

# *Sutton Strategic Conservation Plan*

## *2018 Update*



Prepared by the Sutton Conservation Commission

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## Acknowledgements

The 2018 update of the Sutton Strategic Conservation Plan has been a project of the Sutton Conservation Commission members, including:

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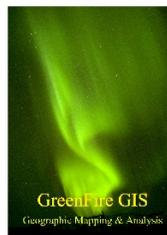
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### **Mapping and Analysis**

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## Introduction

### Background

In 2008 and 2009, the Sutton Conservation Commission (SCC) developed its first science-based strategic conservation plan using the same consensus-building process detailed below in this report. The exercise raised awareness of the importance of a range of natural resource features in the town, and established a set of conservation priorities for the SCC to use in evaluating potential conservation projects. Since that time, new and more accurate data has been released that replaces older data in the 2009 plan, and the mosaic of conservation land in town has also changed, affecting the extent of natural resource protection as well as expansion and linkage opportunities.

In particular, three GIS-based datasets have been updated that are critical to well-founded conservation planning today:

- The USGS has updated its modeling of water quality in watersheds throughout the Northeast, providing a means to identify specific **high quality watersheds** on a stream by stream basis. These watersheds correlate strongly with the last remaining undeveloped land areas where water quality remains at near-pristine levels and wildlife habitats are undisturbed.
- The NH Wildlife Action Plan (NHWAP) has been update by the NH Fish and Game Department in 2015 with more precise **habitat condition analyses** and **updated mapping of habitat types**.
- The Nature Conservancy Eastern Region Office, based in Boston, released a state-of-the-art study of **climate change resilience** in the northeastern United States that provides a broad-scale perspective on the expected impacts of climate warming on plant and animal species both uncommon and common in New England.

### Purpose

A strategic conservation plan accomplishes several important objectives:

- The consensus-building approach used in the planning process develops a “shared vision” of conservation priorities by honoring the views and opinions of a group of community volunteers;

- The science behind the analysis and integration of the shared vision leads to definition of truly high-priority conservation focus areas;
- The determination of conservation focus areas allows the community to direct limited local funding on the best opportunities, and,
- The existence of a science-based strategic conservation plan in a community greatly helps in qualifying for various regional, state and federal funding for conservation projects.

## Report Organization

This report is divided into five major sections:

- An **overview of all the natural resource features** considered in the plan, with highlights on the importance of each feature, a snapshot map to provide an idea of the extent and distribution of the resource, and a note about the protection status of the resource.
- A review of **resource statistics** with more detailed acreage and percentage of town land area calculations, and conservation status in 2018.
- Detail on the development of the **co-occurrence mapping and identification of conservation focus areas** using a Delphi process with the SCC stakeholder group.
- A brief discussion of the **relationship of the Sutton conservation plan to other regional conservation plans**, including the Ausbon Sargent Land Preservation Trust based in New London, and the Quabbin to Cardigan Conservation Partnership convened by the Society for the Protection of NH Forests.
- A **summary of the plan update and recommendations** for SCC action items.

## Reader Guidance

This report is intended to be as brief as possible, understandable by a lay audience, and useful as a reference document. Key concepts and vocabulary are **bolded** for emphasis, and URL links are provided for those who wish to further explore the science behind the studies which form some of the key building blocks in this conservation plan.

## Section 1: Natural Resources Overview

### Introduction

This section provides an overview of the natural resource features considered by the Sutton Conservation Commission in preparing the Sutton Strategic Conservation Plan. Each resource feature narrative contains a brief description of the natural resource, its extent and distribution in the town, and basic statistics of area and percentage of the municipal land area, as well as the current protection status. For a complete summary of these statistics, see **Section 2** with a table of all natural resource features and interpretations.

### Forest Blocks

Forest blocks are defined by travelled roadways, large water bodies, and non-forest land uses. In terms of natural systems, forest blocks serve as a fundamental framework for ecological structure, function and long-term processes. Unbroken expanses of forested land provide multiple eco-system benefits, including maintenance of high water quality in brooks and water bodies, recharge to aquifers, wildlife habitat, timber resources, and remote recreation opportunities. Forest blocks often contain embedded features such as wetlands and grasslands, and so might be best considered as “natural land cover blocks”.

The map to the left on the next page shows the extent and distribution of forest blocks in Sutton by size classification. Mapping includes the extent of forest blocks outside the town boundary, in effect, a shared resource with neighboring communities. Land along roads is buffered back 200’ to remove development along roadways, principally dwellings. Sutton has about 20,100 acres of forested land, or 75% of the town’s total land area.

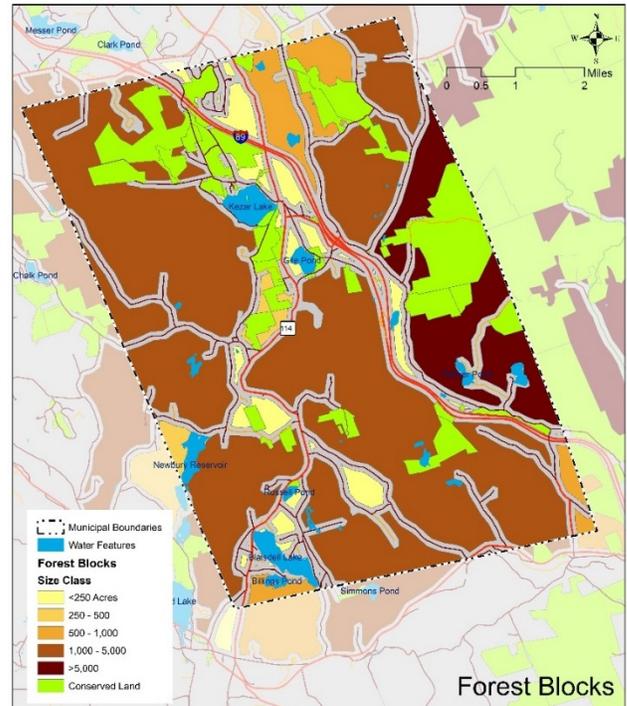
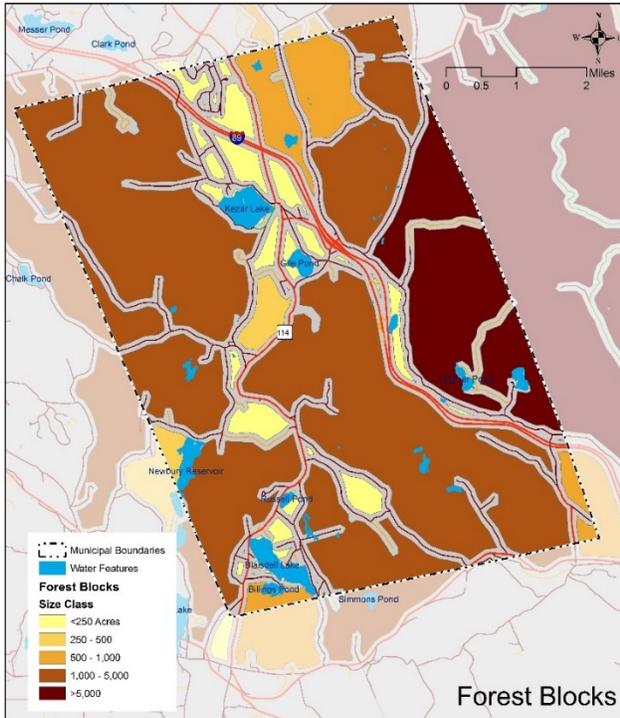
Note the large forest block along the eastern boundary of the town; centering on Mt. Kearsarge, this block totals more than 23,600 acres, and is among the largest blocks in the state.

Blocks greater than 500 acres in size are considered the threshold for sustained economic forestry with well-managed forests on a long-term rotation of timber harvest. Blocks greater than 5,000 acres are considered the threshold for sustaining ecological processes over time.

Two large forest blocks, (4,500 acres and 4,800 acres, respectively), span Sutton from the northwest to the southeast, creating an extensive “spine” of natural land cover across the

town. These two blocks are critical for disturbance-sensitive species such as bear and bobcat, and provide ample home range for other large mammal species such as moose and deer.

A second map on the right shows conserved lands overlaid on the forest blocks data. As can be seen in the map, a great deal of the Mt. Kearsarge forest block is conserved, especially along the eastern boundary of the town where the Forest Society has protected several large tracts. However, the two large blocks mentioned above are not well conserved.



Overall, forest blocks in Sutton are only about 15% protected. The largest blocks >5,000 acres are more than one-third protected, but blocks in the 1,000 to 5,000 acre class are less than 8% protected.

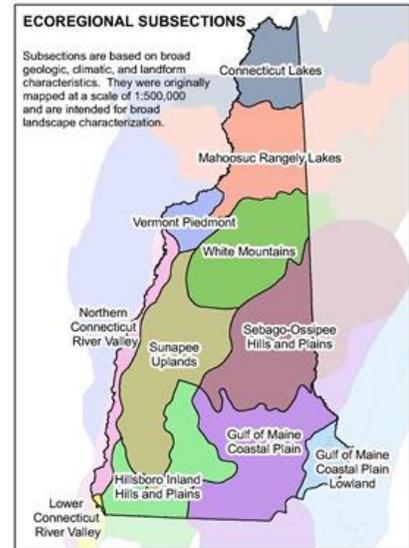
### NHWAP Habitat Condition

The NH Wildlife Action Plan (NHWAP) of the NH Fish & Game Department is charged with identifying the most critical land in the state to protect from a wildlife habitat perspective. The term “wildlife” here should be thought of as both plant and animal species. The NHWAP provides two important natural resource datasets for use in community and conservation planning:

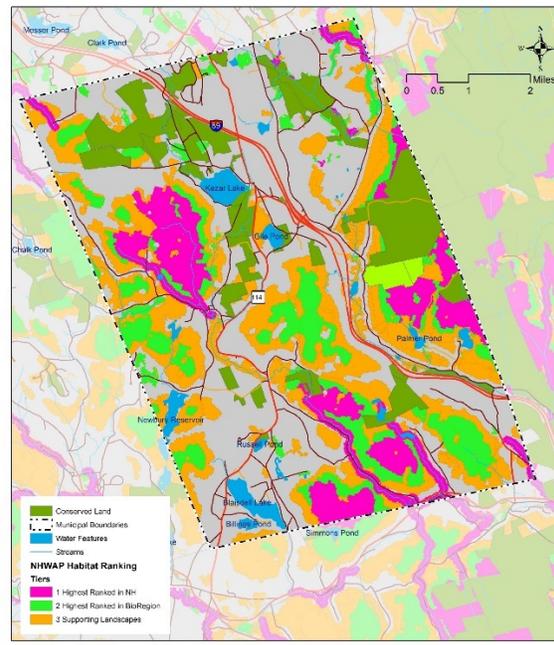
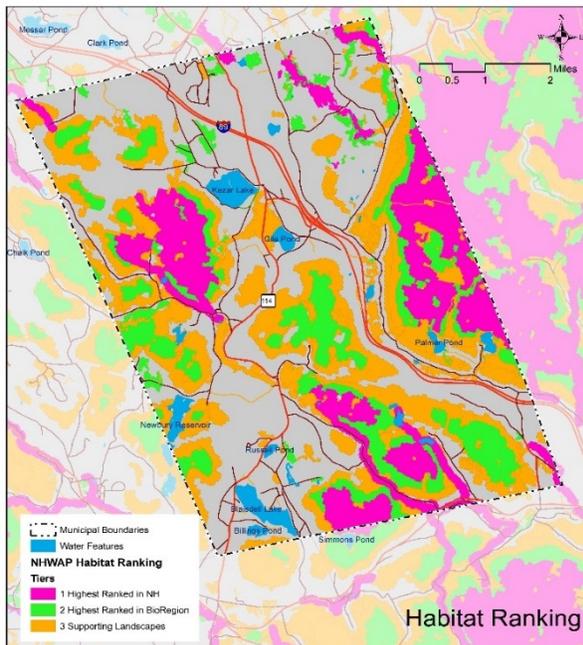
- A statewide assessment of overall habitat quality, expressed as **habitat ranking**; and,
- Mapping of various **habitat types** in NH.

