

TOWN OF BELMONT, NEW HAMPSHIRE

NATURAL RESOURCES INVENTORY

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TABLE OF CONTENTS

INTRODUCTION AND OBJECTIVES..... 3

METHODOLOGY..... 5

 Field Work..... 5

 Gather Existing Digital Data..... 6

 Accuracies of Existing Maps (table)..... 6

 Compile Existing Data into Arcview and ArcGIS..... 7

 GIS Training Workshop and Installation of Project Data..... 9

 Public Information Workshop..... 9

RESULTS..... 10

 Rivers, Streams and Large Waterbodies..... 10

 Riparian Habitat..... 13

 Wetlands..... 17

 Permanent Opening Areas..... 21

 Forested Lands..... 22

 Bedrock Geology..... 25

 Soils..... 25

 Prime, State, and Local Farmland..... 28

 Stratified Drift Aquifers..... 29

 Slope..... 30

 Rare Species and Exemplary Natural Communities..... 31

 Wildlife Action Plan..... 34

 Scenic Resources..... 35

 Conservation Land..... 36

 Cultural Resources..... 37

 Invasive Plant Species..... 39

 Habitat Area Summary Table..... 41

DISCUSSION – FUTURE APPLICATIONS AND BENEFITS..... 42

MAPS..... 44

 #1. Base Map..... 45

 #2. Water Resources and Wetlands..... 46

 #3. Dense Softwood, Permanent Openings, Parcels with Gravel Pits..... 47

 #4. Prime and State Farmland and Steep Slopes..... 48

 #5. Poorly and Very Poorly Drained Soils..... 49

 #6. Conservation Land and Current Use Parcels..... 50

 #7. Subwatersheds – Level 12..... 51

 #8. Bedrock Geology..... 52

 #9. Wildlife Action Plan Data..... 53

INTRODUCTION AND OBJECTIVES

The Town of Belmont, New Hampshire contains approximately 31.9 square miles (20,427 acres) of land and 1.8 square miles (1152 acres) of inland waters. There were 1,189 residents in Belmont when the first census was taken in 1860. Belmont had a population of 7322 residents according to the 2005 census and continues to grow. Most of Belmont's working population commutes to other towns for work (estimated at 78%), in the abutting Cities of Laconia, or Concord. Belmont has a variety of businesses including Wilcom Products, Inc., Shaw's Supermarket, Lakes Region Coca-Cola, Noyes Fiber, The Lodge at Belmont, and Metrocast Cablevision. Belmont also has water frontage along Winnisquam and Silver Lakes resulting in second homes and tourist focused business. After the height of the Agricultural Era, farming declined (though some practices still continue). Much of the Town's history centered on the Tioga River where mills, requiring nearby moving water for power or disposal, operated along its banks. Belmont also contains a large, working sand and gravel pit with plans for an asphalt plant in the southeastern portion of town. A unique business found in Belmont is a large acreage deer and elk farm near the South Road and Shaker Road area. Although not operating at the time, there are plans to bring elk back to the farm.



The high mesh fencing for deer and elk containment with resident geese are grazing in the field.

Belmont was incorporated in 1727 as a parish of Gilmanton called Upper Gilmanton. In 1859 the name was changed to Belmont in honor of Mr. August Belmont, a New York financier, hoping that he might make a financial contribution to the town

A potential business utilizing natural resources, is investigating ground water withdrawal and a bottled drinking water plant More traditional natural resource uses in Belmont include logging, beef farming, raising purebred horses, apple orchards, vegetable and hay farms, and the aforementioned deer and elk farm. These will be discussed further in this report.

The Tioga River flows roughly east to west through much of Belmont with most of its headwater tributaries located in Belmont. Its sinuous path and rather wide floodplain provide

Natural Resource Inventory for Belmont, NH

much unique habitat throughout Belmont with its confluence, the southern end of Silver Lake, and the Winnepesaukee River located in the southwestern tip of Belmont.

Like most New England towns, much of Belmont experienced the clearing of large open fields and pastures during the Agricultural era as can be witnessed by the numerous stone walls found throughout much of what is now reforested.

Belmont contains a wide range of ecological habitats, many of which have not been documented by the Natural Heritage Bureau at this time. Several diverse habitat types were documented during this study indicative of the rolling terrain containing sandy knolls contrasted by wetland complexes and streams with beaver activities, and places of exposed ledge. Co-occurring in Belmont is a large portion of the Tioga River watershed, a portion of the Lake Winnisquam watershed, a small portion of the Silver Lake watershed, and a small portion of the Gues Meadow Brook (Soucook River) watershed.

Belmont contains portions of two large water bodies: Lake Winnisquam; and Silver Lake. There are several smaller water bodies including Clough Pond, Pout Pond, and Sargent Lake; Badger, Durgin, Pumping Station Branch Brooks are some of the larger perennial streams flowing through town. Belmont also contains large wetland complexes and many rolling upland hills and knolls, offering spectacular views. Scenic roads and vistas exist throughout the Town. As of 2004, approximately 3.1% of Belmont contains Conservation land with additional parcels being investigated. For comparison, approximately 22% of New Hampshire's land base is currently protected through ownership by public or private conservation agencies, conservation easements, or other form of permanent protection, most of which occurs in the northern part of the State.

Development for residential homes is ongoing throughout Belmont and will need to be addressed in the near future with careful planning focused on natural resources to maintain the unique characteristics and rural setting throughout the Town. With many areas of well drained upland soils, scenic views, good job markets, and the many water bodies found in the area, this trend is sure to continue.



Developmental pressures in Belmont are expected to persist

As is true of many NH communities of its size, Belmont has a municipal Drinking Water System and Sewage Disposal System, though most residents in outlying areas rely on private wells and septic systems. With its stratified drift aquifers and sandy soils the Town

Natural Resource Inventory for Belmont, NH

recognizes a need to become more proactive in wanting to sustain natural resources, especially water quality. As with many communities, development and transportation corridors tend to follow along the lake shorelines, rivers and valleys with flatter topography. ‘People like to be near the water’ is a phrase often heard throughout New Hampshire and Belmont is no exception to this rule.

This project provides a Natural Resource Inventory (NRI) with digital data that can be integrated with the existing Belmont GIS database, other studies, and future data. For example, newly digitized data from this project, such as permanent openings and dense softwood cover, is in NH State Plane Coordinates, NAD 83, and compatible with existing Belmont GIS data.

One of the goals of this project is to provide inventory, management recommendations, and planning tools for the Town through incorporation into an update of the Master Plan. Another goal of the project is to integrate all existing data for Belmont, with data created and field verified from this project, wetlands being a prime example. 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 Belmont with new accurate coverages that will integrate with the Town’s existing and future GIS coverages.
2. Incorporate natural resources, scenic vistas, riparian buffers and other related elements into the Master Plan 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 ability for the Town to produce hardcopy printouts of this new data as requested or needed.
5. Provide the ability of the Town to continue to build upon and update the digital database.

METHODOLOGY

Belmont’s Conservation Commission (BCC) chair, Ken Knowlton, assisted Watershed to Wildlife, Inc. (WTW) by providing general information, existing tax parcel maps, and additional sites for field verification and documentation within the Town. Richard G. Ball, Town of Belmont’s Land Use Technician, not only assisted with fieldwork, but also provided WTW with technical assistance by providing the town’s existing GIS data. Ginger Wells-Kay, a member of the BCC, assisted with field work and data collection and Jeffrey Marden, a member of the planning board, provided access information to specific sites. Water Department Manager, David McLelland, Sr. provided information about the Belmont Public Drinking Water System and associated components.

Field Work

Fieldwork was conducted, first to get an overall view of Belmont and secondly with a focus on previously identified target areas. This work included inventories and assessments

Natural Resource Inventory for Belmont, NH

on several wetland complexes, beaver ponds, the Tioga River, forested habitats, 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. GPS data were collected at points of interest including monuments, brook crossings, vernal pool locations, dense softwood stands, and unique or interesting habitats. In addition, photographs were taken with a digital camera along points of interest throughout the Town. During fieldwork sessions any unique habitat co-occurrences were noted and located on a map. Observed invasive plant species were also documented. All data belongs to Belmont and was delivered on CD-ROM(s) with hardcopy formats where appropriate.

Gather Existing Digital Data

Existing maps and data for the Town of Belmont were collected. The Town has an extensive digital database. 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
1992, 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, 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" = 1,667'	Acceptable accuracy within 60 feet
National Wetland Inventory	U.S. Fish and Wildlife Service	1:24,000	1" = 2,000'	Acceptable accuracy within 60 feet

Natural Resource Inventory for Belmont, NH

Data	Source	Ratio	Scale	National Mapping Standard Accuracy
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 was gathered from GRANIT, Natural Resource Conservation Service (NRCS), NH-DES, the US Fish and Wildlife Service, and Belmont Parcel data. 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. Geology

Existing available maps were then integrated using Arcview and ArcGIS software. Using the 1998 and 1992 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.

Watersheds were determined by using the existing GRANIT coverage based on USGS, NRCS, and other Federal and State departments. The entire contiguous United States is comprised of 21 Major Hydrologic Regions using a two-digit code. Further breakdown of these Regions consists of eight-digit Hydrologic Unit Codes (HUC), which in turn are broken down into eight digit plus a three-digit extensions as Watersheds. Final breakdown of the Watersheds into Sub-watersheds, which have 11 to 14 digits codes based on local topography, are a good planning tool at the town-wide scale.

Wetlands were reviewed and analyzed using the Digital Orthophoto Quadrangles (DOQs), National Wetland Inventory (NWI), and Natural Resource Conservation Service (NRCS) soils maps (displaying hydric soil map units). 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

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
Town of Belmont

readily be identified using aerial photography alone, but forested wetlands are often missed. Some types of wetland delineations require extensive fieldwork 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.

Prime farmland, farmland of statewide importance, and farmland of local importance throughout Belmont were determined using the NRCS soils map data. Data was 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 Belknap 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 (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. 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. These areas have been recognized as significant wildlife habitat and could be deer and moose wintering areas. Steep slopes were

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

determined using the NRCS soils maps. Data was displayed in ArcView and queried so only those soils map units with 15% slope and greater were displayed in ArcView.

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 Belmont 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 June 2007 as part of this project for Select Board, Planning Board, Library, Zoning Board, and Conservation Commission members that had an interest in providing GIS access for the Town of Belmont. Future training was offered at a per diem rate.

Public Information Workshop

At the completion of the fieldwork, and GIS analyses for the natural resources, a public information meeting was held in June 2007 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/recreation areas; riparian habitat; wetlands; and associated wildlife habitat. In addition, work done from this project was displayed for public viewing at the meeting.

