

Natural Resources Inventory Hampstead, NH



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Introduction:

The rural town of Hampstead, NH, in Rockingham County, consists of 8,350 acres, 400 of which are inland water area. Population density in 2004 was 649.3 persons per square mile, summing a total of 8,700 residents (Economic & Labor Market Information Bureau 2005).

Recreation activities and attractions of Hampstead include camping, fishing, hunting, boating, snowmobiling, bicycling, cross-country skiing, swimming at designated beach areas, and walking on trails in conservation areas (Hampstead NH 2003a). These activities encourage preservation and conservation of the natural environment of Hampstead.

This Natural Resource Inventory considers many aspects of the natural community, including soil potential, water resources, endangered and threatened plant species, wildlife habitat, transportation and roads, and land-use mechanisms. Various maps compiled in GIS by NH Fish and Game and the Rockingham Planning Commission are included. Throughout the process of compiling data, we have analyzed and interpreted each map, and provided recommendations according to the results.

Our objective in conducting this NRI was to provide Hampstead town officials, community groups, and citizens with a compilation of maps of important natural resources, corresponding tables and figures, and descriptive analyses, so that the Town may be able to formulate appropriate decisions regarding development and land conservation. This NRI was compiled in partial fulfillment of the requirements of the course NR 775 Senior Project at the University of New Hampshire. A complete Memorandum of Understanding outlining our objectives can be found in Appendix A.

Materials and Methods:

Maps:

We acquired the co-occurrence wildlife maps from NH Fish and Game. We created a conservation land and threatened and endangered species map in GIS (Geographical Information Systems) with data provided by the NH Natural Heritage Bureau and from GRANIT (Geographically Referenced Analysis and Information Transfer). GIS is a computer based program that uses spatial data and attribute data to

create dynamic maps that can be analyzed and interpreted. GRANIT is a database created by the Office of State Planning, the University of New Hampshire, and several other state, federal, non-profit agencies that provides data layers of natural resources (Auger and McIntyre 2001). The remaining maps were created and provided by the Rockingham Planning Commission and were obtained from the Natural Resources Inventory section of the Hampstead Conservation Commission website (Hampstead, NH 2003a).

Interpretation:

We evaluated the current conditions of each resource by analyzing and interpreting the maps, and provided descriptive results that may be viewed in the specified sections of this document. The calculations for the co-occurrence coarse filter index were completed by multiplying the acreage of the unfragmented block with the co-occurrence score.

Surface Water Resources:

All organisms on earth require water for survival, though amounts vary among species. It is essential to life to maintain adequate supplies of clean potable water to support Earth's biota. Water is susceptible to both point and non-point sources of pollution. In the 1970s the Clean Water Act was passed indicating the importance of clean water. This act specifically addresses water quality rather than water quantity, but both are equally important. Water resources are crucial in sustaining life thus signifying that it is crucial to protect them. Surface waters, in particular, are those that are directly available for wildlife and aquatic plant species. These waters are most easily recognizable and manageable because they are more visible and attainable than groundwater. These waters are also an important habitat for aquatic species and amphibians, such as fish, frogs, toads, salamanders, as well as birds, bears, etc.

About two thirds of Hampstead demonstrates wetland characteristics, open water included (see Surface Water Resources map in Appendix F). The northwest corner is dominated by forested palustrine wetlands, and a small amount of emergent palustrine wetlands. These areas are classified as an A Flood Hazard Zone meaning it has a one percent annual chance of flooding, and base flood elevations have not been determined

(Rockingham Planning Commission 2006). The southwest corner is mainly open water (Island Pond) with small areas of both emergent and unconsolidated bottom palustrine wetlands. These are classified as AE Flood Hazard Zone which means there is a one percent annual chance of flooding and base flood elevations have been determined.

East of Island Pond is an area of about a square mile which is considered scrub-shrub palustrine wetlands; this is the most significant of the scrub-shrub wetlands in Hampstead. There are a couple other smaller scrub-shrub wetlands scattered mainly in the center and northern areas of Hampstead. There is another significant open water/unconsolidated bottom resource, Wash Pond, just west of the center of Hampstead. Watersheds were delineated by the New Hampshire Department of Environmental Services, Flood Hazard Areas were determined by the Federal Emergency Management Agency, and the classification of the wetlands can be credited to New Hampshire Fish and Game.

The town of Hampstead is found within two major watersheds The Piscataqua River watershed and the Merrimac River watershed. The Exeter River is the only tributary feeding to the Piscataqua River. There are four main tributaries draining into the Merrimack River; these are Powwow River, Little River, Spicket River, and Arlington Mill Reservoir (stopnps.com, Inc. 1999).

Stratified Drift Aquifers:

Stratified drift is till that originates from the terminus of a once flowing glacier; this till is poorly sorted material and provides significant pores where groundwater can flow. A stratified drift aquifer is an area of till that provides adequate water supply for consumption. Stratified drift aquifers provide municipal and private water supplies to their surrounding communities. Groundwater is essential, being the primary water source for human consumption. Groundwater is found to be less susceptible to contamination than surface water due to natural filtering through soil layers. Contaminants such as leachate from landfills, leaky underground storage tanks, and effluent from septic systems, can easily pollute groundwater. Because groundwater moves along under the ground through hydrological flow paths it can be harder to remediate.

