat for such songbirds as woodpeckers, nuthatches, ruffed grouse, purple finches, woodcock, thrushes, bluebirds, robins and warblers. Wetlands are prime habitat for mammals such as beaver, otter, muskrat and mink as well as toads, frogs and salamanders. Heron, black ducks and loons use wetland areas for nesting. Monitoring and maintaining a wildlife inventory is a means to measure the quality and extent of habitat in Dover.

Mammals

Unlike the inventory of estuarine resources, the upland area of Dover has not been studied to the same extent. Much of the data and information is the result of NH Fish & Game surveys of game species. The 1988 Master Plan provided data on the number of fur bearing animals trapped or hunted in Dover as reported to NH F & G from 1980 to 1986. The following table (Table 2) contains data for the period 1994 through 1998.

The NH F & G also tracks coyote, bear, bobcat, fisher and gray fox. None of these species were trapped or hunted during this time period in Dover according to department records. Although these data are not a substitute for wildlife studies, they may indicate relative abundance. In general, it appears that the amount of game hunted or trapped has been on the decline for almost all species, but especially muskrat and both red and grey fox. Deer, on the other hand, seem to be more prevalent.

**Table 2. Fur Bearing Animals Trapped or Hunted In Dover
1994-1996**

	<u>94-95</u>	<u>95-96</u>	<u>96-97</u>	<u>97-98</u>
Beaver	8	9	12	0
Otter	1	1	3	2
Mink	1	0	2	1
Muskrat	12	19	45	12
Raccoon	3	2	5	6
Red Fox	0	0	0	2
Deer	-	-	83	44

Source: New Hampshire Fish & Game Reports

Birds

The Audubon Society of New Hampshire, Seacoast Chapter, conducts breeding bird surveys annually from Dover to Exeter during the month of June. In addition, the Society conducts a bird count at Christmas each year. These data are not habitat studies, but can be used as a guideline for the relative abundance of the more common summering (nesting) and wintering birds in Dover. A number of these species may normally be identified as marine species, but are included here to indicate that they may be seen in upland areas and also that Dover's marine environment extends as far up as the fall line of both the Cochecho and Bellamy Rivers. Some of the more abundant species include the following:

- Sea Birds
herring gull, great black-backed gull, ring-billed gull, bufflehead
- Wading Birds
snowy egret, great blue heron
- Song Birds
starling, black-capped chickadee, rock dove, house sparrow, American crow, mourning dove, cardinal, American goldfinch, blue jay, house finch, American tree sparrow, cedar waxwing, downy woodpecker, chipping sparrow, tree swallow, American robin
- Waterfowl
mallard, Canada goose, American black duck, common golden-eye

Although there are no known unique or endangered species of birds in Dover, historically upland sand pipers have nested near the Strafford County Farm. Hay field mowing practices are necessary to encourage the nesting of this species as well as other species such as bobolinks and meadowlarks.

Raptorial species are not common to Dover, although there have been several recent sightings of peregrine falcons (Scammel Bridge, General Sullivan Bridge) and turkey vultures in downtown Dover. There have also been recent observations of a kestrel and broad-winged hawk living in the fields on Back River Road.

Aquatic Habitat

The primary freshwater habitats in Dover are the Bellamy and Cochecho Rivers above the dams and Barbadoes and Willand Ponds. As reported in the 1988 Master Plan, the rivers support a warm water finfish population that includes: American eel, Lamprey eel, common white sucker, yellow perch, Eastern chain pickerel, Eastern brook trout, small-mouth bass and common shiner. The Cochecho is stocked at its upper reaches by the NH F & G for rainbow and brook trout. Willand Pond that straddles the Dover/Somersworth border support a fish population that includes white perch, largemouth bass, and eastern chain pickerel.

Habitat Protection Plan

In 1997 the Great Bay Resource Protection Partnership prepared a Habitat Protection Plan for the Great Bay area that concentrated on protection and restoration of significant habitat for waterfowl and other migratory birds, fish and wildlife. This Partnership of several state and federal agencies and several environmental organizations evolved in response to the North American Waterfowl Management Plan. The Partnership identified over 14,000 acres of high value habitat in the Great Bay watershed (involving 24 communities) as candidates for further protection. In Dover there are over 6000 acres of significant habitat and associated lands in six different areas within the City that have been identified by the Partnership.

This Partnership is a group of statewide and local-regional private, nonprofit conservation organizations, federal and state public agencies, municipalities and private landowners that was organized in 1994 to support the North American Waterfowl Management Plan (1986) and Wetland Conservation Act (1989). The Partnership has been active in land protection efforts in the region. Funding for the purchase of conservation easements, land in-fee and wetland restoration projects come from a variety of funding sources including federal, state and local governments, non-profit organizations and private fund raising. While efforts in the early years have focused on protecting properties near the Great Bay, lands along the five river corridors that feed into bay, including the Bellamy and Cochecho Rivers in Dover, are also identified as important areas for protection and restoration efforts.

Habitat Protection Plan

The *Habitat Protection Plan* (Plan) provides information about the important habitat resources and lands for waterfowl and other migratory birds, fish and wildlife. The Plan’s intended use is as a guide to furthering habitat protection. Six strategies are identified: 1) Conservation Education; 2) Local Land Use Policies and Regulations; 3) State Regulations; 4) Conservation Easement Acquisition and Donation; 5) Land Acquisition and Donation; and 6) Restoration and Management Practices.

The Plan identified 14,200 acres of high value habitats for 53 species. The species selected for the analysis included a variety of birds, reptiles and fish and were chosen using criteria from the North American Wetland Conservation Act. These criteria included factors related to the quality of the habitat to sustain certain species. The species and their habitats were prioritized and mapped. The composite habitat information was mapped using a geographic information system with ARCInfo software that incorporated data based upon analysis of satellite imagery.

Significant Habitats of Dover

The habitat analysis identified six categories of significant habitat – from “high value” to “no value” or areas of concentrated development. In Dover, 25% of the land base, or 4,642 acres, is rated as having a high or high-moderate habitat value. **See Potential Wildlife Habitat Map.** The acres of significant habitat land and the percentage of each category is provided below in Table 3.

Habitat Value	Acres	Percent of Total Acres
High	783	4
High-Moderate	3,862	21
Moderate	584	3
Moderate-Low	6,893	7
Low	6,427	35
No Value (Urban)	33	less 1%
Total	18,581	100

Source: Great Bay Resource Protection Partnership, Habitat Protection Plan

The Plan further identified 25 areas of significant habitats and associated lands in the Great Bay region. These Significant Habitat Areas represent concentrations of high and high-moderate habitat value areas and associated lands. Throughout the Great Bay region, the Significant Habitat Areas ranged in size from 400 to 10,000 acres. Smaller project sites are selected within these larger areas when land protection projects are undertaken by the Partnership. A project site seeks to protect a concentration of properties, thereby providing a block of contiguous, significant habitat lands for wildlife.

Of the 25 total Significant Habitat Areas around the Great Bay, Dover has portions of five, totaling 6,655 acres or 36% of the land base in town. Lands within these areas contain high value habitats to be considered for protection. These areas are identified as the “Cochecho River / Blackwater Brook” (C), “Dover” (D), “Salmon Falls / Cochecho River” (E), “Bellamy River” (F), and “Madbury” (G). **See Figure 2.**

Rare Species/Exemplary Natural Communities

In Dover there are over 20 rare species of special concern and exemplary natural communities that have been listed by the NH Natural Heritage Inventory (NHI) under the Native Plant Protection Act of 1987 (NH RSA 217-A) and the New Hampshire Endangered Species Conservation Act of 1979 (NH RSA 212-A). This program finds, tracks and facilitates protection of New Hampshire's rare plant species, rare animal species and exemplary natural communities. Although there are no federally listed endangered species, there are three state endangered plant species and 11 state threatened plant species. The three endangered plant species include:

- Large salt marsh astor (*Aster tenuifolius*)
- Northern blazing star (*Liatris borealis*)
- Trailing bush-clover (*Lespedeza procumbens*)

The only state endangered bird species is the upland sandpiper.

Figure 2—Significant Habitats and Associated Lands



In addition to identifying endangered species, the NHI also rates species value by abundance and ranks the species by degrees of importance from highest importance to extremely high, very high or high importance.

In addition to the endangered Northern blazing star, Stout bulrush (*Scirpus robustus*) and Fringed gentian (*Gentiana crinita*) are rated “extremely high importance”.

In an effort to protect these resource areas the NHI does not identify precise locations. It does publish upon request from a local community a map of the community illustrating general locations. A full listing of Dover’s rare species and exemplary natural communities can be found in **Appendix 1**.

Agricultural Resources

There are currently 34 commercial farms in Dover according to the Strafford County Extension Service. The majority of the farm land is used for hay, trees and nurseries. See table below. A more detailed listing of individual farms by location can be found in **Appendix 2**. The 1988 Master Plan reported that there were 16 commercial farm operations in the City. However, horse farms and tree farms were not included in that data. If these are removed from the current list of farms there would be 17 commercial farms involved in fruit, vegetables, beef, hay and nurseries. In addition there are over 1260 acres of commercial farmland compared to 866 in 1988. Again, if horse and tree farms are removed, there are 821.56 acres or approximately 45 fewer acres in these categories. Since the commercial category has been broadened from the previous plan, it is not clear what the recent trends have been in agricultural activity. Using the narrower definition that excludes horse and tree farms, it appears that the number of farms has increased, but the total number of acres has decreased slightly.

Agricultural Type	Acres
Horse farms	11.39
Fruit farms	157.03
Vegetable farms	2.69
Beef farms	78.55
Hay farms	414.85
Tree farms	432.16
<u>Nurseries</u>	<u>137.44</u>
Total	1,337.11

Source: Strafford County Extension Service and Dover Tax Assessor records, September, 1999

At present there seems to have been minimal, if any, loss of agricultural land over the past ten years. Another measure of the amount of land defined as farmland is from the City’s annual Current Use Report. The 1998 report indicates that there are 1990.66 acres of farmland within the City. It is apparent that not all the acreage in current use is also considered to be in commercial farming.

With the recent rapid growth of residential and commercial developments, there continues to be pressure placed on land that is suitable for agriculture. The USDA Natural Resource Conservation Service has

identified the important farmland soils within the City. As discussed in the 1988 Master Plan, these soils are classified as Prime Farmland Soils as well as soils of statewide and local importance. In Dover, there are approximately 2,464 acres of prime farm soils and 1500 acres of soils of statewide importance. In 1980 the NRCS conducted an inventory of farmland based upon soil type that indicated that there were approximately 4680 acres that was considered important farmland that was available for farming. By the end of the decade the supply of important farmland soils available for farming had decreased to 3, 967 or 26% of the City's land area. This represents a decrease of 713 acres.

Thus, while the number of commercial farms in Dover has remained relatively constant during the 1990's, the amount of suitable soils for farming continues to decrease. The City provides opportunity for agricultural, horticultural and floricultural activity through its land use regulations (see table below) and the state Current Use Program. Farm activities are generally permitted in the medium to large lot residential and industrial areas.

Use	District						
	R-40	R-20	RM-20	RM-12	B-4	I-1	I-2
-Agriculture, horticulture, & floriculture	P	P	P	P		P	P
-Greenhouse, retail sale of products raised on site	P	S	S			P	P
-Farm, livestock, poultry, swine	P	P	P	S	P	P	

P=Permitted; S=Special Exception

Construction Materials

This section identifies potential areas for construction materials in Dover as called for in the state master plan statute, RSA 644:2, VII-a. These areas are based upon interpretations of soils identified in the Strafford County Soil Survey. Although this information is useful for land planning purposes, it is only intended to locate potential sources of construction materials.

Construction materials for purposes of this section are categorized as fill, topsoil, sand, and gravel. The soil survey defines road fill and topsoil as being either good, fair or poor. Sand and gravel are rated either as probable or improbable. These ratings are based upon soil characteristics and slope. A full technical explanation of each of these construction material categories is available from the NRCS of Strafford County.

Road fill

Road fill consists of soil material that is excavated from one location and used in road embankments elsewhere. Soils rated for road fill are based upon the amount of material available, ease of excavation and performance after it is in place. The soils rated as a probable source of road fill include: Hinckley (HaA, HaB, HaC), Charlton (associated with Hollis-Charlton complex), Paxton (PdB, PdC) and Windsor (WdA, WdB, WdC, WfB, WfC)

Dover has rather extensive deposits suitable for road fill. The Hinckley and Windsor soils are associated with stratified drift deposits.

Sand

Sand is used for a variety of construction practices. The rating of probable indicates the likelihood of finding the material in suitable quantity. Soils rated as probable include: Acton, Charlton, Deerfield, Hinckley, Charlton (associated with Hollis-Charlton complex), Ondawa, Podunk, Rumney, Saugatuck, and Windsor.

The Hinckley and Windsor soils are suitable for both road fill and sand and are found in the areas described above. The other soils in this category may be associated with alluvial sediments adjacent to the Bellamy and Cochecho Rivers. Although these may be suitable as a source of sand they may also be wet much of the year.

Gravel

Gravel, like sand, is used for a variety of construction purposes. They are rated only for the probability of locating material in suitable quantities. The soils rated as a probable source of gravel include: Acton (AcB, AdB, AdC), Hinckley (HaA, HaB, HaC), Charlton (associated with Hollis-Charlton complex). Only the Hinckley and Charlton soils are probable sources of gravel as well as sand and road fill. Most of Dover's sand gravel operations are located in this soil type.