RESULTS

Rivers, Streams, and Large Waterbodies (See Map #2)

Belmont contains about 1.8 square miles of inland waters. The Town's western boundary is made up entirely by Lake Winnisquam, Silver Lake, and the Winnepesaukee River. Lake Winnisquam is the largest waterbody in Town (4,213.6 total acres, 951 acres in Belmont). Silver Lake is the second largest lake in Belmont with 83 acres out of a total of 202 acres lying within the Town's boundaries. These two waterbodies provide an important recreational value for Belmont and the surrounding area. Due in part to this, both lakes have experienced moderate to heavy development along their shorelines. Silver Lake still retains good buffers and no development along the shores of its outlet where it then transitions into the Winnepesaukee River. These buffers extend into extensive forested upland and wetland habitat reaching an average width of 1 mile before any type of significant human land use is reached. Lake Winnisquam does not have any significant buffers along its edges throughout Belmont. This lake has buildings and roads along the majority of its shoreline. Despite the large amount of intense human activity, Lake Winnisquam still provides an important resource for a wide variety of plant and animal species due to its immense size. There are no extensive buffers, but strips of adequate buffers dominated by hardwoods and white pine do exist in sections of the shoreline. These buffers are important to the health of the Lake's aquatic system and plant and wildlife communities. At the south end of the Lake various fish species, beaver activity, a kingfisher, cormorant, and an active osprey nest were observed. **Conserving what buffers remain and working to increase them where possible should be considered a priority and recommendation based on this study.**



Lake Winnisquam is an important source of recreation for the Town of Belmont and the surrounding area. Docks, boats, camps, and swimming areas are found all along its shoreline. This photo was taken from an approved multi-use path currently scheduled for construction in summer 2007.

Natural Resource Inventory for Belmont, NH

While these two large waterbodies have experienced such extensive development and recreational uses, Belmont has several other smaller, but still significant lakes and ponds. Sargent Lake lies near the southeast boundary of Town and is just over 43 acres. Although present, development on Sargent Lake is significantly less than Silver Lake and Lake Winnisquam. Beyond the minimal development there are expanses of forested uplands on all sides of the lake. This lake is able to serve as an important recreational source while still having valuable wildlife habitat. Two smaller lakes that have experienced even less development are Pout and Clough Ponds.

Pout Pond is almost 12 ½ acres in size and the only major road access to this body of water is gated. This pond serves as part of the Town's drinking water supply. There was noticeable human activity observed at the shoreline landing just beyond the pump station. ATV and bicycle tracks and a fire pit were found by the water's edge. Numerous fish, frogs, and birds were also observed in and around the lake. The entire lake is well buffered, particularly the west side with far reaching forested uplands. In 2004 a wildlife inventory was conducted on the Pout Pond area through a UNH senior project. The students found this area to be some of the highest ranked wildlife habitat in Belmont due in part to the excellent riparian habitat along the nearby Tioga River, the adequate buffers along Pout Pond, and the 512 ± acres of unfragmented adjacent uplands. These uplands quickly transition into sandy well-drained oak and pine knolls and ridges where a significant amount of white-tailed deer activity was observed. **This area holds a great deal of value to Belmont because of its use as a water source and relatively undisturbed habitat making it important for aquatic and terrestrial plant and animal species.** A portion of this area is already in conservation (Murray Park), and existing interests in expanding the amount of conservation land around Pout Pond should continue to be explored.



These two photographs illustrate the well buffered edges of Pout Pond. The photo on the right shows the southwest side of the pond which is dominated by a white pine forested buffer and the photo on the left is a view of the eastern side of the pond dominated by a hardwood buffer

Clough Pond is the most remote large waterbody in Belmont. It is just over 13 acres and lies in the southernmost corner of town. There is no major road access, just a small private dirt drive off South Road with large amounts of forest surrounding Clough Pond on all sides. There is one camp on the pond and other than the clearing for this building and the accompanying lawn, the pond is forested, mainly with white pines, right up to the water's edge. Just beyond the shoreline there is a significant amount of oak regeneration. A very

Natural Resource Inventory for Belmont, NH

limited amount of emergent vegetation was found growing and the depth appears to drop off rapidly. Large mouth bass have been reported in Clough Pond.



This photograph was taken looking out onto Clough Pond from the lawn of the only camp on the pond. As the photo shows, Clough Pond lies between two hillsides and is buffered to the water's edge.

The Tioga River flows for nearly 12 miles through Belmont. Its headwaters are just beyond the eastern corner of the Town boundary in Gilmanton and it flows almost diagonally across Town into the Winnepesaukee River just beyond the southwestern corner of Belmont's boundary. The entire Tioga River flows for just over 13 miles, with 11.8 of these miles within the Belmont town boundary. The Tioga does not carry a large amount of water, but it is still an important natural resource for the Town. It is relatively well buffered, especially in its



The Tioga River has a rich history in Belmont as the source of power for numerous mills with dams. This relatively small, well buffered River also provides important habitat to a number of aquatic and terrestrial plant and wildlife species.

upper half. The lower half of the River flows through more developed sections of Town, but still an adequate buffer is present through the majority of these stretches. Various bird species such as king fishers, a red-tailed hawk, a black duck, and great blue herons along with a very large snapping turtle were observed along sections of this River. Mucky unconsolidated to cobble-stone bottoms were observed substrates alternating throughout the length of the Tioga providing good habitat for numerous fish, shellfish and invertebrate species.

Although the Winnepesaukee River does not flow through much of Belmont, it is still an extremely valuable feature of the Town. An especially diverse section of Winnepesaukee is at the confluence of the Tioga River and Silver Lake. This area contains a variety of aquatic, floodplain, and wetland habitats. Abundant beaver and muskrat activity was documented in this area and diverse habitat components that are preferred by waterfowl: snags and cavity trees along its banks; scrub shrub wetland habitat; aquatic submergent and emergent vegetation such as pickerel weed and arrowhead. This river provides recreational opportunities due to its size and navigability and the potential for wildlife viewing.

Other named brooks that flow through Belmont are Badger Brook, the Pumping Station Branch, both of which are tributaries to the Tioga River, and Durgin Brook. There are also unnamed tributaries feeding into these named brooks and the Winnepesaukee River.



The Winnepesaukee River flows only a short distance through Belmont, but is still an important natural resource for the community. This large and diverse River provides a variety of diverse wildlife habitat and recreational opportunities from canoeing to duck hunting.

Riparian Habitat

Belmont has a diversity and abundance of excellent riparian habitat. There are over 70 miles of rivers and streams flowing through the Town and 1,850 acres of wetlands, accounting for large amounts of adjacent riparian habitat. Belmont contains a diversity of riparian habitat types such as floodplain forests, scrub-shrub wetlands, and meadows.



These black bear tracks were found near an ATV trail in a stretch of excellent riparian habitat along the Tioga River. Black bears are commonly found foraging, resting, traveling, and feeding through riparian lands especially during the spring and summer.

Riparian lands are a significant and beneficial habitat type. These habitats are adjacent to rivers, streams, and other waterbodies. The habitats directly abutting these waterbodies 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 upland habitats and aquatic habitats. Riparian habitats are rich in bird species including 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, beaver, river otter and other weasel species, moose, white-tailed deer, black bear, raccoons, bats, red and gray fox, coyote, bobcat, 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 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 uplands.



This photograph shows mink tracks in the mud along the riparian habitat of a beaver pond. Mink are terrestrial mammals that spend a great deal of time traveling and foraging for fish, shellfish, and amphibians within riparian habitats.

Natural Resource Inventory for Belmont, NH

A specific riparian habitat type is floodplain forests which are abundant in Belmont along the Tioga River near its confluence with the Winnepesaukee River. Floodplain forests are also found in fragmented pieces along Silver Lake and Lake Winnisquam. They are unique natural communities that occur within floodplains along stream corridors. Their uniqueness and location adjacent to riparian habitat and rivers provides valuable wildlife habitat for breeding birds, spring migratory birds, insects, and amphibians. Generally, larger patches of forested floodplains exhibit greater species richness and support a greater diversity of wildlife. Migratory and breeding bird populations associated with floodplain forests include downy and hairy woodpeckers, American robins, gray catbirds, warbling vireos, and song sparrows. Hemlock, white pine, maple, and oak are abundant along the Belmont drainage network, and are dominant tree species in much of the riparian zone.



This photograph taken from the Winnepesaukee River illustrates a shrub-shrub riparian habitat that transitions into a floodplain forest. These habitat edges are important for several wildlife species, specifically migratory and resident birds that are commonly found feeding and nesting in these habitats.

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. The root systems of the riparian vegetation are also important for reducing the amount of erosion caused by moving water and flooding.



This stream has an intact forested riparian habitat. As this photograph shows these trees provide significant amounts of shade allowing the stream to maintain cooler water temperatures. Newts were found in floodwater pools along the edges of this brook.

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 broken limbs or whole trees that fall into the water. **For all these reasons and more, conserving riparian areas is a vital part of conserving Belmont's natural resources.**

As mentioned in the previous section intense development along Lake Winnisquam and Silver Lake has reduced the riparian habitat to small isolated pockets. North of the Silver Lake outlet, the western border of Belmont only contains about 0.2 square miles (100 acres) of intact riparian habitat. These areas of riparian habitat are extremely fragmented and therefore no longer reach their full potential as vital wildlife habitat, a source of water quality, and floodwater control.

In contrast, the southern portion of the Winnepesaukee River in Belmont, near where the Tioga River flows into it has seen very little development. There remains a large tract of riparian habitat that is greater than 500 acres at this location. These large tracts of riparian habitat are found along most of the length of the Tioga River and its tributaries. There is significantly more development to the west of Route 106 (Laconia Road) along the Tioga River when compared to the east side of Route 106. Due to this increased human activity, the riparian habitats along the Tioga River to the west of Route 106, experience significant amounts of fragmentation while the riparian habitats along the River and its tributaries to the east of Route 106, have experienced only minimal fragmentation.

The overall fragmentation of the riparian lands along the Tioga River and its tributaries has not yet reached levels that significantly impact the habitat - not to the degree where it is no longer usable as wildlife habitat and as a protector of water quality. **With the amount of development Belmont is currently experiencing this could easily change if buffers are not left intact along the entire length of Belmont's waterways.** Connectivity or

travel corridors connecting these buffers to forested and open uplands also need to be left complete. When designating buffer areas and travel corridors to conserve connectivity for wildlife, it is important to remember that a wide variety of species are utilizing these habitats from small insects and amphibians to large mammals such as moose and black bears. Buffers and travel corridors should be large enough and structurally diverse in order to accommodate the diverse species using them. **These buffers will not only allow Belmont to maintain its rich and diverse wildlife populations but will also protect human areas from flooding, and will protect and improve the overall quality of Belmont's waters as recreational and drinking sources.**



This photograph is a section of the Tioga River that is not well buffered. These grasses do not provide shade for the river and therefore water temperatures will rise during hot days. The root systems of these grasses on the relatively high steep banks will not be strong enough to provide bank stabilization or protect against erosion during severe floods. Establishing a buffer zone the entire length of the river of shrubs or trees such as alders and willows will provide the needed structure to create a suitable riparian buffer.

Wetlands (See Map #2)

Wetlands are the core of life for the majority of plant and animal species. They contain diverse habitats with edge habitat needed by many species. It is estimated that riparian areas and wetlands are utilized by over 90% of the region's wildlife species and provide preferred habitat for over 40% of local species. Future trails and observation points overlooking these wetlands could provide excellent opportunities for wildlife viewing.