The Town of Hampstead has stratified drift aquifers occurring in about one third of the total area of the town, including open water (see Stratified Drift Aquifer map, Appendix F). There do not appear to be any areas of stratified drift which transmits more than 2,000 feet squared per day. There is one area, less than one mile squared, in the north east section of Wash Pond, which admits between 1,000 to 2,000 square feet per day. The rest of these stratified drift aquifers only transmit less than 1,000 feet squared. This data is based on the Complex Systems Research located at University of New Hampshire (Rockingham Planning Commission 2006).

Vernal Pools:

Vernal pools are a special kind of wetland habitat, however, the state of New Hampshire currently does not provides legal protection for vernal pools (Kanter et al. 2001). Vernal pools are contained basin depressions that lack permanent water. These fishless ponds cannot support aquatic life that is dependent upon year round water. Thus, the absence of fish allows amphibians to safely reproduce. Species found in these areas have life cycles that require the aquatic habitat and terrestrial habitat that vernal pools provide. Indicator species of vernal pools are: fairy shrimp (*Branchinecta sandiegonensis*), wood frog (*Rana sylvatica*), and the spotted salamander (*Ambystoma maculatum*).

Vernal pools vary greatly in size. A small vernal pool could be less then a meter wide, while a large vernal pool can be larger then an acre. Pools can be found in a variety of areas. For example, vernal pools can be found in wooded areas, upland forests, near rivers, in meadows, near coastal ponds, near wetlands, and near swampy regions. Vernal pool habitats, unique in nature, support various types of animals and plants. Vernal pools located near busy roads can cause massive annual mortality of frogs and salamanders as they need to cross the road to reach the pools (Kanter et al. 2001).

The Town of Hampstead has vernal pools throughout the town. A very large vernal pool can be found near a walking trail down the road from the Town Hall. In the winter time it is covered in a thin layer of ice. As spring begins it collects water from the ice melting and slowly dries up throughout the summer.

Wetlands:

Wetlands are areas that are inundated or saturated by surface or ground water. They support vegetation that is adapted to saturated soil conditions. They are also identified as marshes, bogs, or wet meadows. Wetlands are considered an important habitat because they provide both aquatic and terrestrial requirements for particular wildlife species. Wetlands provide water for breeding, feeding, and cover for adults and juveniles. Some species that can be found in these habitats are: Blanding's turtle (*Emydoidea blandingii*), wood frogs (*Rana sylvatica*), green frogs (*Rana clamitans*), moose, muskrats (*Ondatra zibethica*).

A little less than half of Hampstead's wetlands are in conservation/public lands. Hampstead can prolong protection of wetlands by prohibiting development in close vicinity of local wetlands. Pollution from human activities and vehicles degrade the prospects of wetlands. Encouraging protective easements by private landowners can also provide wetland protection. Hampstead currently has a zoning ordinance on wetland protection. "The purpose of the ordinance is to protect the public health, safety, and general welfare by controlling and guiding the use of the land areas which have been found to be saturated or subjected to high water table for extended periods of time including established and seasonal wetlands" (Hampstead, NH 2005b). The primary intentions of the ordinance are: to prevent the development of structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewerage or toxic substances or sedimentation, to prevent the destruction of or significant changes to natural wetlands, to protect natural areas, to protect wildlife habitats, and to enhance the aesthetic values associated with wetlands (Hampstead, NH 2005b).

Conservation Lands:

The National Landscape Conservation system states that conservation areas are designated by government institutions with the intent to conserve, protect, enhance, and manage public land areas for the benefit and enjoyment of present and future generations. These designated areas feature exceptional natural, recreational, cultural, wildlife, aquatic, historical, educational, or scientific resources (NRCS 2005). Conserved lands

serve an essential role in providing ecosystems goods and services to their surrounding communities. Ecosystem goods are the physical things that the earth provides for human use; these are things like food, timber, medicinal plants, etc. The ecosystem services are things which are not typically seen or taken for consumption. These include things like maintaining hydrological cycles, storage and cycling of nutrients, cleaning air and water, regulating climate, etc. It is important to maintain lands with minimal human influence in order to preserve the integrity of these ecosystems.

There are various important reasons to set aside acreage as conservation lands, such as wildlife habitat, preservation of wetlands, etc. Setting aside these specified lands while they still exist is essential if we are to retain any sort of wild and natural land.

Currently, about 25 percent of the total land area of the town of Hampstead is classified as permanent conservation lands. Areas that are considered as permanent conservation are blocks of land that exhibit 50 percent protected land and 50 percent natural cover. Some extractive uses such as timber harvest and mining, as well as some other uses, are allowed (Rockingham Planning Commission 2005). The bulk of the permanent conservation land is located in the southwest quadrant of Hampstead, with the majority bordering, on, or within, Island Pond. The map also indicates that there are other blocks of permanent conservation land located throughout the Town of Hampstead.

At present there are eight sites within the town of Hampstead which are considered by the New Hampshire Department of Environmental Services to be Local Resource Protection Priorities. The majority of these are found on the western side of Hampstead. There are also four areas in the town which are considered historical graveyards by the New Hampshire Old Graveyards Association (Rockingham Planning Commission 2005).