Topsoil

There are no soils in Dover that are suitable for topsoil based upon the guidelines of the *Strafford County Soil Survey*.

Water Resources

Introduction

Dover has a variety of water resources including lakes and ponds, wetlands, significant groundwater supplies and streams and rivers. The 1988 Master Plan describes these resources in great detail and this section will summarize and update that inventory. **The 1988 Water Resources Inventory is incorporated by reference in this Master Plan Update.** The discussion below provides an overview of these resources.

Surface Water and Watershed Assessment

Dover is part of two major watersheds--the Cochecho River and Bellamy River—and two minor watersheds—the Salmon Falls/Piscataqua and Johnson Creek (part of the Oyster River watershed). All of these are part of a larger watershed, the Piscataqua River Basin, that includes all rivers that drain into the Piscataqua including the Oyster, Lamprey, and Swampscott. Two-thirds of this 930 square mile basin is located within New Hampshire and the remainder is in southern Maine. The watershed boundaries tend to be east-west lines that originate in the surrounding communities of Durham, Madbury, and Barrington.

The Cochecho watershed comprises over 52% of the land area (8,965.3 acres) of Dover, whereas the Bellamy comprises about 37% (6369.6 acres) of the City. The Salmon Falls/Piscataqua comprises 5% and the Johnson Creek watershed another 5%. Within these greater watersheds, there are a number of smaller watersheds associated with a surface water body or brook. The area for each of these is summarized below in Table 5 including the area within Dover and the area for the total watershed, which includes the area within the adjacent communities. The area of poorly drained and very poorly drained soils (Hydric A and Hydric B, respectively) as well as the area of floodplain in each watershed that is summarized in Table 5 below. **See also the Critical Natural Features Map.**

**Table 5.
Watershed Areas in Acres**

<u>Watershed</u>	<u>Area In Dover</u>	<u>Total Area</u>
Cochecho River Basin		
Berry Brook	1,413	1,413
Blackwater Creek	1,065.9	4,042.6
Emerson Brook	121.7	239.2
Fresh Creek	95.6	4,091.1
Horn Brook	216.7	217.7
Indian Brook	536.3	536.3
Jackson Brook	715.2	715.2
Reyners Brook	1,363.2	1,075.2
LCSB #1	377.8	377.8
LCSB #2	189.9	189.9
LCSB #3	852.1	852.1
MCSB #1	1,227	1,227
UCSB #1	177.5	177.5
UCSB #2	901.5	901.5
Total	8,965	15,432
Bellamy River Basin		
Kelly Brook	1,781	22,400
Varney Brook	1,173	1,173
BSB #1	1427	1427
BSB #2	84	458
Total	6,669	9,265
Piscataqua/Salmon Falls Basin		
PSB #1	563.1	563.1
PSB #2	207.6	207.6
Tate's Brook	73.6	1903.1
Total	844.3	2673.8
Johnson Creek	926.7	1040.35
Total for City	17,105	

Note: LCSB = Lower Cochecho Sub-basin; MCSB = Middle Cochecho Sub-basin
UCSB = Upper Cochecho Sub-basin; BSB = Bellamy Sub-basin

Source: Dover Master Plan, 1988

The watersheds are associated with the three major rivers:

Bellamy River – Originating at Swains' Lake in Barrington, this river flows over 13 falls through the Bellamy Reservoir in Madbury and then southeasterly through Dover. It parallels the Spaulding Turnpike for four miles splitting Dover's "southside" into two halves. At the Sawyer Mills dam it becomes tidal. It discharges into Little Bay at the Scammel Bridge just prior to joining with the Piscataqua at Hilton Point. The City can withdraw up to 720,000 gallons per day (gpd) to artificially

recharge the Ireland and Griffin Wells near the river in the Pudding Hill area adjacent to the Madbury town line. **See the Water Utility Section of the Community Facilities and Utilities Section of this Master Plan.**

Cochecho River – This river originates in New Durham and flows through Farmington and Rochester before entering Dover. The river bisects Dover and it becomes tidal below the mill falls in downtown Dover and joins the Salmon Falls to become the Piscataqua River that eventually empties into the Atlantic Ocean at Portsmouth Harbor.

Salmon Falls - Originating in Maine this river forms a 5.3 mile boundary between Dover and the State of Maine. It is tidal for its whole length in Dover.

**Table 6.
Water Resources by Watershed**

	<u>Length (mi.)*</u>	<u>Poorly Drained Soils(Ac.)</u>	<u>Very Poorly Drained Soils(Ac.)</u>	<u>Floodplains (Ac.)</u>
Cochecho	7 34 (total length)	1600	225	600
Bellamy	5.8	1400	300	525
Salmon Falls	5.3	110	65	91
Johnson Creek		220	15	22

* River length in Dover

Source: 1988 Master Plan

River Water Quality Water

Understanding the extent of these watershed areas and the direction of flow is useful in determining the impact of development activity on water quality. It would appear that both the Bellamy and Cochecho Watersheds are particularly susceptible to water quality impacts from future development. Both of these have large areas of their watersheds outside the City and are subject to significant land use change beyond Dover’s control.

The State of New Hampshire establishes water quality classification for all rivers in the state, both freshwater and tidal. These classifications range from Class A, the highest water quality, to Class D, the lowest. Dover’s rivers are all rated Class B. Prior to 1991 the Bellamy was classified as “A”. The description of Class A and Class B are as follows:

- Class A Potentially acceptable for water supply use after disinfection. No discharge of sewage, wastes or other polluting substance into waters of this classification. (Quality uniformly excellent.)
- Class B Acceptable for swimming and other recreation, fish habitat and, after adequate treatment, for use as water supplies. No disposal of sewage or wastes unless adequately treated. (High aesthetic value.)

Associated with each of these classifications are standards for chemical and biological constituents. In recent years both the Cochecho and Bellamy Rivers have been sampled for various constituents to determine water quality levels. Sampling is conducted on an ongoing basis at several stations by the Great

Bay Coast Watch. The NH Department of Environmental Services (NH DES) also conducts periodic sampling at a number of sites on both rivers. In addition, sites on the Cochecho and Salmon Falls were studied as part of a three-year investigation on storm events in tributaries to the Great Bay by UNH's Jackson Lab.

There has been a general improvement in water quality in the fresh and tidal waters in Dover and the rest of the Piscataqua watershed since the late 1980's. In large part this is due to the improvements to sewage treatment facilities, including the installation of the City's new secondary treatment facility on Dover Point in 1991 and the Strafford County facility in 1992 that ceased discharge into the Cochecho. In addition, two National Pollution Discharge Elimination System (NPDES) industrial discharges have ceased to discharge since that time.

With these improvements to point source discharges, recent focus has been on the non-point sources discharges into these rivers, such as septic systems and urban runoff. One of the key parameters for measuring water quality for non-point source pollution is fecal coliform. Recent sampling by the NH DES, the Jackson Lab and volunteer groups has focused on this parameter.

The NH DES conducts annual water quality sampling on a statewide rotating watershed approach, allowing major watersheds to be sampled every three years. In 1998 the state sampled 55 stations in the Piscataqua Watershed including the Bellamy (three stations), Cochecho (six stations) and Salmon Falls (10 stations) Rivers as well as Fresh Creek. Sampling was conducted for E.coli. (fecal coliform bacteria), DO (dissolved oxygen), and zinc. Some of this sampling was conducted by volunteer monitoring groups. In Dover there were six stations sampled two or three times during the sampling period. On the Bellamy River no samples exceeded the standards for Class B waters for each of these three parameters. On the Cochecho only one sample of E. coli exceeded the standard. The zinc standard was exceeded once. On Fresh Creek no sample exceeded the standard. The upper portion of the Salmon Falls exceeded E. coli standard—twice in one location and once in another. Exceedance of the E. coli and lead standards in Dover appear to be related to the urban environment.

The exceedances in the Salmon Falls are likely to be related to activities and discharges by other communities north of Dover.

Ponds

Dover has no large lakes and only the two large ponds both of which are primarily in adjacent communities—Barbadoes Pond (Madbury) and Willand Pond (Somersworth) Both of these ponds are incorporated into the City's water supply system (see following section on the city's surface water supply). A portion of the Bellamy Reservoir near French Cross Road (Portsmouth's water supply) is also within Dover. There are number of smaller ponds within the City that carry no specific names. These ponds provide not only an aesthetic quality to the City, but also significant recreational value for boating and fishing. Two ponds within the City are monitored by NH DES. A brief description of these water bodies and their water quality status follows.

- Barbadoes Pond – Located primarily in Madbury near Littleworth Road, this pond is 14.02 acres. At its deepest the pond is 48 feet, although its mean depth is approximately 20 feet. Its shoreline is approximately 3,280 feet and is composed of sparse areas of cattail and pickerelweed. Last monitored in 1992, the NH DES has rated this lake as mesotrophic (contains moderate nutrients with moderate algae production).
- Willand Pond – Located primarily in Somersworth, this pond is 83.87 acres. At its deepest it is almost 37 feet, although its mean depth is approximately 15.5 feet. Its shoreline is approximately 1.7 miles and contains a number of aquatic plants along the shoreline including

pondweed, cattail, pipewort, bur reed and water milfoil. Last monitored in 1987 the NH DES has rated this pond as mesotrophic.

Wetlands

Wetlands form a significant part of Dover's surface water resources. They generally are contiguous with wetland or hydric soils discussed previously in the Soil Section. However, for purposes of this discussion, wetlands also include vegetation and hydrologic characteristics that might not be incorporated in hydric soils. These areas include shallow ponds, marshes, swamps, bogs, and seasonally flooded lands. Wetlands are usually areas of low topography and poor drainage with standing water for all or part of the year. Wetlands possess a number of major resource values: maintenance of water quality, flood control, groundwater recharge for water supply, wildlife habitat and vegetative diversity.

The definition and mapping of wetlands varies from agency to agency within New Hampshire and the federal government. The most widely used soil definition used for community planning is employed by the US Natural Resource Conservation Service and comprises the hydric soil category or the poorly and very poorly drained soils as discussed in the Soil Section of this chapter.

Wetland soils in Dover have been mapped by the Natural Resource Conservation District and the data is available through the NH GRANIT/GIS system at UNH using the hydric soil classification. This classification relies only on soil and does not distinguish between wetland types. By quantifying wetland values, a hierarchy of wetland types can be established and appropriate measures for protection and management can be employed.

Wetlands have also been defined and mapped statewide on the GRANIT System using the criteria of the US Fish and Wildlife Service through the National Wetland Inventory Program. In addition, for purposes of managing and permitting activities in wetlands that are of state interest, the New Hampshire Wetland Bureau has adopted the 1987 US Army Corps of Engineers publication *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1*. In an attempt to assist local planning boards to determine the appropriate soil and wetland data for development review, the Office of State Planning issued in November, 1998, a guidance document, *Data Requirements for Site Review, Guidance for Planning Boards*. Dover has adopted a Wetland Overlay District that uses hydric soils as the basis for the district and requires delineation of wetlands on site based upon soil, vegetation and hydrology similar to the Army Corps definition.

Floodplains

Floodplains are areas adjacent to rivers, streams and surface water bodies, which are susceptible to flooding during periods of excessive stormwater runoff. The Federal Emergency Management Agency (FEMA) has prepared Special Flood Hazard Area maps for Dover for the purpose of identifying the 100-year flood areas within the City that may be eligible for federally subsidized flood insurance. The FEMA maps were revised on April 15, 1980, as Flood Insurance Rate Maps (FIRM). These 100-year flood boundaries are for the most part associated with the Cochecho and Bellamy Rivers. The 100-year flood hazard areas in Dover were estimated by the GRANIT System to be approximately 2,701 acres. The City also has a Floodplain Ordinance to regulate development in the flood hazard areas.

Critical Natural Features

Critical Natural Features represent valuable natural resources that should be properly managed and protected. They include hydric (hydric A and hydric B) soils, 100-year floodplains, steep slopes and

shoreland buffers and in total comprise 7,395 acres or almost 40% of Dover as noted below. Wetlands are not only biologically productive, they also help to store floodwaters. Floodplains accommodate and store floodwaters, thus protecting downstream areas. Buffered shorelands provide a means to protect surface water quality and ensure appropriate development along the City’s stream corridors. Steep slopes should also be carefully managed and protected to minimize erosion and sedimentation into surface water bodies. In combination, these resources can form the basis for natural corridors for wildlife, resource protection and open space within the City. **See the Critical Natural Features Map.** They also are integral elements in the Critical Lands Analysis that is discussed in the Open Space and Recreation Chapter of this Master Plan. The City currently regulates each of these areas for resource protection.