Based on National Wetland Inventory (NWI) data, very poorly drained soils, and limited field verification, there are approximately 1,847 acres of wetlands in Belmont, (9% of the land mass). NWI wetland classifications range from PUBHh (Freshwater Pond) to PFOA1 (Freshwater Forested/Shrub Wetlands) with several L1UBH designations (Lacustrine). Based on NRCS data there are approximately 3,694 acres of hydric soils in Belmont, (18% of the land mass). Map #5 displays poorly and very poorly drained soils throughout Belmont. New

Hampshire requires three parameters in defining wetlands: hydrophytic vegetation; hydric soils; and hydrology. Although excellent tools, generally NWI data alone under represents the size and number of wetlands, and NRCS hydric soil data alone over represents the size and number. Future field determinations will be necessary to accurately delineate all wetlands in the town. These can be incorporated over time with additional field verification.



This photograph shows a large, formerly beaver impacted, emergent and scrub-shrub wetland complex, bordered by forested upland located northeast of Grimstone Drive and north of Brown Hill Road. Dead snags and open beaver meadows are attractive to a diversity of wildlife species - many where noted during field work.

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 black spruce (*Picea mariana*) and tamarack (*Larix laricina*) subsequently emerge and balsam fir (*Abies balsamea*), red maple (*Acer rubrum*) and gray birch (*Betula populifolia*) swamps follow the spruce and tamarack. This natural successional process is often referred to as eutrophication.

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 including the mining of gravel and sand could increase wetland sizes and often create new wetlands

Natural Resource Inventory for Belmont, NH

- 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 Belmont 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



This rich wetland, know as the Bean Dam, is human and beaver impacted. This area contains a diversity of plant and animal species with excellent abutting uplands containing dense softwood cover intermingled with many oak, maple, and beech mast trees.

Vernal pools are unique and often isolated wetlands. A vernal pool is a temporary body of water which provides essential breeding habitat for certain reptiles, amphibians, and crustaceans, including wood frogs, spotted salamanders, marbled salamanders, and fairy shrimp. They fill annually from precipitation, runoff, and rising groundwater. Vernal pools are usually dry by the middle of summer, making them uninhabitable for fish, and therefore a safer environment for amphibians. Vernal pools vary in size, shape, and location. They are common in New Hampshire, and the State recognizes their value as important habitat. **Several vernal pools were documented during field work for this NRI, and future studies could easily document additional ones throughout the Town.**

Natural Resource Inventory for Belmont, NH



A vernal pool located near an ATV trail, in the Bean dam area. Bordering this vernal pool is dense forest offering shade and cooler water temperatures. A spotted salamander newt can be seen in the center of the photograph.



A lush potential vernal pool in Belmont located along an old tote road at the end of Wild Acres Road. This pool should be visited in the spring checking for obligate species.

Many wetland complexes and vernal pools exist along the streams and rivers in Belmont, particularly along the Tioga River as it winds its sinuous path flowing roughly diagonally in a southwesterly direction through much of the Town.

Permanent Opening Areas (See Map #3)

As is the situation in most all of New Hampshire, the Town of Belmont has experienced a loss of working farms. There are some remaining agricultural practices, commercial crops and beef cattle, but on a smaller scale involving less of the potential farmland acreage than the Town has to offer. As the percentage of non-developed, permanent opening areas in New Hampshire has decreased significantly over the past 50 years, the state is encouraging landowners to create or maintain permanent openings as important wildlife habitat. These permanent openings dominated by grasses, forbs, brambles, or fruiting shrubs, provide necessary habitat for about 22% of New England's wildlife species, and seasonally important habitat to nearly 70% of species. The eastern bluebird, bobolink, and northern harrier are three examples of species of concern in New Hampshire, which rely on permanent opening areas.

Permanent opening areas in general also have the advantage of creating 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.



One of the remaining agricultural practices maintaining permanent openings in Belmont: hay and vegetable crops are produced at several locations in Town.



A reclaimed hayfield on the east end of South Road. Fields reverting back to shrubs on South Road

Approximately 1,241 acres of land is managed for permanent openings, including agriculture, in Belmont. This is 6% of the total town's land area, and is below the average of 10% permanent open areas throughout the State of NH. Most of the larger permanent openings are found as remnants of large former dairy farms. In some cases alternative farming practices, such as raising deer or elk are found. In a few cases, former hayfields are being reclaimed, but not at a rate to offset the overall acreage of former agricultural fields reverting back to forestland. In addition, development of these openings has caused a permanent loss in openings over time. **Retaining, and ideally increasing, permanent openings will be beneficial to the diversity of wildlife and vegetation throughout the Town.**

Forested Lands

Roughly 65% of the 20,427 acres of land in Belmont is forested lands. The remaining 35% of land mass is waterbodies and wetlands or tied up in various land uses such as farming, gravel pits, and development. Timber harvesting is actively carried out in Belmont's forests, but is not one of the larger businesses in Town. Common tree species that make up these forested lands are: softwood trees including, white pine (*Pinus strobes*), red pine (*Pinus resinosa*), eastern hemlock (*Tsuga canadensis*), and balsam fir (*Abies balsamea*); and hardwood trees such as, red oak (*Quercus rubra*), white oak (*Quercus alba*), yellow birch (*Betula lutea*), white birch (*Betula papyrifera*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), american beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), poplar (*Populus spp.*), and American basswood (*Tilia americana*).

Just over 630 acres of forested land, only 3% of Belmont's land mass, are dense softwood stands (see Map #3). These stands range in size from less than an acre to about 30 acres. Most of these stands are small, averaging less than 10 acres. Dense softwood stands are an important habitat type to various 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, snowshoe hares, ruffed grouse, 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 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 Town of Belmont

yard two basic elements must be met: (1) Core area identified by concentrations of dense softwoods, and; (2) Mixed hardwood and softwoods adjacent to, or within the core area will provide accessible forage. Deer yards cover only about 3% of the land base in New Hampshire so their identification and management for white-tailed deer is an important part of conserving the entire State's natural resources. **Even though Belmont does not contain a large amount of dense softwood stands there is a significant amount of eastern hemlock thriving throughout the entire Town. Hemlock is one of the dominant trees observed growing in Belmont and creates some of the best deer yard habitat. With proper management Belmont has the potential to significantly increase its amount of potential winter deer yards.**



This dense hemlock stand creates habitat that is potentially suitable as a white-tailed deer wintering habitat. A dense softwood stand is only one of the required characteristics for an adequate deer yard. Deer also require an adjacent mixed hardwood and softwood stand that provides food. These stands are vital for deer populations' survival of New Hampshire's harsh winters.

Belmont has a great deal of hardwood and mixed stands that are also important for the Town's wildlife populations. Red oak, red maple, white birch, American beech, white pine, and hemlock are the most common tree species observed throughout Town. All of these tree species - especially oak, maple, beech, and pine - are considered important wildlife trees because of their mast production. 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, chickadees, squirrels, and chipmunks to white-tailed deer, black bears, turkeys, and wood ducks rely heavily on mast as a source of feed. Hard mast produced by oaks and beech 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. Belmont's soils, topography and hydrology make it a suitable environment for a wide variety of mast producing trees and shrubs. **By actively managing**

Belmont's forests and woodlots for these plant species an important step will be taken in managing the Town's wildlife species.



This photograph was taken on top of a sandy knoll west of Pout Pond. This knoll and the surrounding upland area are dominated by white pines with a significant amount of oak and some beech regeneration. This area is consistently utilized by wildlife (as illustrated by the heavily used wildlife trail in the center of the photograph)



Many of Belmont's forests are hardwood stands that are dominated by oak, maple, beech, and yellow birch. All of these trees are important food sources for a wide variety of wildlife species. Under-story and forest floor structural diversity is just as important as the mature tree composition for much of the wildlife. Large woody debris (left photograph) and cavities created by rock structures (right photograph) provide important resting, foraging, and denning sites for a wide variety of wildlife species such as chipmunks, fishers, coyotes, and black bears.

Bedrock Geology (See Map #8)

The familiar pattern of a general southwest to northeast direction of the receding glaciers of over 12,000 years ago can be seen in Belmont as well as most all of New England. This process formed the rivers and lakes 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. This bedrock influences soil formation which in turn influences land formations, hydrology, and vegetation occurring above them. This process is often overlooked as it dwarfs human lifetimes in comparison.

Belmont is made up by four different parent materials: Rangeley Formation, Lower Part-Pelitic Rocks (code: Srl); Rangeley Formation, Upper Part-Sulfidic Schists (code: Sru); Perry Mountain Formation-Pelitic Rocks (code: Sp); and Concord Granite-Peraluminous Granite (code: DC1m). Each of these bedrock types make up between 4% and 6% of the total bedrock types found in New Hampshire. All four of these parent materials are composed of various rock compounds and minerals most of which are common such as granites, quartzes, and sandstones, but some of which are rare. Coticule is a very fine grade rock made up of generally yellow microscopic garnet spessartine. It usually only occurs in thin veins of only a few centimeters in low quantities and is considered rare. Coticule has been used for sharpening metal objects and historically has been mined, but it takes about one ton of rock to produce one kilo of coticule (ratio of 909:1). This rock is found in only four parent materials in New Hampshire and three of these occur in Belmont (Rangeley Formation, Lower and Upper, and Perry Mountain Formation). Coticule layers are common in Perry Mountain Formation and minor and sparse in Rangeley Formation Upper and Lower.

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.

Soil information is critical in making sound land use decisions. By examining soil types and morphology, many predictions can be made regarding forest management, erosion potential, and development possibilities. 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.

Soil information is also an excellent indicator of critical resource areas such as wetlands, agricultural lands, forestlands, and wildlife habitat. In descriptions of soil types, the NRCS evaluates soil types according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat.



Belmont contains a variety of soils and parent bedrock materials. The majority of Belmont contains upland soils, often gravelly, sandy soils. These soils, often found on upland knolls are ideal for development.

Several factors exert a major influence on soil development. These include climate, time, topography, parent material (see bedrock geology section above), biota, and human activities. Studying soil can also lead to an understanding of how that soil was formed. For example, the southwestern end of Belmont along the Tioga River contains: Chocorua and Searsport mucky peats, very poorly drained; and Naumburg sands, poorly drained soils. These soils have been formed by sediments deposited from past floodwaters, and accreting floodplain conditions. These types of soil are classified as Alluvium (deposited by running water) and Histosols (containing over 50% organics in the upper 32 inches). As another example, soils with a deep, rich top layer (or A horizon), such as the Marlow and Dixfield fine sandy loam soils, occurring in prime farmland fields in Belmont, indicate that the area has been used for agriculture for many years. Throughout the forested areas of Belmont, 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.

Belmont contains several large knolls of sandy, gravelly soils which offer the opportunity for mining of these natural resources. Seventeen parcels have current gravel pit permits in town (see map #3). They are at different stages of activity ranging from pre-excavation, to active, to reclamation. Although active sand and gravel pits cause a loss of wildlife habitat and appear to “scar” the land, with proper land reclamation techniques –

replacement of topsoils and vegetation – pit closing can re-create early successional wildlife habitat which is beneficial to a variety of species including woodcock, ruffed grouse, and moose.



A large operating gravel pit off South Road in the southeastern part of town.

A parameter sometimes overlooked in soils is pH. New Hampshire soils are commonly slightly acidic due to the influence of granite, referencing the term ‘The Granite State’. There are undoubtedly a few areas in Belmont 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, and can contain rare plant life (for NH). One example is red maple swamps, where species such as the yellow or showy lady slipper might be found.