The NHWAP was first released in 2005, and has been updated in 2010 and again in 2015 as more and better wildlife data has become available. More information on the data and modeling used in NHWAP can be found at: <http://www.wildlife.state.nh.us/wildlife/wap.html>

The map below to the left shows the NHWAP Habitat Ranking data for Sutton. The bright pink colored Tier 1 areas represent the best habitat ranking in NH with all factors<sup>1</sup> taken into account. The bright green areas are Tier 2: best habitat ranking in the bio-region; see the map inset to the right for an idea of bio-regions in NH; Sutton is within the Sunapee Uplands bio-region (aka eco-region subsections). Tier 3: supporting landscapes work as buffers to help protect the integrity of Tiers 1 and 2. Note also how Tier 1 follows several water courses in the southern part of Sutton, indicating aquatic habitats of high quality.



The second map below shows the NHWAP habitat ranking data with conserved lands overlaid in dark green. Note how the Tier 1 areas on the west flank of Mt. Kearsarge are fairly well protected, but that the large forest block “spine” traversing Sutton shows little conserved land but is dominated by Tier 1 and Tier 2 habitat rankings.



Habitat Ranking

<sup>1</sup> The modeling included bio-diversity factors, landscape context, and threats to wildlife species. See more at <http://www.wildlife.state.nh.us/wildlife/documents/wap/chapter3-wildlifehabitatconditions.pdf>

Overall, the NHWAP habitat tiers are about 15% protected in Sutton. The Tier 1: Best in NH are 24% protected, but the other two tiers are only 13% for Tier 2 and 11% for Tier 3.

## NHWAP Habitat Types

There are two sources of wildlife habitat data available for use in conservation planning: NHWAP habitat types, and the Northeast Terrestrial Habitat (NETH) mapping data. The NHWAP uses the NETH data in its modeling, but in a cross-walked form. Developed by The Nature Conservancy in cooperation with other conservation partners, the NETH data provide a more detailed understanding of habitat classification in NH, and is being used in several major regional conservation plans in the state. Therefore, the Sutton conservation plan will rely upon the NETH data. More information on NETH can be found at:

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx>

See related and more detailed information in the sidebar on this webpage.

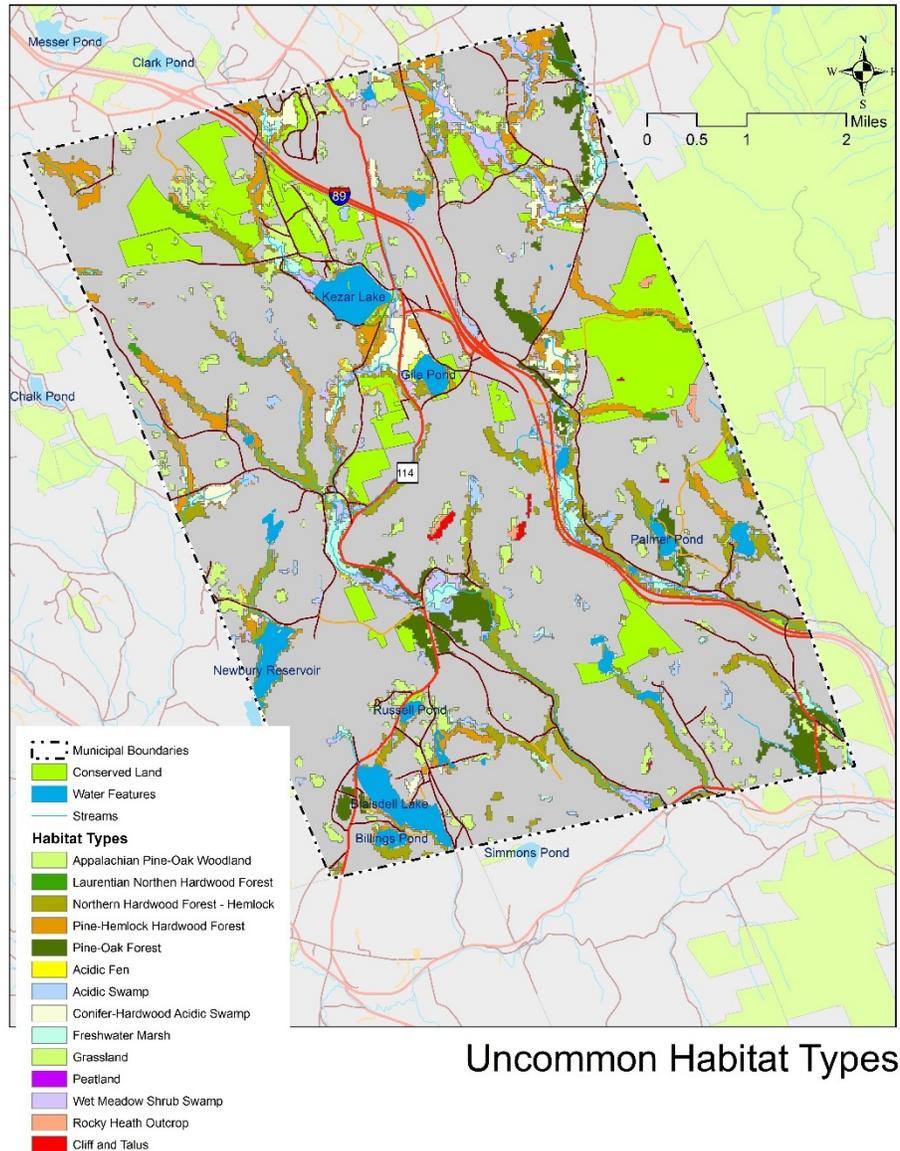
An analysis of habitat types in Sutton has been made using the NETH data. The goal of the analysis is to identify the most **uncommon wildlife habitat types** in the town. By backing out human land use types, water, and the dominant matrix forest types<sup>2</sup> found in Sutton, the less common and in some cases, rare habitat types have been determined.

Summary of Uncommon Habitat Types				
NETH Habitat Name	Generic Name	Total Acres	Percent Uncommon Habitats	Percent Town Land Area
North-Central Appalachian Acidic Cliff and Talus	Cliff and Talus	9.8	0.1%	0.04%
North-Central Interior and Appalachian Acidic Peatland	Peatland	10.9	0.1%	0.04%
Boreal-Laurentian-Acadian Acidic Basin Fen	Acidic Fen	16.2	0.2%	0.1%
Laurentian-Acadian Acidic Cliff and Talus	Cliff and Talus	23.8	0.3%	0.1%
Central Appalachian Dry Oak-Pine Forest	Appalachian Oak-Pine Forest	24.7	0.3%	0.1%
Appalachian (Hemlock)-Northern Hardwood Forest: drier	Northern Hardwood Forest	36.1	0.5%	0.1%
Laurentian-Acadian Northern Hardwoods Forest: moist-cool	Northern Hardwood Forest	39.9	0.5%	0.1%
N. Appalachian-Acadian Rocky Heath Outcrop	Rocky Heath Outcrop	40.9	0.6%	0.2%
Central Appal Pine-Oak Rocky Woodland	Pine-Oak Forest	150.6	2.1%	0.6%
North-Central Appalachian Acidic Swamp	Acidic Swamp	304.6	4.2%	1.1%
Laurentian-Acadian Freshwater Marsh	Freshwater Marsh	381.2	5.2%	1.4%
Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp	Conifer-Hardwood Forest	493.3	6.7%	1.8%
Laurentian-Acadian Wet Meadow-Shrub Swamp	Wet Meadow-Shrub Swamp	499.8	6.8%	1.8%
Northeastern Coastal and Interior Pine-Oak Forest	Pine-Oak Forest	682.6	9.3%	2.5%
NLCD agricultural classes 81-82	Grassland	946.2	12.9%	3.5%
Laurentian-Acadian Pine-Hemlock-Hardwood Forest: moist-cool	Pine-Hemlock-Hardwood Forest	1,118.9	15.3%	4.1%
Laurentian-Acadian Northern Hardwoods Forest: typic	Laurentian Northern Hardwood Forest	1,244.7	17.0%	4.6%
Appalachian (Hemlock)-Northern Hardwood Forest: moist-cool	Northern Hardwood Forest - Hemlock	1,289.9	17.6%	4.8%
		<b>7,314.2</b>		<b>27.06%</b>

<sup>2</sup> Matrix habitat types are typically forest habitats in NH. They are extensive and uniform in their characteristics, and provide the dominant “habitat matrix” for the less common patch habitat types.

The NETH habitat types are ranked from least to most extensive in size. The NLCD agricultural land cover classes are primarily grasslands which constitute an important habitat type in NH for various species. The three forest habitat types at the bottom of the list are matrix forests in southern NH, but are typically at the northernmost extent of their range in Sutton. Therefore, all the habitat types in the list can be viewed at patch habitat occurrences.

Uncommon habitat types in Sutton are shown in the map below listed by generic name and overlaying existing conserved and public land for clarity.



In addition to the NETH data, the New Hampshire Office of State Planning prepared a fact sheet for the New Hampshire Department of Environmental Services (NHDES) concerning Atlantic white cedar swamp communities, found at <https://www.des.nh.gov/organization/commissioner/pip/factsheets/cp/documents/cp-20.pdf>

While uncommon in New Hampshire and even rarer away from the coast, a significant Atlantic white cedar swamp is located in north Sutton, near Chalk Pond Road. Atlantic white cedar swamps provide excellent cover for deer and rabbits, and the larvae of one butterfly, Hessel's Hairstreak (*Mitoura hesseli*), feeds exclusively on Atlantic white cedar. In addition, the few currently existing populations of the state endangered Banded Bog Skimmer dragonfly are sometimes found in cedar swamp habitats.

**Uncommon habitats are 14% protected throughout Sutton. Wetlands habitats are better protected than upland habitats. Some patch habitats, such as Cliff and Talus, Acidic Fen, and Rocky Heath Outcrop, for example, are not protected. Note the correlation between certain patch habitats and the riparian network in Sutton.**

## Wetlands

The importance of wetlands is well documented by many years of scientific study. Not only do they provide habitat for a wide range of plant and animal species, but they also act as floodwater storage basins and biological purification systems, improving water quality.

At community scale, there are two data sources for mapping wetlands:

- The National Wetlands Inventory (NWI), which classifies wetlands by type; and,
- NRCS soils mapping for hydric soils.

The NWI mapping was generated by aerial photo reconnaissance and delineation of obvious wetland areas. Unfortunately, many forested wetlands were not mapped due to the lack of visual clues; some were mapped where spring flooding appeared in the aerial photos. To offset the lack of forested wetlands mapping by NWI, soils mapping is commonly used as a proxy for this wetlands type. Soils mapping identifies **hydric soils**, that is, soils which are classified as very poorly drained and poorly drained soils. While the mapping standards for these soils is somewhat generalized (i.e., is not as accurate as on-the-ground field survey mapping), it is sufficient for community planning purposes.