Land Use:

Various types of land use impact ecosystems in different ways. Buildings and roads increase the amount of impervious land surfaces, which influences the amount, location, and quality of water that permeates the soil and contributes to groundwater. Forested land provides services such as storm buffers, recreational uses, timber products, and soil structure. Open wetlands provide extensive wildlife habitat and water

purification systems. Industrial and commercial land is key to economic development, while playing fields and forest trails are fundamental for recreational enjoyment of land.

Knowledge of location and degree of land uses provides insight as to where and whether to continue, expand, or curtail development projects. Some lands are best left untouched, while others provide a better medium for development. The various types of land use in Hampstead are residential, industrial/commercial, mixed urban, playing fields/recreational, agriculture, farmsteads, forested, water, open wetlands, and other (see Land Use map in Appendix f). The most common land use types are forest and residential areas. There are also a fair number of industrial/commercial blocks along Rte 111. The least common land use type is farmsteads.

Soils:

The study of soil structure and composition are inherently important to the health of an ecosystem because soils provide a medium for plant growth, a system for water supply and purification, a mechanism for breaking down organic matter and recycling nutrients, a habitat for soil organisms, and a surface on which to build. For these reasons, soil type and structure are important to consider in determining land use options and zoning. More specifically, it is important to know where different types of soils exist in a community so as to choose development locations best suited to soil potential.

Soil potential ratings define how suitable a soil is for development; it is dependent upon septic tank absorption fields, homes that obtain basements, and local roads. On the Soil Potential map presented in Appendix F, deeper shades represent higher soil potential while the lighter colors represent lower soil potentials. The grey hue represents a value that is not available or rated. The Northeast region of Hampstead contains the highest soil potential rating and obtains the least amount of forested land in the town. The Southwest region of Hampstead has the lowest soil potential rating; it is a heavily forested area containing large abundances of surface water.

Soil orders that exist in Hampstead are inceptisols, entisols, vertisols, histosols, and spodosols (see Appendix B for specific soils series). The majority of Hampstead soils are inceptisols (see Soil Series map in Appendix F). Inceptisols are light-colored soils that are low in organic matter. They occur in humid and subhumid regions, and are

subject to leaching out of base cations (Ca, Mg, Na) and aluminum and iron. They exhibit a slight degree of weathering, are not exceptionally fertile, and occur mainly under forested lands (NCSS 2006). Histosols are black to dark brown soils characterized by very high organic matter; they occur in marshes, bogs, and swamps (NCSS 2006). Entisols exhibit very little soil profile development; they occur over thin, recently exposed bedrock. Vertisols are soils with extremely high clay content that swell when wet and shrink when dry (NCSS 2006); they occur under grasslands. Spodosols are well-drained, sandy soils under coniferous forest (NCSS 2006). For more information on each specific soil series, go to the NRCS's Official Soil Series Description at <http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>.

Wildlife:

Wildlife refers to all plants and animals that are not under direct human control; these species are not cultivated nor domesticated (Bolen and Robinson 2003). Hampstead, New Hampshire, contains a variety of wildlife habitats located in wooded areas and suburban neighborhoods. A wildlife habitat can be defined as an area that contains all requirements (such as cover, shelter, food, and water) essential to the survival of a specific species (Auger and McIntyre 2001). Fields, early succession openings, stands, and forested wetlands all provide sufficient habitats for wildlife.

Grassy fields, orchards and cropland account for seven percent of New Hampshire. These specified areas are convenient for human development thus leading to a significant decline in species. Human development displaces wildlife species that would be expected to occupy these areas. Grassy field areas are characterized by soils that retain water near the surface. This provides for thick grassy vegetation that is ideal nesting sites for certain species. Various bird species that inhabit these locations include; hawks (*Accipiter spp.*), turkeys (*Meleagris spp.*), eastern meadowlarks (*Sturnella magna*), bobolinks (*Dolichonyx oryzivorus*), and savannah sparrows (*Passerculus sandwichensis*). Other wildlife species that inhabit grassy fields include white-footed mice (*Peromyscus leucopus*), and meadow voles (*Microtus pennsylvanicus*).

Early succession openings provide areas for wildlife to nest, feed, and seek cover. Examples of early succession openings include young trees and shrubs. Specific

examples native to Hampstead, NH are blueberry shrubs and grey birch. These specific areas provide homes for a wide range of wildlife species that include: prairie warbler (*Dendroica discolor*), field sparrow (*Spizella pusilla*), eastern towhee (*Pipilo erythrophthalmus*), chestnut-sided warblers (*Dendroica pensylvanica*), indigo bunting (*Passerina cyanea*), gray catbird (*Dumetella carolinensis*), flycatcher (*Muscicapa sp.*), moose (*Alces sp.*), grouse (*Bonasa spp.*), rabbits (*Sylvagus spp.*), black bear (*Ursus americanus*), and deer (*Odocoileinae spp.*). Early succession openings are also home to moths and butterflies.

A stand is an area that provides multiple species of wildlife with food, cover, and nesting sites. These areas contain species of pine (*Pinus spp.*), hemlock (*Tsuga spp.*), maple (*Acer spp.*), and other mixed hardwoods. One critical habitat available to wildlife is snags, which are dead trees that continue to stand in the forested area. Some species that can be found in stands are: grey squirrel (*Sciurus carolinensis*), chipmunks (*Sciuridae spp.*), deer, raccoons (*Procyon lotor*), skunks (*Mephitis mephitis*), black bear, and coyotes (*Canis latrans*).