A view of bedrock ledge (and infrastructure) in downtown Belmont.

ArcView compatible shape files of the NRCS soils map and the USGS geologic bedrock of the Town of Belmont 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.

Prime, State and Local Farmland (See Map #4)

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, 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.



Belmont contains active farms ranging from the Farris Arabian Horse Farm in the left photograph, to crops, such as hay in the right photograph.

Out of the total 20,416 acres of land that make up the town of Belmont, 951 acres of land have been classified as USDA prime farmland, 1,268 acres have been classified as farmland soils of statewide importance, and 10,898 acres have been classified as farmland soils of local importance. All of the soils that make up these three categories are relatively

evenly distributed throughout the Town's boundaries. The amount of development in Belmont has and continues to increase since these prime farmlands were designated and mapped by the USDA over 10 years ago. In that time, Belmont has lost approximately 10% (1,037 acres) of locally important farmlands, approximately 15% (191 acres) of statewide important farmlands, and approximately only 2% (22 acres) of prime farmlands. Incorporating these losses due to development there are 929 acres (4.5% of Belmont's land) of potential prime farmland and 191 acres (5.3%) of potential statewide important farmlands left in Belmont. Despite a 10% loss of locally important farmlands there is still potentially 1,037 acres remaining which makes up 48.3% of Belmont's land.

Belmont has high potential for agricultural land use with 64% of the land being designated important farmland at the national, state, and local scales. **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 (See Maps #2 and #5)

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 solid 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 rock is fractured.

Stratified-drift aquifers are an important source of ground water for commercial, industrial, domestic, and public-water supplies in the State of New Hampshire. Approximately 14% of land surface in the State is underlain with Stratified-drift aquifers. In and around Belmont they consist of stratified, sorted, principally coarse-grained sediments (sands and gravels) deposited by glacial melt-water during the time of deglaciation.

Nearly 7,586 acres or 37% of the area of Belmont is underlain with Stratified-drift aquifers, well above the State average. These are located primarily along the Tioga River area, including downtown Belmont and south of Route 140 to Silver Lake. They are also found in other areas of the Town such as along Durgin Brook and paralleling the Winnepesaukee River. Most of these stratified drift aquifers are coarse gravel and fine gravel material, but there are a few small aquifers composed of till materials, most of which are found near the headwaters of the Tioga River in the northeastern part of Town. Belmont is fortunate to have these potential drinking water sources.

Belmont currently has two gravel packed wells and a one million gallon holding tank serving around 610 hookups. The system is not at capacity and a third well is planned for future growth. There are 14 private water systems also using gravel packed wells. The drinking water in Belmont is good and clean, with only a pH adjustment and ortho-polyphosphate (food grade classification) to sequester iron and manganese. Chlorination or other disinfectants are not needed which speaks highly of the water quality.



One of two pump stations for gravel packed wells providing the Belmont Public Water supply.

These aquifers should be protected to insure their future quality and availability. A concern in Belmont is the large amounts of well drained and excessively well drained sand and gravel found throughout town and the active gravel pits and industry located within these aquifers. Due to the porosity and high transmissivity of these soils, pollutants could easily enter the system and be extremely difficult to clean up. The Town of Belmont is developing and monitoring Best Management Practices (BMPs) for equipment and industrial activities within these areas.

Slope (See Map #4)

Slope is the amount of rise or fall in feet for a given horizontal distance. It is expressed in percent. A 15% slope means that for a 100-foot horizontal distance, the rise or fall in height is 15 feet. Slope is one significant aspect of landform, which presents limitations for development. As slopes become steeper, the expense of building increases. Furthermore, increased slope means there is a greater chance of erosion, structural problems, and water pollution. In general, slopes greater than 25% and even some over 15%, are considered too steep to provide adequate sites for structures such as roads, homes, and septic systems. On steep slopes, soils are usually shallower, the volume and velocity of surface water runoff is higher, and the erosion potential is greater than on flatter areas. The consequences of erosion are loss of soil resulting in sedimentation of surface waters and loss of the productive capacity of the land. The NRCS soils maps were used to determine areas with slopes equal to and greater than 15%: areas where development would be restrictive.

Approximately 2,604.3 acres or 12.7% of land throughout Belmont contains slopes that are over 15%. Of that, approximately 515.5 acres or only 2.5% of the Belmont land mass contain slopes over 25%. The flat land in Belmont is fairly well scattered throughout the town. These flatlands, though, are often associated with flood hazard areas, erosion issues,

and water quality issues, especially if the water table is high and particularly with the immense area of stratified drift aquifers in Belmont.

A positive aspect of Belmont's steep slopes is the opportunity for panoramic views throughout Town. Identification and proper planning are important to Belmont to maintain these viewsheds. (Please refer to the section on 'Scenic Resources' in this report). These steep slopes also provide unique habitats for various plant and wildlife species.

Rare Species and Exemplary Natural Communities

The Town of Belmont has five listed species of concern from the NH Natural Heritage Bureau's data base. Due to its unique and diverse habitats, the number is potentially much larger. Belmont's waterbodies, especially the large lakes create potentially unique habitat for a wide variety of mammals, birds, fish, amphibians, reptiles, and invertebrates. Ospreys are an example of a state threatened species that has been utilizing this habitat type in Belmont. They have been successfully breeding in Ephraim's Cove, just above the outlet of Lake Winnisquam, for several years. This nesting site one of New Hampshire's more successful in recent years averaging 3 offspring a year.



This nesting platform in Ephraim's Cove has been a successful nesting sight for Ospreys. These large raptors feed almost exclusively on fish and require access to large, deep waterbodies for hunting. Listed as threatened in the state of New Hampshire they have been monitored and managed since 1980 by the New Hampshire Audubon Society and New Hampshire Fish and Game Department.

The large amount of riparian habitat (as mentioned in previous sections) also has high potential for creating suitable habitat for less common wildlife and plant species. These habitats can be areas where unique plant and wildlife species are found because they are transition zones between aquatic conditions and uplands and allow for edge habitats to exist. Plant and animal species found in Belmont which are listed as Rare or Endangered in NH NHB's database are: river bank quillwort (*Isoetes riparia*); bald eagle (*Haliaeetus Leucocephalus*); osprey (*Pandion haliaetus*); wood turtle (*Glyptemys insculpta*); and lake whitefish (*Coregonus clupeaformis*).



Closed gentian (*Gentiana clausa*) (left) and purple false foxglove (*Agalinis purpurea*) (right) were both found growing in riparian habitats in the Bean Dam area and the Belmont Town Forest. While not threatened or endangered in the United States, purple false foxglove is listed as an endangered species by Canada's COSEWIC (Committee on the Status of Endangered Wildlife In Canada).



Pipsisewa (*Chimaphila umbellate*) is a small plant typically found growing in drier sandy soils such as white pine habitats.

New Hampshire is home to more than 500 species of vertebrate animals. Many of these animals live in Belmont 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 percent 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 Town of Belmont

Natural Resource Inventory for Belmont, NH

Game Department maintains a list of Endangered or Threatened animal species in New Hampshire, which is shown below. Little information is available relative to their occurrence in Belmont, but their habitats, when identified should be protected.

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>
Peregrin 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>

Natural Resource Inventory for Belmont, NH

Common Name	Scientific Name
BIRDS	
Common loon	<i>Gavia immer</i>
Osprey	<i>Pandion haliaetus</i>
Cooper's hawk	<i>Accipiter cooperii</i>
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).

Wildlife Action Plan (Map #9)

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 broad tools for restoring and maintaining critical habitats and populations of the state's species of concern and their habitat. NH Fish and Game claim it to be a first step on a state-wide scale to work towards helping keep species off 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 conservation priorities throughout the state and at a state-wide level. In Belmont, the area ranked highest in town from this analysis is in the western portion. This includes areas along and adjacent to the Tioga River and flood plain area, where it enters the Winnepesaukee River, north to Silver Lake and further north into Winnisquam Lake.

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

Scenic Resources

With its hilly topography and abundance of gentle slopes, Belmont has many scenic resources. In recent years, development and population growth throughout the state and region have caused people to appreciate the natural scenery New Hampshire has to offer. Due to its conserved land, highlighted by the Town Forest, areas near Sargent Lake, and areas near Durgin Brook (located in the northwestern part of town), Belmont has retained many aesthetic values. Traveling along the roads and trails throughout Belmont, visitors and residents have scenic views of rolling hills, fields, lakes, and town overlooks. From different vantage points the views include landscape scenery dominated by wetlands or waterbodies surrounded by forest. Other examples of Belmont's rolling hill views are found around the remaining agriculture fields and permanent opening areas.

Another means to obtain a view of the landscape is from the air. The abutting town of Laconia has an airport close to Belmont. This offers a unique opportunity for people to fly over the Town for a birds-eye-view. This is a particularly popular view during the fall foliage season. With the large scenic lakes around the Belmont area, there is a great deal of attractive scenery in 'The Lakes Region'.

The following are some of Belmont's scenic vistas identified by the residents and the fieldwork of this project:

- Lake Winnisquam
- Winnepesaukee River
- Tioga floodplains off Rte. 140
- Silver Lake
- The Bean Dam Area
- Belmont Mill
- South Road
- Cotton Hill Road

There are also views towards of the White Mountains from the rolling knolls and hills in Belmont, one of the best being from Cotton Hill Road, which has views of three lakes and Mt. Washington.



A beaver pond enhancing the diversity of habitat.



A beautiful white pine stand with an abrupt boundary at the water's edge.



Rolling hills behind the 4H Riding Ring.



A view overlooking Winnisquam Lake

Conservation Land (See Map #6)

At the time of this study, there are approximately 415 acres of conserved or protected land in Belmont. This makes up only 2% of the available land in Town. **This is a significantly small percentage of land highlighting that these conservation parcels are of great importance to Belmont, especially in the face of the heavy development pressures this Town and its surrounding area has been experiencing.** One group, The Society for the protection of NH Forests, has set a goal to see every NH community conserve or protect at least 25% of their land base by 2025. Town residents have shown interest in expanding their conservation lands and have mapped out four areas as conservation priorities. Three of these areas are large: ranging in size from over 400 acres to almost 1800 acres. **Continuing to explore and work towards obtaining parcels within them for conservation should be a priority.**

The current conservation lands in Belmont are as follows:

- Town Forest (64.8 acres)
- Murray Park (37.0 acres)
- SPNHF CE (12.5 acres)
- Water Tower (6.5 acres)
- Fox Hill Estates (2.8 acres)
- Highcrest (5.7 acres)
- Riverside Estates (21.0 acres)
- Sottach (18.9 acres)
- Badger Glen (1.8 acres)
- Badger Brook Estates-3 lots (64.2 acres)
- Claremont (33.7)
- Upper Parish Settlement-3 lots (77.6 acres)
- Caulfield (6.5 acres)
- Stonington Heights P (19.2 acres)
- Tioga River Wildlife Conservation Area (208 acres)
- Unnamed-7 lots (42.8 acres)



This beaver pond in the Belmont Town Forest is a favorite destination for Belmont residents. This parcel of conservation land provides important recreation opportunities for the community, with a trail network throughout. It also provides important wildlife habitat. A great blue heron, kingfisher, and ducks were observed using this pond during field work for the NRI.