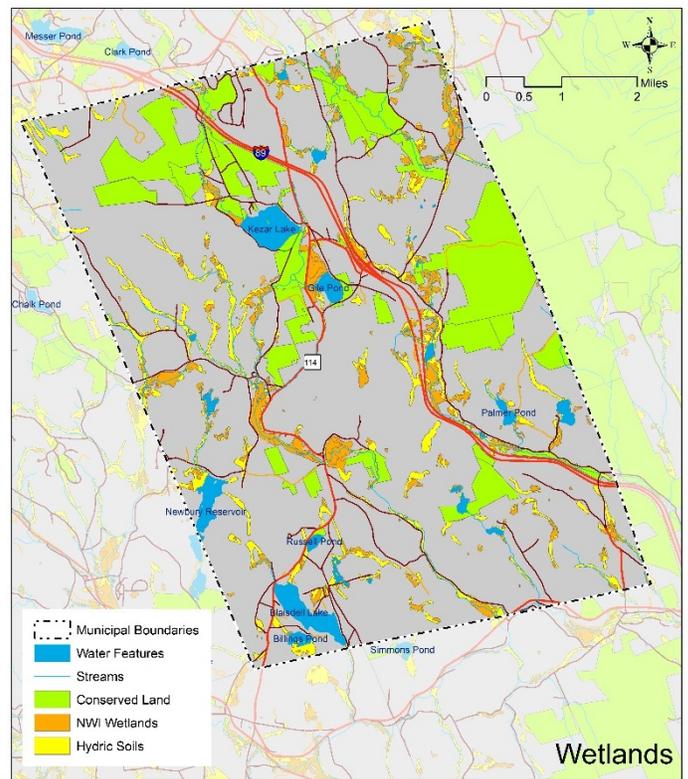
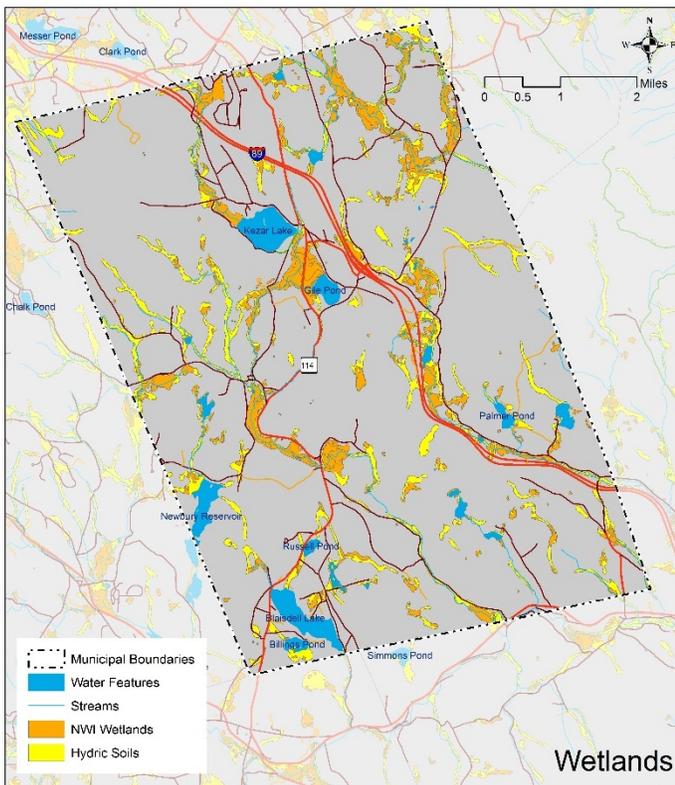
The maps on the next page show a combination of NWI data overlaid on hydric soils mapping. Note how wetlands tend to follow stream drainage patterns, with more expansive areas of low-lying land that is perennially wet. As will be seen in later maps, wetlands are also associated with aquifer zones and floodplains.

Wetlands are fairly well protected by conserved land in Sutton, particularly in the area of the Cascade Marsh wildlife management area in the northeastern portion of town, and the so-called Town Wetlands west of Route 114 near North Sutton village. Several other large wetlands areas along the Lane River south of Sutton Mills and east of South Sutton are not currently protected.

Wetlands in NH are regulated by the NH Department of Environmental Services, and permits are required for any dredge or fill operations. This regulation tends to protect wetlands in situ,

but it is also important to consider protecting buffers around wetlands. The general recommendation for a buffer is 100 meters, or about 300 feet, which matches the buffers used for the NH Wildlife Action Plan. This distance allows for water quality filtration into the wetland and wildlife habitat and corridors around wetlands.

**Wetlands are 16% protected in Sutton, primarily along the Lane River in North Sutton.**



## Riparian and Shoreland Buffers

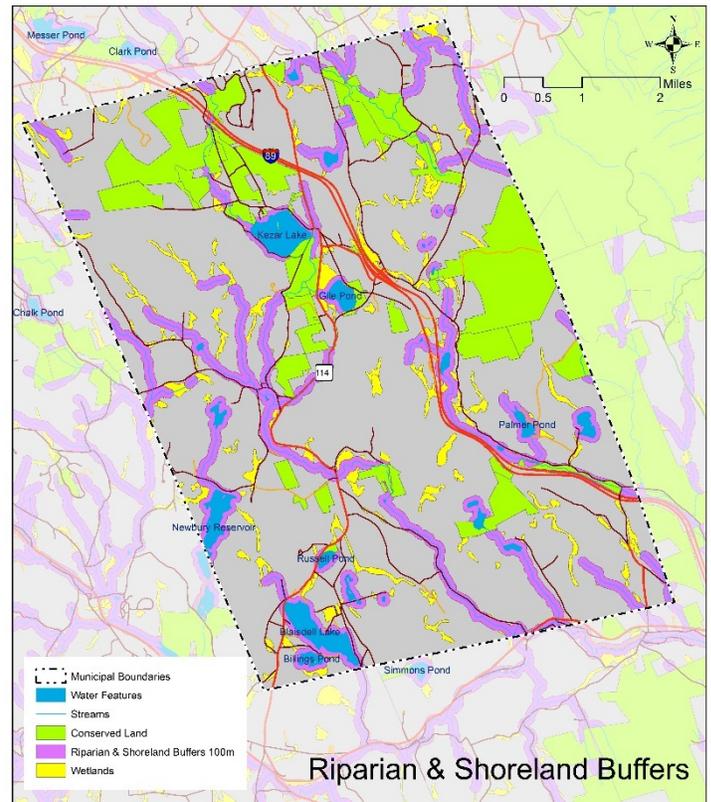
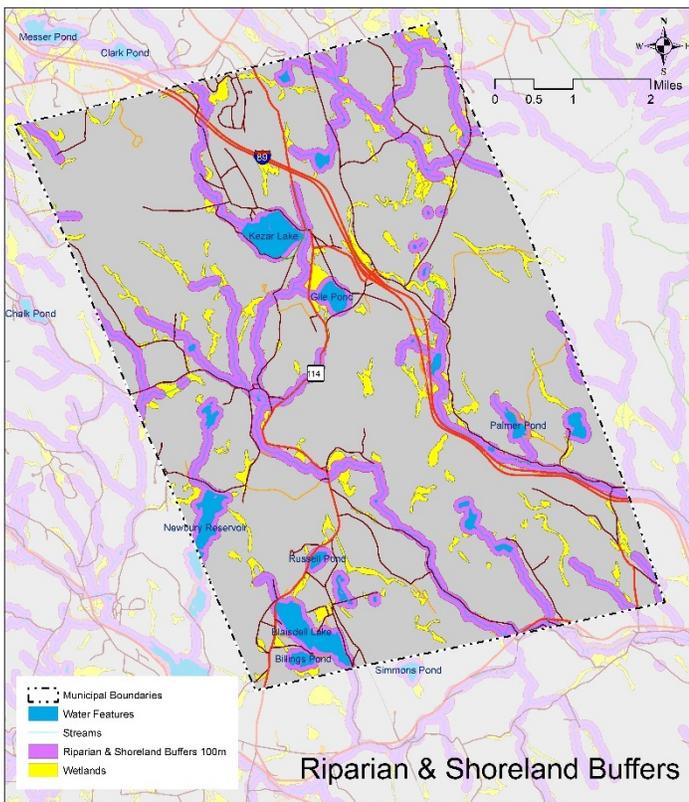
Naturally vegetated buffers on both sides of streams and surrounding lakes and ponds filter stormwater runoff, reducing sediment and nutrients inputs. Shade from trees also helps maintain cooler water temperatures which are key to species such as brook trout and the invertebrates on which they feed. Many wildlife species also use riparian corridors for home range movement (otter, mink, beaver, etc).

Studies show that 85% of stormwater sediment load can be removed with a buffer of 65', but this depends on a well-vegetated strip of land with an herbaceous layer on the ground, and thickly interspersed shrubs, understory trees, and mature forest trees. Forested buffers in NH

do not typically have luxuriant vegetative cover; rather, the understory and forest floor is relatively sparsely vegetated, indicating a need for a greater buffer distance.

The NH Wildlife Action Plan uses a 100-meter (328') buffer to ensure habitat quality along water features and to provide cover for animals using the corridors. This distance also helps ensure maintenance of water quality in streams, lakes and ponds. The maps below show a 100-meter buffer along all perennial streams and around lakes and ponds.

Note that there is a strong correlation between stream riparian zones and wetlands soils in many locations.



**Riparian and shoreland buffers are about 15% protected throughout Sutton. The Lane River and Stevens Brook are not well protected.**

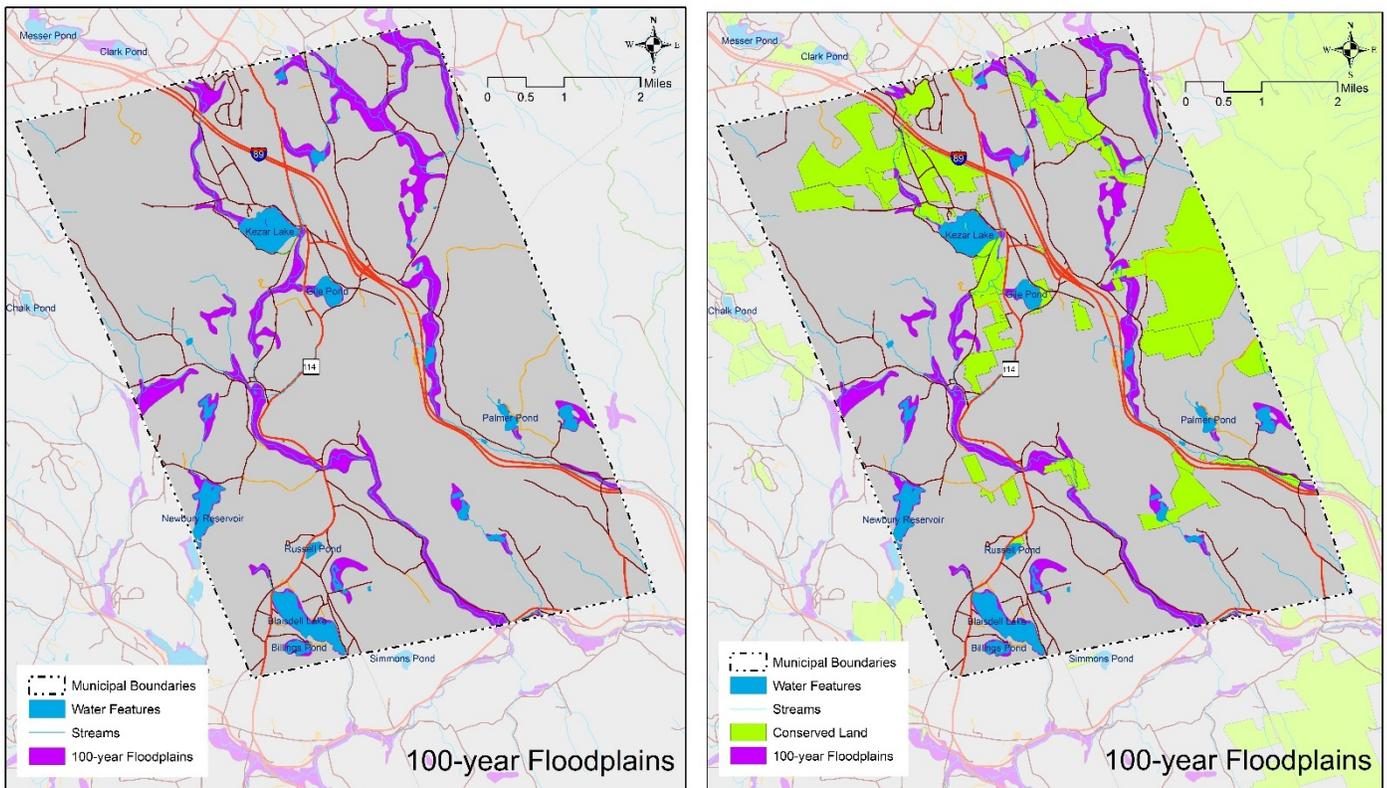
## Floodplains

Low lying areas adjacent to streams and rivers are often inundated during spring thaw and during storm events. These floodplains are important for storing floodwaters (thus reducing flood level crests over time), and are also home to several unique natural communities such as floodplain forests and associated wetlands features. Generally, it is good policy to limit community development in these flood-prone areas, although building is not prohibited by

State law. The Federal flood insurance program (DFIRM) allows property owners in flood-prone areas to develop land and protect against property damage. However, from a flood hydrology perspective, it is key to keep floodplains clear of buildings and bridges to allow unimpeded flow of water.

The DFIRM program has mapped flood-prone areas in NH according to the frequency of a certain level of flooding occurring. Typically, land within a 100-year floodplain can expect to be inundated once in a hundred years, statistically. However, recent severe storm events in NH in the last decade or so have shown a return rate of 100-year storms every few years. Some flooding has been classified as a 500-year storm, with very high levels of inundation.

The maps below show the 100-year floodplain mapped for Sutton. Note the strong correlation between floodplains and wetlands (shown in previous mapping). The Lane River, from Sutton Mills to the Warner town boundary is of special concern as it is fed by a 13 square mile watershed above Sutton Mills, and is prone to flooding.