Wildlife Co-occurrence Maps

Coarse Filter Significant Wildlife Habitat: Habitat Features Map Analysis

This map (see Appendix F) shows the location of various types of wildlife habitat in Hampstead. Following is a brief explanation of each habitat type.

Wetland:

- A wetland is a lowland area, such as a marsh or swamp. A wetland's function is to absorb strong winds and tides, protect terrestrial areas adjoining them from storms, floods, and tidal damage. Wetland plants filter pollutants that are in the water.
- Hampstead contains three different types of wetlands. They are classified as five plus acres, wetland clusters, and palustrine emergent wetlands. On the map the five plus acre wetlands are indicated by a light green color. Wetland clusters are indicated on the map by dark green. Palustrine emergent wetlands are identified on the map by blue dots. Wetland

clusters are less than five acres and are found within one kilometer of another wetland that is less than five acres. Instead of identifying all wetlands that are less than five acres wide, they are identified together as a wetland cluster.

- The Town of Hampstead has about a dozen wetland clusters. Palustrine emergent wetlands are dominated by trees, shrubs, emergents, mosses and lichens. Emergents are erect rooted herbaceous plants that can tolerate flooded soil conditions, but will not survive if emerged for long periods of time. In Hampstead palustrine emergent wetlands are found in wetlands that are five plus acres. Wildlife species seen in palustrine emergent wetlands are beaver (*Castor canadensis*) and great blue heron (*Ardea herodias*).

Riparian Area:

- Riparian areas contain lush vegetation located adjacent to rivers, creeks, lakes, springs, and wetlands. They are transition zones and buffer areas between upland and aquatic ecosystems. They provide nesting and foraging sites for migratory song birds and protection from harsh weather for wildlife. Riparian areas naturally purify water, recharge ground water, slow or alleviate floods, and reduce erosion by water. Riparian zones produce high quantities of forage which is beneficial to wildlife.
- Hampstead appears to have a significant amount of riparian areas surrounding large and small bodies of water as well as some wetlands (about one fifth of wetlands represented). These areas are indicated along water systems by black dots. There are also some riparian zones around cleared lands areas.

Agricultural Lands:

- Agricultural lands are those used to cultivate food for human consumption. These can be a significant source of nutrient inputs to surrounding ecosystems. They can also contribute high amounts of sediment through erosion due to some management practices such as plowing and bare soils. Agricultural lands provide food for wildlife,

however they can be a nuisance for farmers. Birds and mammals will eat grass, seeds, and vegetables which are grown on the land. Coyotes and foxes may kill farm animals or barn cats. Agricultural lands can be viewed as detrimental to wildlife for these areas that could have once been valuable are now cleared for agriculture.

- These areas are small and scattered in the town of Hampstead. They are indicated by orange on the significant wildlife map.

Disturbed Areas:

- Disturbed areas are impaired and not highly beneficial as wildlife habitat. Disturbed areas do not provide adequate soil for vegetation to grow or develop.
- Disturbed areas are indicated on the map by the color purple. There are about 20 disturbed areas found in Hampstead. These areas consist of sand lots, quarries and gravel pits, empty lots, or are unidentifiable. Some areas that are gravel pits are under new construction resting on, and in, close proximity to the quarries.
- Large boulder walls provide homes for birds that like elevated nesting sites. Examples are hawks and pigeons (*Columba livia*), also known as the rock dove.
- By creating disturbed areas, small wildlife creatures are more likely to be successfully preyed upon.

Cleared Lands:

- Cleared lands have been severely altered by mankind. The act of clearing lands is the physical and mechanical removal of naturally occurring vegetation for human use. Some reasons for clearing the land include agriculture, grazing lands, and urban development. These areas are depleted because the removal of vegetation allows the land to become susceptible: soil and wind erosion, loss of nutrients, limited water retention, etc. Cleared lands have minimal to zero ecological value; these lands can no longer provide habitat or food for wildlife. Cleared land leads

to habitat destruction and loss which is the number one cause of a loss of biodiversity.

Coarse Filter Significant Wildlife Habitat: Co-occurrence Scores Analysis

This map (see Co-occurrence Scores map in Appendix F) provides wildlife habitat co-occurrence scores for all of Hampstead's land area. Unfragmented Habitat Block scores are based upon size (total land acres) and area/perimeter ratio (only blocks greater than twenty-five acres in size). The light colors on the map represent small-unfragmented blocks of land while the dark green colors represent larger unfragmented blocks.