There are several options available to conserve lands in Belmont. One way is through a conservation easement on private land. A conservation easement is a property right that can be bought or sold. It allows property owners to put limitations on their property when an easement is sold, or for another person to set limitations upon the property owner when an easement is purchased. **Promoting landowners in town to conserve and connect smaller parcels into one larger, contiguous area of land for conservation can be a great and important place to start when increasing conservation lands.** This typically is a feasible place to begin because it does not necessarily put pressure on landowners to feel like they must give up extremely large parcels of land. Adding onto already existing conservation lands or working towards connecting nearby parcels is important for wildlife because it will increase the connectivity while decreasing the amount of fragmentation between parcels. Another method of obtaining and conserving land is ownership by the Town.

Cultural Resources

As is the case in most New England towns, Belmont has a rich history of land use changes from its original settlement to current times. Early on farming was a common livelihood throughout much of Town. Most of the land was cleared for croplands and pastures. This way of life is far less common today, but some families in Belmont still maintain working farms as their trade. It has been expressed as an overall goal of the community to preserve this way of life.



Stonewalls, such as this one at the 4H Farm Complex, portray the link between historic and current agricultural culture of Belmont.

Mills and factories along Belmont's waterways, especially the Tioga River, were also a common business in Town for a period of time. Dams were erected throughout Belmont including the Bean Dam, Fellows Mills Dam, Tioga River Dam, Sawyer Lake Dam, Sargent Lake Dam and Badger Pond Dam. Upkeep of dams that are no longer being utilized is time consuming and costly and therefore can be hard to justify. For these reasons many of Belmont's historic dams have been neglected or in some cases breached. For example, the Badger Pond Dam on the Tioga River was removed in 2004 through the aid of New Hampshire Department of Environmental Services and the Dam Bureau's Dam Removal and River Restoration Program. Dams also can have negative effects on the surrounding plant and wildlife communities, especially aquatic species that travel up and down the rivers.

Belmont has worked towards preserving and highlighting some of its historic features. The Belmont Mill was saved from demolition and restored. This building now serves the community as an important service center. The Belmont Historical Society's main project currently is the restoration and preservation of the Province Road Meeting House, built in 1793. The Town also has preserved a historic Indian Mound which lies within Murray Park, a 37 acre parcel of conservation land. Belmont is also home to a state historical marker, the Lochmere Archaeological District, which represents the long and diverse history of human use of the Winnepesaukee River. Purchase of this archaeological site by the State saved the area from development.



During the Country's shift from agriculture to industrialization, mills along Belmont's waterways became a common sight. Many of the dams created for these mills no longer serve a purpose and have either been neglected, like the Bean Dam, or removed completely.

Reference to historic topographic maps, printed historic records, metal detector sweeps, and archeological studies could result in artifacts and a more complete documentation of Belmont's cultural past.

Invasive Plant Species

There is an increase in public awareness and concerns about the rapid growth of invasive species in NH and throughout New England, particularly around water bodies and wetlands. Without counting plantings on people's lawns and gardens, three species were observed and documented during fieldwork for this project: Japanese Knotweed (*Polygonum cuspidatum*), Purple loosestrife (*Lythrum salicaria*), and Common Reed (*Phragmites communis*). There are areas in Belmont where these plants have established themselves in quantities sufficient to be a concern: along portions of Rte. 106 and in the lower floodplain of the Tioga River. It should be noted that this was not an exhaustive search for invasive species. Belmont Conservation Commission members have noted problems with oriental bittersweet (*Celastrus orbiculatus*) and garlic mustard (*Alliaria petiolata*) in Town.

BCC members also note that the invasive, nonnative water milfoil (*Myriophyllum heterophyllum*) is an environmental issue in Silver Lake and Lake Winnisquam. The NH Department of Environmental Services is working to reduce populations of milfoil in all of the lakes throughout the State.

The Town of Belmont may want to consider seeking assistance from the Local Watershed Association(s), Invasive Plant Atlas of New England (IPANE), New England Wildflower Society, and other organizations that have begun programs to control or eradicate

Natural Resource Inventory for Belmont, NH

invasive species. For further information on Invasive Species, and an update of the increasing list of these species, review the IPANE website at nbii-nin.ciesin.columbia.edu/ipane/ipanespecies/ipanespecies.htm.



Purple Loosestrife was observed along Lake Winnisquam, the Tioga River and other areas in Belmont.



Purple Loosestrife is already threatening to choke out these Cardinal flowers.

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
Belmont Town Boundary	20,427.0	31.9	100%
Dense Softwood Cover	631.78.0	1	3.1%
Wetland Complexes (from National Wetland Inventory data)	1,413.0	2.2	6.9%
Hydric Soils (from Natural Resource Conservation Service data)	3,694.0	5.8	18.1%
Wetland Analysis and Fieldwork results	1,847.3	2.9	9.0%
Aquifers	7,586.5	11.9	37.1%
Permanent Opening	1,241.3	1.9	6.0%
Prime Farmland	928.8	1.5	4.5%
Farmland of Statewide Importance	1,077.2	1.7	5.3%
Farmland of Local Importance	9,860.9	15.4	48.3%
Steep slopes – 15% and greater	2,088.8	3.3	10.2%
Steep slopes – 25% and greater	515.5	0.8	2.5%
Conservation Lands	419.3	0.7	2.1%

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 Belmont, available for inclusion in the Master Plan update. It contains a database with a comprehensive, updateable, digital inventory of the entire Town in a compatible format with the existing Belmont GIS. 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 Belmont.

It is anticipated that results from this study will help the Town of Belmont 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 Planning and Select Boards, and the Conservation Commission in foreseeing possible conflicts of future development. This project is intended to serve as a foundation for future studies and events to be integrated and 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. There are several wetland complexes adjacent to brooks and their tributaries, including some large water bodies. 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 additional Prime Wetland Designations.
 - a. An in-depth inventory of vernal pools throughout Belmont would also enable the Planning Board, Conservation Commission, and Select Board to critique and adjust future subdivision proposals if vernal pools are likely to be impacted. Due to the gravelly and sandy soils of Belmont, there is not likely to be an overabundance of vernal pools.
2. Based on the locations and large area (over one third of the Town) with underlying aquifers in Belmont, and the gravelly/sandy nature of the soils, it is important that steps be taken to protect the groundwater, brooks, and aquifers in Belmont. They are:
 - a. Monitor and adjust, if necessary, industrial and sand + gravel activities within the aquifer areas and along waterways
 - b. Implement Best Management Practices (BMPs) within aquifer areas
 - c. Monitor septic system plumes with a focus on parcels adjacent to brooks, wetlands, and aquifers
3. Based on results from this project, there are relatively small pockets of softwood stands scattered throughout Belmont. This suggests that 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 when abutting wetlands and riparian buffers.
4. The Town of Belmont does not have a very large percentage of Conservation Lands within its borders. With only approximately 2.1% of the Town under some sort of land protection, it would behoove Belmont to continue to explore the areas identified in a

Natural Resource Inventory for Belmont, NH

previous study (priority conservation lands), and consider purchase of additional parcels from willing landowners. Belmont should also encourage placement of land into Conservation Easements where possible, once again with willing landowners.

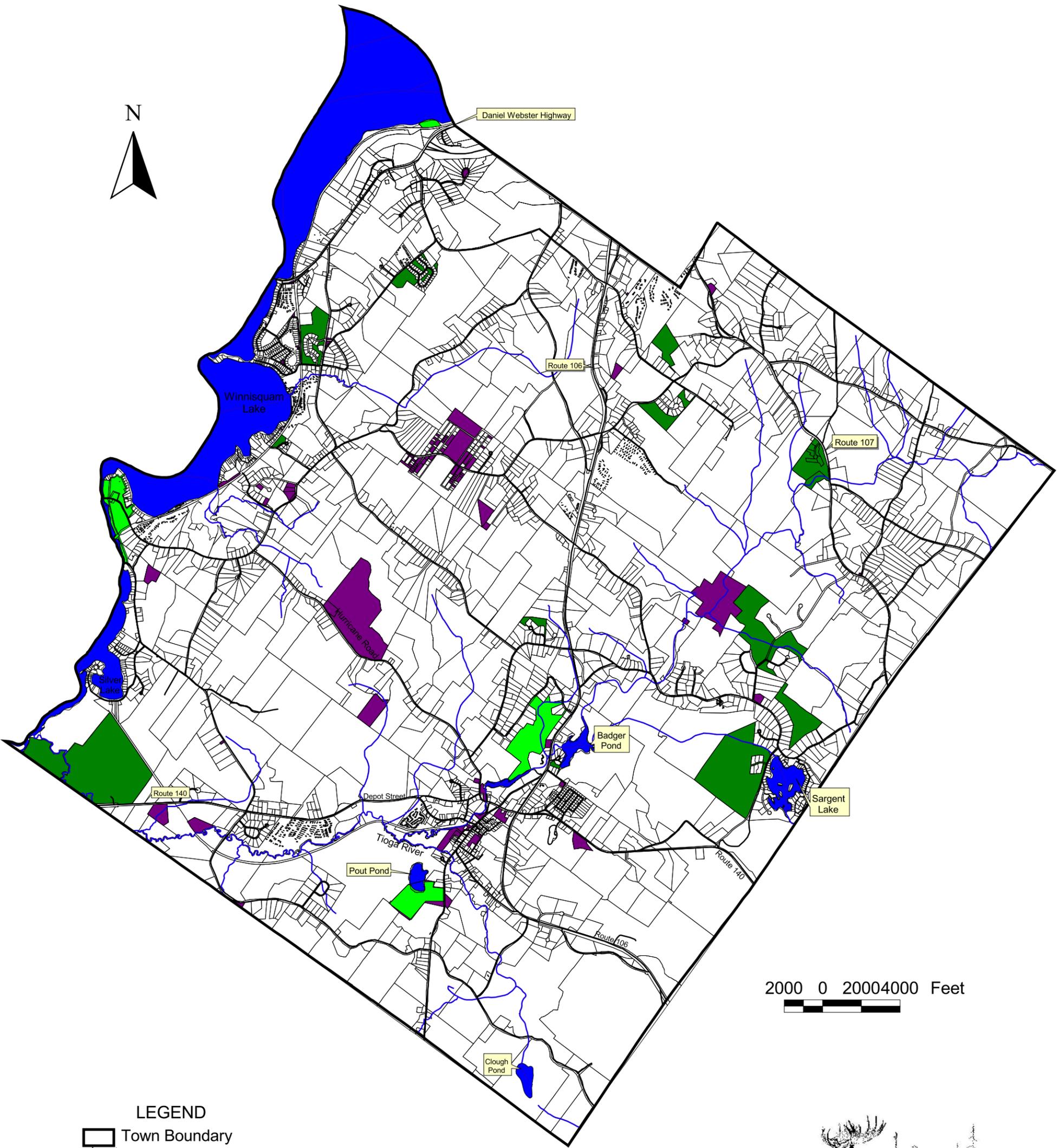
- a. Stewardship planning of these properties is recommended
 - b. Investigating purchasing adjacent parcels to current Conservation Lands would increase and maintain existing travel corridors. It would be beneficial to the Town by maintaining the connectivity of forestlands, wetland complexes, and open space habitat.
 - c. Agricultural land in Belmont under conservation easements would serve a dual purpose. First of all, farmland in NH is continuing to decrease. Conserving these lands will help ensure they are not developed and have the potential to continue to be or revert back to working farms. Secondly, with current movements towards local food production, conservation of these farmlands could benefit Belmont if the trends towards local agriculture and small farms continue in the next decade.
5. 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.
 6. The existing tax map and parcel data currently digitized in NH State Plane, NAD 83 coordinates using AutoCAD software which conforms to other GIS data, provides an excellent tool for planning purposes and the creation of ‘what if’ scenarios. The Town would be wise to continually update these databases and refer to these data at the Planning Board level.
 7. It is hoped that Belmont will continue to work with other organizations and agencies throughout the region to share future data as it becomes available. This will avoid an all-to-common problem of separate entities replicating work. Data generated from NH Fish and Game Department was examined as one part of this NRI. Further, data generated from this project can be shared with surrounding towns and Fish and Game to help refine areas for wildlife habitat enhancement and conservation.

