

TOWN OF SPRINGFIELD, NEW HAMPSHIRE

NATURAL RESOURCES INVENTORY

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Report Prepared by:
Watershed to Wildlife, Inc.
John C. Severance and Elise J. Lawson
Natural Resource Consultants
42 Mill Street, Suite 3
Littleton, NH 03561

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This report has involved hard work by many people in Springfield. Involvement of volunteers has greatly increased the amount of data collected on natural resource features throughout town.

Town of Springfield

Springfield Conservation Commission members: John Trachy, Cynthia Bruss, Todd Richardson, Daphne Klein, Ken Jacques, Bob Anderson, and Jane Seekamp

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Howard A. Lewis, Forester I, DRED

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TABLE OF CONTENTS

INTRODUCTION AND OBJECTIVES.....	4
METHODOLOGY.....	5
Field Work.....	5
Gather Existing Digital Data.....	6
Accuracies of Existing Maps.....	6
Compile Existing Data into Autocad and Arcview.....	7
GIS Training Workshop.....	9
Public Information Presentation.....	9
RESULTS.....	10
Rivers and Large Waterbodies.....	10
Sub Watersheds.....	11
Riparian Habitat and Flood Plains.....	12
Wetlands.....	13
Permanent Openings.....	18
Forested Lands.....	21
Bedrock Geology.....	23
Soils.....	26
Farmland.....	27
Stratified Drift Aquifers.....	28
Slope.....	29
Rare Species and Exemplary Natural Communities.....	30
Wildlife Action Plan.....	35
Scenic Resources.....	37
Conserved Land.....	38
Cultural Resources.....	39
Invasive Plant Species.....	41
Habitat Area Summary Table.....	43
DISCUSSION – FUTURE APPLICATIONS AND BENEFITS.....	44
REFERENCES.....	47
MAPS.....	48
Wetlands and Hydric Soils.....	49
Dense Softwoods and Permanent Openings.....	50
Prime, State and Local Farmland.....	51
Conserved Lands and Vernal Pools.....	52
Subwatersheds – Level 12 and Aquifers.....	53
Bedrock Geology.....	54

INTRODUCTION AND OBJECTIVES

The Town of Springfield, New Hampshire contains 28,478.8 acres (approximately 44.5 square miles). Of that total area, 2,064.6 acres is inland water (GRANIT data), approximately 8,480 acres are conserved lands (public and private) and the remaining 20,000± acres are either developed or available for development.

Springfield was incorporated in 1794 and at the time of the first census the population was 210. In 1950 the population was 324, had risen to 948 in 2000 and was 1,114 in 2005. The population increase underscores the importance of compiling information that will assist in future land use planning.

Two lumbering operations and a wood burning electric generating plant are the main industries in Springfield, with additional businesses focusing on services, tourism, and recreation. Springfield has many miles of snowmobile and hiking trails. The 6,500+ acres of the Gile Memorial Forest provides a large area for outdoor activities in all seasons. McDaniel's Marsh is a New Hampshire Fish and Game Management Area where people enjoy canoeing, kayaking, and fishing. Springfield also has a number of lakes and ponds that are suitable for swimming and other water activities.

Springfield contains a wide variety of ecological habitats due to the great diversity in its landscape, many of which were observed during this inventory. Most of the land in Springfield that is not part of the residential downtown areas is presently forested, differing dramatically from the height of the Agricultural Era when approximately 85% of the land was cleared. Only a small percentage of land is currently farmed and limited permanent openings exist.

This project provides a base Natural Resource Inventory (NRI) with the creation of a Springfield GIS database that can integrate other studies and future data. Newly digitized data from this project (permanent openings and dense softwood cover) is projected in NH State Plane Coordinates, NAD 83, and compatible with existing GRANIT Springfield GIS data.



Areas kept open, such as this field, offer scenic views of hills and wildlife ponds.

Natural Resource Inventory for Springfield, NH

One of the goals of this project is to provide inventory, management recommendations, and planning tools for the Town of Springfield. Another goal of the project is to integrate all existing data for Springfield, with new data created and field verified from this project, including dense softwood stands and permanent opening areas. This produces a seamless comprehensive town-wide composite, and provides an educational and planning tool. It promotes conservation of riparian habitat, wetlands, and unique co-existing natural resource features throughout the town.

Measurable objectives of this project include the following:

1. Provide the Town of Springfield with new accurate, standardized coverages that can begin building a GIS database.
2. Incorporate natural resources, scenic vistas, cultural resources, and other related elements for comprehensive planning.
3. Increase awareness of the values of the rural characteristics of the Town including scenic view areas, recreation areas, riparian buffer habitat, and wetlands with associated wildlife habitat through a public presentation and discussion.
4. Provide the Town with the ability to produce hardcopy printouts of this new data as requested or needed.
5. Provide the Town with the ability to continue to build upon and update the digital database.

METHODOLOGY

The Springfield Conservation Commission (SCC) appointed Cynthia Bruss as the contact person for Watershed to Wildlife, Inc. (WTW). WTW consulted with the SCC for location of field work. Copies of the Springfield Master Plan completed in 2005, Springfield Zoning Ordinances (current as amended March 13, 2007), and a series of maps with GPS locations taken within the Gile State Memorial Forest in Springfield were provided to WTW.

Field Work

Fieldwork was conducted to get an overall view of Springfield, with a focus on previously identified target areas. This work included inventories and assessments on several wetland complexes, beaver ponds, lakes and ponds, forested habitats, rock outcrops and overlooks, and agricultural uses of the land throughout the Town. Existing roads and trails were followed to access most field sites, while in some cases compass-based orienteering and topographic maps were used. Most of one field day was dedicated to canoeing the entire length of McDaniels Marsh for a unique perspective of natural resources from the water. GPS data were collected at points of interest including monuments, brook crossings, vernal pools, dense softwood stands, rare plant species, old cemeteries, and unique or interesting habitats. In addition, photographs were taken with a digital camera at points of interest throughout the Town. During fieldwork sessions any unique habitat co-occurrences were noted in field books and located on a map. Observed invasive plant species were also documented. Springfield residents volunteered and guided WTW on several occasions and offered local knowledge of sites and areas.

Natural Resource Inventory for Springfield, NH

Several residents of Springfield have conducted fieldwork, noted observations, and taken GPS points in their Town over the past several years. This is especially true of locations within the Gile State Memorial Forest. WTW reviewed three maps provided from these previous studies:

1. Map 1 - general points of interest with wildlife observations, vernal pools, beaver activities, wetlands and brook crossings,
2. Map 2 – locations of old cellar holes and names of former occupants
3. Map 3 – focusing on dams, bridges, culverts, mines, quarries, mill sites, camps, stone piles, retaining walls, markers, stone wells, and other features such as old fields, apple orchards, lanes, and snowmobile trails.

Data from these maps was entered into the Towns GIS system for use with all NRI data.

All digital information belongs to Springfield and was delivered on CD-ROM(s) with hardcopy formats where appropriate.

Gather Existing Digital Data

Existing maps and data for the Town of Springfield were collected. The following table shows which maps were obtained, their scale, and the national mapping standard accuracy measure. Since many decisions are based on parcels as they relate to rivers, roads, trails, ponds, wetlands and other features, it is important to point out the working accuracies of these data sources. Combining these sources in various overlays provides an excellent overview and planning tool, but does not replace the need to perform site-specific investigations for many subdivision requests. Please refer to the table below to better understand some of these accuracy issues.

Accuracies of Existing Maps

Data	Source	Ratio	Scale	National Mapping Standard Accuracy
1998 and 2003 Digital Orthophoto Quadrangle (DOQ)	GRANIT -.sid version	1:5,000	1" = 416.7'	Acceptable accuracy within 12.48 feet
Topographic Maps (DRGs)	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Roads and Trails, Power Lines, Railroads, Watershed Boundaries, Hydrology, and Conservation Lands	GRANIT	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
Soils	Natural Resource Conservation Service (NRCS)	1:20,000	1" = 1,667'	Acceptable accuracy within 50 feet
Geology & Aquifers	USGS & NH –Dept. of Environ. Services	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet

Natural Resource Inventory for Springfield, NH

Data	Source	Ratio	Scale	National Mapping Standard Accuracy
National Wetland Inventory	U.S. Fish and Wildlife Service	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet
GPS Points	Garmin III plus	N/A	N/A	Generally within 30' but dependent upon satellite availability, PDOP, refraction, and topology.

Compile Existing Data into Arcview and ArcGIS

GIS analyses were conducted by WTW. Digital data were gathered from GRANIT, Natural Resource Conservation Service (NRCS), NH-DES, the US Fish and Wildlife Service, Natural Heritage Bureau, and Springfield. These data include the following:

1. DOQs – Aerial photography
2. Topographic maps
3. Hydrology (rivers, streams, lakes and ponds)
4. Roads and trails
5. Power lines and rail roads
6. Conservation lands
7. National Wetlands Inventory
8. Soil Information
9. Aquifers, and Subwatersheds
10. Documented Rare or Endangered Plant and/or animal species
11. Geology

Existing available maps were then integrated using ArcView and ArcGIS software. Using the 1998 Digital Orthographic Quadrants (DOQ), USDA 2003 aerial photography, topographic maps, and soils maps, features were digitized and overlaid onto a base map. These include: permanent openings, dense softwood stands, and field verified wetlands. Potentially significant wildlife habitat areas were noted. WTW also digitized and included attribute data for the features presented in the three maps provided by the previous work done by Springfield residents.

Wetlands – Wetlands were reviewed and analyzed using the Digital Orthophoto Quadrangles (DOQs), National Wetland Inventory (NWI), Natural Resource Conservation Service (NRCS) soils maps (displaying hydric soil map units), and fieldwork notes. New Hampshire state laws require that three parameters be met for classification as a jurisdictional wetland: the presence of hydric soil (very poorly and poorly drained soils); sufficient hydrology; and hydrophytic¹ vegetation. When soils maps alone are used, they could potentially over-estimate the number of wetlands throughout the Town. This is particularly true given that up to 35% of a soil classification can be inclusions (for example, upland areas within NRCS hydric soil units or wetland areas within NRCS upland units). On the other hand, examining the NWI data alone would under-represent the number of wetlands, due to the U.S. Fish and Wildlife Service's method of using aerial photography to identify wetlands. Open water, emergent, and scrub-shrub wetlands can readily be identified using aerial photography alone, but forested wetlands are often missed. Some types of wetland delineations require extensive fieldwork

¹ Hydrophytic vegetation are plants that grow in water or on a substrate that is at least partially deficient in oxygen as a result of excess water; plants typically found in and adapted to wet habitats.

beyond the scope of this project. Despite differences and potential errors, data provided from these sources are important tools, and can be built-upon in future studies.

Farmland Soils – Prime farmland, farmland of statewide importance, and farmland of local importance throughout Springfield were determined using the NRCS soils map data. Data were displayed in ArcView and queried so only those soils classified as important farmland were displayed in the Town. Much of the prime farmland, farmland of statewide importance and some of the farmland of local importance are now used for crops (including hayland). Land used for pasture, woodland, recreation, or land uses other than urban, built-up or disturbed areas can still qualify as prime farmland, farmland of statewide importance, or farmland of local importance. The rationale for this approach is that land not already committed to irreversible (urban) uses is still available for cropping. Three categories of important farmlands have been described by the NRCS and they are:

1. Prime Farmland as defined by the U.S. Department of Agriculture is the land that is best suited for food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained yield of crops in an economic manner. These soils are generally flat and free of stones.
2. Farmland soils of statewide importance are lands, in addition to prime farmland, that are of statewide importance for the production of food, fiber, forage and oilseed crops. Criteria used to define this agricultural land were determined by State and local agencies in New Hampshire. The soils on the list are important to agriculture in New Hampshire, yet they exhibit some properties that exclude them from prime farmland. These soils can be farmed satisfactorily by greater inputs of fertilizer, soils amendments and erosion control practices than those necessary for prime agricultural farmland. They produce fair to good crop yields when managed properly.
3. Farmland of local importance is land, in addition to prime and statewide farmland, that is of local importance for the production of food, fiber, forage and oilseed crops. The criteria used to define this farmland were determined by local agencies in Sullivan County. Relative values from 100 to 0 were assigned to each of the county's soils based on each soil's potential to grow corn silage or grass-legume hay. The local agencies then determined that soils with relative value of 54 or greater would qualify as farmland of local importance.

Permanent Openings & Dense Softwoods – Permanent openings (areas dominated by grasses, forbs², brambles, or shrubs) were digitized from the DOQs with additional field verification. With the ability to utilize smaller map scale compilation and field verification, these data are more accurate than the coarser LandSat data often used in GRANIT analysis. The regions digitized include only those openings managed as permanent opening habitat (i.e. areas bush hogged at least once every year or two). They do not include clear-cuts where the intent is for timber harvesting and regeneration for future logging. Dense softwood (or conifer) cover areas were also digitized from the DOQs and fieldwork notes. These areas have been recognized as significant wildlife habitat and could be deer and moose wintering areas. Steep slopes were determined using the NRCS soils maps. Data were displayed in ArcView and queried so only those soils map units with 15% slope and greater were displayed in ArcView. A similar query provided areas of 25% and greater slopes as a further analysis.