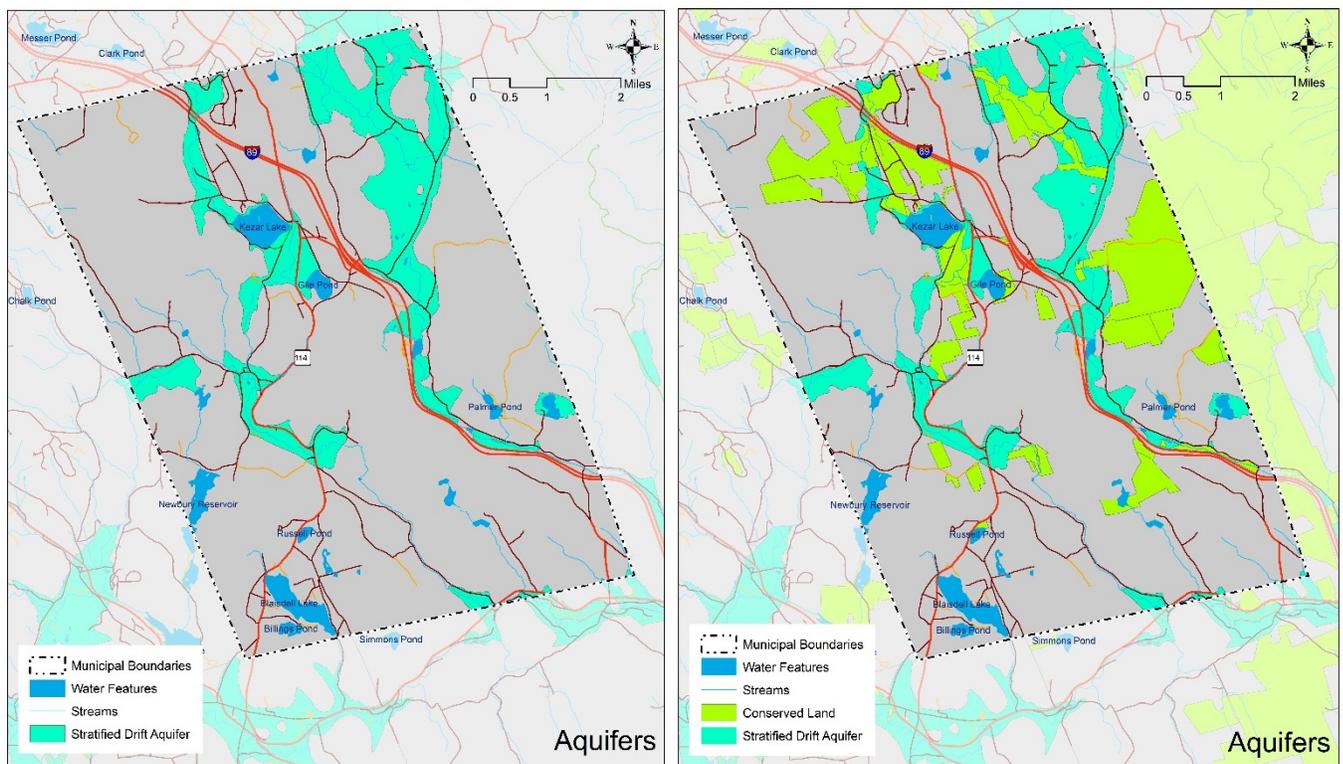
**Floodplains in Sutton are a little more than 20% protected. Large areas along the Lane River, a major water course draining Sutton, are not well protected.**

## Aquifers

Glacial deposits of sand and gravel at the end of the last ice age formed extensive **stratified drift aquifers** in many locations in NH. Some of these deposits are deep and permeable, and contains abundant groundwater. About 60% of municipal water supplies in NH draw from wells in these aquifer formations. Bedrock aquifers also exist, but are much less productive.

Sand and gravel aquifers also support unique natural communities, especially in the form of various wetlands types. Upland areas within and adjacent to aquifers are also a valuable source of building and road construction materials.

The maps below show the extent of stratified drift aquifers in town. Note the strong association with wetlands shown in maps above. There is no municipal water supply system in Sutton at present, but the three schools have wells associated with these aquifers (see drinking water protection on the next page)



**Aquifers in Sutton are 20% protected. Large areas of aquifer in the northeastern portion of town are not well protected.**

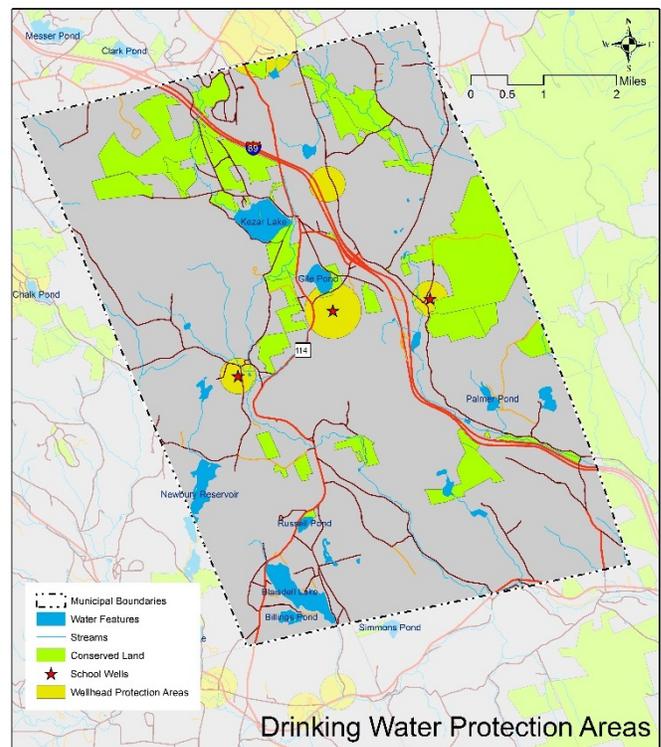
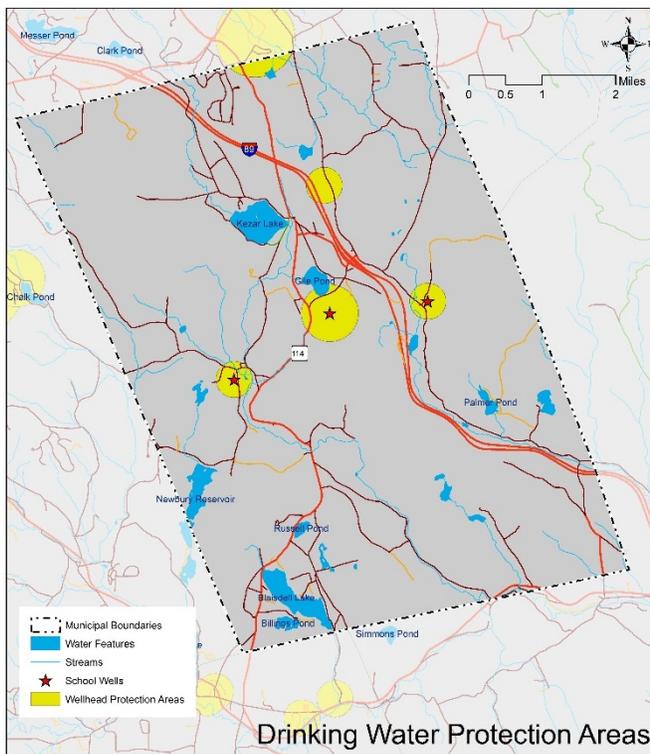
## Drinking Water Protection Areas

The NH Department of Environmental Services has mapped critical water supply protection zones around all public water supplies. Most of these areas are circular and represent the typical area of influence for each well (the surface area affected by drawdown of water into the well when operating).

There are four water supply protection areas in Sutton: three are associated with wells at the Sutton Elementary School, the Middle School, and the High School (see red stars in the map below). The fourth is a well supplying water to the Country Club of NH golf course (restaurant, etc).

Except for a small sanitary radius around each well, the NHDES does not mandate that these water supply protection areas remain in a natural land cover condition, but it does recommend communities consider this in planning and proposed development reviews. Under the best of circumstances, it would be prudent to keep the water supply protection areas as natural as possible to ensure water quality. This would seem to be especially important to water supply for schools, which is Sutton's most concentrated population. The total school population served by these wells is 2,586 pupils and staff.

As can be seen in the map to the right, very little of the school water supply protection areas is currently protected by conserved land.



**Drinking water protection areas are only 6.3% protected in Sutton. Unfortunately, development of the Middle School and High School properties precludes significant opportunities for conserving land to protect the wellheads.**

### High Quality Stream Watersheds

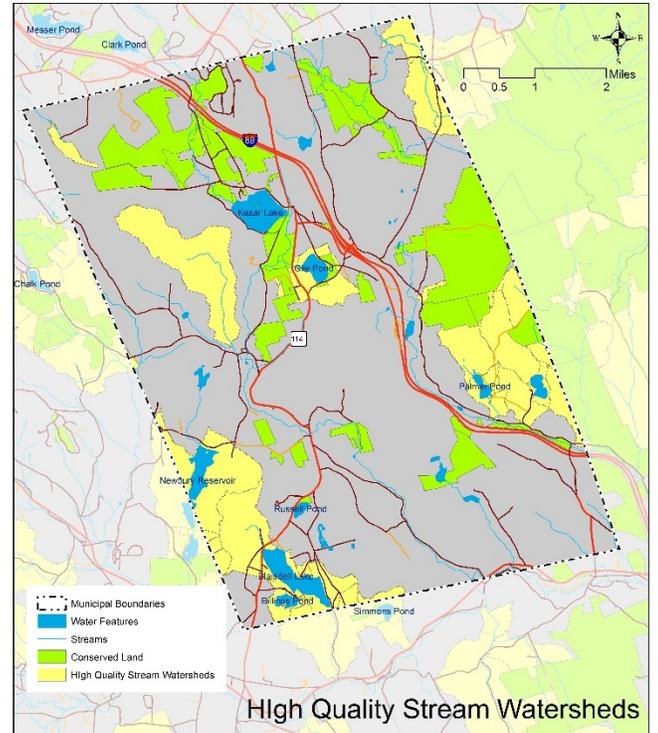
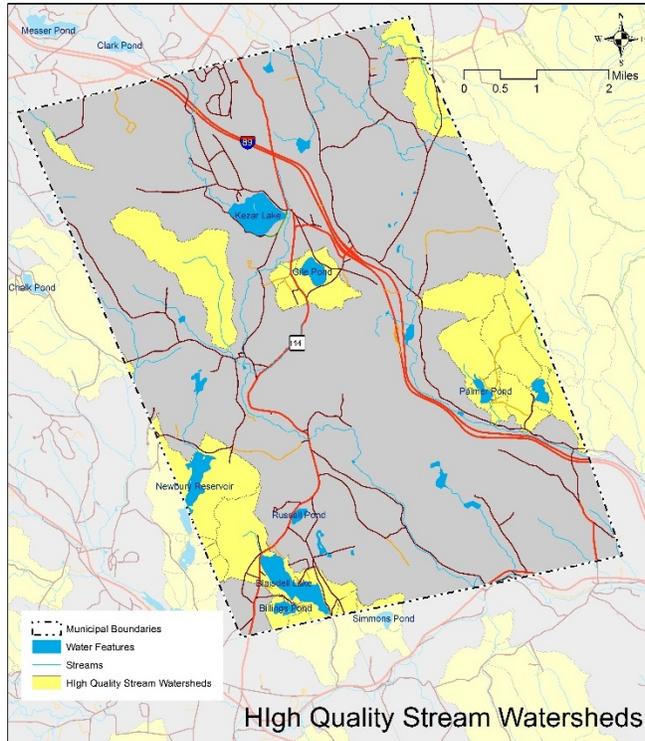
The USGS has conducted nationwide-studies of phosphorus and nitrogen loading in stream water course via a water quality model termed SPARROW<sup>3</sup>. As part of this study, they mapped each individual stream watershed, resulting in a mosaic of watershed delineation of relatively small size. By “reverse engineering” the SPARROW data, it is possible to identify the more pristine stream watersheds in any area.

The maps on the next page show the watersheds which rank in the top 25% for lowest loading of phosphorus and nitrogen, in other words, the watersheds with the highest water quality. These watersheds are typically found in the headwaters areas of river tributaries where there is little developed land and/or agricultural activities. Several of these watersheds are known to support wild brook trout populations.