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 on natural resources; promoting a protection plan for the large aquifers under much of the Town, and further identification of land for purchase or easements for protection into the future. Furthermore, the Town 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.

MAPS

- #1. Base Map**
- #2. Water Resources and Wetlands**
- #3. Dense Softwood, Permanent Openings, and Parcels with Gravel Pits**
- #4. Prime and State Farmland and Steep Slopes**
- #5. Poorly and Very Poorly Drained Soils**
- #6. Conservation Land and Current Use Parcels**
- #7. Subwatersheds – Level 12**
- #8. Bedrock Geology**
- #9. Wildlife Action Plan Data**

Belmont Natural Resource Inventory
 Base Map with
 Lakes, Ponds, Rivers, Streams,
 Conservation Land and Town Owned Parcels
 May 2007
 MAP #1



2000 0 2000 4000 Feet

LEGEND

- Town Boundary
- Roads
- Rivers and Streams
- Tax Maps
- Open Water
- GRANIT Conservation Land
- 2004 Conservation Properties
- Town-Owned Parcels



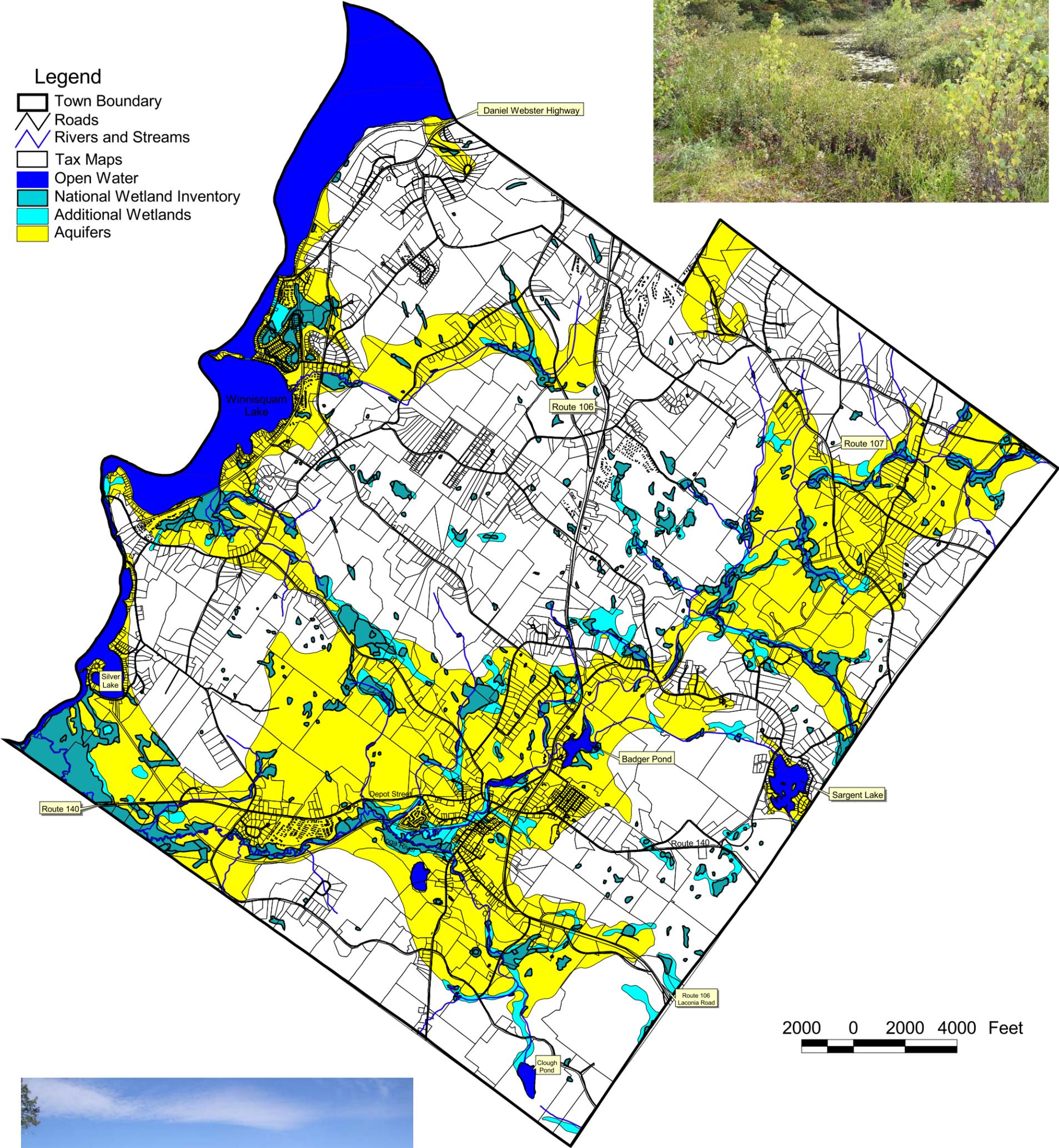
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 (603) 444-0000
www.watershedtowildlife.com

Belmont Natural Resource Inventory
 Water Resources and Wetlands
 May 2007
 MAP #2



Legend

-  Town Boundary
-  Roads
-  Rivers and Streams
-  Tax Maps
-  Open Water
-  National Wetland Inventory
-  Additional Wetlands
-  Aquifers



2000 0 2000 4000 Feet



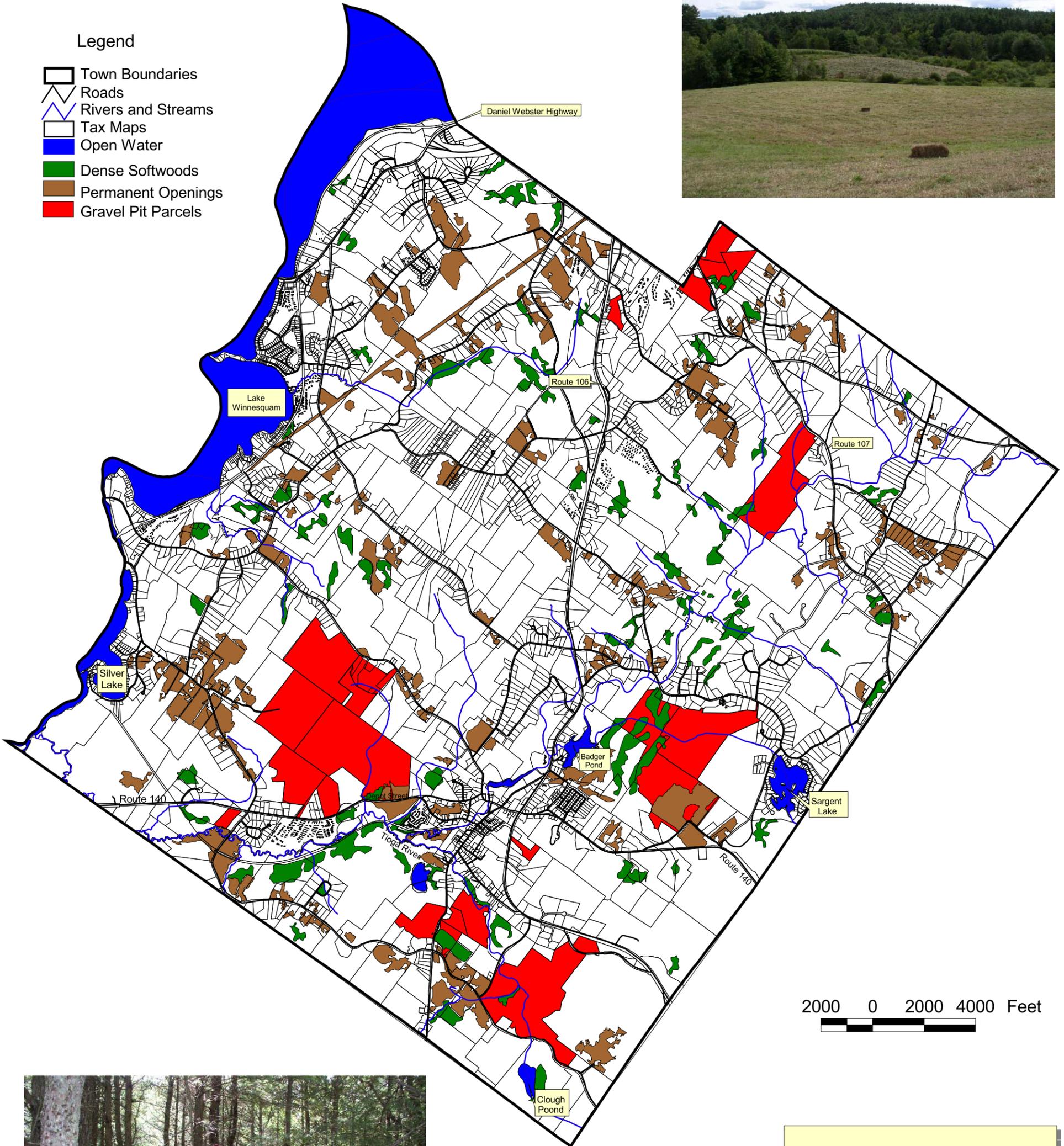

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Belmont Natural Resource Inventory
 Dense Softwoods, Permanent Openings
 Parcels with Gravel Pits
 May 2007
 MAP #3



Legend

-  Town Boundaries
-  Roads
-  Rivers and Streams
-  Tax Maps
-  Open Water
-  Dense Softwoods
-  Permanent Openings
-  Gravel Pit Parcels