Critical Natural Features

Feature	Acres	% Total Area
Very Poorly Drained Soils	467	2.5
Poorly Drained Soils	3,725	20.0
Steep slopes > 15%	934	5.0
Floodplains	2,701	14.6
Shoreland Buffer	1,345	7.3
Total*	7,395	40

* Total is less than sum of individual features due to overlap of some features

Dam Sites

There are currently 52 dam sites in the City, although there are only major dams. There are two on the Cochecho River—one at the Pacific Mills in downtown Dover and another at Watson Road and one on the Bellamy River at Sawyer Mills. The other major dam is at the intersection of Mast Road and Spruce Lane on Johnson Creek. These sites are permitted and inspected by the New Hampshire Water Resources Board (the Board). The Board is responsible for regulating all structures in waterways that are four or more feet high. Consequently, many farm/wildlife ponds dams as well as storm water detention ponds in recent developments are included within the Board’s jurisdiction. For example, of the 52 dams, 18 are for detention ponds while only nine may be considered major dams on the City’s rivers. Of these nine, however, four are classified as in ruins and are no longer in service nor are considered a threat to human safety by the Board.

The list of dams in **Appendix 3** identifies the dam and the potential hazard based upon the most recent inspection. A “Class AA structure” means that a dam failure would not threaten life or property, a “Class A structure” means a dam with low hazard potential the failure of which would not threaten life and would result in minimal property damage. A “Class B structure” means a dam with a significant hazard potential, the failure of which would result in possible loss of lives and damage to property, in some cases major damage. Dover has two Class B dams both located on the Bellamy associated with the Sawyer Mills area.

Surface Water Supply

At present Dover uses surface water recharge to supplement its groundwater drinking supplies. As noted in the 1988 Master Plan, Dover has received state approval from the state Department of Environmental Services to withdraw water from both the Bellamy and Isinglass Rivers. The City has approval to withdraw up to 720,000 gallons per day (gpd) from the Bellamy to recharge the Griffin and Ireland Wells. Water is withdrawn from the Bellamy near these wells and is discharged into a settling pond that recharges

the aquifer. This withdrawal is done on a seasonal basis based upon the volume of stream flow. During the winter months withdrawal is impeded by ice conditions while in the summer, low flow in the river prevents withdrawal. The maximum withdrawal is approximately 2.2 million gallons per day (mgd).

The City also has permission to withdraw up to 2.88 mgd from the Isinglass River in Rochester to the recharge the Campbell and Calderwood Wells in the Hoppers area of the City. Water is withdrawn from the Isinglass in Rochester near the Rochester Neck Road and transmitted to the Hoppers wells where it is also discharged into a recharge basin. Withdrawal is subject to the same seasonal limitations as with the Bellamy. Additional discussion of Dover's water supply is also found in the Community Facilities and Utilities Chapter of this Master Plan.

Potential Surface Water Supplies

The 1988 Master Plan identified three options for future surface water supplies—an off-stream reservoir at Jackson Brook near the County Farm, direct withdrawal from the Cochecho River and increasing the yield from the Bellamy Reservoir, currently the major source of water for the City of Portsmouth. Since that time none of these options has been pursued. As noted later in this chapter, the City has concentrated its efforts on developing groundwater resources for future water supplies.

The Jackson Brook option is unlikely since there has been development in the area that was originally designed for the reservoir. In addition, the City is currently withdrawing water from the Isinglass River, a tributary to the Cochecho, for purposes of recharge to the Hoppers.

Groundwater Resources

Groundwater occurs in openings in bedrock or pores in surficial materials. Although water can be withdrawn from bedrock, glacial till or stratified drift deposits, the most significant amounts of groundwater in New Hampshire and Dover are usually found in stratified drift. A report by the US Geological Survey (USGS), *Geohydrology and Water Quality of Stratified Aquifers in the Bellamy, Cochecho and Salmon Falls River Basins* in 1992 identifies the location of stratified drift in Dover. The 1988 Master Plan has an extensive discussion of the various stratified drift aquifers in Dover that include the Hoppers, Barbadoes Pond, Pudding Hill and Willand Pond. That discussion is based upon work done by Bradley and Cotton in 1964 and 1977, respectively.

As noted previously in the Geology Section, most of the stratified drift in Dover is located within the Cochecho or Bellamy river valleys along with significant deposits of stratified drift along Dover Point and in the Pudding Hill, Hoppers and Willand Pond areas. While the stratified drift areas in Dover tend to be continuous and interconnected, there are portions of these deposits that yield greater quantities of groundwater than others. For example, the Hoppers area seems to be hydraulically connected to the Cochecho River and consequently produces the highest yield of groundwater in the City.

Groundwater yield is rated by the transmissivity of the stratified drift. Transmissivity is measured in feet squared per day and the USGS has classified yield into four categories: less than 500, 500 to 1000, 1000 to 2000, and 2000 to 3000. **See Wells and Well-Head Protection Areas Map.** The Willand Pond aquifer (Smith and Cummings Wells) is the largest in extent in Dover extending into Somersworth. Within this aquifer are two areas with significant yield with average saturated thickness of approximately 40 feet. **See Table 7 below.** One near No Bottom Pond is estimated at 5,300 to 6,700 ft sq. per day. The second near Willand Pond is estimated at 4,700 ft. sq. per day. The Pudding Hill aquifer (Ireland and Griffin Wells) that extends into Madbury has saturated thickness that exceeds 100 feet and yields of approximately 6,600 to 14,700 ft. sq. per day. This aquifer may be in hydraulic connection with the Bellamy River.

The Barbadoes Pond aquifer (Hughes Well) is situated along the Madbury border and lies between Pudding Hill and the Hoppers. The average saturated thickness extends to 85 feet and the yeild is in the range of 13,300 ft. sq. per day. The City of Dover withdraws approximately 1.8 mgd from the wells in the Hoppers aquifer (Campbell and Calderwood Wells). The area has an average saturated thickness of 54 feet and approximate yield of 13,300 to 26,700 ft. sq. per day, the highest in the City.

<u>Aquifer</u>	<u>Ave. Saturated Thickness (ft)</u>	<u>Yield (ft²/day)</u>
Pudding Hill	36	6,600 to 14,700
Barbadoes Pond	85	13,300
The Hoppers	54	13,300 to 26,700
Willand Pond 1	37	5,300 to 6,700
Willand Pond 2	40	4,700

Source: *Geohydrology and Water Quality of Stratified Drift Aquifers, Southeastern, New Hampshire, USGS Report 90-4161, 1992*

Potential Groundwater Supplies

The City has conducted periodic hydrogeologic studies and test well programs over the years to investigate the potential for additional water supplies. Prior to the 1988 Master Plan, BCI Geonetics conducted extensive surveys which are documented in that plan. The 1988 Master Plan described the potential sites for future water supply for the City based upon a 1987 report by BCI. This report identified 11 possible sites for further exploration including areas in stratified drift as well as bedrock. Subsequently, the City conducted additional testing. The following areas have the most promise for future municipal water supplies.

Bellamy Site

The most recent successful program has identified a new well site near French Cross Roads and the Bellamy Reservoir. The well, referred to as the Bouchard Well, has been developed, but has not yet been put on line. At present this well is about 180 feet deep and yields approximately 700 gpm. It is expected to be brought on line in 2002. Additional pump and filtration equipment and transmission lines need to be installed. The City would like to connect this well with the Barbadoes (Hughes) well and have a joint filtration facility to serve both wells, which have elevated levels of iron and manganese.

Blackwater/Cotton Farm Site

This site has had five wells drilled into bedrock that are approximately 400 feet deep. At present, the yields have not been as high as the City would like (500-600 gpm) to further develop the site.

The water would also need to be treated for high levels of iron and manganese. Since this site is currently privately owned, the City may be limited in its ability to further develop a well site unless its is brought under its control.

Bagdon-Kirkwood (a.k.a Gabriel) Property

This site off County Farm Road is protected by a conservation easement under the Land Conservation Investment Program (LCIP) program. A condition of the easement allows the City to develop a water supply on this privately-owned land. The site appears to have sufficient bedrock fractures to yield significant amounts of water. To date, only minimal exploration has occurred. Additional exploration will be necessary to determine the feasibility of the area as municipal water supply.

Reyners Brook/Sixth Street

This site was also identified by BCI and appears to be part of a northeast to southwest bedrock fracture system that also includes the Cotton and Gabriel sites. Additional exploration will be required to determine if this area would be suitable for a future water supply.

Potential Threats to Water Resources

Non-Point Source Pollution

Monitoring by the Jackson Lab has revealed that in both the Cochecho and Salmon Falls, fecal coliform concentrations have been elevated during dry weather in the freshwater portions of the rivers compared to other tributaries in the Piscataqua Basin including the Bellamy. In the tidal portions of these rivers concentrations were low in the Salmon Falls and Bellamy and high in the Cochecho. During storm events, concentrations increased in all three rivers, but especially the Cochecho. Attenuation of the bacterial concentrations occurs in the tidal portion of the both Bellamy and Cochecho Rivers with even lower concentrations in the Piscataqua below where the Cochecho and Salmon Falls join.

These high concentrations of bacteria in the downtown areas of the City suggest that the urban areas of Dover are the major sources of contamination, especially during storm events. Further studies of the storm drain system in downtown Dover have revealed the presence microbial contaminants in both wet and dry weather. It is speculated that cross connections and leaking sewer pipes were the major source of these contaminants. In addition, these surface waters appear to be susceptible to direct impact from land use change and existing water/sewer infrastructure. Recent water quality monitoring and infrastructure studies have identified elevated levels of e.coli bacteria in the Cochecho.

The City is currently working to address these problems and recently contracted with a consultant to analyze the nature and causes of the inflow/infiltration problems within the City's stormwater and sewer system. In addition the City has recently completed a Stormwater Management Plan that addresses non-point source pollution. **For further information refer to the Community Facilities and Utilities Section of this Master Plan and the City's Stormwater Management Plan.**

Hazardous Materials

The Bureau of Hazardous Waste in NH DES maintains a statewide inventory by community of all sites that may have hazardous waste or petroleum products associated with them that may pose a threat to water resources. In Dover the NH DES has listed 63 such sites, although a number of these are closed and do not pose a problem. In addition, others are properly registered with the state and do not pose a threat. Those that are currently under active review include the following in Table 8. There are a number of additional

sites that are not active and are of low priority to NH DES. These usually involve underground storage tanks or fuel facilities.

Current Regulatory Programs for Natural Resource Protection

Introduction

The City of Dover's land-use regulations and ordinances have been reviewed for compliance with current standards and practices relative to surface and subsurface water quality and quantity, aquifer protection, wetland regulation, and floodplain protection.

The first part of this analysis involved a review of the Existing Regulatory Programs and Ordinances Section of Dover's 1988 Master Plan, pages 75-83, to determine whether the recommendations made in the Plan have yet been implemented, in whole or in part. This analysis specifically addresses the land-use components and recommendations which have not been fully implemented to date. Additionally, this analysis included a broader review of Dover's land-use regulatory scheme to evaluate the regulations for conformity with current planning practices.

Chapter 155: Subdivision of Land.

The 1988 Dover Master Plan cited one section of the Subdivision Regulations that should have been modified which requires further examination. 155-41. Storm Sewers and Drainage Appurtenances, found at page 155-45 of the Subdivision Regulations, remains unchanged since adoption of the 1988 the Master Plan.

The 1988 Master Plan also raised the issue that the Subdivision Regulations do not provide erosion and sediment control procedures, and that the City must rely on NHRSA §149:8-a (Site Specific-Alteration of Terrain Permit for projects in excess of 100,000 square feet of contiguous disturbance (or 50,000 square feet within a protected shoreland area) for control measures. Excepting Section 155-41.B.7. which states, "Erosion protection of ditches or pipe outlets shall be provided where soils and/or velocity conditions warrant protection by paving or use of stone", the Subdivision Regulations still do not address erosion control.

The Subdivision Regulations should be amended to better regulate both stormwater management and erosion control.