In Sutton, these high quality stream watersheds are most notable on the western flank of Mt. Kearsarge along the eastern town boundary and surrounding the Newbury Reservoir and Blaisdell Lake. Another area is found surrounding Gile Pond, and a fourth watershed involves Crate Brook which flows into the Lane River near Sutton Mills. None of these watersheds is well protected by conserved land, with the exception of parts of the drainage from Mt. Kearsarge.

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<sup>3</sup> See this link for more information: <https://water.usgs.gov/nawqa/sparrow/mrb/>

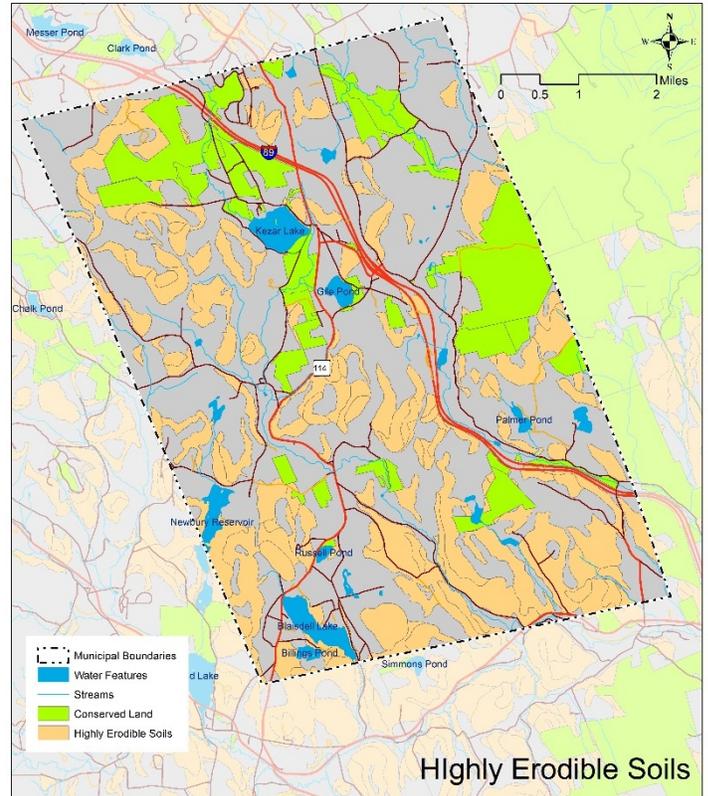
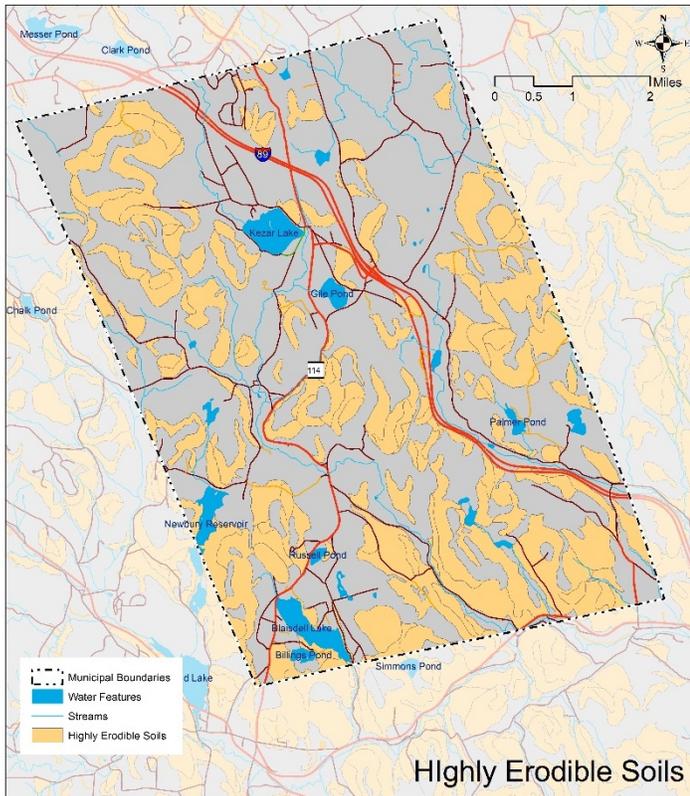


**High quality stream watersheds are only 4% protected in Sutton, about 180 acres of a total of more than 9,000 acres.**

### Highly Erodible Soils

The NRCS has classified soils in Merrimack County for erosion potential, using associated with agricultural activities but also applicable to land disturbance anywhere these soils exist. These soils, especially in combination with steep slopes (see Steep Slopes below), will erode readily when vegetative cover is removed and/or land grading for roads and building sites occurs. One strategy for minimizing sediment and nutrients in local streams and water bodies is to limit or regulate development activities in these areas, or conserve the land with the intent of keeping

it in natural land cover. The map below shows the extent and distribution of highly erodible soils in town. These soils tend to be associated with hilly terrain and steeper slopes (see Steep Slopes below). These soils are not well protected by conserved land except on the flanks of Mt. Kearsarge along the eastern town boundary, enhancing water quality in Stevens Brook. The King Hill Reservation and Bean Quarry Lot also help to limit disturbance of highly erodible soils, benefitting Lyon Brook. Note that extensive areas of highly erodible soils in the lower Lane River watershed are not well protected, which raises risk for water quality issues in both the Lane River and the Warner River just south of the town boundary.



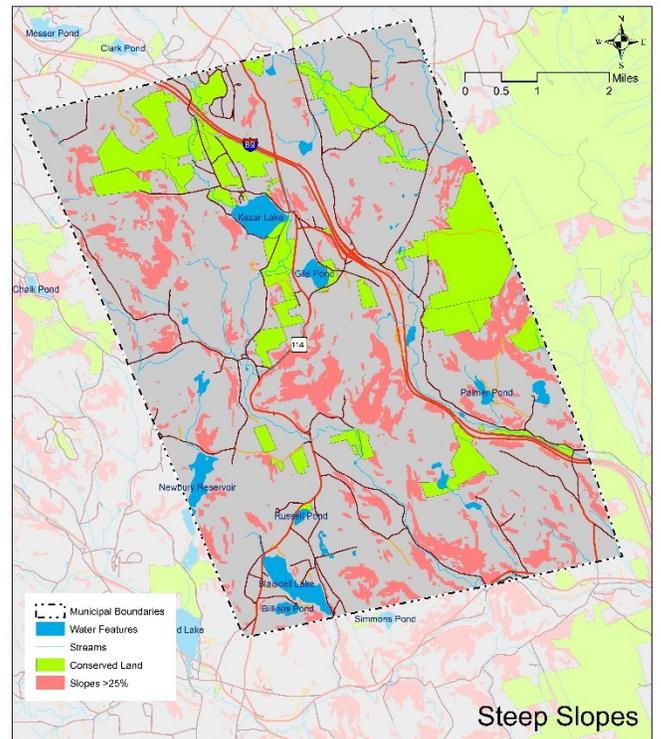
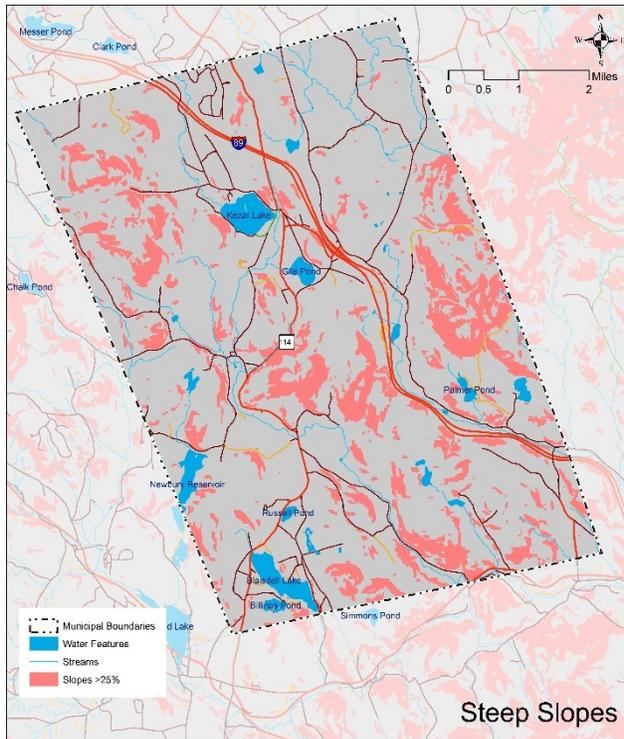
**Highly erodible soils are about 14% protected by conserved land in Sutton, but cover more than 9,300 acres.**

### Steep Slopes

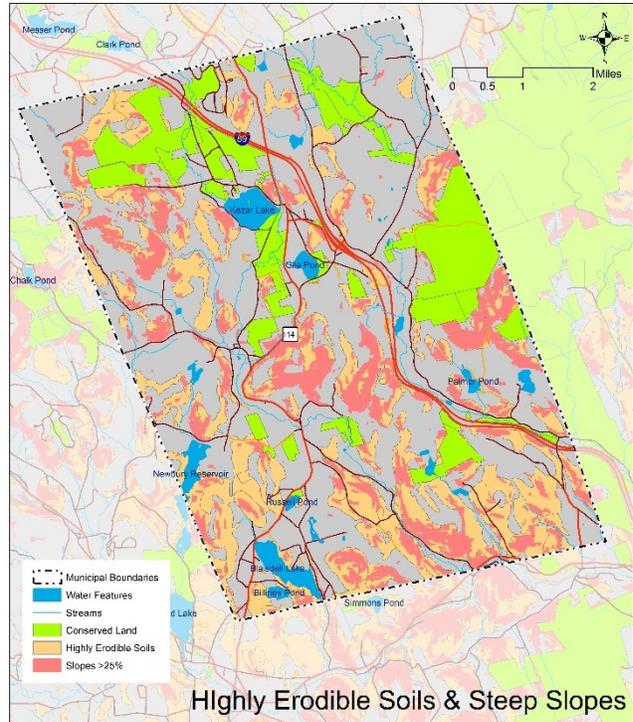
A general rule-of-thumb in community planning is to steer development away from steep slope areas, especially terrain with slopes in excess of 25% gradient (a rise of one foot for a horizontal run of four feet). The reason for this is that grading of land for new roads and building sites requires extensive cut and fill land disturbance, and tends to require steeper grades along road centerlines to traverse these slopes. Roads cut into steep slopes tend to act as stormwater diversions, channeling and concentrating water and increasing erosion.

Some communities are now regulating development on slopes greater than 15%, requiring storm drainage studies and appropriate engineering solutions to minimize stormwater problems. Sutton does not allow slopes in excess of 25% to be counted as “buildable area” in subdivision design, but it may permit building in these areas if enough lot area less than 25% can be designed in a subdivision plan.

The map below shows the areas in town with steep slopes of 25% or greater, derived from a USGS digital elevation map. The second map combines the steep slope data with conserved land.



The map to the right shows both steep slopes and highly erodible soils. Note the correlation between the two data factors in the hilly terrain in several areas of town.



**About 17% of steep slopes >25% are protected in Sutton. Many large areas of steep slope are correlated with other natural resource factors such as forest blocks, high quality stream watersheds, and wildlife habitat.**

## Climate Change Resilience

### Background

A large body of cutting-edge scientific information on climate change resilience was released by the TNC Eastern Regional office in August, 2016. Titled *Resilient and Connected Landscapes for Terrestrial Conservation*, this report integrated resilience, diversity, and permeability to identify a connected network of sites that represent the full range of geophysical settings and connectivity needed to support the continued rearrangement of plant and animal species in response to climate change.