The co-occurrence score is based on:

- Riparian corridors and priority wetlands:
 - Riparian corridors are identified by 300 foot buffers around perennial streams and surface water.
 - PEM (palustrine emergent wetlands), selected from NWI data, include mixed wetlands.
 - Wetlands greater than five acres in size are included.
 - Clusters (greater than five acres in size) of wetlands are included.
- Agricultural and open lands:
 - Active agriculture is determined by various farming practices, such as crop rotation, permanent pasture, row crops, livestock, and fruit orchards.
 - Barren land classes are disturbed, cleared, and open/other areas.
- Rare and unique habitats:
 - Uncommon habitat types are pine barrens, salt marsh, alpine, and ledges. Pine barrens are classified as areas that are greater than 25 acres in size primarily consisting of pitch pine. Salt marsh areas are estuarine emergent marshes that include tidal wetlands. Alpine areas are tundra oriented. Ledges consist of bedrock and vegetated bedrock.
- South-facing slopes:
 - South facing slopes have inclines that are greater than ten percent. Hampstead, primarily being flat, does not contain a lot of slope areas at

this level incline. Therefore this applies to few areas in Hampstead (New Hampshire Fish and Game Department 2005).

Co-occurrence scores identify habitats that provide various levels of biodiversity, which includes plant life, wildlife, forest, water, and agricultural/cleared landmasses. These scores are integrated in order to determine areas that contain greater occurrences of the above-mentioned biodiversity. The lighter, peachy colors represent areas of low co-occurrence, while the darker reds signify areas of high co-occurrences. Areas of high co-occurrence are of greater concern and should be recognized as a conservation priority. Specific areas located in Hampstead receive high scores of co-occurrences due to large wetland areas throughout the town.

Coarse Filter Significant Wildlife Habitat: Base Map

This is a base map of Hampstead with unfragmented blocks outlined in various shades of green. Each block includes an ID number and acreage.

ID #	5838	5896	5977	6006	6067	6104	6118	6155	6185
Acreage	217	422	104	605	186	221	182	179	277
C-score	2	4	2	6	4	1	2	6	4
Index	434	1688	208	3630	744	221	364	1074	1108

Table 1. Co-occurrence index based on coarse filter significant wildlife habitat base map

This co-occurrence index was created by multiplying the acreage of each unfragmented block by its wildlife co-occurrence score. It can be used in land-use planning because it shows which blocks are a high priority for conservation due to size *and* co-occurrence. Many times, areas are chosen for preservation based on their size; however, habitat value should be considered as well. For example, ID # 6104 has a larger acreage than ID # 6067, but a significantly lower co-occurrence score. Traditionally, ID # 6104 would be conserved because it is larger; however, one can refer to this index and see that ID # 6067, while smaller, should be considered for conservation first because it holds more value for wildlife.

Plant species:

Plants provide a foundation for all communities because they serve as a direct link in energy cycles. Plant species are able to convert solar energy into usable forms for the organisms that consume them. The biodiversity of plant species directly affects the abundance of biodiversity of animals. Plant biodiversity is important to a community because it ensures survival against catastrophic events such as disease or weather perturbations, which would not be as prevalent in a monoculture community. Plants create diverse habitats for wildlife, microbial community biomass, respiration, and fungal abundance which are directly correlated to plant diversity.

Threatened and endangered plant species can increase the value of conservation lands in a community. These plants can directly influence zoning laws. The New Hampshire Heritage Bureau states that a plant is listed as endangered if there are three or fewer natural occurrences in the state observed within the last fifty years (NHHB 2005). The NHHB has also determined that plant species documented as having ten or fewer natural occurrences within the last twenty years are threatened. The New Hampshire Native Plant Protection Act lists 11 plants as special concern. These plants are not currently listed as rare, but they are vulnerable and could become rare if not protected. (NHHB 2005). These include species such as downy arrowwood, dwarf huckleberry, tufted loosestrife, and sicklepod. A complete list of species can be found in Appendix D. Locations of these aforementioned threatened and endangered plant species are included on the Hampstead Rare Plant Species map (see Appendix F) in 500-foot buffer areas. This is because the NH Natural Heritage Bureau cannot provide exact locations of rare plant species, for protection purposes; thus, locations of rare plant species are shifted 500 feet in an arbitrary direction.

Roads:

Roads are of great importance when considering the levels of disturbance to the natural community. They are a prominent anthropogenic modification of natural lands. We have established these road systems as our most pertinent and convenient means of travel. Roads and roadway travel can introduce various contaminants into conservation lands, the most common being road salt. They create barriers that interrupt sensitive

ecosystems such as watersheds, wetlands, and conservation lands. They can also disturb naturally occurring hydrological flow patterns. Roadway travel increases the incidence of animal death and roadside plant disturbance. Roads also add a significant amount of impervious surface to systems, which can increase flooding patterns and intensity.

There are various road types in Hampstead including; private, municipal, and a secondary system (see Transportation map in Appendix F). Hampstead contains very few unmaintained municipal roads. There is a passenger rail service that connects Boston to Portland that runs along Sandown road and Eastmain Street. It also runs along Rte 111. Hampstead obtains a statewide bike route along Wash Pond Road, Emerson Ave, Maple Ave, and East Road. The primary road types found in Hampstead are both private and municipal (Class V) roadways (Rockingham Planning Commission 2006). Symbols for these road types can be found in Appendix E.

Zoning:

Zoning is how the governments directly control land use and development. Zones can be divided into federal, state, and town regulated lands. Zoning laws typically specify the areas in which residential, industrial, recreational, or commercial activities may take place. Towns classify their communities and designate areas of zoned land as open space, agricultural, industrial, commercial, or residential. Agricultural zoning is also identified as farming. Commercial and industrial classes are identified as economic production, such as businesses.