Table 8. Site Remediation and Groundwater Hazard Inventory

Site Name	Site Address	Permits	Project Type
CALCUTT LAND FILL	DOVER NECK ROAD	0	HAZWASTE
TOWN BRUSH & STUMP DUMP	GARRISON RD.	0	LAND/UNLN
GRIFFIN RECHARGE PROJECT	OFF MAST ROAD	2	UIC
ELLIOTT&WILLIAMROSE	DOVER POINT RD.	0	UIC
DOVER GAS WORKS	COCHECO & PORTLAND STREETS	0	HAZWASTE
HOPPERS RECHARGE	GLENHILL RD.	0	UIC
NEPD SUNOCO	60 NEW ROCHESTER RD.(ROUTE16)	1	LUST
C.A.B.SERVICES,INC.	72 LITTLEWORTH RD	2	
DAVIDSON RUBBER	INDUSTRIAL PARK DR		HAZWASTE
SISUBOAT CO.	INDUSTRIAL PARK DRIV	0	HAZWASTE
DUPONT'S CITGO	171 SILVER ST.	2	LUST
DOVER LANDIFILL	TOLEND ROAD	0	LAND/UNLN
		0	CERCLA
D.F.RICHARD	81-83 BROADWAY		FUEL
BOB'S GULF	21 I CENTRAL AVE	0	LUST
SWIFT INDEPENDENT PACKING CO	KNOX MARSH ROAD/SUMNER DRIVE	0	LUST
STEAM PLANT	WASHINGTON STREET	0	LUST
GEORGE ST. CATCH BASIN	GEORGE ST	0	LUST
FORMER CLAROSTAT MANUFACTURING CO.	I WASHINGTON ST.	3	HAZWASTE
RIVERSIDE REST HOME(STRAFFORD COUNTY)	6 TH ST .EXT.(COUNTY FARM RD)	0	LUST
JETLINE SERVICES	8 PROGRESS DRIVE	0	HAZWASTE
FORMER WAIKIKI RESTAURANT	914 CENTRAL AVENUE	0	LUST
HARRISGRAPHICS	121 BROADWAY	1	HAZWASTE
D&M MOBIL	221 CENTRAL AVE.	1	LUST, AST
		0	HAZWASTE
SPAULDING CITGO	52 CENTRAL AVE	0	LUST
		1	AST
DARLENE WHITE BEAUTY SALON	PISCATAQUA RD.	0	UIC
DOVER PUBLIC WORKS GARAGE RIVER ST.	0	LUST, OPUF	
		0	HAZWASTE
MOORE BUSINESS FORMS	279 LOCUSTAVE	0	UIC
SALTA TIRE(DAYS OF DOVER)	899 CENTRAL AVENUE	0	LUST
LORD&KEENAN COMPANY	63 FOURTH STREET	0	LUST, AST
ERA LANDMARK ASSOCIATES	45 CENTRAL AVE	1	LUST
ALCOTT MANAGEMENT PROPERTY	890 CENTRAL AVENUE	1	LUST
519 CENTRAL AVE PROPERTY	519 CENTRAL AVE	1	HAZWASTE
FORMERLY CHRISTIE PROPERTY 66-67 THIRD ST	0 HAZWASTE		
SOUTHSIDE GETTY	237 CENTRAL AVE		LUST
U-HAUL RENTAL	622 CENTRAL AVE		LUST
FRANKLIN ELECTROPLATING	519-B CENTRAL AVE		HAZWASTE
TEXACO SERVICE STATION	169 SILVER ST	0	LUST, AST
COCHECO COUNTRY CLUB	GULF ROAD	0	AST, HAZWASTE
DOVER PAINT & VARNISH CO	25 LITTLEWORTH RD	0	LUST
BIT O GREEN FLOWER SHOP	2-10 PIERCEST	0	OPUF
JAMES GRIMES REALTY TRUST	569 CENTRAL AVE.	0	OPUF
SPINELLI PROPERTY	I GREEN ST.	0	OPUF
RADIO STATION WTSN	IOI BACK RD	0	LUST
IRVING MAINWAY	ROUTE 155 & PROGRESS DR-	0	LUST
BIOPURE CORPORATION	4 PROGRESS DRIVE	0	UIC, HAZWASTE
FRANCES CHICKERING/PETER DOBROSKI	32 MIDDLE ROAD		LUST
ROBERT CARRIER COMMERCIAL PROPERTY	629 CENTRAL AVE.		LUST
JAMESA.SMITH	COUNTY FARM CROSS ROAD		UIC
CENTURY 21	233 CENTRAL AVE		LUST
PETER CHINBURG PROPERTY	11 ½ HAMILTON STREET	0	OPUF
KEN'S SOUTHSIDE SERVICE	46 CENTRAL AVENUE	0	H20SAMPLE
DOVER CHILDRENS HOME	207 LOCUST STREET	0	OPUF
PSNH LITTLEWORTH RD. SUBSTATION	LITTLEWORTH RD/ ROUTE 9	0	AST
PSNH NORTH DOVER SUBSTATION	CENTRAL AVE.	0	AST
PSNH STARK AVE. SUBSTATION	STARK AVE./DOVER POINT ROAD	0	AST
MARIE PRATT	8 NELSON STREET	0	OPUF
LITTLE BAY MARINA	423 DOVER POINT ROAD	0	MOST, LUST
PISCATAQUA PUMP STATION	WENTWORTH TERRACE	0	LUST
DONALD MCKINNEY	73 PORTLAND AVENUE	0	OPUF
B&M RAILROAD PROPERTY	OAK STREET	0	LUST
FLORA VALHOS RESIDENCE	132 COURT STREET	0	OPUF
SCOTT EVANS	4 SHADOW DRIVE	0	OPUF
EDNA GOODNOE	18 CENTRAL AVENUE	0	OPUF

Key: OPUF = On Premise Fuel Facility
 AST = Above Ground Storage Tank - Registered
 HAZ WASTE = Hazardous Waste Project
 LAND/UNLIN = Existing Landfill or Landfill Closure
 UIC = Underground Injection Control
 LUST = Leaking Underground Storage Tank
 CERCLA = Superfund Site
 FUEL = Fuel Oil Storage

Chapter 149: Site Review Regulations.

Similar to the concern raised in the 1988 Master Plan regarding the lack of regulations designed to protect water resources in the Subdivision Regulations, the Master Plan identified the same concern relative to the Site Review Regulations. Chapter 149 of the Dover Code, Site Review Regulations, remains largely unchanged since the original adoption in 1988. This notwithstanding, Section 140-14, Site Development Design Criteria was recently amended on 5/25/99.

In light of the size and complexity of developments being constructed in the Seacoast, it is recommended that both the Dover Site Review Regulations and Subdivision Regulations be amended by adopting, either by reference or by addition to the Regulation, the *Model Stormwater Management and Erosion Control Regulation*, cited previously. Dover's reliance NHRSA §149:8-a Site Specific-Alteration of Terrain Permits to manage stormwater has several pitfalls, most notably the fact that all projects which result in less than 100,000 square feet (or less than 50,000 square feet within a protected shoreland area) of disturbance of a site would be exempted from the permit requirements.

Chapter 170: Zoning.

The 1988 Dover Master Plan cited several sections of the Zoning Ordinance which address natural resources, including the Conservation District, Well Site Protection District, Interim Growth Management District IV – Aquifer Recharge Areas, and Extraction Industries. Each of these is discussed below.

Conservation District: Section 170-27, found at page 170-28.

The 1988 Master Plan raised the concern that the Conservation District Ordinance was too permissive due to the fact that Special Exceptions could be obtained for many uses without a thorough review by the City. This portion of the Ordinance has been amended. The Planning Board must now grant a Conditional Use Permit, although the criteria remain similar to the 1988 Ordinance, excepting the requirement for written review by the Conservation Commission.

Consideration should be given to amending the Ordinance to enhance the level of review for erosion and sedimentation control under the Conditional Use Permit.

Extraction Industries: Section 170-29, found at page 170-62.

Dover's 1988 Master Plan confirmed that Section 170-29 Extraction Industries was ostensibly identical to NHRSA §155-E. This section of the ordinance remains unchanged since 1988, although the controlling state statute has been substantially amended.

There are several areas of concern. Section 170-29 of the ordinance does not state, categorically, that all excavations shall at a minimum comply with NHRSA §155-E. The Ordinance does reference the statute relative to the removal of visual barriers, restoration provisions, and, in Section 170-31.3 Issuance of Permit, the Ordinance does state that if “(the excavation)...is not prohibited by NHRSA §155-E:4” Prohibited Projects, the permit will be granted. The Ordinance should clearly state that ALL provisions of NHRSA 155-E are hereby adopted.

Overall, this section of the Ordinance is dated. Amendments to the Statute have effectively increased the scope and level of review for excavation permits. Examples of our areas of concern include:

- improper titles of State agencies (170-31.A.(8) Water Supply and Pollution Control Commission is now NHDES);
- NHRSA §155-E:4-a.II-a is an entirely new section that was added to the statute in 1991 which requires minimum setbacks from wetlands and waterbodies and

- there are five specific reclamation standards called out in NHRSA §155-E:5 whereas Section 170-31.B. contains four restoration criteria which are condensed from language contained in the statute.

There are other natural and water resource related issues that the City may want to consider reviewing and regulating including:

Large Volume Water Withdrawal

The Dover Zoning Ordinance is silent on the regulation of large volume water withdrawals by non-municipal entities. This issue is of increasing concern to communities in the Seacoast and southern New Hampshire. Dover may want to consider the adoption of an ordinance which regulates this use in accordance with NHRSA §4-C:22.

Biosolids

The Dover Zoning Ordinance neither refers to, or regulates the land application and surface disposal of sewage sludge, or “biosolids”. Many communities have adopted such ordinances as part of the Zoning Ordinance; these are typically more stringent than the controlling Federal statute, 40 CFR 503.1 et seq. Dover should review the need for such an ordinance.

Floodplain Ordinance

The City of Dover has such an ordinance, however, it is not a part of the zoning ordinance, which is the most appropriate location. The City should consider placing the ordinance within the Zoning Code.

Shoreline Protection

NHRSA §483-B:8 authorizes municipalities to adopt land use controls which are more stringent than those contained in the referenced statute. While Dover has adopted components of Shoreline Protection, they are not easily found in the zoning ordinance. These components are located within section 170-27 of the Ordinance. The City should consider adding a separate shoreline section to the Zoning Code.

Alternative Design Subdivision

This provision of the City’s Subdivision Regulations allows for an alternative design for residential subdivisions to allow potentially higher densities if certain conditions are met to protect resource areas. However, no specific standards are provided to encourage development to meet this purpose. Such standards should be included in the regulations. The Dover Planning Board is currently considering revisions to this section of the ordinance.

Strategies and Recommendations

This section presents specific recommendations to achieve the goals and objectives for natural resources. They are broken down into six categories:

- Organization and Management
- Soil Mapping
- Resource Protection
- Storm Water Management
- Environmental Contamination
- Citizen Education

Organization and Management

1. Undertake a program to implement an updated City-wide Management/Geographic Information System (GIS) as follows:

- Prepare a long-range plan to establish a City-wide coordinated and consistent Management Information System (MIS) that incorporates geographic information.
- Implement a Management Information System (MIS) that has the capability to coordinate and maintain a common digital database that can be shared by all City departments. This may require establishing a position for an MIS coordinator who would report directly to the City Manager.
- Coordinate the geographic data in the Community Services Department with the City's property records to establish a consistent data base.
- With each change to a property or land record, revise the City Assessor's parcel map and data base appropriately.
- Amend the Subdivision and Site Plan Review Regulation to require that all subdivision plans include an accurate, geographically referenced digital copy of the plan as well as an "as-built" plan that can be used to revise the City's parcel data base and map.
- Prepare a map inventory of the City's natural, historical, recreational and built resources that would be consistent with the City's common digital database to be available in hard copy and on the City's web site to allow greater public awareness of these resources.

At present the City has geographic data in different formats in different City Departments that are not linked or compatible. The City should seek ways to link these different formats so that departments can share common data. The City would benefit substantially through better, more efficient record keeping if there were a well-maintained management information system that allowed City departments to share consistent data.

2. Insert the Floodplain Ordinance in the Zoning Code for ease of review of the City's Ordinances.
3. Update the City's tree inventory including locations and enter the information into the City's GIS database.
4. Further investigate the Class B dams on the Bellamy River with the NH Water Resources Board to determine the best course of action for future management of these structures.

Soil Mapping

5. Amend the City's Subdivision and Site Plan Review Regulations to:
 - Require all major subdivision and site plans to provide soil maps and information in accordance with the *Site Specific Soil Maps for New Hampshire and Vermont*, SSSNNE Special Publication No. 3, June, 1997. This provision is consistent with mapping required in the proposed Conservation Overlay District and is consistent with the NH DES Site Specific permits. This provision would supersede the current provision for High Intensity Soil (HIS) mapping that is inconsistent with current NRCS standards.
 - Require that maps prepared by field examination be prepared and stamped by a Certified Soil Scientist.
 - Adopt, when available, the language of the New Hampshire Office of State Planning's model health ordinance in accordance with RSA 147:1, L. This ordinance will be consistent with, and make reference to, appropriate state programs and regulations for septic systems, for example Env-Ws - 1000 - *Subdivision and Individual Sewage Disposal Design Rules*, sludge, biosolids, etc.

Resource Protection

6. Initiate a process for designation and protection of natural areas in the City that should be protected through such techniques as strict regulation, conservation easements or acquisition.

Such natural areas should address specific criteria similar to those established for: 1) the critical habitat analysis conducted for the Great Bay region as part of the state's Estuary Program or 2) prime wetlands designation as provided for in RSA 483--A:7 (See the *Guide to the Designation of Prime Wetlands in New Hampshire*, 1983). Such a designation would identify areas that require a higher level of protection for particularly valuable habitats over and above the City's current ordinances, such as the Wetland Protection District.

7. Amend the Wetland Protection District under Procedural Requirements for wetland delineation to:
 - require wetlands to be delineated by either a certified soil scientist or certified wetland scientist and
 - to be compatible with the definition of the New Hampshire Wetlands Bureau based upon the following:
 - *Chapters WT 100-800 of the NH Code of Administrative Rules*, April 12, 1997;
 - *Regional Field Indicators for Identifying Hydric Soils in New England*. New England Interstate Water Pollution Control Commission, 1998; and
 - the *Army Corps of Engineers Wetland Delineation Manual, Technical Report Y-87*, Dept. of the Army, 1987.
8. Amend the Subdivision and Site Plan Review Regulations to provide for the submission of an Environmental Impact Assessment (EIA) for large developments.

An EIA could be required for all subdivisions greater than 15 lots and commercial/industrial proposals of greater than 50,000 sf or 200 parking spaces. The applicant could be required to evaluate the development with regard to impacts on such phenomena as: air quality, noise, plants and wildlife, water resources, community facilities, traffic, existing neighborhoods, and the fiscal impact to the City.