² A forb is a non-woody, broad-leaved plant other than a grass, especially one growing in a field or meadow.

Maps were created at the end of this project with the features described above. All information gathered, compiled, and mapped for this report was delivered to the Town of Springfield in digital format.

GIS Training Workshop and Installation of Project Data

A two-hour 'hands on' training session in accessing and viewing the data, and plotting maps was conducted in March 2008 as part of this project for Conservation Commission, Select Board, Zoning Board, and Planning Board members that had an interest in providing GIS access for the Town of Springfield. A second training is scheduled to take place after the Town has used the GIS for six to twelve months for more detailed oriented questions and functions.

Public Information Presentation

At the completion of the fieldwork, and GIS analyses for the natural resources, a public information meeting was held in March 2008 to explain results from the NRI. The goal of this meeting is to increase public awareness of the importance of the natural resource inventory including: scenic and recreation areas, riparian habitat, dense softwood stands, wetlands, and associated wildlife habitat. In addition, work done for this project was displayed for public viewing at the meeting.

RESULTS

Rivers, Streams and Ponds

Springfield contains about 2,064.6 acres of inland waters. The Town's largest waterbody is McDaniel's Marsh which has just over 153 acres of open water, surrounded by a diversity of wetland habitats. It is accessible from George Hill Road. Lake Kolelemook, at 94.29 acres, Baptist Pond at 83.31 acres, Star Lake with 65.43 acres, Morgan Pond with 50.99 acres, and Dutchman Pond with 30.29 acres of open water are some of the larger open water habitats found throughout Springfield. All ponds offer excellent open water wildlife habitat. Some are stocked with fish by New Hampshire Fish and Game Department.



Morgan Pond lies just to the west of the Gile State Forest. The New London-Springfield Water Precinct retains the rights on the pond as a back-up water supply. There are excellent cover and buffers all around the pond. Morgan Pond feeds Kidder Brook which flows south into Little Sunapee Lake.

Star Lake at Star Lake Farm contains a diversity of habitats, from steep cliffs at the water's east shore to flat wetland coves and shallow water with aquatic vegetation. The New Hampshire Fish and Game Department leases Star Lake for brook trout breeding and therefore access is restricted. Biologists net trout and strip them of roe (eggs) and milt (sperm) to deliver to the State fish hatcheries. Excellent and diverse habitats surround Star Lake. A pair of loons and their two chicks was observed during the 2007 field work visit.



Cliffs on the east side of Star Lake go right to the lake edge. A pair of loons was observed near the shore by these cliffs.

There are three main named stream systems in the Northwestern Part of Springfield: Carter, Grove, and Colcord Brooks. They flow into Bog Brook and eventually Stocker Brook in Grantham and are part of the Sawyer Brook-Stocker Brook-Eastman subwatershed. Kidder Brook originates at Morgan Pond, and enters Little Lake Sunapee as part of the Lake Sunapee subwatershed. Kimpton Brook is the main named stream in the Frazier Brook subwatershed and flows southeast out of Springfield through Wilmot.

Springfield's running water system contains several minor named and unnamed perennial and intermittent streams that flow in all directions, dependent on topography and aspect. These cold water systems are generally pristine with little to no turbidity, and very picturesque. With a few exceptions, water bodies and streams are well buffered with excellent riparian corridors.

Sub-Watersheds

The ability to view the landscape from a watershed or sub-watershed perspective helps to understand drainages, flows, and associated habitat throughout town. Sub-watersheds do not stop at town boundaries; highlighting the fact that all things downstream are affected by land management upstream, particularly in the headwaters.

Springfield contains the headwaters of eight sub-watersheds broken down to the level 12 hydrologic unit code (HUC) listings. The largest subwatershed is the Sawyer Brook- Stocker Brook- Eastman watershed which covers most of the western side of Springfield and is 13,810 acres. The Lake Sunapee subwatershed is the next largest in Springfield covering 7,281 acres and is located in the southern portion of Town. North of the Sunapee subwatershed is the Upper Blackwater River headwaters covering 811.9 acres in Springfield. Moving northward on the eastern side of Springfield is the Frazier Brook subwatershed covering 4,328 acres with the Smith River Upper subwatershed which consists of 1,943 acres in Springfield.

It is noteworthy that Springfield also contains small headwater portions of three other subwatershed; 227 acres of the Newport Tributaries in the southwestern corner, 74 acres of the

Mascoma subwatershed in the northwestern portion, and 2 acres of the Crystal Lake Brook subwatershed in the north-central end of Town. As with their associated tributaries and streams, these sub-watersheds flow in all directions, dictated by their respective aspect of topography at the landscape level. This highlights the value and richness of the water resources which are evenly distributed throughout Springfield. Water sources are available and accessible throughout town to people, as well as plant and wildlife species. Please refer to the attached Sub-watershed map at the end of this report.

Riparian Habitat and Flood Plains

With miles of streams, brooks, and lake edges, Springfield contains a significant amount of riparian habitat. There are approximately 93 miles of rivers and streams flowing through the Town, several miles of pond shoreland, and just over 1,607 acres of wetlands creating opportunities for large amounts of adjacent riparian habitat. Springfield contains diverse riparian habitat types such as floodplain forests, scrub-shrub, grasslands, and meadows, the majority being forested zones.



This photograph illustrates riparian habitat providing aquatic habitat with excellent cover for a multitude of wildlife species: along an unnamed perennial stream.

Riparian lands are an extremely significant and beneficial habitat type. These habitats include plant and wildlife communities adjacent to rivers, streams, and other waterbodies. They are unique because of the varying water regimes that exist and periodic natural disturbances through events such as flooding. They also provide an important transition zone between terrestrial and aquatic habitats. Riparian lands are rich in bird species; numerous songbirds, raptors, ducks, herons, and others are commonly found utilizing the scrub-shrub, grasslands, meadows, and forests that make up these areas. Aquatic and terrestrial mammals such as muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), river otter (*Lutra canadensis*) and other weasel species, moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), black bear

Natural Resource Inventory for Springfield, NH

(*Ursus americanus*), raccoons (*Procyon lotor*), bats, red fox (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and many others also rely heavily upon these habitats. Riparian areas provide important birthing, mating, feeding, and resting sites for these species. They are also commonly used as travel corridors. In many cases wildlife species may not linger within these habitats, but they are a relatively well protected mode for travel linking various upland habitat types.

A specific riparian habitat type is floodplain forests which are relatively narrow strips of land, particularly in Springfield along the numerous small streams. They are diverse and dynamic ecosystems affected by periodic, temporary flooding. Sediments are transported from upstream and deposited where water slows and spreads out across the floodplain terraces.



The photo on the right illustrates unmanaged riparian and forested flood plain habitat found in Springfield. On the left is a golf course, which has managed riparian areas. The vast majority of Springfield's streams contain excellent forested buffers.

Intact riparian areas are also essential for creating and maintaining a healthy aquatic system. Overhanging vegetation such as shrubs and trees provide important shade to aquatic habitats allowing them to maintain cooler water temperatures and adequate amounts of dissolved oxygen. This is particularly important for brook trout and other salmonid species, throughout Springfield's extensive network of streams and coldwater ponds. The root systems of the riparian vegetation are also important for reducing the amount of erosion that the constant moving water and flooding situations could potentially cause. By reducing erosion, relative stream bank stabilization and sedimentation are controlled. Riparian habitats also slow and hold floodwaters reducing far reaching damage and can work as a filtration system removing nutrients and toxicants from the water. Riparian vegetation can also provide habitat structure to aquatic systems through dead or broken limbs (or sometimes whole trees) that fall into the water.

For all these reasons and more, conserving riparian areas and shoreland buffers is a vital part of conserving Springfield natural resources. With exceptionally few areas, Springfield has a wealth of excellent riparian habitat providing wildlife travel corridors and good water quality.

Wetlands and Hydric Soils

In Springfield, National Wetland Inventory (NWI) GIS analyses indicate there are 1,607.3 acres (2.5 mi²) of wetlands while NRCS hydric soils data indicates there are 3,983 acres (6.2 mi²). Despite the relatively low percentage of wetlands in Springfield, there is a significant amount of diversity. NWI data describe numerous types of ponded, emergent, scrub-shrub, forested, and riverine wetlands. Springfield contains a significant amount of upland soils and a

large amount of steep slopes reducing the Town's potential for containing high amounts of large wetlands. These conditions make Springfield's existing wetlands a very important natural resource for the Town to continue to conserve.

Of the hydric soils in Springfield, over 2,813 acres are classified as poorly drained and nearly 1,170 acres are very poorly drained. Poorly drained soils are defined as soils where water is removed from the soil so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. In very poorly drained soils, water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season.

Wetlands are an essential habitat type for the majority of plant and animal species in New Hampshire. As a whole, wetlands are extremely diverse depending on the hydrology, soils, topography, and climate of an area. There are four general types of wetlands: marsh, swamp, bog, and fen, and a diversity sub-types exist within each of these categories. This diversity extends into each individual wetland where numerous plant and wildlife species and hydric regimes co-exist. This creates edge habitats within and around wetlands which are frequently used by a great deal of wildlife species. It is estimated that riparian areas and wetlands are used by over 90% of the region's wildlife species and provide preferred habitat for over 40% of local species. For these reasons wetlands provide plentiful wildlife viewing and hunting opportunities.



This wetland in the Gile State Forest illustrates the diversity of plants and animals found within wetland complexes. This wetland is a series of beaver ponds connected by a well-buffered and shaded cobbly stream – Kimpton Brook. Wildlife travel corridors were found along this series of wetlands, with signs of bear, deer, moose, beaver, and many amphibian species. Just upslope is a large beech stand with abundant bear claw marks on the trees, indicating excellent beech nut production.



Forested wetland in the Gile Forest. This wetland contains primarily balsam fir with some red spruce and hemlock, and is adjacent to an upland hemlock stand. There is a large network of deer and moose trails found throughout the area and it is probably used as a wintering area for deer, moose and many other species.

Article IV – Wetlands Conservation Overlay District – (March 2007 amended Zoning Ordinance)

Springfield's wetland ordinance calls for protection of wetlands over 10,000 ft² in size along with a 100-foot upland buffer beyond the wetland boundary. McDaniel's Marsh WMA has further protection with a 660-foot buffer beyond the wetland boundary. This article was established to:

1. Prevent the development of structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and groundwater by sewage or toxic substances;
2. Prevent destruction of or significant changes to natural wetlands which provide flood protection;
3. Protect unique, rare and valuable natural areas;
4. Protect wildlife habitat and maintain ecological balance;
5. Protect potential water supplies and existing aquifers (water bearing stratum) and aquifer recharge areas;
6. Prevent expenditure of municipal funds for the purpose of providing and/or maintaining essential services and utilities which might be required as a result of misuse or abuse of wetlands;
7. Encourage those low intensity uses that can be harmoniously, appropriately and safely located in wetlands

Please refer to Springfield's zoning ordinance for details, permitted activities and exemptions.

Vernal Pools – Distinct, often isolated, and important wetland types are vernal pools. Vernal pools provide essential breeding habitat for certain amphibians and invertebrates such as

Town of Springfield

Natural Resource Inventory for Springfield, NH

wood frogs (*Rana sylvatica*), spring peepers (*Pseudacris crucifer*), spotted salamanders (*Ambystoma maculatum*), marbled salamanders (*A. opacum*), and fairy shrimp (*Branchinecta lynchi*). These creatures depend on vernal pools as breeding sites because they are only temporary water bodies preventing fish and other aquatic predators from taking up residency. Reptiles such as Blanding's turtles (*Emydoidea blandingi*) and spotted turtles (*Clemmys guttata*) also rely on vernal pools as an important feeding area in early spring. Vernal pools fill annually from precipitation, runoff, and rising groundwater, typically in the spring and fall. By mid-summer, however, these wetlands are typically dry, making them a dynamic system inhabitable to specifically adapted plant and wildlife species. For this reason many unique, rare, threatened, and endangered species are linked to this wetland type. They are common in New Hampshire, and the State recognizes their value as important habitat. Many confirmed and potential vernal pools have been documented in Springfield, and future studies would undoubtedly document more.



This vernal pool was found on a class VI road off of Deer Hill Road. At the time of this photo (July 17, 2007) two spotted salamander egg masses were found, although they did not hatch and were not viable. It was late enough in the summer that the wood frog tadpoles had morphed into adult wood frogs and left the pool.

Along with providing important plant, wildlife, and fish habitat, wetlands are also an important protector of water sources. Because they often contain hydrophytic vegetation and mucky hydric soils, wetlands are able to store significant amounts of flood/run-off water, minimizing serious damage in times of high water. They are also important contributors to groundwater recharge. This ability to retain water allows wetlands to act as a filtration source. As moving water is slowed and stored in wetlands, suspended sediments and particles settle to the mucky substrate and plant roots are given a chance to absorb excess nutrients, toxicants, pollutants, and contaminants. These functions make wetlands an important source in maintaining the health of aquatic systems.