Since it is not within the scope of this report to delve into the details of the data and the complex modeling conducted by TNC, the report on this study can be found at the following link:

<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/Downloads.aspx>

Each aspect of the study – geophysical settings, diversity metrics, and connectivity – are complete studies in their own right, but they contribute to and are integrated into the final climate change resilience mapping. The complexity of the climate change resilience data is

further distilled down into a key dataset: the **8-class prioritization mapping**. This data utilizes various combinations of diversity metrics and regional flow modeling to delineate broad areas with similar characteristics. More information on how this data was developed can be found at the following link, which takes the reader to a special “story map”:

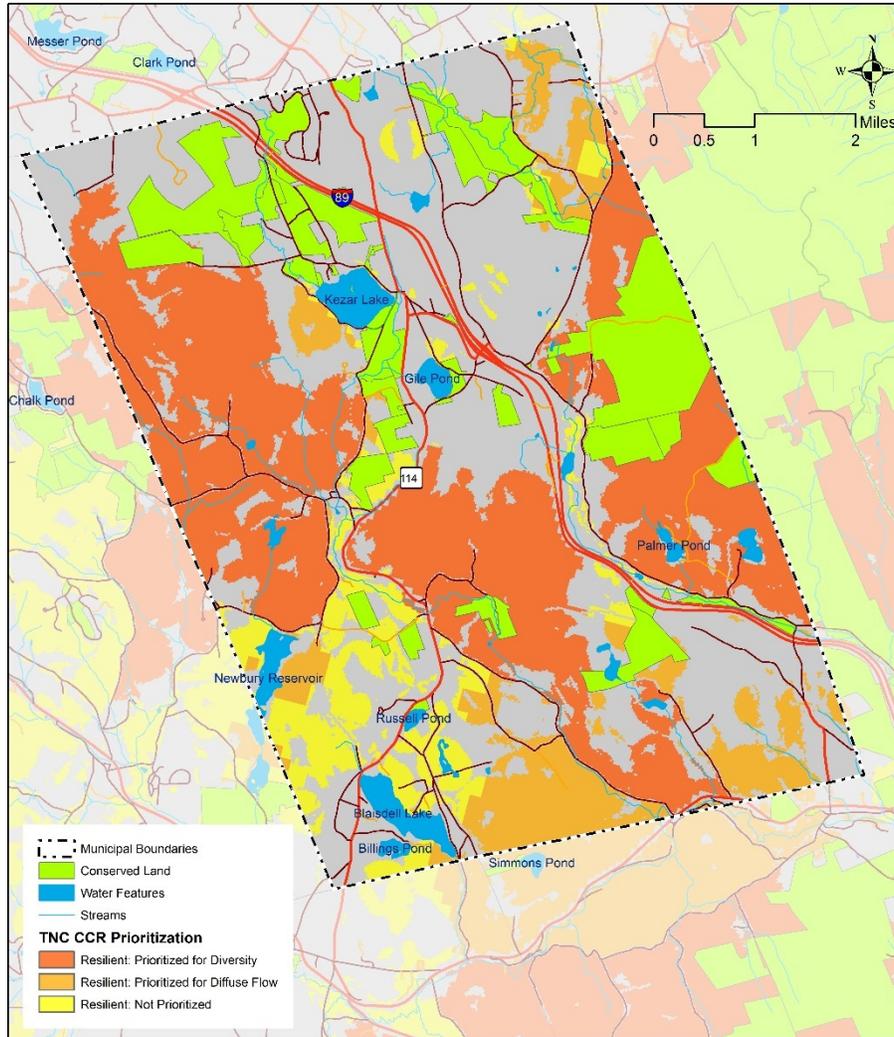
<https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/Maps.aspx>

By clicking on the numerical buttons at the top of the map, one can view a short narrative and map addressing each step of the process used to create the 8-class prioritization data used in the Sutton conservation plan update. The map window is scalable to the Sutton study area by using the +/- toggle.

### *Sutton Situation*

The following map shows the prioritized data for Sutton and vicinity, here displaying only the three prioritization categories found in the town: **Resilient and Prioritized for Diversity**, **Resilient and Prioritized for Diffuse Flow**, and **Resilient Not Prioritized**. Of these, the first two are the most important areas in Sutton. These areas tend to correspond with large existing blocks of natural land cover or sparsely developed landscapes. Note that these data categories do not imply any ranking, although the orange areas tend to convey more importance in the graphics.

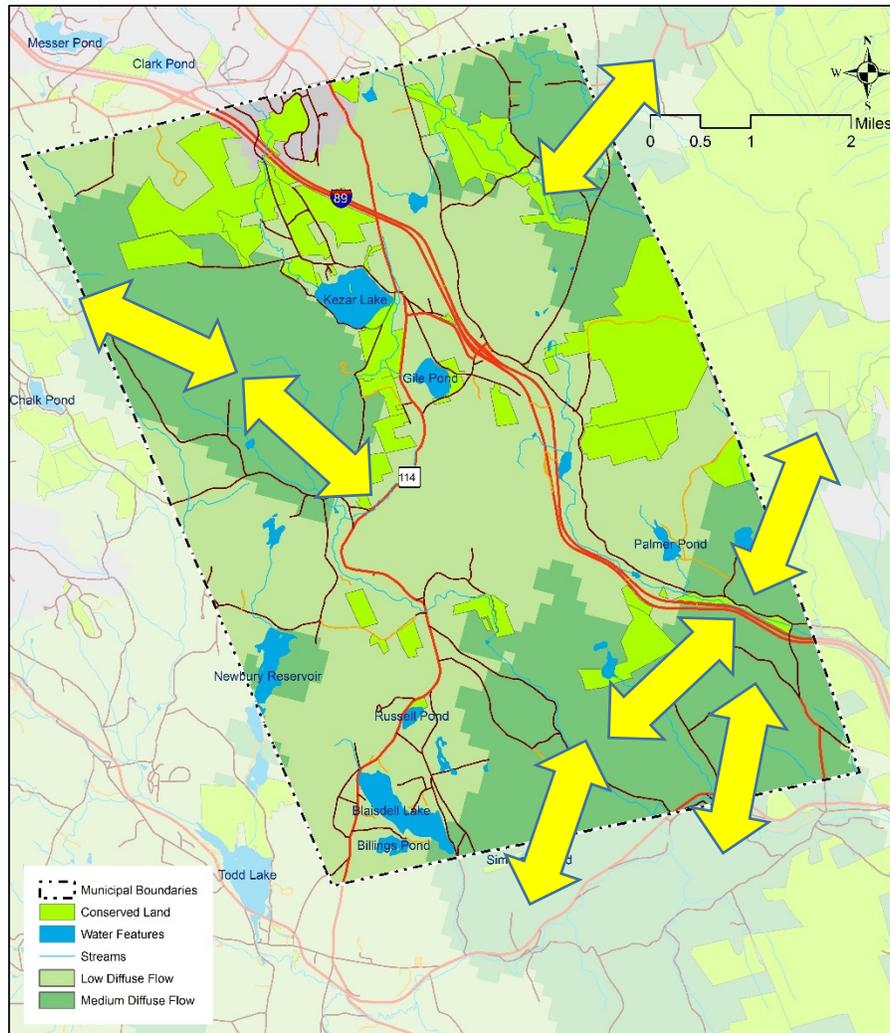
Also compare this map to the **Regional Flows** map following and note overlapping areas of importance.



## Climate Change Resilience

The map on the next page shows the **Regional Flows** subset of the TNC climate change resilience study which was developed to identify the most probable species movement corridors due to climate change. The **Medium Diffuse Flows** category (darker green) is the most important aspect of this data because it implies broader areas of diverse physical habitat that will support the maximum and least-impeded flow of plant and animal species.

Yellow arrows have been overlaid on the map to help show probable movement patterns across Sutton. Note how the large forest block area surrounding Mt. Kearsarge to the east serves as a hub for movement corridors into and across Sutton. A second corridor is found in the northwest quarter of the town, connecting the Stony Brook area of Newbury into Sutton, and likely to the southeast towards the Mink Hills in Warner.



Regional Flows

The TNC regional flows data is future-oriented and considers species resilience as the climate warms. This is not the same as “wildlife connectivity corridors” which are known to exist across the natural landscape. For a more detailed look at existing connectivity corridors, see the Quabbin to Cardigan Regional Plan discussion in **Section 4: Relationship to Regional Conservation Plans.**

**Climate change resilience priority areas are about 13% protected in Sutton. Regional flow movement corridors are 11% protected.**

## Section 2: Resource Protection Summary

### Introduction

Using GIS mapping technology, it is possible to develop statistics on natural resource features that give an idea of the extent of that resource in Sutton and by overlaying data on conserved and public lands, also gain insight into the level of protection of each natural resource feature. This summary provides an overview that informs the assignment of weighted values for each resource feature which are in turn used in the development of a co-occurrence map of all features (see **Section 3** for more discussion).

A table of the total acreage of each natural resource and the current level of protection from development can be found at the end of this section.

### Interpretation

By scanning the tan column in the table (percent of town area) versus the pink column (percent of resource feature protected), one can gain a quick idea of the extensiveness of any resource feature and the level of its current protection. Note some of the bolded “bottomlines”: **75% of the town is forested, but only 15% of that forest land is conserved; 52% of the town involved important NH Wildlife Action Plan habitat rankings, but only 15% is protected.** And within some categories, certain classifications are better protected than others; for example, **forest blocks of 1,000 to 5,000 acres cover more than half the town, but are less than 8% protected.** On the good news side, **about a third of the largest forest blocks in town (>5,000 acres) are protected, and nearly a quarter of the best habitat in Sutton is protected.**

Slicing the data another way, it can be seen that several of the natural resource features being considered in the strategic conservation plan occupy relatively small fractions of the town, mostly in the teens of total land area percentage. These, in turn, have relatively low levels of protection, often in the single digit percentages.

The natural question when looking at resource protection figures is: ***How much is enough?***  
The answer is: ***It depends.***

One perspective is to consider how critical a particular resource is to the eco-system services<sup>4</sup> provided for human use. For example, drinking water supplies are critical to the schools in town; it makes sense to maximize protection of the existing wellhead protection areas designated by NHDES **and** to protect aquifer options for future water supplies in the sand and gravel aquifers of the town.

Another eco-system services example is the role of wetlands in storing floodwaters during extreme storm events. Floodplains have similar flood storage and transit functions. And what about forest land? As discussed above, large forest blocks provide many eco-system benefits to wildlife, water quality, and recreation, not to mention economic forestry values. Farming soils and actively managed farm lands provide food and forage for communities. Wildlife habitat might seem a bit subjective to include under eco-system benefits, but what about hunting, fishing, hiking experiences, as well as our responsibilities to other species with which we share the land?

Another approach could be to evaluate relative scarcity of a resource feature, and the level to which it is currently protected. Farm soils account for only 2.5% of the town, but are presently only about 25% protected; that is a case of not much of not much. Uncommon habitat types, taken all together, amount to about 22% of the town, but are just 17% protected, and some habitat types are not conserved at all. Drinking water protection areas cover only about 2.5% of the town, but are just 6% protected.

There is no easy approach, and conserving all of the resource features would no doubt turn most of Sutton “green” on the conserved lands maps. But that is not possible, nor desirable since communities must be allowed to prosper and grow. The key is finding the best balance for community and conservation planning.

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<sup>4</sup> “Eco-system services” are community benefits provided by natural systems functioning at peak performance, such as clean water from forested watersheds, flood storage in floodplains and wetlands, etc.

Natural Resource Protection Summary				
Sutton Strategic Conservation Plan				
Feature	Total Acres in Sutton	Percent of Town	Acres Protected	Percent Protected
<b>Forest Blocks (by Size Class)</b>				
<250 Acres	1,368	5.1%	336	24.6%
250 - 500	396	1.5%	139	35.1%
500 - 1,000	1,495	5.5%	328	21.9%
1,000 - 5,000	13,850	51.2%	1,101	7.9%
>5,000	2,995	11.1%	1,054	35.2%
	<b>20,104</b>	<b>74.4%</b>	<b>2,958</b>	<b>14.7%</b>
<b>NHWAP Habitat Tiers</b>				
<i>Tier 1: Best in State</i>	3,946	14.6%	947	24.0%
<i>Tier 2: Best in Bio-Region</i>	3,567	13.2%	449	12.6%
<i>Tier 3: Supporting Landscapes</i>	6,641	24.6%	740	11.1%
	<b>14,154</b>	<b>52.4%</b>	<b>2,136</b>	<b>15.1%</b>
<b>Uncommon Habitat Type (Grouped)</b>				
	6,069	22.5%	1,016	16.7%
<b>Wetlands (NWI &amp; Hydric Soils)</b>				
	3,580	13.2%	572	16.0%
<b>Riparian &amp; Shoreland Buffers (100m)</b>				
	4,121	15.2%	593	14.4%
<b>Floodplains (100 year)</b>				
	1,975	7.3%	405	20.5%
<b>Aquifers</b>				
	4,015	14.9%	807	20.1%
<b>NHDES Drinking Water Protection Areas</b>				
	669	2.5%	42	6.3%
<b>High Quality Stream Watersheds</b>				
	4,622	17.1%	180	3.9%
<b>Highly Erodible Soils</b>				
	9,391	34.7%	1,303	13.9%
<b>Steep Slopes &gt;25%</b>				
	3,750	13.9%	631	16.8%
<b>Climate Change Resilience</b>				
<i>TNC Prioritization (Diversity &amp; Diffuse Flow)</i>	11,595	42.9%	1,533	13.2%
<i>TNC Regional Flows (Medium Diffuse Flow)</i>	12,009	44.4%	1,325	11.0%

## Section 3: Co-Occurrence Mapping

### Introduction

The purpose of co-occurrence analysis and mapping is to identify areas where resources are “co-located”, indicating areas of high-priority conservation values for consideration in long-range strategic conservation planning or for evaluating site-specific conservation opportunities as they occur.