Based on the results of such an assessment, the planning staff shall issue conditions of approval that would preserve critical resources and minimize the environmental impact of a proposed development.

9. Amend the Site Plan and Subdivision Regulations to incorporate a wildlife impact study for developments within, or directly adjacent to, the High Value or High Moderate Value of the Potential Wildlife Habitat Map incorporated as part this Master Plan.
10. Amend and review Article VIII—*Extraction Industries* of the Zoning Ordinance as follows:
 - Amending Section 170-31.A.(1) or elsewhere where obvious, by adding language stating that “Where an excavation can not meet all of the minimum standards set forth in NHRSA §155-E”.
 - Review NHRSA §155-E in its entirety, and especially paragraphs 4-a and 5, Minimum and Express Operational Standards and Minimum and Express Reclamation Standards, respectively, to ensure that the City’s Ordinance reflects the current statutory requirements.
 - Amend the Ordinance by updating the names of State Agencies, where appropriate.
 - Review the proposed Water Resources Chapter of the this Master Plan and any other relevant documents to determine whether the standards set forth in the ordinance adequately provide the level of water resource protection desired. As an example, some communities prohibit excavation within 5’ of the seasonal high water table in an effort to reduce the potential impact on groundwater resources. Pursuant to NHRSA §155-E:11, the City of Dover may have special concerns or unique resources which warrant a higher level of regulation.
11. Add a separate section to the Zoning Ordinance which contains the regulations that apply to land within the shoreland district. Re-evaluate the standards set forth to regulate such land uses and determine if they are sufficient for the intended purpose.
12. Review the provisions of the City’s Zoning Code relative to agricultural activity and use and determine if they should be amended to provide greater opportunity for agriculture, horticulture and floriculture activity as an effort to maintain the City’s country-like character. At a minimum adopt a definition for agriculture that is consistent with the state’s definition under RSA 21:34a.
13. Revise the Subdivision Regulations under the Alternative Design Subdivision (ADS) provision to provide specific standards and incentives to promote greater protection for natural and historical resources.

Storm Water Management

14. Adopt the *Model Stormwater Management and Erosion Control Regulation*, prepared in 1997 by the NH Association of Conservation District and the Water Quality and Urban Conservation Committee, as part of both the Subdivision and Site Plan Review Regulations.

This model was written to be inserted into both the Subdivision and Site Plan Review Regulations. The model provides a greater level of review than currently exists in Dover, as it regulates all developments which result in a disturbed area in excess of 20,000 square feet and establishes design standards for erosion control.

15. Amend Section 170-27.C.(2)(a) of the Zoning Ordinance by adopting, either by reference or by addition to the Ordinance, the *Model Stormwater Management and Erosion Control Regulation*,

prepared in 1997 by the NH Association of Conservation District and the Water Quality and Urban Conservation Committee.

16. Insert a new paragraph at the beginning of Article VIII, Design Specifications of the Subdivision Regulations, regarding design standards for drainage facilities, and into the Site Review Regulations at 149-14.A.(1) or elsewhere if appropriate. These new section would read as follows:

“All stormwater management and erosion control measures shall be consistent with the Best Management Practices outlined in the *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas of New Hampshire*, 1992, as amended.”

17. Insert performance standards for storm water runoff for nitrogen, phosphorous and Total Suspended Solids (TSS) into the Subdivision and Site Plan review regulations to protect the water quality of the City’s surface waters.
18. Add a provision to the Subdivision and Site Plan review regulations that allows the Planning Board to require developers for large projects to provide specific structural and maintenance measures for oil and gas separation from storm water. These measures may also include requirements for a long-term inspection and maintenance program for such developments.

Environmental Contamination

19. Amend the Site Plan Regulations by adopting the current state standards in Env-Ws 421, rules for Best Management Practices, prepared by NH DES in 1996. These requirements are aimed at facilities that may generate hazardous or petroleum/chemical products or spills to mitigate threats to groundwater.
20. Map, monitor and amend the All Sites Hazardous Waste Data Base kept by the NH DES.

The NH DES maintains a data base and associated mapped locations for all hazardous waste and petroleum sites under investigation or are a potential hazard. The City should capture this data base and continually monitor and update it.

21. Review the need for an ordinance to regulate the application and surface spreading of biosolids. If appropriate, amend the Zoning Ordinance to include a biosolid section that references the NH DES regulations Env-Ws-800 for biosolids and sludge.

Citizen Education

22. Undertake a City-wide education program aimed at informing Dover citizens about the importance of protecting and managing the City’s natural and cultural resources by:
 - Reviewing and revising curriculum and programs in the schools;
 - Conducting public workshops on timely environmental topics with similar articles in the City’s newsletter;
 - Exploring the possibility of cooperative use of the City’s public lands with the school and recreation departments and conservation commission for mutual education, recreation and sustainable resource management programs and activities; and
 - Preparing information brochures and Web site presentations that promote natural and cultural resource management and protection.

Implementation Program

Based on the discussion above, the following program has been prepared to assist the City in the process of implementing the recommendations. The implementation program organizes the recommendations discussed in the chapter by type of activity and identifies the local department and entities that will be most responsible for carrying out the actions. The program also identifies a time period for implementation. These categories are: organization and management, soil mapping, resource protection, storm water management, environmental contamination, and citizen education.

The following are the time periods for implementation:

- Ongoing Actions which are continuous or are already being carried out
- Immediate Actions which should be undertaken in 1-2 years
- Short Actions which should be undertaken within 3-5 years
- Long Actions which will take more than 5 years to be initiated or completed.

Organization and Management

1. Implement an updated, City-wide Management/Geographic Information System that allows City departments to share common data	Immediate	City Manager, Assessor, Planning Department, Environmental Services (GIS)
2. Insert the Floodplain Ordinance in the Zoning Code.	Immediate	Planning Board
3. Update the inventory of City trees and enter into GIS database.	Short	Community Services, City Arborist
4. Investigate Class B dams with NH Water Resources Board.	Short	Community Services, City Engineer

Soil Mapping

5. Amend the City's Subdivision and Site Plan Review Regulations to require all major subdivision and site plans to provide soil maps and information in accordance with the <i>Site Specific Soil Maps for New Hampshire and Vermont</i> , SSSNNE Special Publication No. 3, June, 1997.	Immediate	Planning Department, Planning Board
6. Amend the City's Subdivision and Site Plan Review Regulations to require that all soil/wetland maps be prepared by a certified soils scientist or certified wetland scientist.	Immediate	Planning Department, Conservation Commission

Resource Protection

7. Amend the Wetland Section of the Zoning Ordinance to update the delineation methodology to be consistent with the methodology of the state Wetlands Bureau.	Immediate	Conservation Commission, Planning Department
8. Amend the Zoning Code to include a definition for agriculture that is consistent with RSA 21:34a.	Immediate	Conservation Commission, Planning Department
9. Amend provisions of ADS regulation in the Subdivision Regulations to encourage greater resource protection.	Immediate	Planning Board
10. Add a separate section to the Zoning Ordinance which contains the regulations that apply to land within the shoreland district. Re-evaluate the standards set forth to regulate such land uses and determine if they are sufficient for the intended purpose.	Short	Conservation Commission, Planning Department
11. Update, amend and review Article VIII— <i>Extraction Industries</i> of the Zoning Ordinance as delineated in the Recommendation section above.	Short	Planning Department, Planning Board, City Council
12. Amend the Subdivision and Site Plan Review Regulations to provide for the submission of an Environmental Impact Analysis (EIA) for large developments. See Recommendation Section.	Short	Conservation Commission, Planning Department
13. Amend the Site Plan and Subdivision Regulations to incorporate a wildlife impact study for developments within the High Value or High Moderate Value of the Wildlife Potential Map incorporated as part this Master Plan.	Short	Conservation Commission, Planning Department
14. Initiate a process for designation of high value natural areas in the City.	Short	Planning Board, City Council
15. Review the Zoning Ordinance to determine if standards for agricultural activity is consistent with City’s objective to maintain agricultural resources.	Short	Conservation Commission, Planning Department

Stormwater Management

16. Adopt the <i>Model Stormwater Management and Erosion Control Regulation</i> , prepared in 1997 by the NH Association of Conservation District and the Water Quality and Urban Conservation Committee, as part of both the Subdivision and Site Plan Review Regulations.	Immediate	Planning Department, Planning Board
17. Amend the appropriate sections of the Subdivision and Site Plan Review Regulations as follows: “All stormwater management and erosion control measures shall be consistent with the Best Management Practices outlined in the <i>Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas of New Hampshire</i> , 1992, as amended.	Immediate	Planning Department, Planning Board

18. Amend Section 170-27.C.(2)(a) by adopting, either by reference or by addition to the Ordinance, the <i>Model Stormwater Management and Erosion Control Regulation</i> , prepared in 1997 by the NH Association of Conservation District and the Water Quality and Urban Conservation Committee.	Short	Planning Department, Planning Board, City Council
19. Insert performance standards for storm water runoff for nitrogen, phosphorous and Total Suspended Solids (TSS) into the Subdivision and Site Plan review regulations consistent with the City's Stormwater Management Plan.	Short	Planning Board
20. Add a provision to the Subdivision and Site Plan review regulations to require developers to provide specific structural and maintenance measures for oil/gas separation from storm water	Short	Planning Department, Planning Board

Environmental Contamination

21. Amend the Site Plan Regulations by adopting the current state standards in Env-Ws 421, rules for Best Management Practices, to address facilities that may generate hazardous/petroleum/chemical products.	Immediate	Planning Department, Planning Board
22. Map, monitor and amend the All Sites Hazardous Waste Data Base kept by the NH DES	Short	Environmental Services, Planning Department
23. Amend the Zoning Ordinance to include a biosolid section that references the State of New Hampshire's DES regulations Env-Ws-800 for biosolids and sludge.	Short	Environmental Services, Planning Department

Citizen Education

24. Undertake a City-wide education program aimed at informing Dover citizens about the importance of protecting and managing the City's natural and cultural resources.	Short	School Department, Planning Department, Environmental Services
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Dover's Historic Resources

Introduction

Dover contains a diverse and historically significant set of historic resources including sites, monuments and buildings. A number of buildings and places have been placed on the National Register of Historic Places. Dover's surviving historic resources can best be understood in the context of Dover's history.

First settled in 1623 by David Thompson at what is now known as Hilton Point (Dover Neck), Dover has gone through many changes. Shortly after the initial settlement, a small village was established on nearby high ground known as Meeting House Hill. This "plantation" was under the jurisdiction of Massachusetts for the next 100 years. During that period farming, fishing, and logging enterprises were established. A lumbering and saw mill was begun at the falls of the Cochecho about four miles north. During the latter half of the 1600's there were numerous encounters with the native Americans who originally inhabited this whole area. The center of settlement shifted north from the hill at Dover Neck where a new meeting house was built at Pine Hill in 1712. By 1758 the center again shifted to Tuttle Square where the First Parish built a wooden church at the site of the current brick one. By the late 1700's and early 1800's Dover became an industrial community centered on the falls of the Cochecho River. The original grist and saw mills gave way to cotton textile manufacturing.

For almost 100 years Dover Manufacturing Company (incorporated in 1827) became the major industry in Dover. Sawyer Woolen Mills, established in 1824, was built on the Bellamy River and flourished through the end of World War II. During this period Dover experienced a successive influx of immigrant groups including the Irish, French-Canadians and Greeks. These cultures are represented in the various churches that each group built and remain today.

Although many of Dover's historic resources survive today there have been periods when numerous structures have been razed for new development—such as during the period of Urban Renewal in the early 1970's. The challenge for the City will be grow and redevelop in a manner that is consistent with the protection and enhancement of its valuable historic resources. This following section is an update of the Historic Resources inventory conducted for the 1988 Master Plan. That inventory relied on historic research and a windshield survey to identify existing historic structures and places.

Settlement - Pre-Revolutionary Period 1640-1775

The Piscataqua-Great Bay Region is formed by five tributary rivers flowing together to make Great Bay, Little Bay, and the Piscataqua River which flows through Portsmouth Harbor to the Atlantic Ocean. This extensive water system transformed New Hampshire's small eighteen mile coastline into a historically significant maritime center.

Though humans have lived in the area for over 10,000 years, the first European settlement in the region dates from 1623. During the next 100 years, this section of what later became known as New Hampshire, was divided into four great "towns" or plantations of Portsmouth, Dover, Exeter and Hampton. Until 1680, this area was part of the Massachusetts Bay Colony. Portsmouth developed as a rich mercantile center and a thriving commercial port exporting timber products and importing everything from food to European finery.

The Town of Dover developed further up the Piscataqua River at the confluence of the Salmon Falls, Cochecho and Bellamy Rivers. The first area of settlement was at Dover Point, also known as "The Neck". This point of land is located at the very center of the confluence of the five tributaries of the navigable Piscataqua River and became the natural hub of activity from all points inland as the area was settled. The first village supported itself primarily by fishing and farming. The settlers established a community, building wooden homes and clearing the fields. This location, however, was not sufficient for economic expansion.