Natural Resource Inventory for Springfield, NH

Wetland areas are dynamic and constantly changing. The general trend without severe weather or other outside influences is for wetlands to slowly fill in over time. The process begins with open water and as time passes, submerged plants appear. Floating-leafed plants, such as water lilies, eventually follow. Then further emergent plants such as reeds, sedges, and wetland grasses begin to flourish. Shrubs such as high bush cranberry (*Viburnum trilobum*), sweet gale (*Myrica gale*), and bog rosemary (*Andromeda glaucophylla*) begin to appear and heaths such as leatherleaf (*Chamaedaphne calyculata*) and labrador tea (*Ledum groenlandicum*) surface among the shrubs. Trees such as red maple (*Acer rubrum*) and gray birch (*Betula populifolia*) subsequently emerge. This natural successional process is often referred to as lakefill.

On the other hand, there are several environmental and human-induced reasons for wetlands to actually increase in size. Some examples of these follow:

- Human development including damming or excavation such as the mining of gravel and sand could increase wetland sizes and often create new wetlands
- Severe weather changes – an increase in rain will increase the wetland area, whereas a drought may diminish the area
- The cyclic movements of beaver as hardwood saplings regenerate in early succession. In Springfield there is abundant sign of beaver activities in most of the wetland complexes, large waterbodies, and streams
- Human activities such as logging and landscape alteration can dredge out wetland areas or increase the amount of runoff into wetlands



Though beavers are not currently active in this section of Little Stocker Pond, their impact is long lasting.

The amount of open water is now less than when the beavers were living in this pond, and lakefill is beginning to occur, which is allowing plant communities common to wet meadows to become dominant. Moose, deer, muskrat, bear, turtle, fox, coyote, and duck activity was observed in and around this area.

The 1,607.3 acres of wetlands from NWI data under-represent the actual amount of wetlands that exist in Springfield. On the other hand, NRCS classified hydric soils over-represents the amount of wetland throughout town. Hydric soils are one of three parameters required by the State to document a wetland (hydric soils, wetland hydrology, and wetland plants are all required). This project was not designed to focus solely on wetlands; therefore complete field delineation of all the wetlands present in Springfield was not conducted. Several potential wetlands, some new areas and other extensions of existing NWI areas, were observed in the field where at least two of the required New Hampshire wetland parameters were met, but could not be included in the Town's wetlands acreage because they were not field delineated. Their locations are provided to the Town through map and GPS locations in order that future field verification and/or wetland delineation can be conducted if desired. Most of these potential wetlands are forested wetlands making them difficult to verify and delineate through mapping techniques alone. Hillside wetlands play an important ecological role because of the functions they provide for the waterbodies, wetlands, and communities that exist in the adjacent valleys below. They are important wetlands for Springfield to be aware of due to the potential of residential development occurring on the Town's hillsides. Future field determinations would be necessary to comprehensively delineate all wetlands in the town. These can be incorporated over time with additional field verification.



This vernal pool was found part way up the trail to Aaron's Ledge. It was located at a higher elevation (1,870 ft). The vegetative cover all around the vernal pool offers excellent habitat for vernal pool species. During field work, bear tracks were found along a trail beside this vernal pool.

Permanent Openings

As farming was found to be more productive in areas such as the mid-west, it became increasingly less popular in Northern New England. As a result, most of New Hampshire has experienced a loss of working farms. In the height of the Agricultural Era, much of Springfield

was cleared land. Some portions of Springfield, particularly in the eastern portion and the Gile State Memorial Forest, where rugged terrain areas are located, were never cleared for farmland. The central and western portions of Springfield with less severe slopes and more rolling hill topography were farmed. There are some remaining agricultural practices, equine and beef, but on a smaller scale involving less of the potential farmland acreage than the Town has to offer. This overall loss of working farms has caused a significant decrease in the percentage of non-developed, permanent openings over the past 50 years, and New Hampshire is now encouraging landowners to create or maintain permanent openings as important wildlife habitat. Some of these practices are occurring in the Gile State Memorial Forest and at the Star Lake Farm and will hopefully continue. For further discussion of farming practices in Springfield, please refer to the Prime, State, and Local Farmland chapter of this report.

Permanent openings are dominated by grasses, forbs, wild flowers, brambles and fruiting shrubs. It is estimated that they provide required habitat for about 22% of New England's wildlife species and are seasonally important for nearly 70% of species. Insects are not accurately incorporated into these figures, but a large number of these species occupy or use openings. White-tailed deer, black bears, numerous rodents, such as deer mice (*Peromyscus maniculatus*), meadow voles (*Microtus pennsylvanicus*), shrews (*Soricidae* spp), and woodchucks (*Marmota monax*), commonly feed on the vegetation present in these habitats, and carnivores from weasels to coyotes in turn feed on these species. Permanent openings are heavily used by bird species as feeding and nesting sites, specifically by the eastern bluebird (*Sialia sialis*), and northern harrier (*Circus cyaneus*), which are both species of concern in New Hampshire. They also create important edge habitat. Wherever an open area meets the forest, the area of transition will attract the largest diversity of species, both plant and animal. Generally, there will be species adapted to permanent openings, those adapted to forested habitat, and those who specialize in the transition zone area, who will frequent these edge habitats. For example, many bird species that feed in openings are known to frequently nest within the edge habitat because there is typically more structural diversity and cover.



With the decline of agricultural practices in Springfield and throughout all of New England, large open fields such as this one off New London Road are less common than 50 years ago. These permanent openings are a frequently utilized habitat type by a diversity of wildlife species and New Hampshire is encouraging landowners to create and maintain them.

Natural Resource Inventory for Springfield, NH

Though the positives of former farming landscapes far outweigh the negatives, it is often overlooked that vestigial unused fencing can be prohibitive to some wildlife travel and occasionally cause harm to wildlife. When possible it is a good practice to remove non-functioning fencing, such as barb wire and woven sheep fence.

Agricultural fields are not the only source of permanent openings in Springfield. One non-traditional area in Town that provides permanent opening habitat is the golf course in the southeastern corner of Town north of Little Lake Sunapee (about 21 acres). Another example of non typical permanent openings are the miles of transmission lines that run through portions of Springfield. The switch from chemically treating the vegetation growth beneath these lines to mechanically removing and chipping has made them much more palatable and acceptable as wildlife habitat. Also several landowners are routinely brush-hogging former pastureland and hayfields to maintain them as permanent openings. Meadows created from beaver activities are another source of permanent opening but are typically dynamic, and in various stages of succession as the long-term cyclic movements of beaver occur. These areas provide the characteristics of an open area and are surrounded by forested and wetland habitats, making them attractive for numerous wildlife species.

Currently Springfield has 757.3 acres of permanent openings which make up 2.6% of the Town's landscape. This percentage is significantly less than the New Hampshire's State average of 10% permanent openings. A total of 130 different openings were documented during this project ranging in size from approximately $\frac{1}{4}$ of an acre to just over 58 acres. Diversity in sizes is a good feature to maintain in permanent openings because varying sizes are preferred by different species. For example, northern harriers (*Circus cyaneus*) prefer larger openings while feeding, yet snowshoe hare (*Lepus americanus*) are more likely to feed in smaller openings where cover is more readily available. There are other permanent openings throughout Springfield that are too small to be mapped into the Town's overall acreage of permanent openings, such as lawns near homes and seeded woods roads. These openings, especially those in more isolated parts of Town, are still important habitat and help maintain Springfield's plant and wildlife diversity. A goal to retain, and ideally increase, permanent openings would be beneficial to the diversity of wildlife and vegetation throughout the Town.



With mechanical vegetation control, miles of transmission lines provide permanent opening habitat.



A variety of edge habitat from this multi-use permanent opening (hayfield, apple orchard, and abutting forestland).

Forested Lands

Roughly 85% of the 28,479 acres of land in Springfield is forested lands. Common tree species that make up these forested lands are white pine (*Pinus strobes*), eastern hemlock (*Tsuga canadensis*), red oak (*Quercus rubra*), yellow birch (*Betula lutea*), white birch (*Betula papyrifera*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), poplar (*Populus* spp.), red spruce (*Picea rubens*), American basswood (*Tilia americana*), and balsam fir (*Abies balsamea*).



Cavity trees such as this one found in the Gile Forest, offer excellent habitat for many wildlife species: woodpeckers forage for many insects; flickers, many song birds and mice den in cavities in the tree; bats will sleep behind loose bark; once fallen, ruffed grouse will use the tree as a drumming log to attract a mate.

Natural Resource Inventory for Springfield, NH

Forested areas include hardwood stands, softwood stands, and mixed hardwood and softwood stands. Approximately 2,225 acres of forested land, approximately 7.8% of Springfield's land mass, are dense softwood stands. These stands range in size from around an acre to nearly 90 acres. The largest density of softwood stands is in the southeastern portion of town. Additional stands are found between Baptist Pond and Star Lake. Most of the softwoods stands in Springfield are isolated, but a few are connected allowing for excellent winter cover and travel corridors for wildlife. Dense softwood stands are an important habitat type to many wildlife species. They provide important cover and foraging habitat during harsh winter conditions by reducing snow accumulations and wind speeds. Therefore animals such as red squirrels (*Tamiasciurus hudsonicus*), snowshoe hare, ruffed grouse (*Bonasa umbellus*), and white-tailed deer are often found utilizing them during the winter months. White-tailed deer are not well adapted for traveling in and dealing with deep snow conditions and hence require dense softwood stands in order to survive New Hampshire's harsher winters. When they congregate in these stands they are referred to as winter deer yards. For the stand to be considered a deer yard two basic elements must be met: (1) A core area is identified by concentrations of dense softwoods, and; (2) Mixed hardwood and softwoods adjacent to, or within the core area will provide accessible forage. In 1985 the New Hampshire Fish and Game mapped out four potential deer yards in the town, ranging from 131 to 592 acres. Evidence of recently used deer yard areas was found during fieldwork for this project and it is a goal of the Springfield CC to further document existing deer yards. Deer yards cover only about 3% of the land base in New Hampshire so their identification and management is an important part of conserving the entire State's natural resources.



This grove of eastern hemlock in the Gile Forest was crisscrossed with a network of wildlife trails. Some trees in this stand have been used by pileated woodpeckers foraging for insects.

Springfield has several species of trees that are considered important because of their mast production. These include red oak, beech, maple, hemlock, cherry, junberries (*Amelanchier* spp), white ash (*Fraxinus americana*), and pine. Mast are the fruits produced by woody stemmed plants and can be either hard (seeds and nuts) or soft (fruits and berries). Wildlife species from nuthatches (*Sitta spp.*), chickadees (*Parus spp.*), squirrels, and eastern chipmunks (*Tamias striatus*) to white-tailed deer, black bears, turkeys (*Meleagris gallopavo*), and wood ducks (*Aix sponsa*) rely heavily on mast as a source of feed. Hard mast produced by oaks, beech, and some shrubs such as beaked hazelnut (*Corylus cornuta*), is considered extremely important because it is able to persist for a longer amount of time than soft mast and therefore is accessible to wildlife during times of the year when other food sources are limited. Several areas of oak and beech stands have been located and mapped throughout town, many of which are found in the Gile Forest.



Large trees such as the white ash on the left and the black cherry on the right are important mast producers.

Bedrock Geology

The familiar pattern of a general southwest to northeast direction of the receding glaciers of over 12,000 years ago can be seen in Springfield as well as most all of New England. This process formed the rivers, lakes, stratified drift aquifers, and wetlands that we see today. Soil variations found throughout a given area exist because of the parent material (or bedrock) that lies beneath the surface and the deposits of materials left by the retreating glaciers. These parent materials influence the land formations, hydrology, and vegetation occurring above them. Ledge and rock outcrops exist in Springfield with some sheer drops such as Aarons Ledge and the ledge overlook at Star Lake. These formations provide very unique wildlife and plant habitats such as bear and bobcat den sites and peregrine falcon nesting sites.

Several types of rock formation were sculpted by the glacial erosion in Springfield. These are surficial bedrock formations categorized in broad map unit headings further separated

and defined with assigned codes such as: **Metasedimentary and Metavolcanic rocks of the central Maine Trough** – “D1cs Metaconglomerate and Quartzite – Locally fossiliferous in Whitefield quadrangle”, “D1u Upper unnamed member – light gray metaturbidite, lithologically identical to, and probably correlative with, the Seboomook Formation of Maine. Coticule layers common.”; **Oliverian Plutonic Suite² (Late Ordovician)** – Oo2-3A – Granodiorite or tonalite; and **Ammonoosuc Volcanics (Upper and Middle Ordovician)** – Oalx – Bimodal volcanic rocks – Locally includes unmapped Oals. Please refer to the Geology Map at the back of this report for a complete list of these symbols found in Springfield.

Although the mapping was done at a large scale and is coarse, it provides a tool for location of these shifts in bedrock types and may suggest small inclusions of calcium or alkalis in localized areas where higher pH soils and water may provide unique habitat for rare or unusual species. An example of this type of phenomenon is the abundance of mica (phyllosilicate mineral) that can be observed in the rock at Aaron’s Ledge. In terms of bedrock, the name ‘The Granite State’ aptly suggests an abundance of granite and acidic soils. New Hampshire Bedrock Geology data is available for download from the GRANIT data system. Further details about NH geology are available through the State Geologist – www.des.nh.state.us/geology/ and www.nhgeology.org.