**Section 2** of this report addresses 13 natural resource types as ingredients in the conservation planning process. For the purposes of developing a co-occurrence analysis of these natural resources for the region, **the 13 natural resources types were re-organized into a suite of 20 datalayers used in the co-occurrence analysis**, as follows:

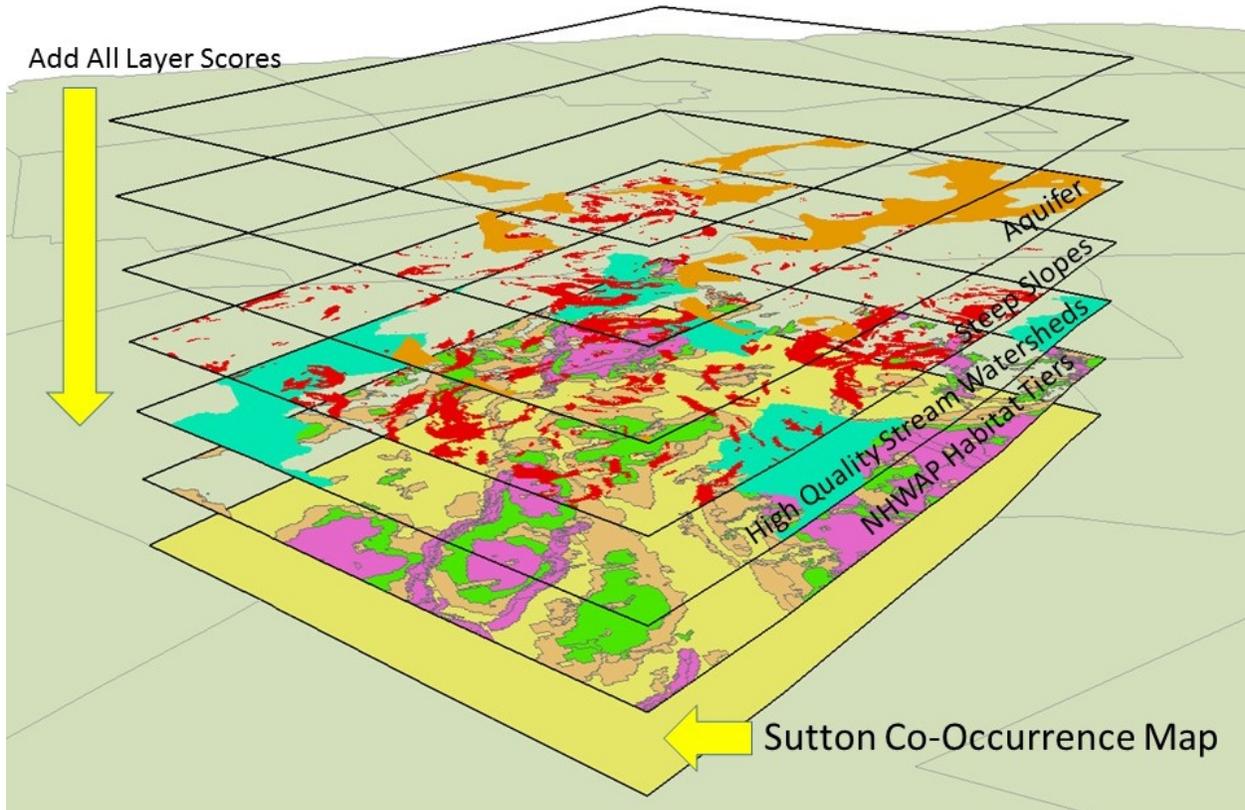
- A few datalayers combined data to simplify the co-occurrence process by using natural resource “themes”. For example, the NHWAP uncommon habitat types were merged into a single datalayer, wetlands includes merged data for National Wetlands Inventory and hydric soils data, and riparian and shoreland buffers are combined.
- Two data factors were subdivided to provide a wider range of choice. Examples include forest blocks which has five size-classes from small to large, and the NHWAP habitat tiers data which has three internal categories.

Co-occurrence mapping is designed to generate a “shared vision” of conservation values and priorities within the watershed. To build consensus, the Sutton Conservation Commission served as a stakeholder group of 8 persons to participate in a **Delphi process**. The stakeholder group met several times to become familiar with natural resource features being considered, and to review results of the co-occurrence mapping.

### Methodology

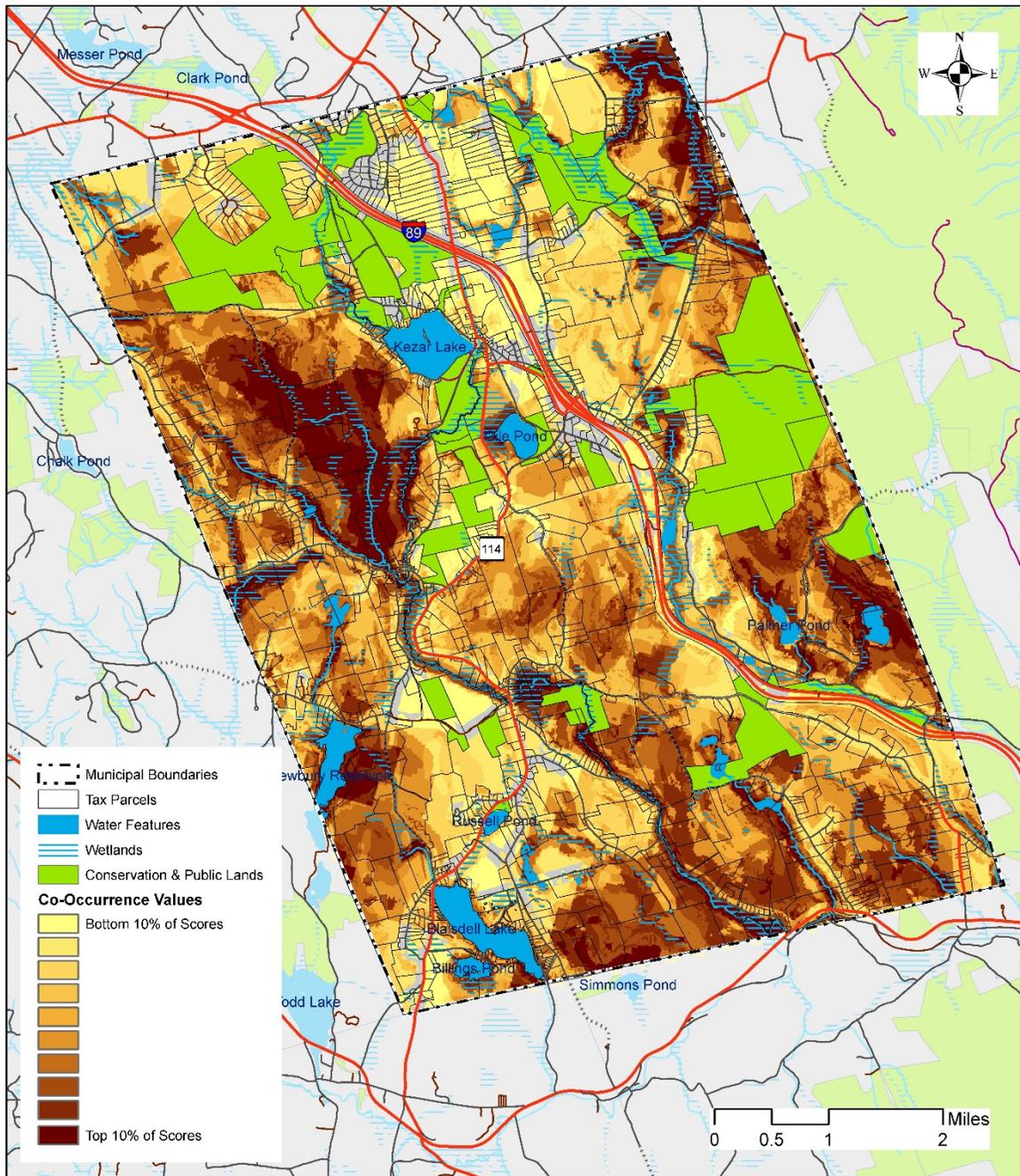
The Delphi process is a consensus-building methodology which fosters dialogue and understanding, leading to anonymous voting by stakeholders on the relative value for each of the 20 natural resource values selected for conservation planning. Working with a “budget” of 100 points, each voter assigned scores to each natural resource feature. After voting, all sets of scores were averaged to rank resource values, also known as **importance values**. The weighted importance values were then coded into GIS data layers of each natural resource feature using a 10-meter grid system which delivers a high-resolution data layer.

The illustration below gives an idea of how the co-occurrence mapping works in terms of GIS processing.



This illustration shows several natural resource data layers stacked over the political boundaries of Sutton. Only a few of the 20 possible data layers are shown. All data is geographically referenced one to another. Thus, any location on the ground is “in sync” with all the layers above it. Each layer has its own weighted importance value based on group voting, and the GIS adds all layers to produce a **co-occurrence map** of aggregated important values across the town.

The map on the next page shows the results of the co-occurrence mapping. Darker colors indicate areas of higher aggregate point values, and therefore higher conservation priority according to the “shared vision” of the group’s voting. Lighter colors have lower aggregate scores, but may contain unique natural resource features of special value to conservation, e.g., uncommon habitat types or exemplary natural communities.

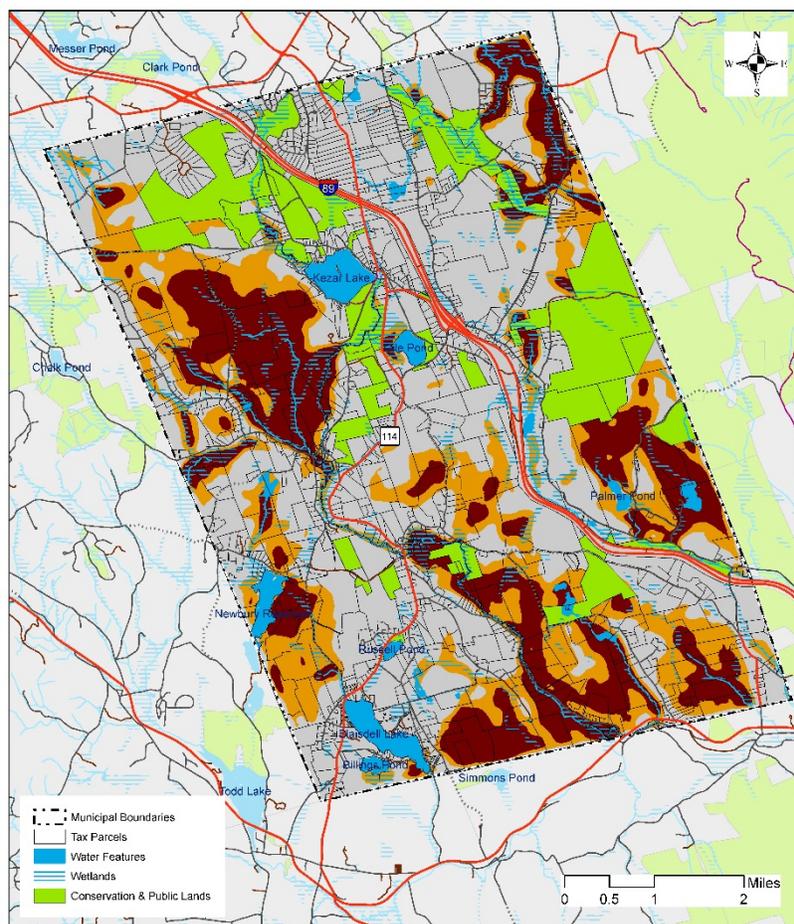


Natural Resource Co-Occurrence Map

## Identification of Conservation Focus Areas

The co-occurrence map can be used to help evaluate potential conservation projects, and by “reverse engineering” the co-occurrence data, users can determine which natural resource features contribute to higher or lower scoring. The map can also be used as a general reference in planning strategic conservation projects by focusing on the darker colored areas. However, the data in the co-occurrence map is subtle and complex, so it does not delineate **conservation focus areas** (CFA) in high-definition.