Fortunately, the Cochecho River offered large falls for water power which soon led the settlers to move the town center from the Neck to the area around the falls. Mills were built to saw and process the widely available timber from the rapidly expanding region. There were 20 saw mills in New Hampshire by 1665, and 50 by 1770. Lumber that was not used to build the expanding town was shipped by gundalow to Portsmouth and on to Boston. The gundalow was a local barge-like vessel that could carry large loads quickly up and down the rivers. There was a great demand for timber resources, partly due to Boston's expansion and the rebuilding of the City of London after the great fire of 1666. Lumbering became incredibly lucrative in the new colony and remained that way for over 100 years. Dover was a natural center for lumber activity, for the rivers offered both power for the mills and easy natural transportation to Portsmouth, Boston, Europe, and beyond. Therefore, lumber became the economic base of the town throughout the 17th and 18th centuries.

Moving inland the settlers cleared the land using and selling the timber and making way for corn fields and the beginnings of agriculture. They moved the rocks from the fields and constructed stone fences and built sturdy, four square, wood frame houses. A system of roads crisscrossed the town with bridges and ferries to cross the rivers. By the middle of the 18th century, Dover had established itself as a thriving town center with sawmills at the falls of the Cochecho River along with large, self-sufficient farms and cleared open land. Other industry included brickyards, shipbuilding and trade. The popular gundalow trade boat was built in Dover.

Surviving Resources of the Period

The evidence of the earliest periods of Dover's habitation survive in archeologically sensitive areas. Prehistoric archeological sites, representing thousands of years of habitation, have been discovered along Great Bay and the streams and rivers which flow into it. The area of first European settlement on the Neck, or Dover Point, has changed radically and no standing resources survive. Pressing inland, however, many of the large early 18th century farms have survived in an intact condition and much open farmland still exists. **See the 1988 Master Plan Historic Resources Map.** The area around the landing on the Cochecho has seen successive generations of use and is today once more clear of built resources. Significant historic archeological evidence could probably be found in this area.

Architecturally, Dover residents chose to build in a plain, utilitarian style. The grand Georgian mansions built by the sea captains and entrepreneurs in the nearby capitol of Portsmouth were not duplicated in Dover. One possible reason for this may have been the relatively large number of Quakers who chose to settle in the area. Perhaps the finest surviving example of Georgian architecture in the City is the Friends' Meeting House, 1768. Another good example is the Michael Reade House, 1785, in downtown Dover. The Tuttle Farm, 1632, on Dover Point Road is a good example of early farm settlement. The John Gage House, c. 1723, is a fine example of vernacular Georgian building surviving in the center of town. The Dam or Damme Garrison, c. 1674, is an interesting example of the primitive fortress structures that were built around Dover to defend against Indian attacks. Originally located in the area of town now known as Back River Road, it was moved to a protected location at the Woodman Institute in 1915.



Dover Friend's Meeting House 1768



John Gage House c1723



Michael Reade House 1785

Post Revolutionary Federal Period 1775-1820

The period following the Revolution was a time of regional expansion in industry, education, transportation and architecture. During this period, the first capitol, Portsmouth, reached a peak of mercantile success, and streets of stately mansions in the new Federal style of architecture sprung up around the community. Dover also grew and prospered as the lumber industry continued to thrive. During the 1790's there appeared to be a lumber crisis as the supply of quality trees dwindled. However, Dover merchants united against the possible loss of their economic base and constructed the first New Hampshire turnpike and other roads into the interior. These improvements in transportation provided easier access to inland timber sources, and the City maintained its economic base through this time of crisis.

The disastrous years of the British embargo and War of 1812, which cut off the lucrative ocean trade, changed forever the destiny of Portsmouth which never recovered an industrial base. Although Dover was also affected by these events, the town turned again to its water resources to develop industry. A group of local entrepreneurs formed in 1812 and incorporated as the Dover Cotton Factory. By 1821, Boston financiers had invested in this operation and by 1830 the Cocheco Manufacturing Company was one of the largest cloth manufacturing centers in the country. These events radically changed the character of the city.

Agricultural enterprise expanded as local farmers took advantage of new technologies to improve their farms. Imported animals, plants and trees added variety to their crops and livestock.

Surviving Resources of the Period

One of the agricultural resources that has survived is the Varney/Horne Homestead on Blackwater Road that was settled in 1810. Following the embargo of 1812, many of the wealthy entrepreneurs invested their money in building fine homes because they could not invest in shipbuilding and trade. Some of the same carpenters and woodworkers constructed these new homes. These fine Federal mansions are concentrated in the area known as Tuttle Square and scattered throughout the city as agricultural settlement continued throughout the City. Brick became a popular building material in Dover after the fires in Newburyport and Portsmouth had made this material a necessity as well as an aesthetically desirable material. Dover's coastline supported numerous brickyards which supplied brick throughout the region, and many of the new mansions and industrial buildings were built from the brick from these brickyards. Significant examples include the William Woodman House, c. 1818, and the John Williams/John Parker Hale House, c. 1814. (John Williams was the agent of the first cotton mill.), which are now the buildings of the Woodman Institute.



Williams/Hale House, 1814



William Woodman House, 1818

Industrialization and the Civil War 1820-1870

During this period, the expansion of the town was phenomenal. In 1855, Dover was officially incorporated as a city. The population grew from 2,871 in 1820 to 5,449 in 1830. This growth generated a need for business and commerce, and an area of shops and stores developed on Central Avenue, known as Merchants Row. Local brick was used to build attractive, fireproof buildings. (Many substantial brick structures have been lost to fire despite these precautions.) Dover's commercial village center grew to equal any of the neighboring towns.

As Portsmouth's maritime prosperity declined, Dover's manufacturing wealth grew. At one time more vessels entered Boston from Dover than from any other place east of New York except Portland, Maine. Good transportation for the import and export business was improved by dredging the Cochecho River. In 1842 the railroad came to Dover and changed the major mode of transportation from water to rail. Dover was the hub of several railroads coming into the City. The Boston & Maine Railroad ran roughly east/west, and a later southern division spur was built from Portsmouth across Dover Point running north/south through the city on roughly the route used today by the Spaulding Turnpike. Railroad yards were located in the City's center to serve both passengers and the mills.

The Sawyer Mills, incorporated in 1824, were located on the south side of Dover on the Bellamy River, manufacturing woolen goods. This industry was fairly self-contained, with mills and worker housing in close proximity. The Cochecho Manufacturing Company in the center of the City produced wool, cotton, calico, and other print fabric and exported them to places around the world. The construction of the great brick mills continued throughout the second and third quarters of the 19th century. These mills became the focus of the community and their presence altered its character.

Not only did manufacturing bring about a visual change in Dover, but it changed the social character of the town as well. The increase in population brought on by a combination of the demand for labor in industry and political problems in Europe introduced new ethnic groups into the population. In the beginning, the company built boarding houses in order to attract the women from farm families in the region to come and work in the mills. Eventually, these "millgirls" were replaced by immigrant families of French, Irish and Greek descent who moved to the City. Several new churches were built during this period due to both the proliferation of new nationalities and the freedom granted by the Toleration Act of 1819. (The number of churches grew from two to ten in a single decade!)

Agriculture continued to prosper, but the advent of the railroad changed the character of the farms as well. The railroad gave the farmers new markets for their crops and the all-purpose farms gave way to the era of the specialty farm. Dairy farming was especially popular in Dover, supplying milk to the City and to Boston.

Surviving Resources of the Period

Many brick commercial buildings survive in Franklin and Central Squares. One particularly significant block is the Hosea Sawyer Block at 29-31 Main Street, built in 1825. The rounded front and square granite lintels are particularly noteworthy. The extensive mills of the Sawyer and Coheco Manufacturing Companies survive in a remarkably intact condition. Worker housing is particularly well-preserved in the First through Fifth Street neighborhood, an area that housed wave after wave of immigrants coming to the city. The best examples of mill-built housing are next to the Sawyer Mills on Charles Street. One unique circumstance was the construction of individual houses on Fifth Street made from a long mill shed.

The Greek Revival Style was the most popular architectural style of this period, a style that wealthy Dover industrialists embraced with enthusiasm. White temple-front residences lined Silver and Locust Streets. The architectural character of Dover varied radically, therefore, from the other cities on the Seacoast because Dover was prospering in an era when the rest of the region was economically depressed.

Two outstanding examples of the Greek Revival Style are the Corporation House c. 1830, at 113 Locust Street, and the Benjamin Barnes House at 89 Locust Street. These were built to house the agent and clerk of the Coheco Manufacturing Company, and they set the style to which others aspired.

Other architectural styles which were popular in this period were the French Second Empire and Italianate Styles. Excellent examples of the French Second Empire or Mansard Styles are found on Summer Street. Included are the Andrew Young House at 37 Summer Street and number 45-47 Summer Street which became Dover's first hospital in 1897.

The railroad is an example of another resource which shaped the character of the city. Unfortunately, most of the large identifiable railroad structures have been torn down, except for an early (c.1842) round house off Chestnut Street and a twentieth century round house on Oak Street.



Hosea Sawyer Block, 1825



Lincoln or Corporation House, c1831



Andrew Young House, 1870



Dover's First Hospital, 1897

Post Civil War Victorian Era 1870-1910

The 30 years that followed 1870 seemed to have been one of the most difficult periods that local farmers had ever faced, a time when they had to adapt to the changing needs of a nation that was moving west. Throughout New Hampshire, many farms were abandoned. In Dover, the agricultural economy was maintained through these ups and downs, primarily in the dairy sector, which continued to supply milk for Portsmouth and Boston.

The period following the Civil War saw the continued expansion of the mills in Dover. From 1876-1878 a new Mill #1 was constructed at the site of the present day One Washington Center. Water wheels were replaced with turbines and overhauls of all the original mill structures were begun. During the 1880's a new Mill #2 was built on the north side of the river, and eventually #2, #3, and #4 were joined to form one continuous building, 732 feet long by 74 feet wide. By 1885 the Cochecho Manufacturing Company had five mills and the printery in full operation. The great flood of 1896 swept so much mud and debris into the Cochecho River that schooners could no longer navigate the river and the shipping industry died.

One noteworthy addition to the City's transportation network was the street railway. It was originally a horsecar system (1882-1890) which ran on Central Avenue between Sawyer's Bridge and Garrison Hill. In 1889, the business was sold to Henry W. Burgett of Brookline, Massachusetts, who expanded the operation to Somersworth and converted it from a horsecar to an electric power railway. The name changed accordingly from the Dover Horse Railroad Company to the Union Street Railroad. Burgett built an amusement park at Willand Pond in Somersworth (a park that no longer exists) to attract passengers to his new enterprise. After a series of bad business operations, the company was consolidated as the Dover, Somersworth and Rochester Street Railway. This type of transportation was soon eclipsed (the last car was removed on October 15, 1926) by the advent of a wonderful new invention - the automobile.

Surviving Resources of the Period

New residential neighborhoods were built during this period. Many of these neighborhoods included expensive and large Victorian houses. An unusual change took place in the Silver Street area. The stylish Greek Revival houses were extensively remodeled to a new Victorian look, with many becoming multi-family dwellings as well. Some of the older residential neighborhoods of the 1840's and '50's became worker housing stock, or the first place people lived before they made good and could move into the new larger Victorian houses. Surviving noteworthy examples can be found on First and Second Streets.

Besides the new mill buildings, many new commercial structures were built in Victorian style. Civic and church buildings built during this era include the Strafford Bank Building (c. 1895) on the corner of Washington Street and Central Avenue and the Baptist Church (c. 1895) at Washington and Fayette Streets.



Baptist Church, c1895

Early Twentieth Century - 1910-1940

After the Civil War, the textile industry blossomed in the South, and because of lower production costs and cheaper labor, it continued to expand. In response to that production increase, the northern textile business declined. In 1909, the Pacific Mills of Lawrence, Massachusetts, took over the Coheco Manufacturing Company and tore down the printworks in 1913. Operations slowed, and then stopped entirely in 1940. The physical plant was sold at auction to the City of Dover in 1941. A mill committee made up of City officials then leased space in the facilities to smaller industries such as Miller Shoe, Clarostat, and Eastern Air Devices.

With the exception of a few successful vegetable and dairy farms, most farming operations were abandoned during this time period.

Despite the economic decline, new residential neighborhoods developed in Dover between 1900 and 1940. The architectural styles included in these neighborhoods are predominantly the Bungalow and the "Square House". New residential neighborhoods developed in walking access to the street car line which ran on Central Avenue. Particular areas of development are near Woodman Park, south of Silver Street, and the area between Oak and Hill Street, south of Oak Street between Park Street and Ela Street also the northern part of Mount Vernon and Maple Streets developed during this era. The automobile put pressure on the owners of earlier houses, and so garages were built in the Arts and Crafts Style throughout the more affluent urban neighborhoods. The Colonial Revival Style expressed a respect for the City's early history. Numerous examples of this popular style are found on sub-divided lots throughout the city, often with exaggerated "colonial" details.

Civic and religious structures were added to the City's building stock in the late 19th and early 20th centuries, including the Court House, 1890, on Second Street, and the Masonic Temple, 1907, City Hall 1935, the Public Library, 1905, and the 1891 Fieldstone Episcopal Church on the corner of Locust and Hale Streets form a "plaza" which still retains a particular turn-of-the-century character. In this area the old Dover High School, 1902, also a brick building can be found. This building served as the Dover Middle School until December 1999. It will be renovated for such use as a courthouse, an alternative school, or City offices.