Trees struggle to grow on very thin developing soils on Aaron’s ledge in this Montane forest zone at an elevation of approximately 2,008 feet.

Springfield has a mesic temperature regime indicating that the mean annual temperature ranges from 45 to 52 degrees Fahrenheit – the frost free season ranges from 105 to 180 days. It is important to consider that some of the ridge tops in Springfield approach conditions found in the frigid temperature regime where mean annual air temperature ranges from 41 to 46 degrees Fahrenheit and the frost-free growing season ranges from 90 to 160 days. Temperature differentials can be roughly calculated to change 5.8 degrees Fahrenheit for every 1,000 feet of elevation change (colder the higher the elevation and warmer the lower elevation). These varying

Natural Resource Inventory for Springfield, NH

temperature regimes in conjunction with the unique bedrock formations can support conditions for rare plant communities and habitat for rare and endangered plant and animal species in New Hampshire.



Erratics found in talus areas offer den sites for a variety of animals.



Igneous rock showing signs of weathering and water erosion near the dam at Morgan Pond in Springfield.

Soils

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material, very poorly drained, or sandy, will affect the type of vegetation adapted to grow in those conditions. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area. Because soils affect the vegetation that will grow in an area they also influence the habitat types and therefore the wildlife species that will occur in particular areas. As a result, understanding soil conditions and characteristics can be excellent indicators of critical areas such as wetlands, agricultural lands, forestlands, and wildlife habitat. In descriptions of soil types, the NRCS evaluates soils according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat. Certain soils are better suited for certain land uses such as agriculture or residential development. For example, residential development should be located away from areas with unstable soil conditions such as high water tables, and slow percolation rates due to constraints for building foundations and septic system placement.

Several factors exert a major influence on soil development. These include climate, time, topography, parent material, biota, and human activities. Studying soil can also lead to an understanding of how that soil was formed. For example, deep, rich, organic soils found in many wetlands were formed by lack of oxygen and slow decaying of plant and animal material.

Throughout the forested areas of Springfield, spodosol soils continue to develop under the organic litter. These soils take many years to develop identifiable horizons and typically have an albic or “E” horizon just under the organic or “O” horizon. The “E” horizon is generally 1 to 3 inches thick and is described as looking similar to wood ash. The phenomenon is caused by the actions of water and acidic decomposition or fallen needles and leaves stripping off the normal coatings of clay and or iron oxides. The spodosols are relatively young soils.

One of the most common soils in Springfield is the Monadnock series. It consists of very deep, well drained soils that formed in a loamy mantle overlying sandy glacial till on upland hills, plains, and mountain side-slopes. The presence of this soil series is consistent with steep slopes and forested habitats found throughout Springfield.

A parameter sometimes overlooked in soils is that of pH. New Hampshire soils are commonly slightly acidic due to the influence of granite, referencing the term ‘The Granite State.’ There are several areas in Springfield where there are calcareous soils with ‘sweeter’ higher pH due to small pockets of calcium within the granite bedrock. They tend to be near wet areas, often seeps. Such areas often offer opportunities for unique habitat and rare (at least to northern NH) plant life. Unusual or rare plant species in an area sometimes suggests higher pH soils. Some of the rare plant and plant communities located in Springfield are in these higher pH soils.

ArcView compatible shape files of the NRCS soils map and the USGS geologic bedrock of the Town of Springfield have been included with the digital data. It is important to recognize that these delineations are limited in detail as they are Category II and III Levels derived from large grid fieldwork done in 1983 and USGS Quadrant maps at 1:24,000 scales. These soil delineations are also limited for site-specific use in that minimum area polygons are three acres in size and can contain up to 35% inclusions of various soils and slopes.

Farmland



This photo shows an old, abandoned horse or oxen drawn farm implement from an era gone by. The remnants of stonewalls within mature forest indicate where fields, croplands, and pastures once existed.

As stated in the methodology section, prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It is land that still has the potential to serve agricultural uses and can be cultivated land, pasture or woodland, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce the highest sustainable yields with minimal inputs of resources while at the same time generating the least possible damage to the environment. Farmlands that hold state and local importance may not be as ideal for producing the highest possible sustainable yield as prime farmlands, but these soil types have been determined to be of agricultural importance on a more localized scale. Along with the factors outlined in the methodology section another factor that influences farmland is the presence of an abundant volume of moving water. The fact that water reacts much more slowly than air to temperature changes provides a mini-climate within the floodplain area, offering cooler temperatures in the extreme heat of summer and warmer temperatures (including the formation of fog) in the cooler fall temperatures extending the growing season.

Out of the 28,478.8 acres of land that make up the town of Springfield only 427.3 acres (1.5%) of land have been classified as USDA prime farmland, 477.7 acres (1.7%) have been classified as farmland soils of statewide importance, and 5,132.2 acres (18%) have been classified as farmland soils of local importance. Most of the soils that make up the prime and state importance categories are located in the central and western portion of the Town, fairly evenly spread out in a north/south direction. The local important farmlands are fairly evenly spread throughout the Town. Small areas of this prime farmland have been lost to development, but most has not been developed yet.

Springfield contains a very limited amount of soils that are conducive for farming when looking at the national level of designated prime farmlands. A significant amount of these lands however are not currently being used for agricultural purposes. Housing developments could encroach on some of Springfield's prime and state farmlands.

Locally important farmland soils are more abundant in Springfield, but remain in jeopardy, as accessible upland soils tend to be flatter and more manageable for building, and many have class VI roads that could be upgraded. These lands could potentially see further losses in the future if land use is not managed.



In contrast to losing farmland and open fields to reforestation, this 58-acre pasture was re-established in 1991 for grazing beef cattle on Star Lake Farm.

Many locations of rolling hills and knolls in Springfield have high potential for building sites with views. Decision makers must be aware of the long term implications of various land use options for the production of food, fiber, forage and oilseed crop, and the trade-offs involved. Actions that put high quality farmland in irreversible uses should be initiated only if those actions are clearly in the public interest.

Stratified-Drift Aquifers

Groundwater is a critical natural resource for the State of New Hampshire. Approximately 98% of public water systems rely on groundwater. There are three types of groundwater aquifers: stratified-drift, till, and bedrock. The basic difference is that stratified drift and till aquifers are composed of unconsolidated glacial deposits (loose earth materials), while bedrock aquifers are fractured rock. In stratified drift aquifers, the materials are sorted sand and gravel. In till aquifers, the material is a gravel, sand, silt and clay mixture. In bedrock aquifers, the material is rock with fractures.

Stratified-drift aquifers are an important source of groundwater for commercial, industrial, domestic, and public-water supplies in the State of New Hampshire. They typically

are the most productive sources of groundwater and therefore the most high yielding public water supply wells tap these aquifers. Stratified-drift or ‘overburden’ aquifers are most directly influenced by surface waters and land-use activities. They are therefore, perhaps most susceptible to contamination. Approximately 14% of land surface in the State is underlain with stratified-drift aquifers. In Springfield most of the aquifers are in the western portion of Town.

Approximately 569 acres or about 2% of the area in Springfield is underlain with stratified-drift aquifers, below the State average. The largest aquifer is in the western part of Springfield and flows into the neighboring town, Grantham. In Springfield the large majority of the aquifers are made up of sand material. Stratified drift aquifers consisting of sand material tend to be more porous and have a higher potential for quicker transmissivity and recharge. (This also raises the risk of contamination.) Springfield is fortunate to have these potential drinking water sources. These aquifers should be protected to insure their future quality and availability for Springfield.



This Scrub-shrub wetland complex along Route 4A in Springfield is underlain by a 73-acre stratified drift aquifer.

Slope

Slope is an important component of an area’s landform and influences the plants and animals living there. Soils tend to be shallower on steeper slopes, the volume and velocity of surface water runoff is higher, and the erosion potential is greater than on flatter areas. These conditions create a unique habitat where in some cases plants and wildlife have special adaptations for dealing with the limitations associated with steep slopes.

Slopes provide opportunities for panoramic views and for this reason tend to be sought out areas for residential development. Slope has numerous limitations for building such as structural problems and a greater chance of erosion. The consequences of erosion are loss of soil resulting in sedimentation of surface waters, loss of the productive capacity of the land, and in severe cases visual scars that can be seen from even long distances. Slope is traditionally expressed as a percent and represents the amount of rise or fall in feet for a given horizontal distance. For example a 15% slope means that for a 100 foot horizontal distance, the rise or fall

in height is 15 feet. As slope becomes steeper the expenses associated with building increase. In general, slopes between 15% and 25% are considered areas where development would be restrictive and slopes greater than 25% are considered too steep to provide adequate sites for structures such as roads, homes, and septic systems. Springfield has addressed this concern and incorporated a multiplier factor of 1.2 for slopes 15% to 25%, and a multiplier factor of 1.3 for slopes greater than 25%, and increased multiplier factors based on soil groups for acceptable lot size minimums beginning with at least 1.5 acres for any building site.



Severe erosion down to solid ledge on a steep 4WD road near Aaron's Ledge. This has changed the water drainage to follow the road, compounding the erosion.

The NRCS soil data incorporates slope for each soil unit type. This data was used to determine areas in Springfield with slopes equal to and greater than 15%. Using this method, 9,625.8 acres or 33.8% of the land in Springfield contains slopes that are over 15%. Of that 2,559.5 acres or about 9.0% of Springfield land mass contains slopes over 25%. These areas represent about one third of Springfield and misuse in future development would have profound effects on the Town's future. These areas provide habitat for plant and wildlife species such as peregrine falcons (*Falco peregrinus*) and other raptors. They also contribute to the Town's tourism industry, and create hiking, rock and ice climbing opportunities, and several viewsheds.

Rare Species and Exemplary Natural Communities

The Town of Springfield has some occurrences of rare species and communities documented within its borders. They are listed by the Natural Heritage Bureau (NHB), the State agency that houses all reported occurrences. It is highly likely that future studies would document additional rare species and communities.

Some NHB listed species within the animal kingdom/Vertebrates/Birds found in Springfield are the common loon (*Gavia immer*) and pied-billed Grebe (*Podilymbus podiceps*). Another listed species under the animal kingdom/Vertebrates/Amphibians is the Northern Leopard Frog (*Rana pipiens*). Bobcats (*Felis rufus*) have been observed in Springfield, a species

given full protection statewide in New Hampshire. Two plants listed by the NHB in Springfield are two species of peat moss (*Sphagnum contortum*) and (*Sphagnum subfulvum*).

With its miles of well buffered coldwater streams, Springfield has the potential of maintaining a sustainable network of wild brook trout populations and spawning areas for continuum.



Unique habitat around McDaniel's Marsh provides nesting opportunities for Canada geese and other species. Bald eagles, ospreys, great blue herons, and a host of other species have been observed here.

There are many residents of Springfield who routinely observe and document areas of the Town in all seasons of the year. There have been rumored sightings of mountain lion (*Puma concolor*) and many attempts to follow up with solid documentation and “proof”, but no concrete evidence has been validated at this time.

New Hampshire is home to more than 500 species of vertebrate animals. Many of these animals live in Springfield and the surrounding towns. The number would be considerably larger if a complete list of invertebrates (insects, crustaceans, clams and snails) were included. About 75% are nongame wildlife species – not hunted, fished or trapped. Twenty-one species are endangered and thirteen are threatened in the state. The New Hampshire Fish and Game Department maintains a list of Endangered or Threatened animal species in New Hampshire, which is shown on the next page. Minimal information is available relative to their occurrence in Springfield, but their habitats, when identified should be protected.

With its large area of mostly unfragmented forestland and diverse habitat types, Springfield has potential for containing many rare and endangered plant and wildlife species, beyond those currently recorded.

Natural Resource Inventory for Springfield, NH



Many species of ground-nesting birds need quiet, undisturbed habitats such as this location found in a riparian zone of one of the many streams with forested buffers in Springfield.

NH Natural Heritage Bureau Listing for Springfield

NH Natural Heritage Bureau



Town Flag	Species or Community Name	Listed?		# reported last 20	
		Federal	State	Town	State
<u>Springfield</u>					
Plants					
**	Peat Moss (<i>Sphagnum contortum</i>)	--	T	1	10
**	Peat Moss (<i>Sphagnum subfulvum</i>)	--	E	1	1
Vertebrates - Birds					
**	Common Loon (<i>Gavia immer</i>)	--	T	2	225
*	Pied-billed Grebe (<i>Podilymbus podiceps</i>)	--	E	1	27
Vertebrates - Amphibians					
**	Northern Leopard Frog (<i>Rana pipiens</i>)	--	-	1	11

Listed?	E = Endangered	T = Threatened	W = Special concern (watch list)	M = Monitored
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 the Natural Heritage Bureau at (603) 271-2214 to learn more about approaches to setting priorities.		