The town of Hampstead is divided into zoning districts designated as follows (see Zoning map in Appendix F) (Hampstead, NH 2005b): residential Zone A, recreational Zone B, commercial Zone C-1, C-2, C-3, C-4, mobile home zone D, and historical zone E. The permitted uses of Zone A are for as follows: farms, single and multiple family dwellings, schools, churches, hospitals, sanatoria, libraries, mobile home subdivisions, adult care, day care and nursery centers. Recreational Zone B permitted uses are limited to single family dwellings only. These specified areas are for keeping animals; prohibited from the creation of health or safety hazards. Fences are required for the prevention of animal escape. Commercial Zone C-1 is designated for retail business such as book, stationary, drug, jewelry, flower or grocery stores, laundry shops, banks, barber

shops, beauty shops, gas stations, schools, and day cares. Zone C-2 allows for the utilization of C-1 economic developments as well as furniture, plumbing, and construction supply buildings, animal hospitals and kennels, bowling lanes and golf courses. Zone C-3 permits the uses of C-1 and C-2 and also the utilization of warehouses, conversion facilities, research, experimental or testing laboratories, and storage of toxic materials. Zone C-4 permits the use of sanitary landfill only and in accordance with the State of New Hampshire Laws and Regulations relating to solid waste and disposal. Mobile home Zone D permits mobile home parks. Historical Zone E permits the use of historical lands; it is identified on the Hampstead Tax Assessors Map.

Recommendations:

Wildlife

Land suitable for wildlife has vertical and horizontal structure: forest, forest edge, open field, and water. The most important needs for wildlife are food, cover, water, and spatial distribution. Any area that has adequate cover provides protection from weather elements and predation. Wetland areas provide immense wildlife habitat, and should continue to be conserved. In addition, forested areas, especially adjacent to wetland areas, should be conserved indefinitely.

Citizens that own natural (forested, meadow, agricultural) land can purchase easements. A conservation easement is “a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. It allows you to continue to own and use your land and to sell it or pass it on to heirs” (Land Trust Alliance 2006). Conservation easements ensure that land that is valuable to wildlife will be protected for the foreseeable future.

Land owners who would like to develop and improve wildlife habitat can register to work with the Wildlife Habitat Incentives Program (WHIP). This is a voluntary program for private land owners. “WHIP promotes the restoration of declining or important native wildlife habitats; protect, restore, develop, or enhance wildlife habitat of at-risk species (candidate species, and state and federally listed threatened and endangered species); reduce the impacts of invasive species on wildlife habitats; and protect, restore, develop or enhance declining or important aquatic wildlife species’

habitats. Through WHIP, USDA's Natural Resources Conservation Service (NRCS) provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat" (NRCS 2006). The land owner and NRCS will work together for five to ten years working to enhance wildlife projects on land and aquatic areas. WHIP is used across the country and is highly effective.

One good way to conserve land for wildlife is to get people involved. One way to inspire people to become drawn into wildlife issues is by use of a sighting list. A sightings list is a bulletin board where people can document and share what types of wildlife they saw, and where, so that other people can go to these specified locations in the hopes of spotting the same animal or an equally exciting one. People are less likely to support development in an area that has been enjoyed in its natural state.

Another way to increase citizen appreciation of wildlife is to invite little critters to their backyards. Residents, if they choose, can increase the attraction of their yards to wildlife by planting bushes and trees, such as staghorn sumac (*Rhus typhina*), blueberry (*Vaccinium spp.*), and blackberry (*Rubus spp.*), which are known to attract songbirds and chipmunks. Residents can also hang bird feeders or bird houses. Residents should take into careful consideration the location of their feeders and bird houses so that their domestic pets do not harm the local wildlife.

However, citizens of Hampstead who use birdfeeders should be cautious of black bears. Black bears are extremely adaptable and show a great variation in habitat types throughout the United States and Canada (DeGraaf, et al., 2005b). They eat hard and soft mast crops consisting of nuts and berries, plants, insects, and small mammals. It is important not to attract bears to residential areas via use of bird feeders because if bears find food in one yard, they will search around the neighborhood for other food sources (Colorado Division of Wildlife 2003b). Bears start preparing for hibernation in late summer; therefore, it is important to take down birdfeeders at this time. In addition, at this time of year citizens should bring in pet or livestock food overnight, clean outside grills after each use, and make sure garbage containers are sealed (Colorado Division of Wildlife 2006a). Bears sighted in residential areas do not always cause damage, rather, they usually move on; however, if a bear does find an abundant food source in a yard, it may regularly visit and increase the chance of encounters (Colorado Division of Wildlife

2006a). Once food is available to a bear, it becomes trained to associate humans with food; after learning this association, a bear becomes a nuisance and often must be killed (Colorado Division of Wildlife 2003b).

Water Resources

Hampstead has abundant water resources, including wetlands, rivers, lakes, vernal pools, and aquifers. Hampstead is located within two major watersheds, the Piscataqua River and the Merrimack River. Water is necessary to maintain all life, and is also a valuable economic resource. In order to conserve the natural integrity of water resources, the town of Hampstead can consider the following recommendations.