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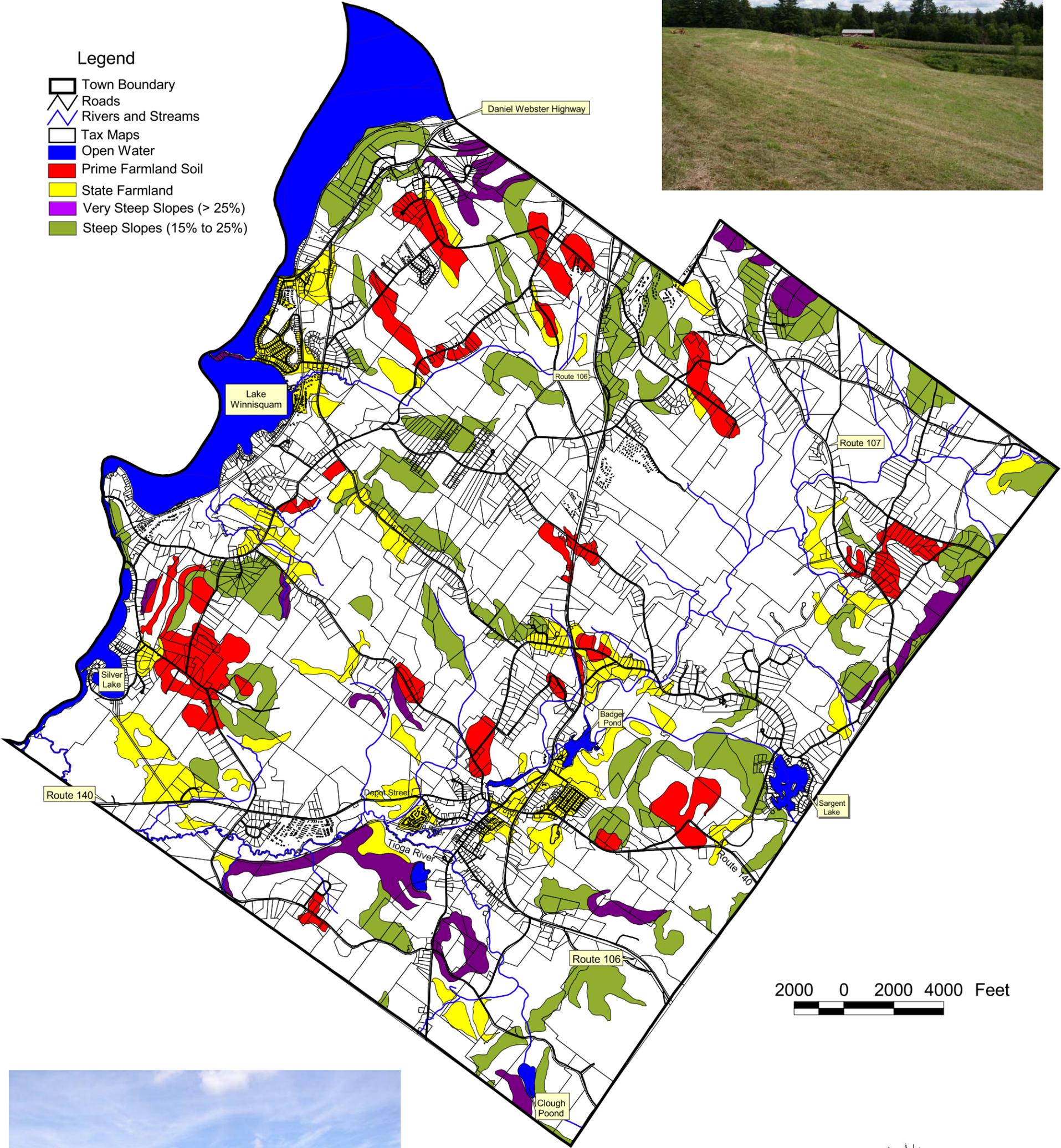


Belmont Natural Resource Inventory
 Prime and State Farmland and Steep Slopes
 May 2007
 MAP #4



Legend

- Town Boundary
- Roads
- Rivers and Streams
- Tax Maps
- Open Water
- Prime Farmland Soil
- State Farmland
- Very Steep Slopes (> 25%)
- Steep Slopes (15% to 25%)



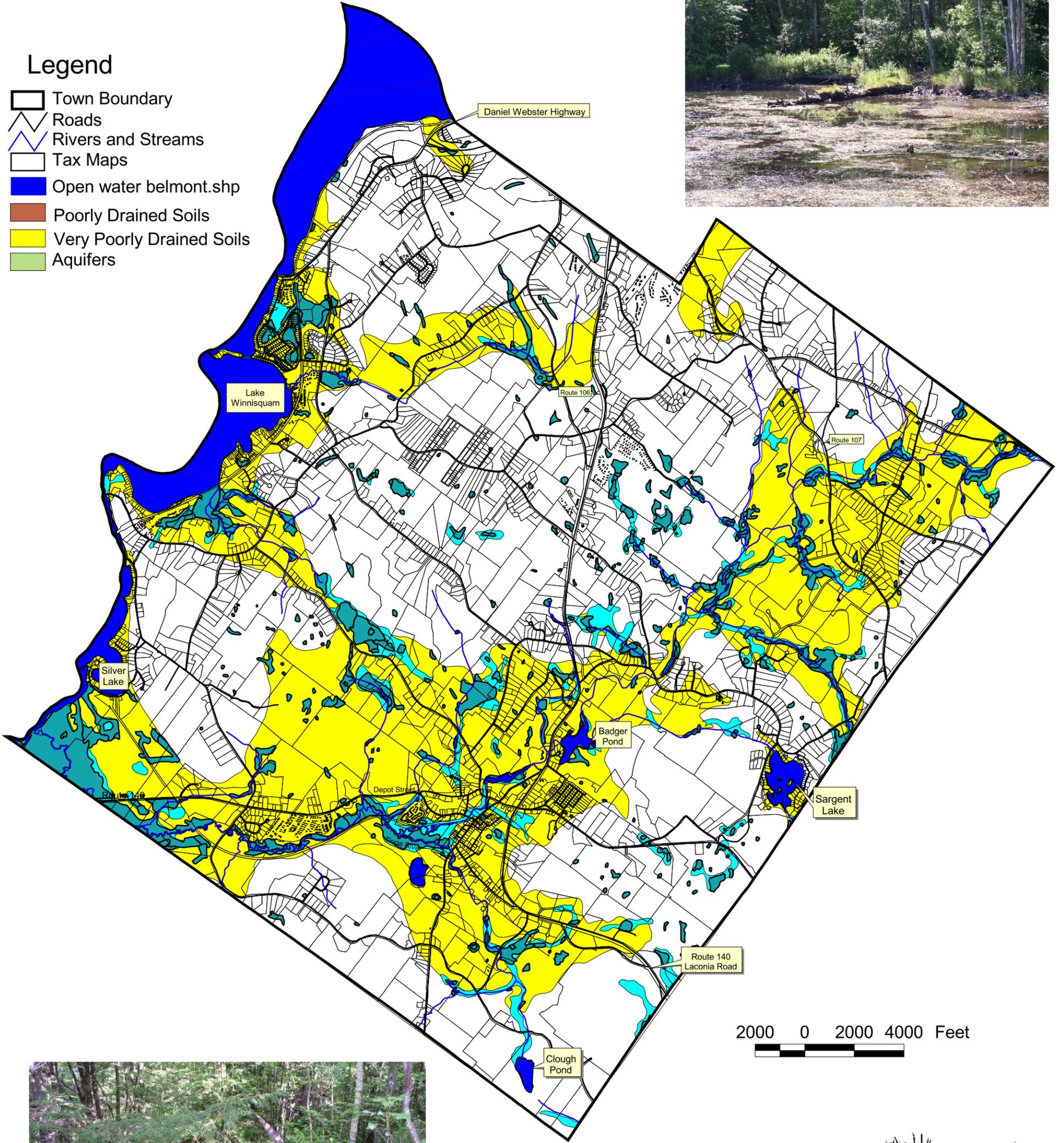
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Belmont Natural Resource Inventory
 Poorly and Very Poorly Drained Soils
 May 2007
 MAP #5



Legend

-  Town Boundary
-  Roads
-  Rivers and Streams
-  Tax Maps
-  Open water belmont.shp
-  Poorly Drained Soils
-  Very Poorly Drained Soils
-  Aquifers

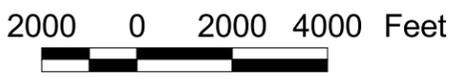
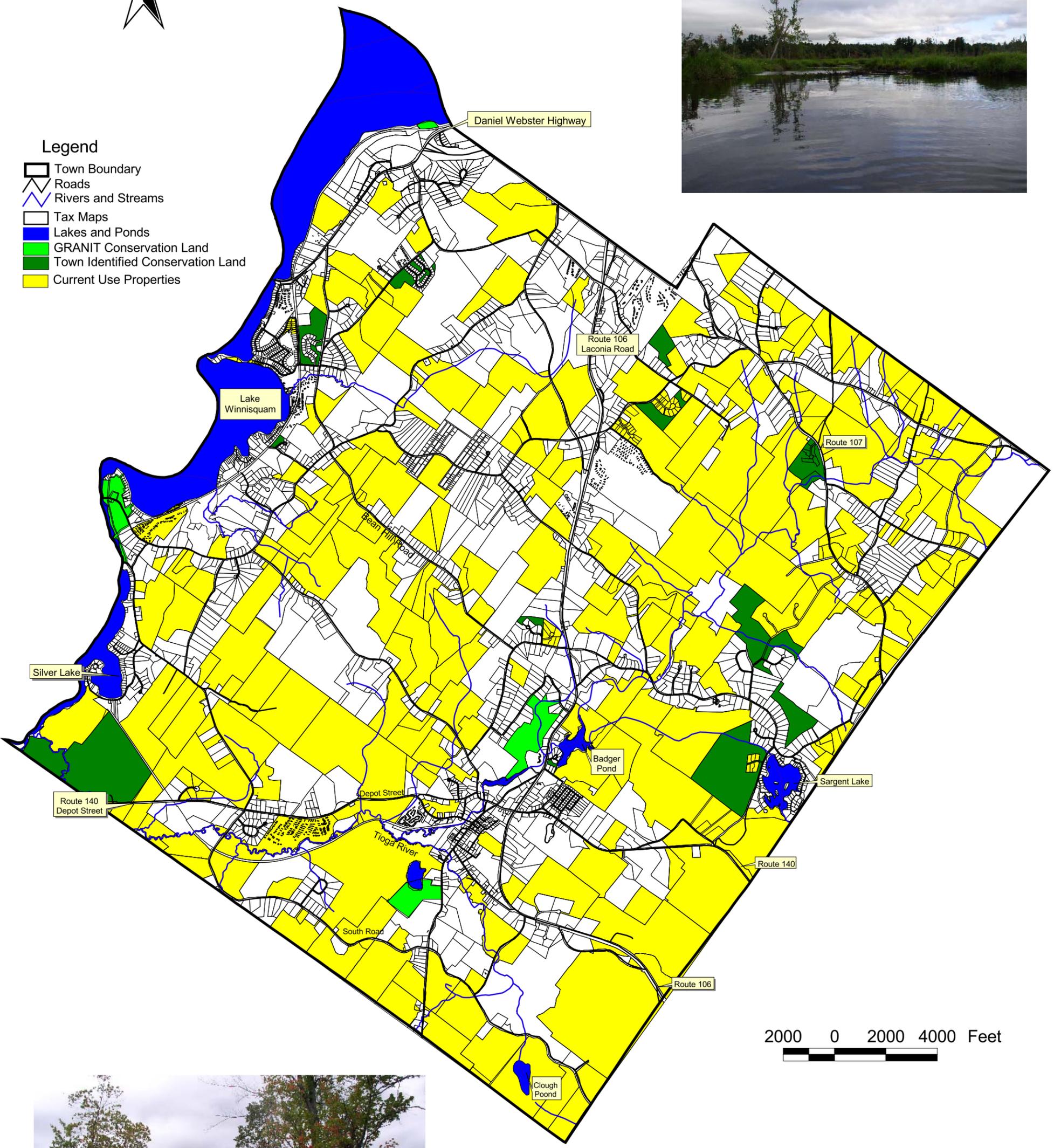