Natural Resource Inventory for Springfield, NH

Endangered and Threatened Wildlife in New Hampshire

ENDANGERED

Common Name	Scientific Name
MAMMALS	
Canada lynx	<i>Lynx canadensis</i>
Small-footed bat	<i>Myotis leibii</i>
BIRDS	
Pied-billed grebe	<i>Podilymbus podiceps</i>
Bald eagle*	<i>Haliaeetus leucocephalus</i>
Northern harrier	<i>Circus cyaneus</i>
Golden eagle	<i>Aquila chrysaetos</i>
Peregrine falcon	<i>Falco peregrinus</i>
Piping plover*	<i>Charadrius melodus</i>
Upland sandpiper	<i>Bartramia longicauda</i>
Roseate tern*	<i>Sterna dougallii</i>
Common tern	<i>Sterna hirundo</i>
Least tern	<i>Sterna antillarum</i>
Purple martin	<i>Progne subis</i>
Sedge wren	<i>Cistothorus platensis</i>
FISH	
Sunapee trout	<i>Salvelinus alpinus</i>
Shortnose sturgeon*	<i>Acipenser brevirostrum</i>
REPTILES	
Timber rattlesnake	<i>Crotalus horridus</i>
AMPHIBIANS	
Marbled salamander	<i>Ambystoma opacum</i>
INVERTEBRATES	
Dwarf wedge mussel	<i>Alasmidonta heterodon</i>
Brook floater	<i>Alasmidonta varicose</i>
Frosted elfin butterfly	<i>Incisalia irus</i>
Karner blue butterfly*	<i>Lycaeides Melissa samuelis</i>
Persius dusky wing skipper	<i>Erynnis persius persius</i>
Ringed bog haunter dragonfly	<i>Williamsonia lintneri</i>

- = federally Threatened or Endangered

THREATENED

Common Name	Scientific Name
MAMMALS	
Pine marten	<i>Martes Americana</i>
BIRDS	
Common loon	<i>Gavia immer</i>
Osprey	<i>Pandion haliaetus</i>
Cooper's hawk	<i>Accipiter cooperii</i>

Natural Resource Inventory for Springfield, NH

Common Name	Scientific Name
Arctic tern	<i>Sterna paradisaea</i>
Common nighthawk	<i>Chordeiles minor</i>
Three-toed woodpecker	<i>Picoides tridactylus</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
REPTILES	
Eastern hognose snake	<i>Heterodon platyhinus</i>
INVERTEBRATES	
Pine pinion moth	<i>Lithophane lepida lepida</i>
Pine barrens Zanclognatha moth	<i>Zanclognatha Martha</i>
Cobblestone tiger beetle	<i>Cicindela marginipennis</i>

To learn more about threatened or endangered species or unique communities, contact the New Hampshire Natural Heritage Bureau office of NH Division of Forest and Lands for plant species (271-3623 website – www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/index.htm), or the Nongame and Endangered Species Program of the NH Fish and Game Department (271-2461 website – www.wildlife.state.nh.us/Wildlife/nongame_and_endangered_wildlife.htm).



This colony of pitcher plants thriving in a riparian zone off a small perennial stream influenced by a former beaver dam in the Gile Forest. Pitcher plants are insectivorous with pitcher-shaped, hollow leaves which hold water and trap insects. They are not listed as a rare plant species in NH but require specialized habitat and conditions.



An active Great Blue heron rookery located in the southern portion of Springfield.

Wildlife Action Plan

The New Hampshire Fish and Game Department worked together with partners in the conservation community to create the state's first Wildlife Action Plan. The plan, which was mandated and funded by the federal government through the State Wildlife Grants program, provides a base tool for restoring and maintaining critical habitats and populations of the state's species of concern and their habitat. New Hampshire Fish and Game claims it to be a first step on a statewide scale to work towards helping keep species off the rare species lists. The NH Wildlife Action Plan was submitted to the U.S. Fish and Wildlife Service on October 1, 2005, and was approved in the spring of 2006.

In the GIS phase of the Wildlife Action Plan, biologists conducted co-occurrence analyses using a variety of large scale digitized natural resource features such as wetlands, riparian habitat, unique rock outcrops, dense softwood stands, alpine areas, etc. This analysis identified and ranked areas of conservation priorities throughout the state and at a statewide level. Approximately 7% of Springfield contains land that was classified as "Highest Rank Habitat by Condition in NH" and "Highest Rank Habitat by Condition in Biological Region." Nearly 1/3 of the Town contained land classified as "Supporting Landscapes." The areas ranked highest are found throughout McDaniel's Marsh Wildlife Area in the northwestern part of town as well as in the Gile Forest – northeastern part of Springfield.

Natural Resource Inventory for Springfield, NH



The McDaniel's Marsh Wildlife Management Area was identified as the highest rank habitat condition in NH as well as the highest rank habitat by condition in biological region. The area is rich and diverse in wildlife, plants, and habitat types. It is protected by the state of NH.

Because the Wildlife Action Plan was done at a broad scale, not all areas containing important wildlife habitat were identified in Springfield. It is also important to note that this analysis focused on 123 species and 27 habitats in greatest need of conservation throughout the State, which contains over 1,300 known species. Nevertheless, it is an important starting point for Towns, including Springfield. Future work, including this NRI, can be shared with Fish and Game, and incorporated into the Wildlife Action Plan to build upon and improve data and habitat analyses.



Although not a “species of concern” there was abundant bear sign throughout field work inventory in Springfield. In this photo, a bear had been digging at the base of a yellow birch. This was found off a Class VI road at the end of Sanborn Hill Road along a diverse wetland complex.

Scenic Resources

Springfield with its hilly and mountainous topography, offers many scenic views and viewsheds throughout the Town. Many of these locations and overviews were identified by the Planning Board in the recent Springfield Master Plan Update (2005). Places such as Aaron's Ledge, McDaniel's Marsh, Croydon Mountain, Cardigan Mountain, the White Mountains, Mt. Kearsarge, Mt. Sunapee, Lake Krolelemook, and Morgan Pond are a few of the 'best scenic views' identified by the Planning Board. (Please refer to the Master Plan document, 2005 for further details.) There are many scenic viewsheds scattered throughout the Town of Springfield. Town roads, jeep trails, and hiking trails also offer spectacular views, some extending into Vermont.

Springfield's hills, mountains and ledges are not the only scenic resources the Town has to offer. McDaniel's Marsh and several streams and ponds offering scenic views from a different perspective compared to hill tops. In all cases, wildlife and plant observations are available and diverse. Many of Springfield's larger wetlands also provide easily accessed scenic viewing areas. From a natural resource perspective, there are opportunities for scenic vistas throughout the entire town.

Closely associated to scenic views are the fields and permanent openings in Springfield. One can only imagine the hundreds, if not thousands of additional views that were available during the height of the Agricultural Era.



A view of McDaniel's Marsh from Aaron's Ledge and a view of Aaron's Ledge from McDaniel's Marsh.

In recent years, development and population growth throughout the State and region have caused people to increase their appreciation of the natural scenery New Hampshire has to offer. In 2003, the Upper Valley Lake Sunapee Regional Planning Commission inventoried scenic resources along Route 10. Ironically, this highlights the concern of future development on the ridgelines and top of hills. Throughout the State there have been extensive debates over wind towers, cell towers, and houses built on ridgelines because of their detrimental effect on viewsheds. In Springfield's latest Master Plan, it was noted that the preservation of scenic natural resources received the highest rating from respondents of any natural resource to protect.



A scenic overview of an active beaver pond just below Morgan Pond.

Conserved Land

Approximately 8,480 acres equaling 29.8% of Springfield is land conserved by governmental ownership or conservation easements, and is protected as conserved land. The largest protected area is the Gile State Forest in the eastern portion of Town. It is just over 6,534 acres. There are several adjacent protected parcels abutting the Gile Memorial Forest, many of which are owned by the Town of Springfield as Town Forests. The McDaniel's Marsh Wildlife Management Area contains nearly 537 acres of conserved land. New Hampshire Fish and Game Department owns most of the Marsh. Additional protection is afforded by a 660-foot wetlands buffer beyond the wetland boundary.



McDaniel's Marsh contains nearly 537 acres of conserved land including a 660-foot buffer.



The Gile State Forest is over 6,534 acres and contains a wide diversity of wildlife and habitat including rock outcrops in a dense softwood stand to open water beaver ponds with adjacent wetlands and upland habitat.

There are several ways to conserve land. Many lands are owned by federal, state, and local governments (national forests, state parks, and town forests for example). A conservation easement on private land is another means to protect property. It creates a legally enforceable land preservation agreement between a landowner and a municipality or a qualified land protection organization. It restricts real estate development, commercial and industrial uses, and certain other activities on a property to a mutually agreed upon level. The decision to place a conservation easement on a property is strictly a voluntary one where the easement is sold or donated. The restrictions, once set in place, are binding on all future landowners. The restrictions are spelled out in a legal document that is recorded in the local land records and the easement becomes a part of the chain of title for the property. The landowner who gives up these development rights continues to privately own and manage the land and may receive significant state and federal tax advantages with their land for future generations. The easement holder has a responsibility to monitor future uses of the land to ensure compliance with the terms of the easement and to enforce the terms if a violation occurs.

Cultural Resources

As is the case in most New England towns, Springfield has a rich history of land use changes from its original settlement to current times. According to Springfield Historical Society research, some early settlers were here prior to the Revolutionary War, but it was after the Revolutionary War that the veterans began moving north and settling the Town. Settlers disbursed throughout Springfield, in the hills and valleys where many streams were available as a source of water power. Land clearing created hill farms where subsistence crops of corn, grains, potatoes, apples, maple syrup, pastures, and hay were harvested or produced. After the Civil War many people left Springfield, with its poor rocky soils, and moved west seeking richer lives and better land. This phenomenon was common throughout much of New England and towns like Springfield saw a decline in population. There is still evidence of old farms and miles of stonewalls in areas which have reverted to forest. The many miles of abandoned and Class VI town-owned roads throughout Springfield are further evidence of former farms and dwellings. Old stone cellar holes are scattered around Town, and many have been mapped by volunteer efforts of town residents, particularly in the Gile Memorial State Forest. Mica mines were

Natural Resource Inventory for Springfield, NH

another use of natural resources, and former evidence of mine sites can still be found. Forestry and logging continue and are still a part of the culture of the Town.

Several cemeteries, some restored and protected, and others yet to be restored, are found throughout Springfield. The Historical Society has begun the arduous task of recording the many listings and names found in them for documentation and permanent records.



Stone walls show where former farms and fields have reverted back to forest, leaving remnants of cultural history.



A cemetery almost hidden by reforestation located off the New London Road.



A maintained Cemetery located along the Prescott Hill Road on the road to Aaron's Ledge.

Invasive Plant Species

There is an increase in public awareness and concern about the rapid growth of invasive species in NH and throughout New England. Invasive species are plant and wildlife species that are not native to an area, but take up residency and can out-compete native species. These species tend to be more common in wet areas such as lakes, wetlands, riparian habitats, and areas of recent disturbance. They can also be found at old farm sites where people have planted various fruiting and ornamental plants for agricultural purposes. Without counting plantings on people's lawns and gardens, four species were observed and documented during fieldwork for this project; purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonum cuspidatum*), black locust (*Robinia pseudoacacia* L.), and coltsfoot (*Tussilago farfara*). Fortunately, Springfield does not appear to have an abundance of invasive plants at the time of this report. This NRI was not designed to be an all inclusive search and documentation of invasive species in Springfield. There may be other species and locations where invasive species occur in Town.

Natural Resource Inventory for Springfield, NH



Purple loosestrife shown in the photo was found along Bog Brook.



Healthy patch of Japanese knotweed found near the McDaniel's Marsh WMA.

The Town of Springfield should continue their efforts to help identify and eradicate these invasive species, and may want to seek assistance from the Invasive Plant Atlas of New England (IPANE), New England Wild Flower Society, and other organizations that have begun programs to control or eradicate invasive species. For further information on invasive species, review the IPANE website <http://nbii-nin.ciesin.columbia.edu/ipane/>.

Habitat Area Summary Table

The table displayed below is a summary of different habitat areas in acres and square miles.

Habitat Type	Number of Acres	Number of Square Miles	Percentage of Town Land Mass
Springfield Town Boundary	28,478.8	44.5	100%
Dense Softwood Cover	2,225.4	3.48	0.8%
Wetland Complexes (from National Wetland Inventory data)	1,607.3	2.51	5.6%
Hydric Soils (from Natural Resources Conservation Service data)	3,982.84	6.22	14.0%
Aquifers	568.51	0.89	2.0%
Permanent Opening	757.3	1.18	2.7%
Prime Farmland	427.34	0.67	1.5%
Farmland of Statewide Importance	477.74	0.75	1.7%
Farmland of Local Importance	5,132.22	8.02	18.0%
Steep slopes – 15% and greater	9,625.75	15.04	33.8%
Steep slopes – 25% and greater	2,559.50	4.00	9.0%
Conserved Lands • Including the Gile State Forest	8,479.60	13.25	29.8%

DISCUSSION – FUTURE APPLICATIONS AND BENEFITS

This project has compiled natural resource data into a digital database in GIS format and produced a written report for use in the Town of Springfield. It contains a database with a comprehensive, updatable, digital inventory of the entire Town. It is also anticipated that efforts from this project will aid in future work and inventories, as well as provide data to guide future development throughout Springfield.