Riparian buffers should be created and maintained around all water bodies to ensure protection of aquatic ecosystems and the enhancement of water quality. Buffers are naturally vegetated upland areas adjacent to wetlands or to surface waters (Burdick 2006). In New Hampshire, a minimum of one hundred feet buffer is recommended (Burdick 2006). Buffers act as a natural filter of nutrients and contaminants. They offer a supply of organic matter that acts as an energy source to benthic macroinvertebrates and fish. The roots of trees provide bank stabilization and flood prevention. Riparian areas are a great habitat for wildlife, for they provide a major source of large woody debris and supply shade over water bodies, which help slow the eutrophication process. Lastly, riparian areas increase recreational and aesthetic value of natural water bodies.

Wetlands are “transitional lands between terrestrial and aquatic ecosystems” (Burdick 2006). Wetlands act as a filter of contaminants, provide wildlife habitat and flood protection, shield shorelines from erosion, and recharge aquifers. Development should be avoided on or surrounding specified wetland areas. Buffers should be implemented and sustained in order to maintain optimum wetland health.

Groundwater is water below the aquifer, where soil pores are saturated, and water moves by gravity. An aquifer is the water bearing layer of soil that contains and transmits significant quantities of water. Sixty percent of New Hampshire gets its drinking water from groundwater; for this reason, it is very important to avoid polluting this water resource. Here are a few ways to maintain clear and clean groundwater. Septic tanks should be checked annually and pumped as needed; otherwise, septic tank

failure will lead to leaching of wastewater into soils, causing contamination of groundwater. Chemical applications, agricultural fertilizers, and residential fertilizers should be minimized to decrease the amount of nitrogen, phosphorus, and other nutrients and contaminants leaching through the soil. Also the industrial, agricultural, and residential application of various pesticides should be minimized.

One major problem affecting New Hampshire's water resources is eutrophication. Eutrophication is a natural process however the rate in which it occurs has been greatly accelerated by human activities. It is defined as the "physical, chemical, and biological changes that take place when a water body receives excessive inputs of nutrients (mainly nitrogen and phosphorus) from natural and anthropogenic processes such as erosion and runoff" (Burdick 2006). The excess amounts of nutrients lead to harmful algal blooms. One of the main sources of nutrient loading is urban and agricultural runoff from intensive human activities. Eutrophication process can be slowed by purchasing laundry detergents that have low phosphorus content, reducing application of fertilizer and other chemicals on lawns, gardens, and crops, reducing erosion into water bodies by maintaining riparian buffer zones, and improving wastewater treatment processes (Burdick 2006).

Conservation Lands

Hampstead is a beautiful town with several large natural areas. Conservation of these lands is a high priority of the town, and in order to keep these areas pristine, development should be carefully planned. Hampstead has already conserved roughly twenty- five percent of its natural areas, but its attractiveness makes it vulnerable to future development: people want to live here. We are not suggesting that Hampstead should deter further development for the sake of conservation, because development increases economic activity. We merely mean to say that some areas are more appropriate for development than others. For example, all areas that receive high co-occurrence scores that are not already conserved should be considered for conservation in the future rather than for development projects. These areas received high co-occurrence scores because they are valuable wildlife habitats and wetland areas. In contrast, areas suitable for development are those adjacent to already developed areas. Natural areas

that are not currently listed as conservation land should be considered for that honor in the future.

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Appendix A

Memorandum of Understanding

Appendix B

Soil Series and Orders

Inceptisols

Canton
Charlton
Chatfield
Hollis
Montauk
Paxton
Ridgebury
Scarboro
Scituate
Walpole
Woodbridge

Histosols

Chocorua
Greenwood
Ossipee

Entisols

Deerfield
Hinckley

Vertisols

Pit

Spodosols

Pipestone

Appendix C

Potential Wildlife Species Living Throughout Hampstead, NH:

Common Name**Scientific Name****Forest/ Fields:**

Northern Dusky Salamander	<i>Desmognathus fuscus</i>
Northern Redback Salamander	<i>Plethodon cinereus</i>
Northern Two-lined Salamander	<i>Eurycea bislineata</i>
Eastern American Toad	<i>Bufo americanus</i>
Grey Treefrog	<i>Hyla versicolor</i>
Northern Redbelly Snake	<i>Storeria occipitomaculata</i>
Common Garter Snake	<i>Thamnophis sirtalis</i>
Northern Ringneck Snake	<i>Diadophis edwardsii</i>
Eastern Milk Snake	<i>Lampropeltis trianulum</i>
Turkey Vulture	<i>Cathartes aura</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ruffed Grouse	<i>Bonasa umbellus</i>
Wild Turkey	<i>Meleagris gallopavo</i>
Rock Dove	<i>Columba livia</i>
Great Horned Owls	<i>Bubo virginianus</i>
Barred Owl	<i>Strix varia</i>
Hummingbird	<i>Archilochus spp.</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Eastern Wood-Pewee	<i>Contopus virens</i>
Blue Jay	<i>Cyanocitta cristata</i>
American Crow	<i>Corvus brachyrhynchos</i>
Eastern Meadowlarks	<i>Sturnella magna</i>
Bobolinks	<i>Dolichonyx oryzivorus</i>
Savannah Sparrows	<i>Passerculus sandwichensis</i>
Common Raven	<i>Corvus corax</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>
Wood Thrush	<i>Hylocichla mustelina</i>
American Robin	<i>Turdus migratorius</i>
European Starling	<i>Sturnus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Prairie Warbler	<i>Dendroica discolor</i>
Field Sparrow	<i>Spizella pusilla</i>
Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Chestnut-sided Warblers	<i>Dendroica pensylvanica</i>
Indigo Bunting	<i>Passerina cyanea</i>
Gray Catbird	<i>Dumetella carolinensis</i>
Flycatcher	<i>Muscicapa spp.</i>
Meadow Voles	<i>Microtus pennsylvanicus</i>
Snowshoe Hare	<i>Lepus americanus</i>
Eastern Chipmunk	<i>Tamias striatus</i>
Woodchuck	<i>Marmota monax</i>