Dover Public Library 1905



Episcopal Church, 1891

1960 to Present--Downtown Revitalization/Urban Renewal

During this time period, the downtown area of Dover has undergone a number of dramatic changes. From 1974 to 1978, the City undertook a huge \$9 million urban renewal project. Almost 16 acres were razed on Orchard, Waldron, Chestnut, Fayette, and Green Streets. 119 dwelling units, 56 buildings, 33 businesses (including the tannery) were knocked down to bring new life to the area. Parking lots and new open spaces replaced the buildings that earlier stood on these streets. The present day Handy Hardware and professional offices building was constructed in the area as well as the brick apartment buildings along the river.

During this same period, a riverwalk was also constructed along the Cochecho above the falls with a number of park benches and pathways. This project helped create more green space, residential living and commercial opportunity in the downtown area. The urban renewal of Dover continued in the early 1980s as the City reached an agreement with the Dover Mills Partnership to renovate and refurbish the Washington Street mills (factories #2, #3, and #4). The interior of the mills were completely redone and the area around the mills was redeveloped. Liberty Mutual relocated one of its main offices into the downtown mills, helping to create a new atmosphere in the City center. By 1993 Clarostat Manufacturing closed its operation putting 250 people out of work. The Partnership acquired the building and has attracted a number of new businesses including office, retail and manufacturing. In 1997, Liberty Mutual moved to new offices outside of town. The spaces in the mills were filled by such prominent businesses as MBNA, PC Connection, Xylan along with a number of other firms.

The redevelopment of the mill and the arrival of businesses to downtown Dover also encouraged the growth of additional businesses on Central Avenue and Main Street. The Cochecho Arts Festival also moved into the newly renovated plaza in front of the mills on Central Avenue for weekly Friday night and weekday lunch time concerts.

Recently, the city has focused its energy on the riverfront below the Washington Street bridge. A riverwalk has been constructed through Henry Law Park that continues down the newly refurbished covered footbridge next to One Washington Center.

Dover Sites on the National Register of Historic Places

In and around Dover, a number of sites have earned a place on the National Register of Historic Places. Most of the sites were put on the register in the 1980s. This national program only recognizes these structures for their historical significance. It does not guarantee their protection. Nomination can provide tax benefits to owners who wish to rehabilitate these buildings and who agree to maintain the historic integrity of their buildings. Protection can only be afforded through the adoption of a local historic district that is implemented through a historic district commission. Dover has unsuccessfully attempted to establish such a district and commission twice in the past twenty years.

The following include the sites in Dover on the National Register with date of inclusion:

<u>Building/Site</u>	<u>Location</u>	<u>Date Constructed</u>	<u>Date of Inclusion</u>
Back River Farm	Bay View Rd.		6/22/84
County Farm Bridge (Site)	County Farm Rd		5/21/75
First Parish Church	218 Central Ave.	1829	3/11/82
First Parish Church Site	Dover Point Rd.	1634	5/27/83
Garrison Hill Park & Tower	Abbie Sawyer Mem Dr.	1880 (1 st) 1919 (2 nd)	9/11/87
William Hale House	5 Hale Street	1806	11/18/80
Public Market	93 Washington St.	c.1840	3/7/85
Michael Reade House	43 Main St.	1785	2/12/80
Friends Meetinghouse	141 Central Ave.	1786	2/29/80
Sawyer Building	4-6 Portland St.	1825	5/23/80
Sawyer Woolen Mills	1 Mill St.	1824	9/13/89
St. Thomas Episcopal Church	5 Hale St.	1891	6/7/84
Strafford County Farm	County Farm Rd.	1866	2/25/81
US Post Office Main	133-137 Washington St.	1909	7/17/86
Woodman Institute	182 Central Ave.		7/24/80
Damm Garrison		1674	
Woodman House		1818	
John Parker Hale House		1814	
Samuel Wyatt House	7 Church St.	1835	12/2/82

Current Programs/Activities

Main Street Program

Dover was selected as a Main Street community by the New Hampshire Main Street Program. The state program is supported by the National Main Street Center that is a program of the National Trust for Historic Preservation. The purpose of this program is to urge communities to recognize the value of their historic downtowns and develop strategies and programs for historic preservation and community revitalization, business development and downtown promotion. This program should help to preserve and protect the valuable historic resources of downtown Dover.

Northam Colonists-Dover Historical Society

Organized in 1900 the Northam Colonist Historical Society is dedicated to the research, documentation and protection of local history while increasing public awareness through such activities as:

- Meetings open to the public featuring programs on local and regional history;
- Educational exhibits and informational archives;
- Heritage Walks and historical tours; and
- Presentations and lectures for schools, community groups and the general public.

Dover Heritage Walk Committee

Formed in 1979 as a subcommittee of the now-defunct Dover Tomorrow, Inc. organization, the Dover Heritage Walk Committee was formed to promote awareness of Dover's history and heritage and to call attention to particular neighborhoods: their architecture, their former residents, and their evolution in the City.

The Committee organized its first annual historic walking tour, featuring the Silver Street area, during the summer of 1979 and has featured a different walking tour for each of the past 20 years.

Additionally, informational brochures (22 in all) have been designed to accompany the walking tours. These information-packed historical brochures are available for sale at the Dover Public Library and the Woodman Institute.

About 1990, the committee changed its name to the Dover Heritage Group and aligned itself as an arm of the local historical society, the Northam Colonists. At this time, the annual walk is scheduled each year for the Sunday of Columbus Day weekend. All tours are guided, last approximately one hour, and are free. A display of historical maps and photos of the area is always set up at each walk's starting point.

Woodman Institute

This institution is composed of three historic buildings on Central Avenue dedicated to the study and preservation of local history, natural history and art. In 1915 Annie E. Woodman bequeathed \$100,000 for the creation of such an institute. By 1916 the trustees of the institute opened its doors to the public having acquired the homes of Charles Woodman, John Parker Hale and the 1675 Damm Garrison.

Each of the buildings composing the institute have been placed on the National Register of Historic Places. The Damm Garrison, built in 1675 in the back river district of Dover, was moved to its current site at the institute and protected with the construction of a canopy. It now displays over 800 items which are illustrative of the area's early history. The Woodman House, built in 1818 as the residence of Charles and Annie Woodman, now houses the Natural History and War Memorial museums. The Hale House was originally built by John Williams who started the Dover Cotton Factory in 1812. It became the home of famous abolitionist and US Senator John Parker Hale in 1840. It now houses the museum's historical collections, art and period furniture. In addition to the historic buildings and displays, the institute also provides guided tours as well as an annual free lecture series.

Historic District Commission

In 1977 Dover established an historic district commission that never really became functional, because there no historic districts for the commission to regulate. Subsequent to the establishment of the commission there were two attempts to establish districts, both of which failed. Consequently, even though there is a district in the City's code it has no legal role and has never had a membership.

Scenic Roads

In 1973, Dover designated three scenic roads that exhibit visual, natural, and historical character in accordance with RSA 231:157-158. These include:

- Old Garrison Road between Bay View Road and Spruce Lane;
- David Tuttle Lane between Piscataqua Road and its terminal on the eastern side of the Old Garrison Road; and
- Rochester Neck Road between the location of the former Covered Bridge and the boundary line between Dover and Rochester.

This designation requires that the Planning Board provide consent to any cutting of trees 15 inches or more in circumference or destruction of stone walls.

Techniques for Protection of Historic and Cultural Resources

National Register of Historic Places

Structures, sites, and districts of important historical or architectural significance may be nominated to and listed on the National Register, a Federal listing of such structures, sites, and districts. Dover has already had a number of sites listed through this process. The nomination process starts by anyone or any organization preparing a nomination form (it must have the owner's consent) and submitting it to the State Historic Preservation Office (SHPO). The SHPO then reviews the nomination and makes its recommendation to the National Park Service which then decides whether or not to list the property. Such a listing provides protection to the property relating to Federally approved or licensed actions. Any Federal action, like constructing a federally aided highway near such a structure, would require an environmental impact assessment to determine if the listed property could be adversely impacted by the proposed Federal action. Listing on the National Register provides no protection against demolition or alteration by a private owner. Structures normally have to be at least 50 years old before being eligible for National Register status. They must also be architecturally distinguished or be associated with a famous person or event.

Investment Tax Credits

In certain cases, an owner of income-producing property (not including a private residence of an owner-occupant) listed on the National Register may be eligible to apply for and receive an investment tax credit of 20 percent of the eligible rehabilitation costs of a certified rehabilitation project. While the process is complex, the tax credit often does provide a significant economic incentive for commercial developers to rehabilitate an historic property that otherwise would not get rehabilitated. The reason that this is important from an historic preservation standpoint is that the work must be done to federally approved standards.

Historic Districts by Local Governments

Another mechanism to provide protection for historic resources is the creation of a locally controlled historic district for areas with a distinctive historic and/or architectural character. Under 674:45, "The preservation of structures and places of historic and architectural value is hereby declared to be a public purpose." The State allows the creation of local historic districts and commissions to regulate these districts.

There may be a number of historic districts within a community and they may have a residential focus, or a commercial or industrial focus or a combination. "All districts and regulators shall be compatible with the master plan and zoning ordinance of .. the Town." (RSA 674:46-a.Iv.)

Historic districts include all the buildings within the district. They do not prevent the ordinary maintenance or repair of the buildings nor do the districts prevent new construction within the district. Their purpose includes: "preserving (and reflecting) elements of...cultural, social, economic, political and architectural history, conserving property values, fostering civic beauty, strengthening the local economy and promoting the use of a historic district for the education, pleasure and welfare of the citizens of a municipality." (RSA 674:45 I-V).

The City of Dover has twice attempted to establish an historic district that proposed to encompass an area on either side of Silver Street. The City Council adopted an ordinance, but no district was ever established rendering moot the ordinance. The ordinance has been amended on several occasions and has some unusual features. In addition to the district itself, there is a provision for owners of "landmark properties" outside the district to voluntarily come within the provisions of the district's review and approval powers.

While there remain a number of historic structures in the area of Silver Street as well as other areas in the urban core, there does not appear to be significant interest in establishing an historic district. Part of this reluctance may be to the powers that an Historic District Commission might have. Another approach for Dover may be to establish a Heritage Commission

Heritage Commission

Under RSA 674:44-a communities may establish heritage commissions that have similar powers and duties as conservation commissions. Unlike historic district commissions that have regulatory powers within specific areas of a community, the heritage commission advises and assists other local boards relative to the value of historical, cultural and archaeological resources through out the community. The commission may also accept and expend funds for the protection of heritage resources. This may be accomplished through a non-lapsing heritage fund similar to the conservation fund that may be established for conservation commissions.

Preservation Easements

Another method of providing protection for historic properties, is to grant a preservation easement on the exterior of an historic building, which keeps it in perpetuity as it currently appears. The easement is granted by the owner to either a governmental unit or a non-profit corporation in the historic preservation field. Essentially, it is a giving up of certain rights to change the structure. These easements are an extension of conservation easements given by property owners to maintain their land (all or part) in open space for perpetuity. While conservation easements have been used extensively in New Hampshire, preservation easements are less common and somewhat more complex to administer.

Fee Simple Purchase/Gift

Either a governmental unit or a non-profit historic preservation organization might use this technique to purchase or receive a gift of a building for that entity to preserve and maintain for the public to view. With limited funds, this method can save only a small portion of the many buildings worthy of preservation.

Preservation of Other Resources

Dover, because of its farming heritage, has an array of natural vistas and landscape features that may be worthy of preservation. For example, there are surviving farmsteads, rolling fields, mature trees, stone walls and rural roads that all contribute to the historic character of the community. These features are not suitable for protection through historic districting techniques. An essential criteria for an historic district is a group of structures that possess characteristics worthy of protection. In these circumstances other techniques might be suitable.

Scenic Roads

Roads with attractive large trees and/or stone walls along the side may be designated as scenic roads under New Hampshire Statute RSA 235:157. Under the statute, 10 voters or landowners along a road may petition for a warrant article to designate a scenic road. If a scenic road is designated by a City Council vote, then no repair, maintenance, reconstruction or paving work may be done if it involves removal of certain size trees, or demolition of stone walls unless the Planning Board has held a public hearing and has given its written consent. Additionally, the Planning Board in its Subdivision and/or Site Plan Review procedures may want to have a provision to modify its road standards if a designated scenic road is part of or adjacent to a proposed development.

Scenic Easements

It is also possible for a landowner to grant an easement over his/her land in order to protect views, vistas or other features that are worthy of protection. When such easements are granted to a non-profit or governmental organization, if the fair market value of the property is reduced by these restrictions, then the owner may be eligible for a reduction in property taxes.

Implementation Program

Dover has a wealth and variety of historical and cultural resources throughout the community. These resources give Dover a unique character and add value to the City. At present many of these resources are vulnerable to impacts from urban growth. A program to fully inventory and protect these resources would be in the City's interest. The following provides a set of recommendations to undertake such a program. In order to achieve a workable and realistic program, these actions will need to be implemented over varying time frames. For instance, some actions may require a relatively long time frame to implement, while others should be addressed over a much shorter term.

The timeline involves the following classifications for each action:

Ongoing	Actions which are continuous or are already being carried out
Immediate	Actions which should be undertaken in 1-2 years
Short	Actions which should be undertaken within 3-5 years

Long

Actions which will take more than 5 years to be initiated or completed.