It is anticipated that results from this study will help the Town of Springfield in many ways. Town-wide zones based on habitat and vegetation can be identified and classified. Data gathered from this work will also assist the Conservation Commission, Planning and Zoning Boards, and Select Board, in foreseeing possible conflicts of future development. Perhaps the most powerful advantage of this project is that future studies and events can be integrated to build upon this database indefinitely.

Based on results from this study, Watershed to Wildlife, Inc. has identified areas for additional work. They include the following:

1. **Wetland Identification and Protection** - There are several wetland complexes adjacent to brooks and their tributaries, and along some hillsides. The importance of conserving these wetlands cannot be over emphasized. It is hoped that the Town will continue to pursue ways to further inventory the functionality and vulnerability of these wetlands with a ranking system, and a long-term goal of Prime Wetland designations.
 - a. An in-depth inventory of vernal pools throughout Springfield would also enable the Conservation Commission, Planning Board, and Select Board to critique and adjust future subdivision proposals if vernal pools are likely to be impacted.
 - b. The Town of Springfield should consider designating Prime Wetlands for some of its wetland complexes. The Conservation Commission should continue to explore designating some of the more vulnerable wetlands.
 - c. Compile previously delineated wetlands, documented wetland locations, and other areas containing wetlands; conduct future expanded wetland delineations according to the Routine Onsite Determination Method of the U.S. Army Corps of Engineers in the 1987 manual. This method meets New Hampshire requirements for standardized wetlands delineations.
2. **Shoreline Protection** - Most of the shoreline along the miles of streams and ponds have adequate to excellent vegetative buffers. There are some sections in Springfield where enhancement of the buffer by plantings would help maintain and improve water quality.
3. **Aquifer Protection** - Based on the locations and relatively small size of the underlying aquifers in Springfield, it is important that steps be taken to protect the groundwater, brooks, ponds and aquifers in town. Future water supplies are a very valuable natural resource, for Springfield and its abutting towns; proven by the drinking water systems already in use. They are:
 - a. Implement Best Management Practices (BMPs) within aquifer areas.
 - b. Monitor septic system plumes with a focus on parcels adjacent to brooks, wetlands, and aquifers.
 - c. Monitor the placement of future septic systems keeping in mind the typically high permeability of many of Springfield's soils.

4. **Hillside and Ridgeline Protection** - Springfield's mountainous topography and abundance of Class VI roads are directly related to the Town's tourism industry, scenic beauty, and assortment of natural resources (wetlands, streams and rivers, wildlife, plants, soils, etc.). Research and considerations should be made towards evaluating and possibly updating the zoning ordinance in Springfield to conserve these unique and important natural features.
5. **Class VI Roads and Erosion** – Springfield contains many miles of Class VI roads and trails. Several locations, highlighted by the access to Aaron's Ledge and to a lesser degree a trail along Little Stocker Pond, have experienced severe erosion problem due to ATV and/or 4 wheel drive use. In some cases the erosion will be difficult to repair and without repair will rapidly worsen. Given the extensive miles of woods roads and trails, with hilly and steep gradients, the Town should implement a program to repair and maintain drainage structures, e.g. waterbars and 'get aways' with an enforcement system to prevent potential destruction of these areas. In some cases the sedimentation from erosion could be detrimental to nearby streams, ponds, and wetlands and cause degradation to water quality.
6. **Dense Softwood Stand Protection** - Based on results from this project, there is an adequate acreage of dense softwood stands scattered throughout Town, but connectivity to each other and travel corridors could be improved. Maintaining the existing stands for the benefit of the deer, moose and other wildlife populations is very important. Places to extend the existing softwood areas and connect patches of softwood in a continuum should be further investigated and willing landowners should be encouraged to do so, particularly with abutting wetlands and-riparian buffers.
7. **Land Conservation** - Even though approximately 30% of Springfield's land is already conserved, in large part due to the Gile Memorial State Forest, continuing to explore lands to potentially conserve will further benefit the Town's natural resources. Focus should be on connectivity between already conserved parcels or looking at habitat types that are not currently well represented in conservation lands such as wetland complexes, permanent openings, and dense softwood areas. Springfield should continue to encourage landowners to place land into conservation easements.
 - a. Stewardship planning of these properties is recommended.
 - b. Investigating purchasing adjacent parcels to current conservation lands would increase and maintain existing wildlife travel corridors. It would be beneficial to the Town by maintaining the connectivity of forestlands, wetland complexes, and open space habitat.
8. **Scenic View Conservation** - The potential for a continued population increase throughout the Town makes it wise for landowners to sustainably conserve their land. By taking a proactive approach to deal with future development pressures, the scenic vistas and beauty will remain as impressive (or even better) tomorrow as they are today. Scenic easements are types of conservation easements that make protection of scenic resources possible.

9. **Natural Resource Planning at the Parcel Level** - The Town should consider upgrading the tax map to a GIS format and requiring new subdivision maps to be in GIS format. More accurate and detailed parcel information will aid in determining impacts of future subdivisions on natural resources, including wetlands and wildlife travel corridors.
10. **Interagency Cooperation** - It is hoped that Springfield will continue to work with other Towns, organizations, and agencies throughout the region to share future data as it becomes available. This will avoid an all too common problem of separate entities replicating work. An excellent example of cooperation is the partnership with the Gile Memorial State Forest management and the Town of Springfield; another is the working relationship with the New London - Springfield Water System Precinct.

Long-term uses of this project could include, but are not limited to: assisting the Town and others in determining “least-impact” sites for future development, telecommunication towers or wind farms; guiding refinement of the Master Plan based on impacts to natural resources; promoting a protection plan for the large aquifers under some of the Town; and further identification of land for purchase or easements for protection in the future. Furthermore, the Springfield is in a position to request that all future development plans be delivered in digital format, which would build upon the initial database as well as assist in updating the tax maps for assessment at little cost to the Town.

REFERENCES

State of New Hampshire. 2007. Economic & Labor Information Bureau, NH Employment Security. Updated 06/23/06.

Town of Springfield. 2005. *Springfield, NH Town Plan 2005*.

Town of Springfield. 2007. *Zoning Ordinance as amended March 2007*.

MAPS

1. Wetlands, Hydric Soils, and Water Resources
2. Dense Softwoods and Permanent Openings
3. Prime, State and Local Farmland
4. Steep Slopes
5. Conserved Lands and Points of Interest
6. Subwatersheds – Level 12 and Aquifers
7. Bedrock Geology

Data Sources:

Town Boundary, Roads, Open Water, Aquifers, and Streams obtained from GRANIT.












National Wetland Inventory data obtained from U.S. Fish and Wildlife Service and GRANIT.

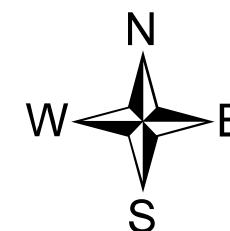
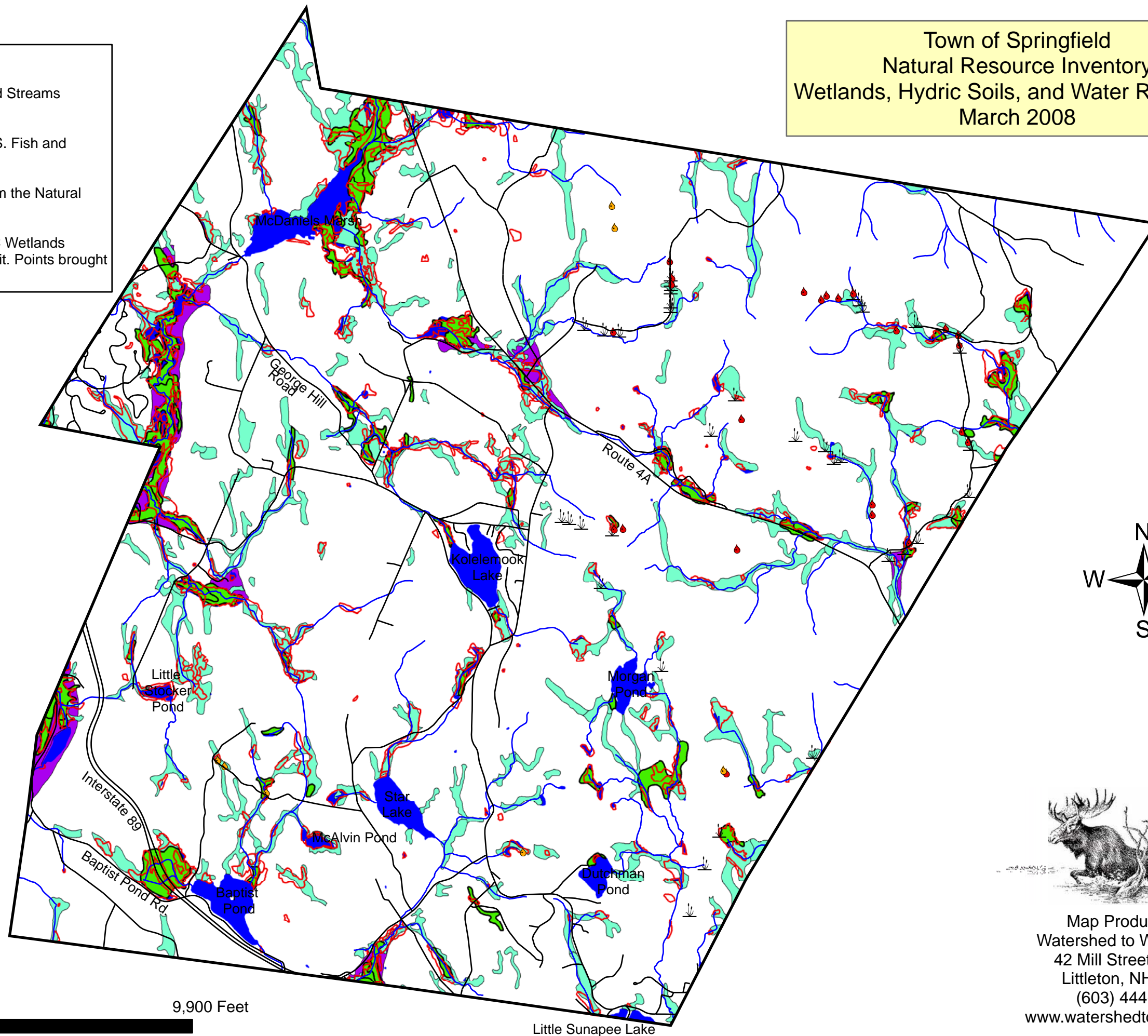
Poorly and Very Poorly Drained Soils obtained from the Natural Resource Conservation Service.

WTW Vernal Pools 2007, SCC Vernal Pools, SCC Wetlands and Wet Trails collected using a handheld GPS unit. Points brought into ArcMap.

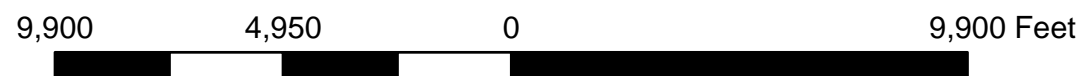
**Town of Springfield
Natural Resource Inventory
Wetlands, Hydric Soils, and Water Resources
March 2008**

Legend

-  Town Boundary
-  Roads
-  Rivers and Streams
-  National Wetland Inventory
-  NRCS Poorly Drained Soils
-  NRCS Very Poorly Drained Soils
-  Lakes and Ponds
-  Aquifers
-  Vernal Pools noted by SCC
-  Wet Areas noted by SCC
-  Vernal Pools noted by WTW