Gray Squirrel
Red Squirrel
White-footed Mouse
Deer Mouse
House Mouse
Porcupine
Coyote
Red Fox
Gray Fox
Raccoon
Stripped Skunk
White-tailed Deer
Black Bear

Sciurus carolinensis
Tamiasciurus hudsonicus
Peromyscus leucopus
Peromyscus maniculatus
Mus musculus
Erethizon dorsatum
Canis latrans
Vulpes vulpes
Urocyon cinereoargenteus
Procyon lotor
Mephitis mephitis
Odocoiles virginianus
Ursus americanus

Wetlands:

Bullfrog
Northern Leopard Frog
Green Frog
Pickerel Frog
Common Snapping Turtle
Wood Turtle
Painted Turtle
Northern Water Snake
Great Blue Heron
Green Heron
Canada Goose
Wood Duck
Mallard
American Tree Sparrow
Song Sparrow
Salt Marsh Sparrow
Northern Cardinal
Red-winged Blackbird
American Goldfinch
Water Shrew
Star-nosed Mole
Beaver
Muskrat

Rana catesbeiana
Rana pipiens
Rana clamitans
Rana palustris
Chelydra serpentina
Clemmys insculpta
Chrysemys picta
Nerodia sipedon
Ardea herodias
Butorides virescens
Branta Canadensis
Aix sponsa
Anas platyrhynchos
Spizella arborea
Melospiza melodia
Ammodramus spp.
Cardinalis cardinalis
Agelaius phoeniceus
Carduelis tristis
Sorex palustris
Condylura cristata
Castor Canadensis
Ondatra zibethicus

Vernal Pools:

Fairy Shrimp
Blue-spotted Salamander
Red-spotted Newt
Four-toed Salamander
Spotted Salamander
Northern Spring Peeper

Branchinecta sandiegonensis
Ambystoma laterale
Notophthalmus viridescens
Hemidactylium scutatum
Ambystoma maculatum
Pseudacris crucifer

Wood Frog	<i>Rana Sylvatica</i>
Eastern Box Turtle	<i>Terrapene Carolina</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
Wood Turtle	<i>Clemmys insculpta</i>
Ribbon Snake	<i>Thamnophis sauritus</i>
Northern Short-tailed Shrew	<i>Blarina brevicauda</i>
Masked Shrew	<i>Sorex cinereus</i>
Star-nosed Mole	<i>Condylura cristata</i>

Appendix D

Rare Plant Species

The following table lists plant species that are endangered (E), threatened (T), and special concern (SC), and informs whether they are located in the town of Hampstead (NHHB 2005). At the time of writing of this NRI, there are no known sightings of special concern species in Hampstead.

Common Name	Latin Name	Status	Currently Listed in Hampstead
Downy arrowwood	<i>Viburnum rafinesquianum</i>	E	Yes
Downy false foxglove	<i>Aureolana virginica</i>	E	Yes
Dwarf huckleberry	<i>Gaylussacia dumosa</i>	T	Yes
Four-leaved milkweed	<i>Asclepias quadrifolia</i>	T	Yes
Green adder's mouth	<i>Malaxis unifolia</i>	T	Yes
sicklepod	<i>Arabis Canadensis</i>	T	Yes
tufted loosestrife	<i>Lysimachia thyrsiflora</i>	T	Yes
Pink lady's-slipper	<i>Cypripedium acaule</i>	SC	No
Dutchman's breeches	<i>Dicentra cucullaria</i>	SC	No
Trailing arbutus	<i>Epigaea repens</i>	SC	No
Grass pink	<i>Calopogon tuberosus</i>	SC	No
Flowering dogwood	<i>Cornus florida</i>	SC	No
Mountain laurel	<i>Kalmia latifolia</i>	SC	No
White fringed orchid	<i>Platanthera blephariglottis</i>	SC	No
Large purple fringed orchid	<i>Platanthera grandifolia</i>	SC	No
Rose pogonia	<i>Pogonia ophioglossoides</i>	SC	No
Lapland rosebay	<i>Rhododendron lapponicum</i>	SC	No
Pitcher plant	<i>Sarracenia purpurea</i>	SC	No

Appendix E

Common Road Types

Class	Road Type	Color
I	Primary System	
II	Secondary System	
III	State Recreational	
IV	Within Compacts	_____ (Thin)
V	Municipal	_____ (Thick)
VI	Unmaintained Municipal	- - - - -
Private	Private	

Appendix F

Natural Resources Maps