To determine CFA boundaries based on co-occurrence map scoring, a second GIS-based analysis is necessary. Therefore a **focal mean analysis** has been calculated using the scores embedded within the co-occurrence map, but smoothing the differences in scoring from locale to locale by averaging individual grid scores in a 25-grid search radius. The focal mean analysis can then be further refined by distilling out the top percentage scores. The map below shows the results of the focal mean analysis, with the top 20% of scores (brown) and the top 40% of scores (orange) defining the CFA. These areas offer the highest conservation benefit within the community “shared vision” for the limited available funding (local, state, federal).



Conservation Focus Areas

## Section 4: Relationship to Regional Conservation Plans

### Introduction

This strategic conservation plan has been prepared with a focus within the Town of Sutton municipal boundaries for obvious reasons, but it should be recognized that Sutton also is a stakeholder in at least two other conservation plans which are regional in scope. One of these is the strategic conservation plan for the Ausbon Sargent Land Preservation Trust (ASLPT), based in New London, NH, and the other is the Quabbin to Cardigan Conservation Partnership (Q2C), convened by the Society for the Protection of NH Forests, which embraces all of western New Hampshire. Partnership and funding opportunities for local conservation projects are possible in both instances. A brief overview of each plan is provided below.

### Ausbon Sargent Plan

Ausbon Sargent's mission is to preserve the rural landscape of the Mt. Kearsarge/Ragged/Lake Sunapee region. ASLPT partnered with Colby-Sawyer College to develop a strategic conservation plan for the region, using a data-gathering and co-occurrence model similar to that used in developing the Sutton conservation plan. This study area spans 12 municipalities surrounding New London, including Sutton where ASLPT holds several conservation easements.

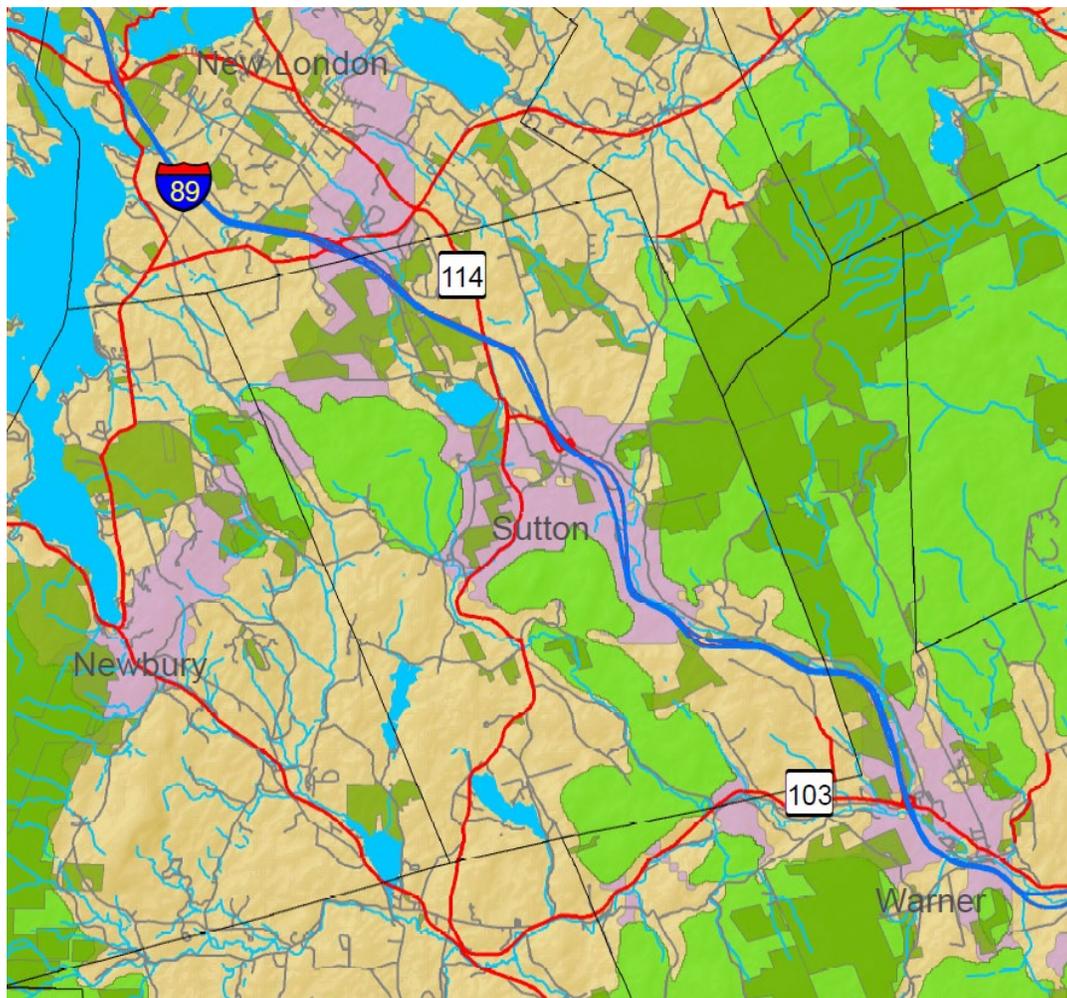
### Quabbin to Cardigan Conservation Partnership

The original regional conservation plan for the Q2C was developed in 2003 and has been recently updated with new data and methodology, including climate change resiliency data. Led by the Forest Society, this plan includes a partnership of more than 25 conservation organizations and agencies in New Hampshire and Massachusetts. The plan is actually super-regional in scope since it covers 3,000 square miles of both states, and spans territory from the Quabbin Reservoir in Massachusetts to Mt. Cardigan and the White Mountain National Forest to the north.

This science-based plan has attracted attention from major funding sources, and the Forest Society now operates a land conservation grants program in both states. More information on the Q2C can be found at this link: <https://q2cpartnership.org/>

Click on the **Resources** button to view the 2018 Q2C plan map, and learn more about the programs.

Zooming into Sutton on the 2018 map, several details can be noted. See Q2C map detail below.



The familiar parallelogram shape of Sutton is in the middle of the snapshot. The dark green polygons are conservation and public lands, with Mt. Kearsarge to the right. The lighter green shapes are **core conservation focus areas** in the Q2C plan, and the light purple represents wildlife **connectivity corridors** in the vicinity of Sutton. Grants made through the Q2C program must fall in either a core focus area or a connectivity corridor.

Sutton is fortunate to have both core focus areas and significant wildlife corridor connectivity. Compare this map with the results of the co-occurrence analysis in the previous section to see correlations that can be beneficial to land conservation projects in Sutton.

## Section 5: Conclusions & Recommendations

### Summary

Sutton enjoys a unique natural setting tucked between Mt. Kearsarge and Lake Sunapee, with three distinct village centers and outlying rural areas that work together provide a strong sense of a community within a desirable nature setting. Development pressures have been well-managed by the Town over the years, with a fortunate balance of residential growth and conservation; the King Hill area of town is a prime example of partnership between Town boards and developers that has helped to maintain the quality of life we all enjoy in Sutton.

Future development will require careful consideration of the next best locations for new land uses while protecting the key natural resources that give Sutton its community character. While the emphasis of this study has been to identify those areas in Sutton with the highest conservation values, the information contained in this report will also be key in providing guidance for day-to-day decision-making by Town boards and staff when development proposals emerge over the next several years, and to help the Town achieve a balanced approach to both community and conservation planning.

Natural resource features in Sutton provide various eco-system benefits that are often invisible, or taken for granted, but are key to the quality of life in the community. Clean drinking water is critical to residents, and high water quality in our streams and lakes is linked directly to property value and tax revenues. Intact wildlife habitat across forested landscapes and along Sutton's roadways and rivers contributes to the scenic and rural quality of life in Town. Wetlands and floodplains provide flood water storage and natural filtering of sediments. All of these natural systems work together to benefit the community, and at no cost to the Town; all they require is careful management.

### Recommendations

The following action items are offered below as starting points for implementation of Sutton's conservation plan. This implementation will require the cooperation of other Town boards in order to move forward on both the conservation of key natural resource features in town and the planning for the locations of future development.

- 1. The Sutton conservation commission (SCC) should discuss and decide an approach methodology for using the information contained in this strategic plan.**

Implementation of the plan depends upon reconnaissance and identification of the best areas in town to move ahead with conservation projects (see more on partnered conservation below). Remember that conservation may be **opportunistic** (a landowner approaches the SCC with interest in conserving their land), or **strategic** in the sense that the highest conservation benefit is achieved with the least expense. Strategic conservation projects flowing from a science-based plan will be more successful in securing funding from sources outside the municipality.

2. **Partnerships with regional land trusts should be pursued to help leverage significant conservation projects in Sutton.** ASLPT has had a long involvement in conserving land in Sutton and the Sunapee Region; the typical scale of their projects is quite appropriate to the landownership patterns in much of Sutton. The Society for the Protection of NH Forests also has an impressive record of conservation achievement, especially on the eastern side of town with the recent Black Mountain and PK Brown Lot projects. Other potential partners include the NH Fish & Game Department which has protected significant wetlands areas for wildlife in the northeastern part of Sutton, and The Nature Conservancy, whose mission includes protecting land for climate change resilience.
3. **Partnerships with neighboring towns also offer great potential for conserving land in border areas of Sutton.** While the natural resource co-occurrence mapping is limited to Sutton as a municipality, there are several areas along the boundaries with Warner, Newbury, and New London where mutual conservation initiatives are likely if promoted. This has already been the case with the Gore Farm project by SPNHF along the eastern boundary with Warner.
4. **The SCC should develop an outreach and engagement plan** designed to inform the Planning Board, the Select Board, the Zoning Board of Adjustment, and a range of Town staff tasked with management of land uses in the town about the strategic conservation plan and its goals. This outreach effort should also include public presentations to raise public awareness and support for the plan, with an emphasis on methods and means of land conservation that benefit private landowners; the Ausbon Sargent Land Preservation Trust (ASLPT) is a logical partner in such public outreach programs.
5. As part of public outreach, **the report and selected maps showing the location of high-priority conservation focus areas should be posted on the Town website.** This publication of the work of the SCC can also be accompanied with a narrative about how interested landowners can explore options to conserve their land, including appointments with the SCC and/or conferral with conservation partners in the region.
6. **The findings in this plan should be coordinated with the SCC's development of a town-wide trail system utilizing connected conservation land.** Not only does the regional recreation trail of the Sunapee-Ragged-Kearsarge Greenways cross Sutton, but many tracts of existing conservation land in town offer trails for recreational use. Some areas in town can offer truly remote recreation experiences, e.g., east of Interstate 89, the King Hill Reservation, and various high places such as the Dresser Hills, Meetinghouse

Hill, Dodge Hill, and Hedgehog Hill. These areas may become relatively wild “nodes” in a town-wide trail system.

7. **Finally, this strategic plan is a dynamic document which depends on regular updating.** New data will be available from the NHWAP periodically, and TNC’s climate change resilience data will be continually refined (a regionalized version of the original super-scale analysis is expected in 2019 or 2020). Not only will new data change the outcome of the mapping and analysis, but public knowledge and opinion is likely to change as Sutton’s demographics change. It would be a good idea to plan to widen the “shared vision” aspect of the 2018 plan by inviting a committee of interested persons to participate in deciding importance values for various natural resources.

## Section 6: Implementation

After reviewing the updated plan, the SCC determined that drinkable water is critical to both human and animal residents of Sutton, and that high quality water is important both for habitat and recreation. The Natural Resource Protection Summary on p. 26 indicates, however, that only 6.3% of DES drinking water protection areas and only 3.9% of high quality stream watersheds are currently protected. Therefore, the SCC voted to increase the conservation of properties containing high priority water resources by 5% a year until 50% of such properties are protected.

In addition, the SCC was concerned that agricultural areas and grasslands are dwindling, which decreases habitat diversity. Therefore, it voted to increase the conservation of agricultural properties and to allow town-owned land to be used for agricultural purposes, where appropriate.

Using the maps in this plan, the SCC will identify properties that meet the criteria above and determine which might be candidates for conservation. While the SCC does not have the resources to purchase large blocks of land, it can assist landowners in creating conservation easements to accomplish these goals. Public presentations will be held to spread this message to interested parties.