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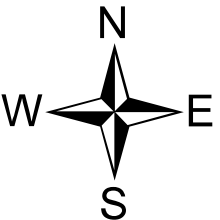
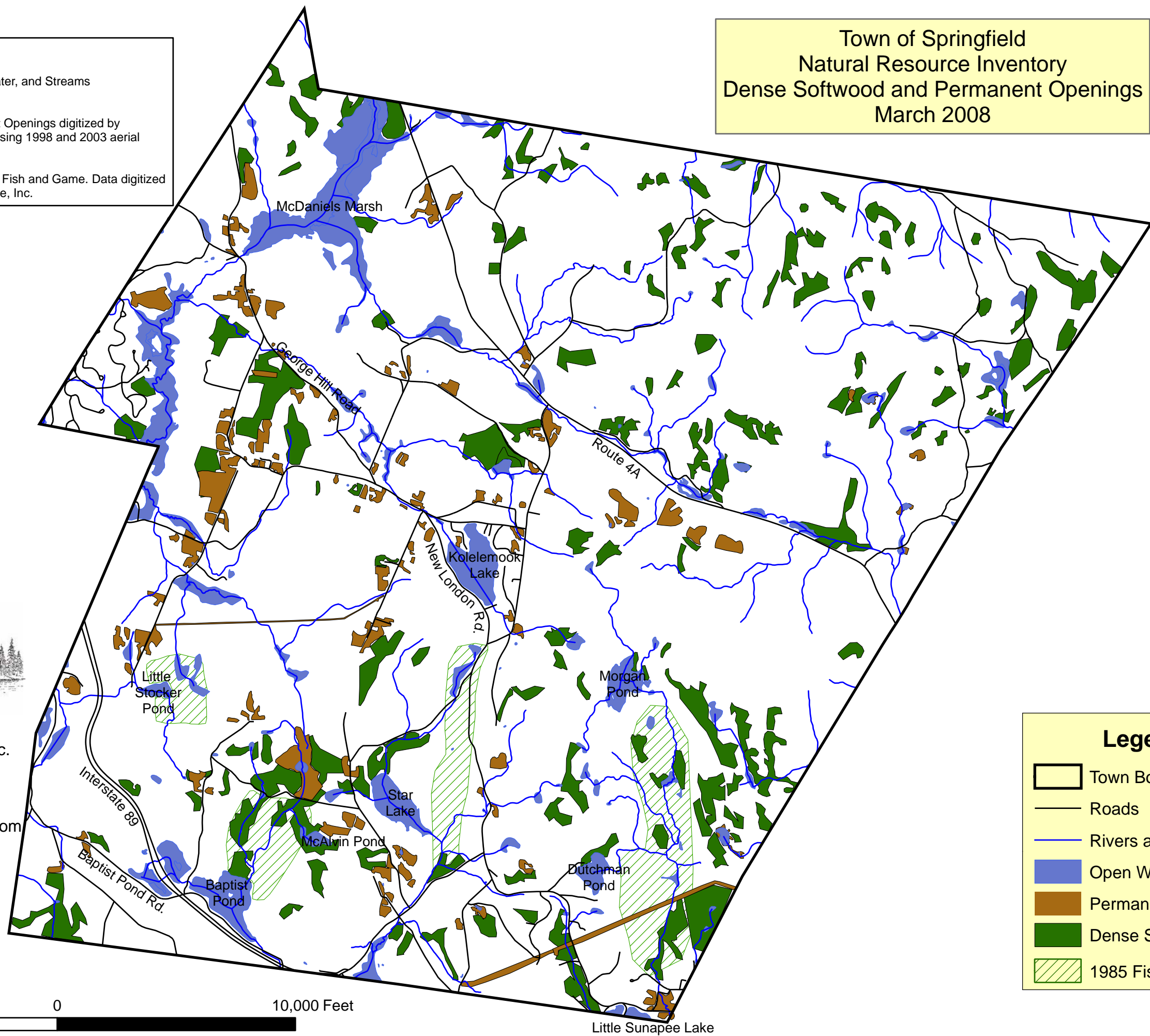
Data Sources:

Town Boundary, Roads, Open Water, and Streams obtained from GRANIT.

Dense Softwoods and Permanent Openings digitized by Watershed to Wildlife, Inc. 2007 using 1998 and 2003 aerial photographs.

1985 Deer Yards identified by NH Fish and Game. Data digitized in ArcMap by Watershed to Wildlife, Inc.

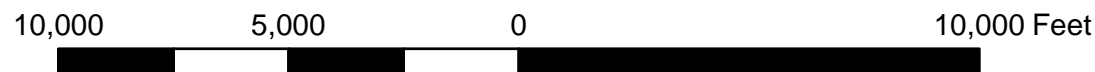
Town of Springfield
 Natural Resource Inventory
 Dense Softwood and Permanent Openings
 March 2008



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Legend

- Town Boundary
- Roads
- Rivers and Streams
- Open Water
- Permanent Openings
- Dense Softwood
- 1985 Fish and Game Deer Yards

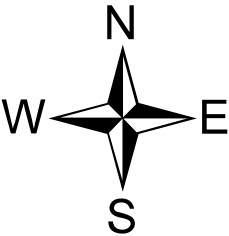
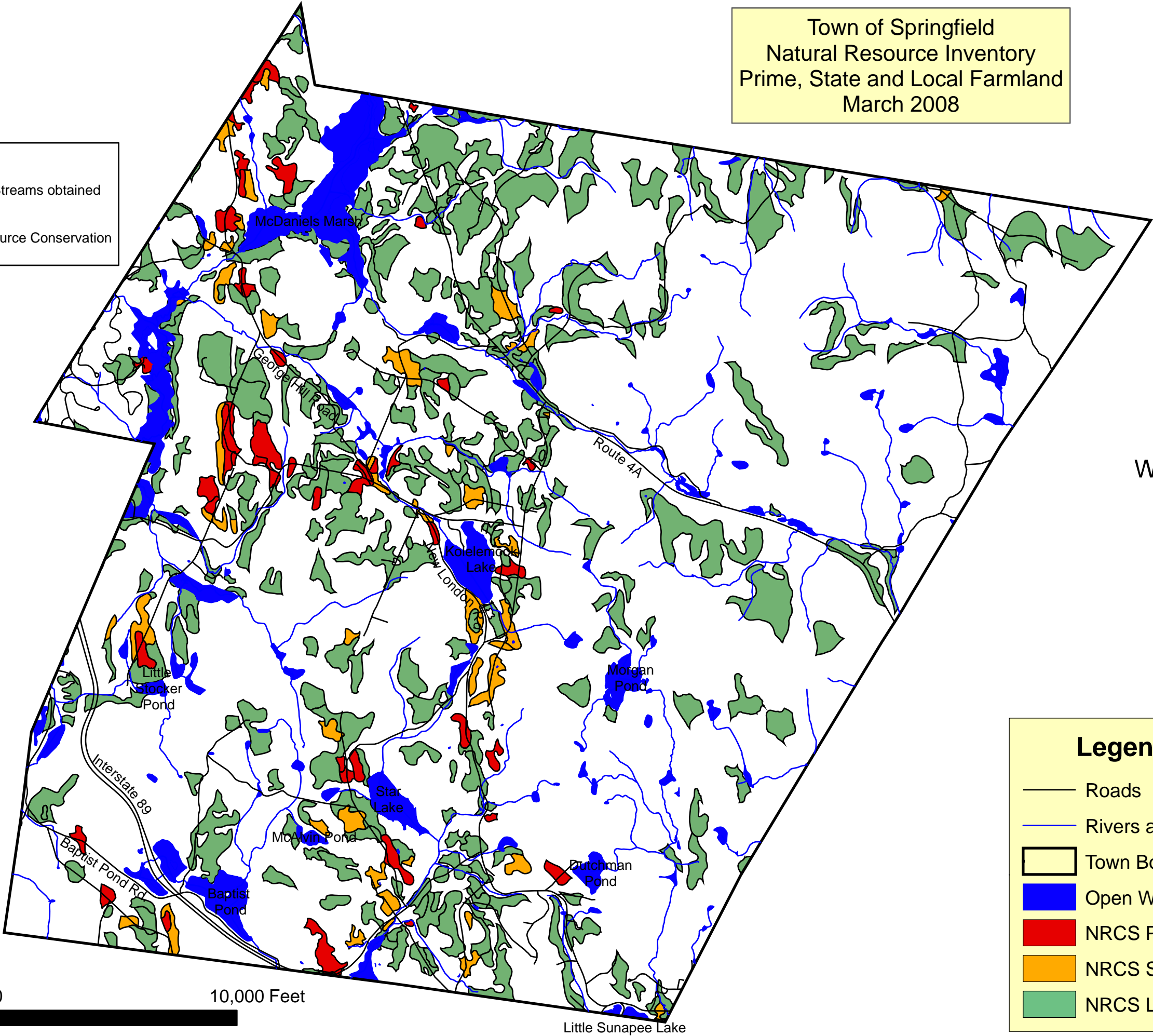


Town of Springfield
Natural Resource Inventory
Prime, State and Local Farmland
March 2008

Data Sources:

Town Boundary, Roads, Open Water, and Streams obtained from GRANIT.

Farmland Soils obtained from Natural Resource Conservation Service and queried to display farmland.



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10,000 5,000 0 10,000 Feet

Legend

- Roads
- Rivers and Streams
- Town Boundary
- Open Water
- NRCS Prime Farmland
- NRCS State Farmland
- NRCS Local Farmland

Town of Springfield
 Natural Resource Inventory
 Steep Slopes
 15% to 25% and > 25%
 March 2008

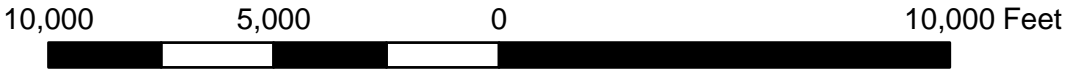
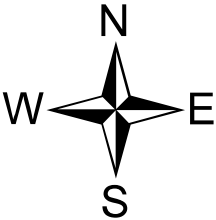
Data Sources:

Town Boundaries, Roads, Open Water, and Streams obtained from GRANIT.

Steep Slopes obtained from the Natural Resource Conservation Service and queried to display steep slopes units.

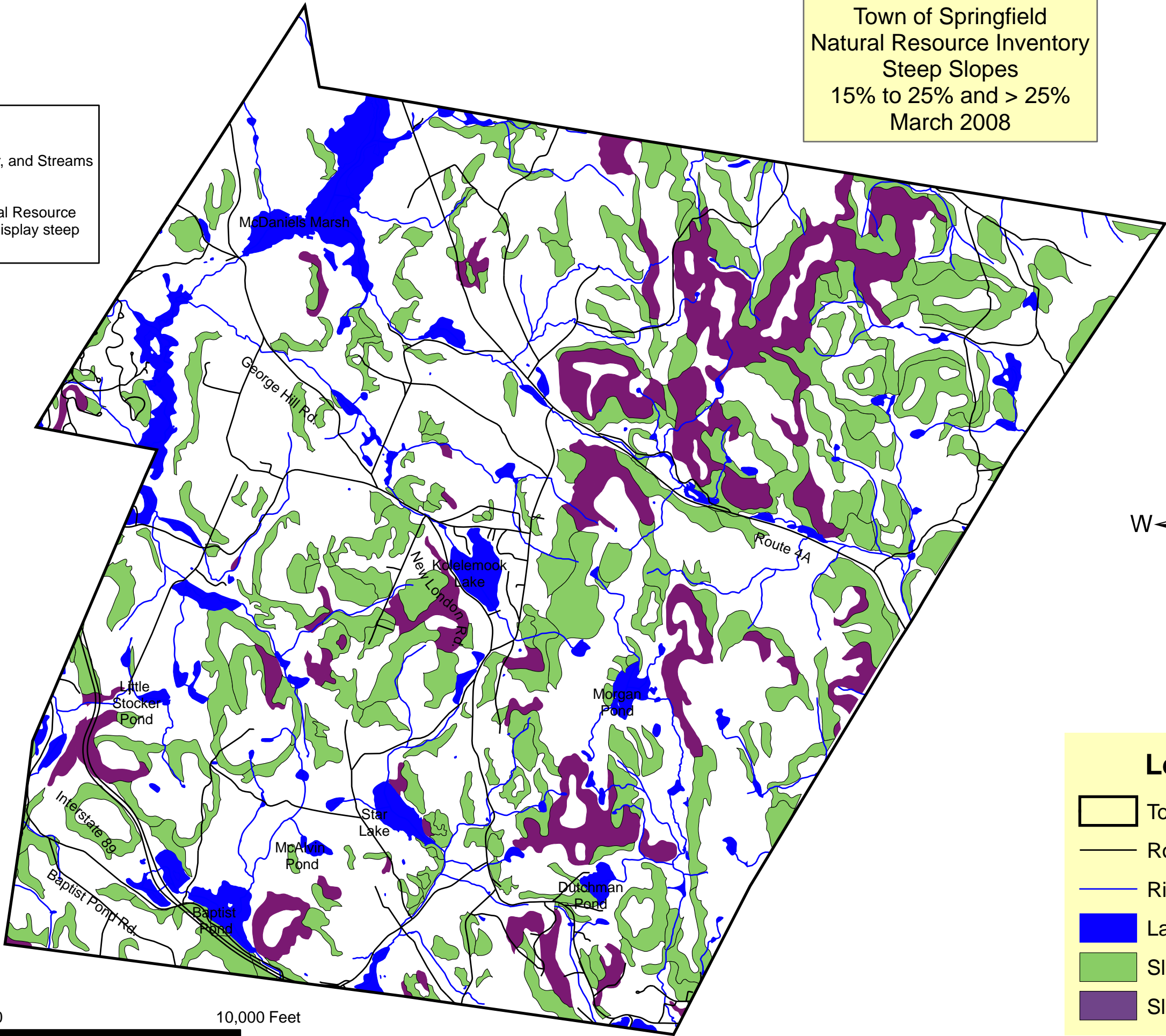


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Legend

- Town Boundary
- Roads
- Rivers and Streams
- Lakes and Ponds
- Slopes 15 - 25%
- Slopes >25%



Town of Springfield
Natural Resource Inventory
Conserved Land and Points of Interest
March 2008

Data Sources:

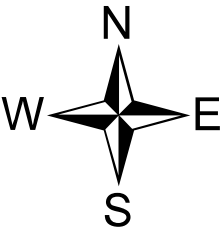
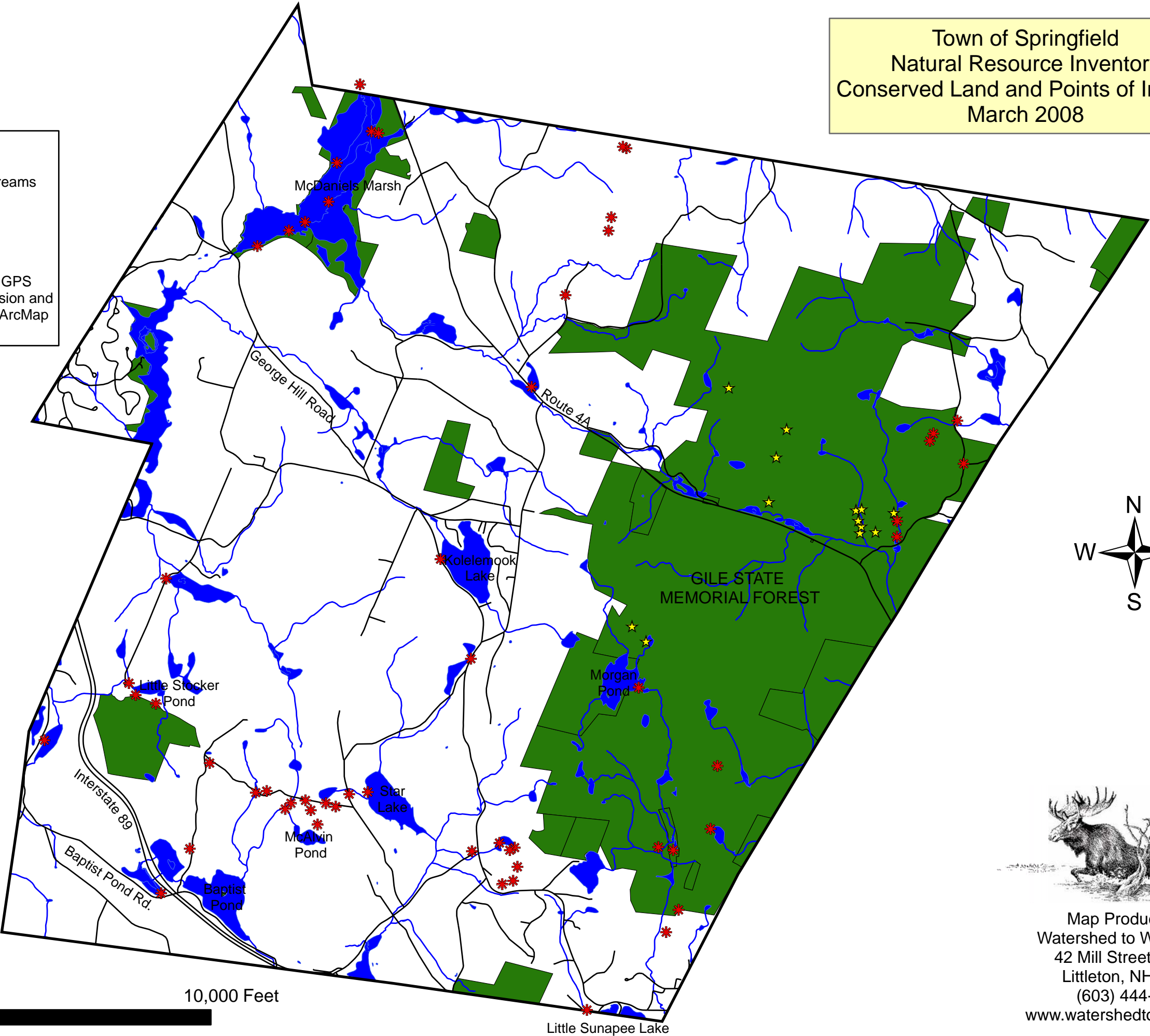
Town Boundary, Roads, Open Water, and Streams obtained from GRANIT.

Conserved Lands obtained from the Town of Springfield and GRANIT.

Points of Interest collected using a handheld GPS unit by the Springfield Conservation Commission and Watershed to Wildlife, Inc. Data entered into ArcMap by Watershed to Wildlife, Inc.

Legend

- * Points of Interest WTW
- ★ Points of Interest SCC
- Town Boundary
- Roads
- Rivers and Streams
- Lakes and Ponds
- Conservation Land



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Town of Springfield
Natural Resource Inventory
Subwatersheds and Aquifers
March 2008

Data Sources:
Town Boundary, Roads, Open Water, Aquifers, Streams,
and Subwatersheds obtained from GRANIT.

Legend

Roads

Rivers and Streams

Town Boundary

Lakes and Ponds

Aquifers

Springfield watersheds

Crystal Lake Brook

Frazier Brook

Mascoma Lake

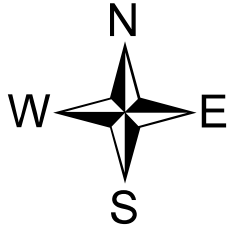
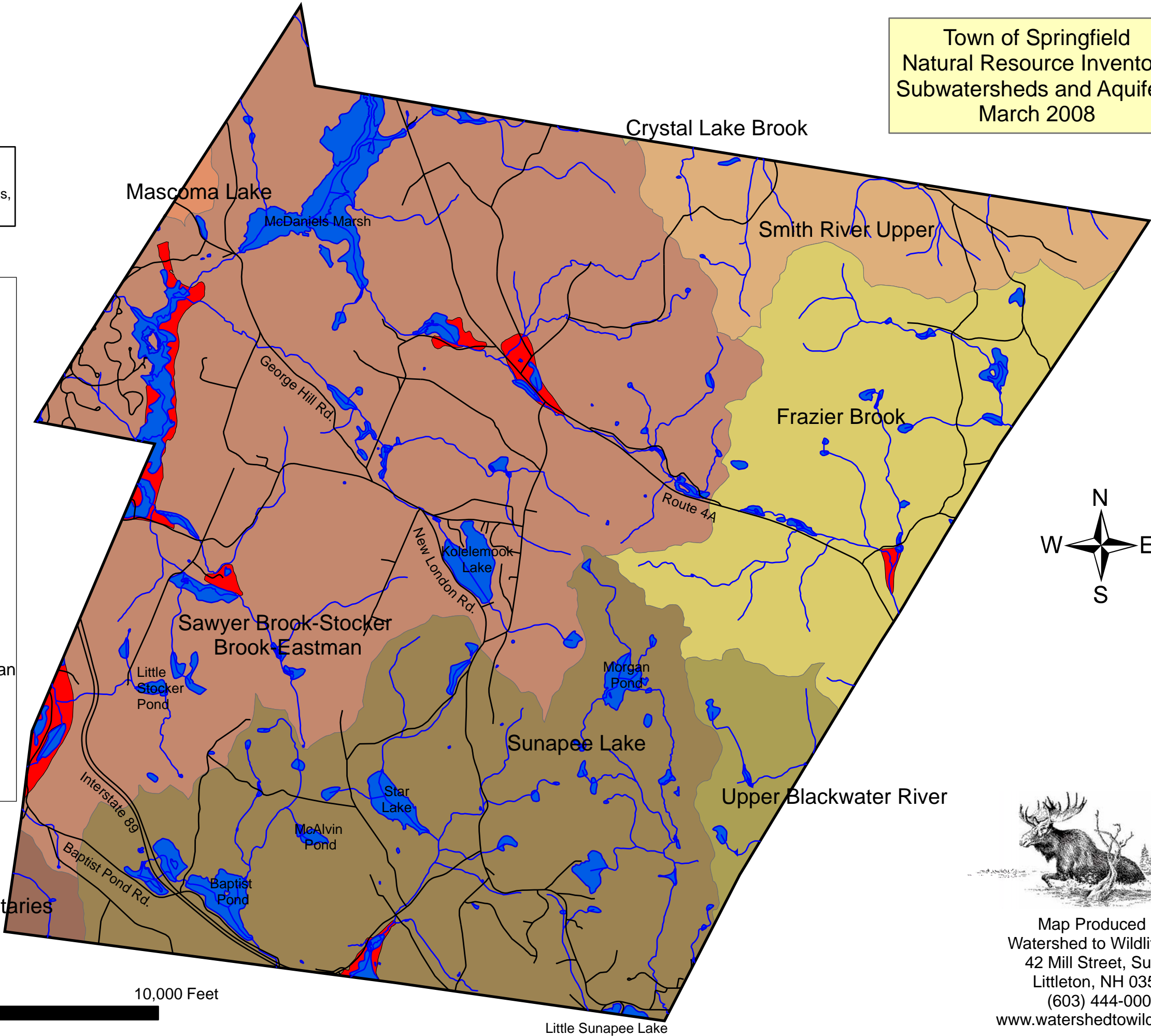
Newport Tributaries

Sawyer Brook-Stocker Brook-Eastman

Smith River Upper

Sunapee Lake

Upper Blackwater River



10,000 5,000 0 10,000 Feet

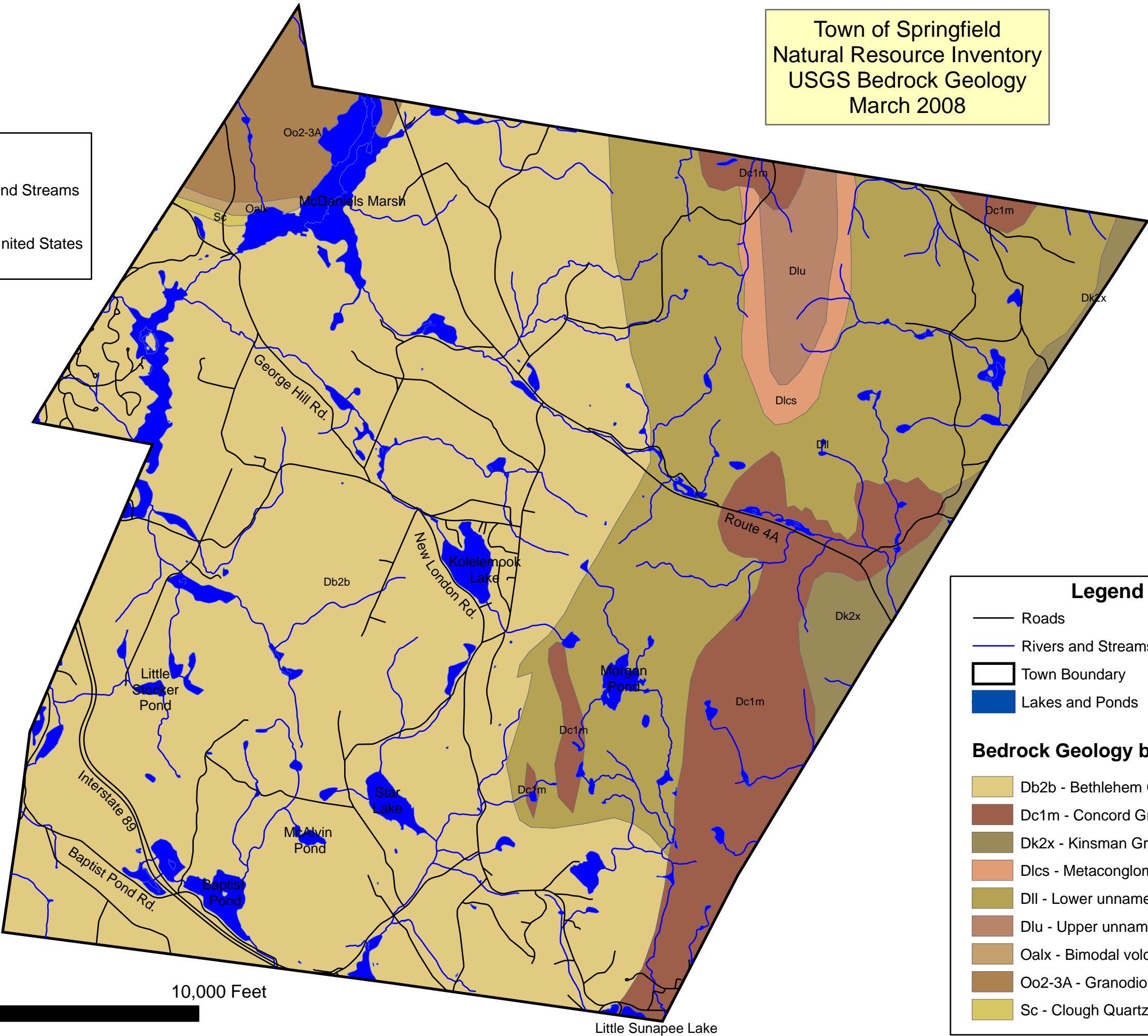
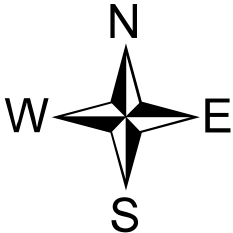
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Town of Springfield
Natural Resource Inventory
USGS Bedrock Geology
March 2008

Data Sources:

Town Boundary, Roads, Open Water, and Streams
obtained from GRANIT.

Bedrock Geology data obtained from United States
Geologic Survey and GRANIT.



Legend

Roads

Rivers and Streams

Town Boundary

Lakes and Ponds

Bedrock Geology by Code

Db2b - Bethlehem Granodiorite

Dc1m - Concord Granite

Dk2x - Kinsman Granodiorite

Dlcs - Metaconglomerate and quartzite

DII - Lower unnamed member

Dlu - Upper unnamed member

Oalx - Bimodal volcanic rocks

Oo2-3A - Granodiorite to tonalite

Sc - Clough Quartzite



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