1. Continue the Heritage Walk Program.	Ongoing	Dover Heritage Group
2. Establish a Heritage Commission under the provisions of RSA 674:44-a that can advise the Planning Board or other community boards relative the value of the City's heritage (historical, archaeological, and cultural) resources.	Immediate	City Council, Planning Board
3. Consider adding additional roads, or road segments, to the City's scenic road inventory consistent with RSA 231.157 that have trees and/or high quality views that include historical agricultural landscapes, including stone walls.	Short	City Council, Planning Board
4. Prepare a comprehensive inventory—both written and photographic—of all historic properties in the City of Dover based upon information collected and published for the Heritage Walks and other relevant documents.	Short	Heritage Commission, Northam Colonists
5. Encourage more property owners to place their properties on the National Register of Historic Places. Consider establishing a national register district for the area north and south of Silver Street between Arch Street and Central Avenue.	Immediate	Heritage Commission, Northam Colonists
6. Provide opportunities through the Main Street Program to encourage appropriate levels of visitors and tourists that would use Dover's historic character as an attraction.	Immediate	Main Street Program, Chamber of Commerce
7. Maintain a permanent heritage walking trail in the historic urban core that would include an updated map and permanent markers for specific historic properties.	Immediate	Dover Heritage Group, Main Street Program, Chamber of Commerce
8. Work with other groups—public and private—to establish historic road and river programs that involve Dover and surrounding communities. Such programs might include specific designations such as Historic Byways or an American Heritage River or involve tours and trips along such historic corridors.	Long	Heritage Commission, Conservation Commission
9. Manage the gateways into the City, such as Silver Street, Stark Avenue and Portland Street, to protect their historic character and ensure that new development is consistent with this character.	Immediate	Planning Board
10. Re-consider establishing an historic district in the Silver Street neighborhood for the purpose of protecting and enhancing the properties in this area as well as providing a long-term community asset.	Long	Heritage Commission

**Appendix 1 -
Rare Species and Exemplary Communities**

**New Hampshire Natural Heritage Inventory
Rare Species and Exemplary Natural Communities List**

Town Flag Species or Community Name	Listed?		# Locations Reported in the last 20 year	
	Federal	State	Town	State
Natural Communities - Terrestrial				
** SNE Stream Bottom Forest	-	-	2	7
Natural Communities - Estuarine				
** Gulf of Maine Brackish Tidal Marsh	-	-	2	61
** Gulf of Maine Fresh/Brackish Intertidal Flat Community	-	-	3	7
Plants				
** Eastern Lilaeopsis (<i>Lilaeopsis chinensis</i>)	-	T	2	61
Engelmann's Quillwort (<i>Isoetes engelmannii</i>)	-	-	Historical only	17
** Exserted Knotweed (<i>Polygonum exsertum</i>)	-	T	1	13
** False Water Pimpernell (<i>Samolus parviflorus</i>)	-	T	2	6
*** Fringed Gentian (<i>Gentiana crinita</i>)	-	T	3	28
* Hairy Hudsonia (<i>Hudsonia tomentosa</i>)	-	T	1	18
Knotty Pondweed (<i>Potamogeton nodosus</i>)	-	-	Historical only	18
* Large Bur-Reed (<i>Sparganium eurycarpum</i>)	-	T	1	16
** Large Salt Marsh Aster (<i>Aster tenuifolius</i>)	-	E	1	4
*** Northern Blazing Star (<i>Liatris borealis</i>)	-	E	1	13
** Pale Green Orchis (<i>Platanthera flava</i> var <i>herbiola</i>)	-	T	3	8
Prolific Knotweed (<i>Polygonum prolificum</i>)	-	T	Historical only	9
Salt-Marsh Gerardia (<i>Agalinis maritima</i>)	-	T	Historical only	18
** Small Spike-Rush (<i>Eleocharis parvula</i>)	-	T	3	19
*** Stout Bulrush (<i>Scirpus robustus</i>)	-	T	1	16
Trailing Bush-Clover (<i>Lespedeza procumbens</i>)	-	E	Historical only	2
Vertebrates - Birds				
** Golden-Winged Warbler (<i>Vermivora chrysoptera</i>)	-	-	1	2
** Upland Sandpiper (<i>Bartramia longicauda</i>)	-	E	1	5
Invertebrates - Insects				
A Noctuid Moth (<i>Chaetagnela cerata</i>)	-	-	Historical only	5
A Noctuid Moth (<i>Idia diminuendis</i>)	-	-	Historical only	4
Pink Sallow (<i>Psectraglaea camosa</i>)	-	-	Historical only	4

Listed? E = Endangered T = Threatened

Flags **** = Highest importance
 *** = Extremely high importance
 ** = Very high importance
 • = High importance
 • =

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact Natural Heritage Inventory at (603) 271-3623 to learn more about this or alternative ways of setting priorities.

1 January 1999--

Appendix 2 - Commercial Farms

Appendix 2

Dover's Commercial Farms September, 1999

Name	Location	Map-Lot #	Farm Acres	Total Acres
Horse Farms				
Sunswept Stables	229 Spruce Lane	J-6-1		40,175 sf
Hidden Valley Stables	10 Hidden Valley Dr.	I-94C	1.85	45.47
Red Horse Farm	200 Sixth Street	E-70A		6.12
Tiny Barn Farm	374 Middle Road	M-80		1.13
Leroy Smith Farm	185 County Farm Cross Rd.	B-17A		1.10
Janet & Peter Mason	28 Birch Drive	I-83P		11,680 sf
Fruit Farms				
Roy Josselyn	Dover Point Road	L-107		21,666 sf
Thornwood Farm (Flowers)	32 Dover Point Road	K-19		83.58
“ “	“ “	K-19A		25,265 sf
“ “	“ “	K-19B		1.38
“ “	“ “	K-38		43,200 sf
Hickory Hill Farm (Veg & Hay)	245 Back Road	M-100A		1.0
”.....”	“ “	M-100		69.0
<i>Vegetables</i>				
Charles Boyle	9 Boyle Street	0020-081000		24,120 sf
Frank Manha	227 Dover Point Road	L-27		2.14
<i>Beef</i>				
Dan Ayer	McKone Lane	N-18	7.0	12.13
Richard Kay	Littleworth Road	H-28	12.0	13.7
“ “	“ “	H-26	11.5	13.0
“ “	“ “	G-29B	3.0	20.0
“ “	“ “	G-29		62.5
George Sousane (Veg & Hay)	Littleworth Road	H-31A		1.0
“ “	“ “	H-31	49.55	50.5
Peter Rousseau (Veg & Hay)	200 Henry Law Avenue	K-1	32.0	54.0

Hay

Edith Holley	245 Pickering Road	A-27	49.0	98.0
“ “	“ “	B-9	10.0	20.0
Randy Parsell	Pickering Road	B-24	1.0	3.9
Haze Schultze	74 Piscataqua Road	J-27	49.15	52.0
Strafford County Farm (Trees)	County Farm Road	B-20		14.0
“ “	“ “	B-20-1	86.6	
“ “	“ “	C-4A	64.1	124.1
“ “	“ “	C-4		29.0
Fred Riley	Littleworth Road	G-2	64.0	85.0
Cleo Huggins	22 Bay View Road	J-22	48.0	80.0

Tree Farms

Gerald Avery	246 Shaw's Lane	I-2C		15.9
Sam Bagdon/K. Kirkwood (Hay)	115 County Farm Cross Rd.	B-11G	16.26	89.84
Montgomery Childs	Kings Highway	N-8A		61.0
Coheco Country Club	Box 267	N-15		35.0
Elizabeth Feren (Not Certified)	538 Sixth Street	B-21		64.0
Elizabeth Foster	406 Sixth Street	E-27D		50.0
Bertha Jalbert	Gulf Road	N-6A		21.0
Joseph/Florence Parks	195 Long Hill Road	A-18M		69.0
Teresa Picard	39 Varney Road	A-19		48.0
James Smith/Lenore Ekwertzel	County Farm Cross Road	B-17A		40.0
Charlotte Wood	256 Knox Marsh Road	H-40C-1		12.0

Nurseries

Sherwood Nursery	55 Knox Marsh Road	H-32A-1		5.99
Tuttle's Red Barn (Veg & Fruit)	151 Dover Point Road	L-1		8.5
“ “	“ “	M-52	31.0	88.0
“ “	“ “	M-53A	14.0	32.0
“ “	“ “	M-54	12.0	27.0
“ “	“ “	M-83		63.0
GC/AAA Nurseries	317 Durham Road	H-1		2.95

Notes:

1. Where the farm acreage is distinct from the owner's total acreage, it is noted in the Farm Acreage column. Otherwise "Total Acres" represents the full farm acreage.
2. Some owners have more than one lot. The acreage for each lot has been identified
3. Some enterprises engage in more than one agricultural activity. Additional agricultural practices are noted in parenthesis.

Source: Dover Tax Assessor records, September, 1999

Appendix 3 - Existing Dams

CITY OF DOVER DAM SITES

05/04/99

Dam	Hazard class	Name	Owner
067.01		COCHECO RIVER I	MR TIM PEARSON
067.02	A	WATSON WALDRON DAM	NH WATER RESOURCES COUNCIL
067.03		COCHECO RIVER III	NH WATER RESOURCES COUNCIL
067.04	A	CENTRAL AVE DAM	CITY OF DOVER
067.05		BELLAMY PARK DAM	CITY OF DOVER
067.06		BELLAMY RIVER 11	CITY OF DOVER
067.07	B	SAWYERS MILL DAM	SAWYERS MILLS ASSOC INC
067.08	B	BELLAMY RIVER IV	SAWYERS MILLS ASSOC INC
067.09	AA	BELLAMY RIVER V	MR FRANK HOLMWOOD
067.10	AA	FIRE POND	- ELIZABETH HUGGINS TRUST
067.11		FARM POND	MS THELMA JERALDS
067.12	AA	FARM POND	MR DONALD SCHULTZE
067.13	AA	FARM POND	
067.14	AA	FARM POND	TUTTLE MARKET GARDENS
067.15	AA	FIRE POND	
067.16	AA	RECREATION POND	MR ROBERT D SYLVESTER
067.17		IRRIGATION POND	COCHECO COUNTRY CLUB
067.18	AA	ELLIOT ROSE SUPPLY POND	ELLIOT & WILLIAMS ROSES
067.19	AA	FARM POND	MR A LEROY SMITH
067.20	AA	FARM POND	MR ERNEST BOULANGER
067.21	AA	WATER SUPPLY POND	
067.22	AA	FIRE POND	MR FRANK ROBBINS
067.23	AA	WILDLIFE POND	MR CRAIG WILLIAMS
067.24		SCENIC POND	MR ARTHUR G DAVIS
067.25		SCENIC POND	MR ARHTUR G DAVIS
067.26	AA	FARM POND	MR DANIEL GABRIEL
067.27	AA	WILDLIFE POND	MS CHALOTTE WHEAT
067.28	AA	FARM POND	MR JAMES P NADEAU
067.29	AA	FIRE POND	MR FRANK DICICCO
067.30	AA	FARM POND	MR MARDEN FRAZER
067.31	AA	ELLIOT ROSE POND	ELLIOTT ROSE COMPANY
067.32		HANNAFORD BROTHERS DAM	HANNAFORD BROTHERS CO
067.33	AA	DETENTION POND	GOV SAWYER LANE HOMEOWNERS ASSOC
067.34	AA	GATEWAY DETENTION POND	DAVIS FARM OWNERS ASSOC
067.35	AA	PAOLINI DEVELOPMENT POND	PAOLINI DEVELOPMENT TRUST
067.36	AA	DUNNS BRIDGE DETENTION POND	
067.37	AA	GLENWOOD DETENTION POND	GLEN SIX PARTNERS
067.38		DETENTION POND	ROBBINS AUTO PARTS REALTY
067.39	AA	BROWN FARM DET. POND	LAND BUY UNLIMITED OF NH INC
067.40	AA	ED BYRNES CHEV. DET. POND	ED BYRNES CHEVROLET
067.41			DAM # 67.41 DOES NOT EXIST
067.42	AA	COBBLE HILL DET POND	COBBLE HILL COMMUNITY ASSOCIATION
067.43	A	REDDEN POND	CITY OF DOVER
067.44	AA	SHOP N SAVE DET POND	THE SAMPSONS SUPERMARKETS INC
067.45	AA	MALES DETENTION POND	MR STEPHEN MALES
067.46		WILDLIFE MAN POND	NH FISH & GAME DEPARTMENT
067.47	AA	SIXTH ST DET POND 1	LIBERTY MUTUAL INSURANCE CO
067.48	AA	SIXTH ST DET POND 2	LIBERTY MUTUAL INSURANCE CO
067.49	AA	SIXTH ST DET POND 3	LIBERTY MUTUAL INSURANCE CO
067.50	AA	SIXTH ST DET POND 4	LIBERTY MUTUAL INSURANCE CO
067.51	AA	DETENTION POND	NH CATHOLIC CHARITIES, INC
067.52	AA	BACK RIVER DET. POND	BACK RIVER VENTURES LLC

A BLANK HAZCL MEANS THE DAM IS INACTIVE

B. ALL DATA SUBJECT TO CONTINUOUS REVIEW AND UPDATE

(1391-025.doc)