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Belmont Natural Resource Inventory
 Conservation Land and Current Use Lots
 May 2007
 MAP #6



- Legend**
- Town Boundary
 - Roads
 - Rivers and Streams
 - Tax Maps
 - Lakes and Ponds
 - GRANIT Conservation Land
 - Town Identified Conservation Land
 - Current Use Properties



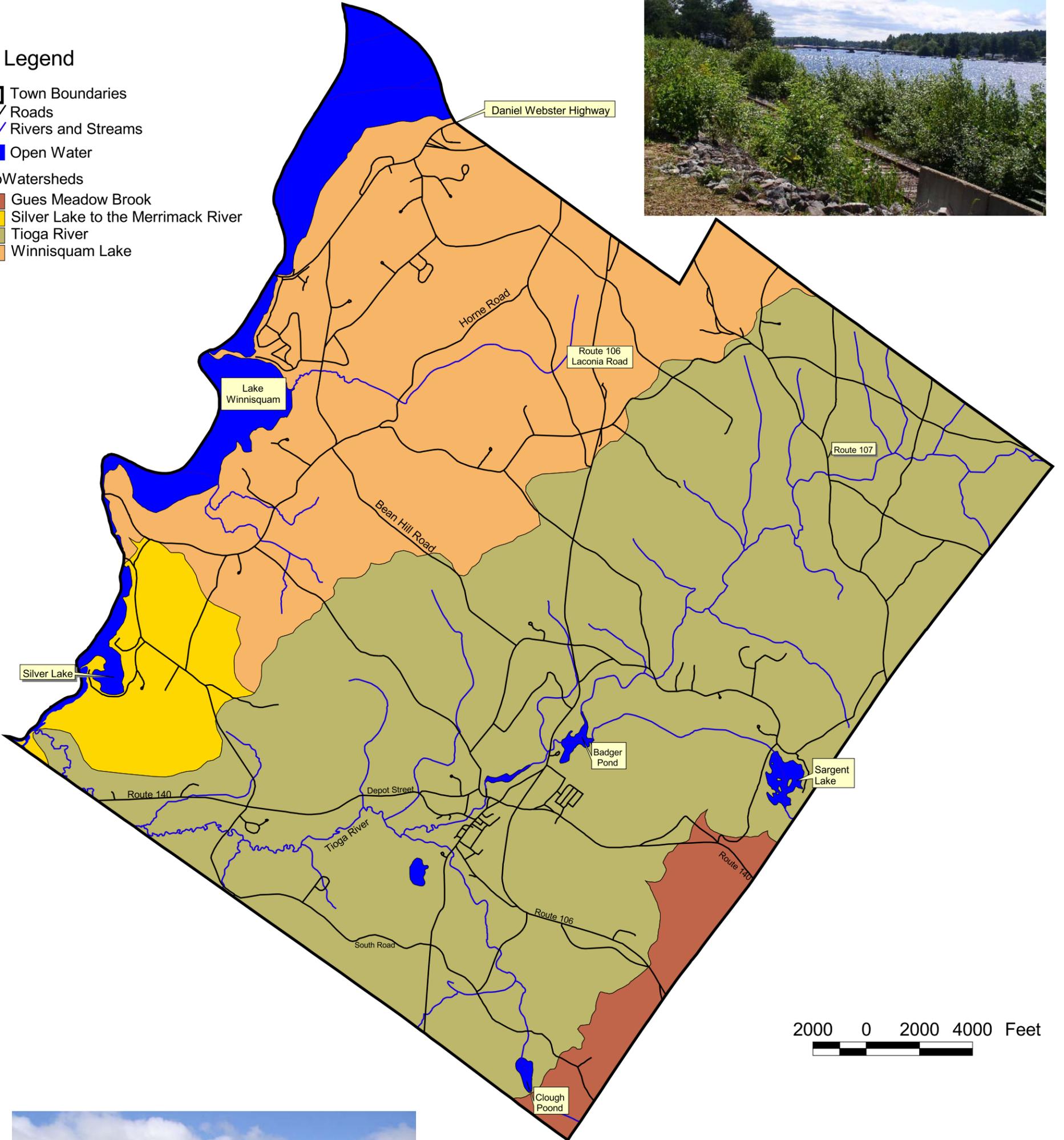
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Belmont Natural Resource Inventory
 Sub-Watersheds
 May 2007
 MAP #7



Legend

-  Town Boundaries
-  Roads
-  Rivers and Streams
-  Open Water
- SubWatersheds
-  Gues Meadow Brook
-  Silver Lake to the Merrimack River
-  Tioga River
-  Winnisquam Lake



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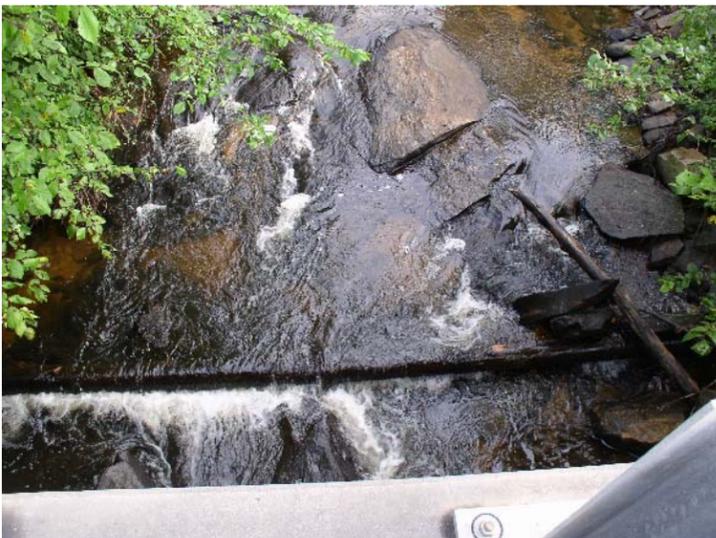
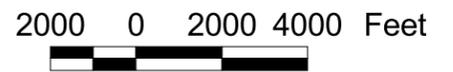
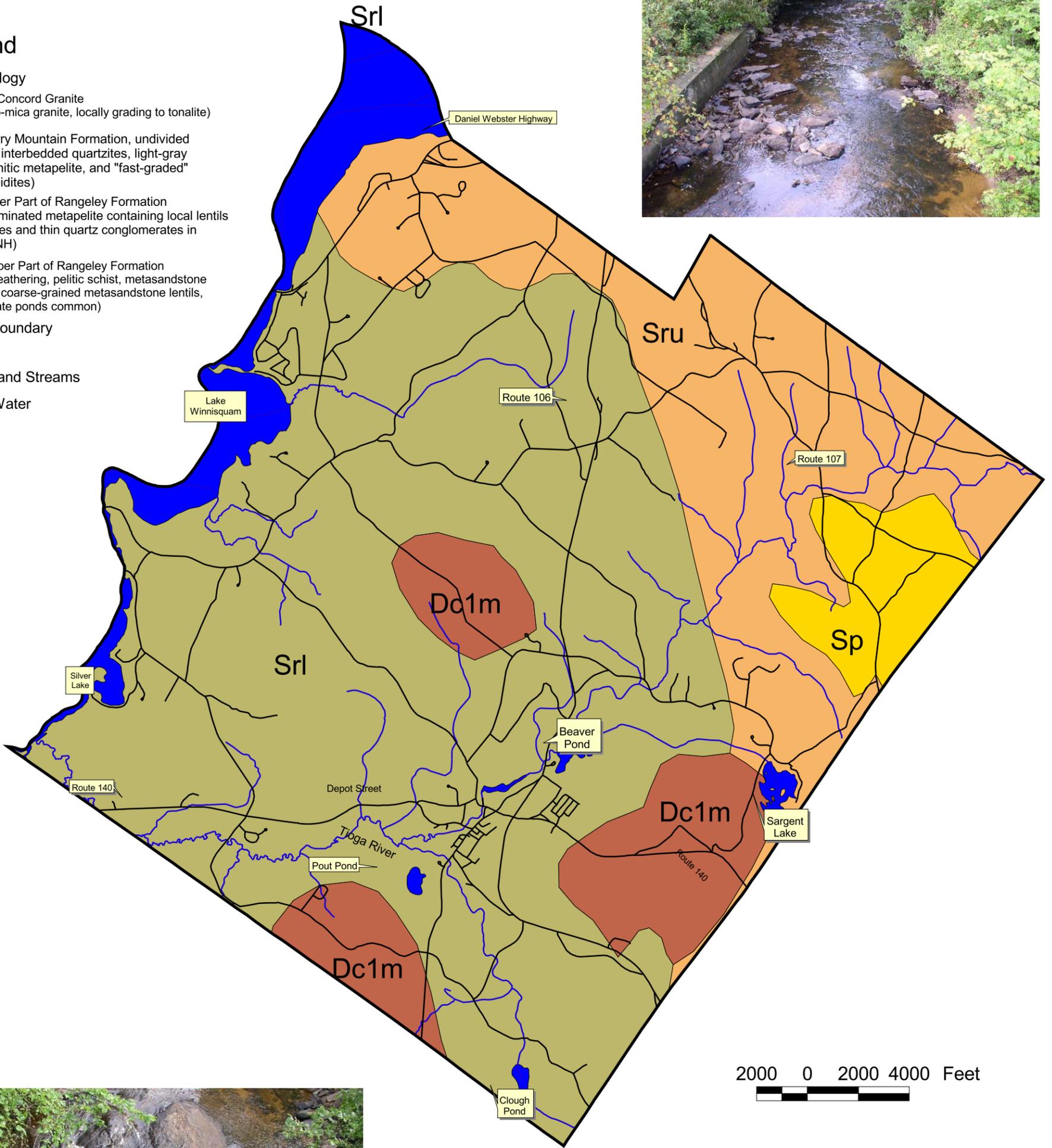
Belmont Natural Resource Inventory
 Bedrock Geology
 May 2007
 MAP #8



Legend

Bedrock Geology

- Dc1m = Concord Granite
(gray two-mica granite, locally grading to tonalite)
- Sp = Perry Mountain Formation, undivided
(Sharply interbedded quartzites, light-gray nongraphitic metapelite, and "fast-graded" metaturbidites)
- Srl = Lower Part of Rangeley Formation
(Thinly laminated metapelite containing local lentils of turbidites and thin quartz conglomerates in western NH)
- Srl = Upper Part of Rangeley Formation
(Rusty-weathering, pelitic schist, metasandstone and local coarse-grained metasandstone lentils, calc-silicate ponds common)
- Town Boundary
- Roads
- Rivers and Streams
- Open Water



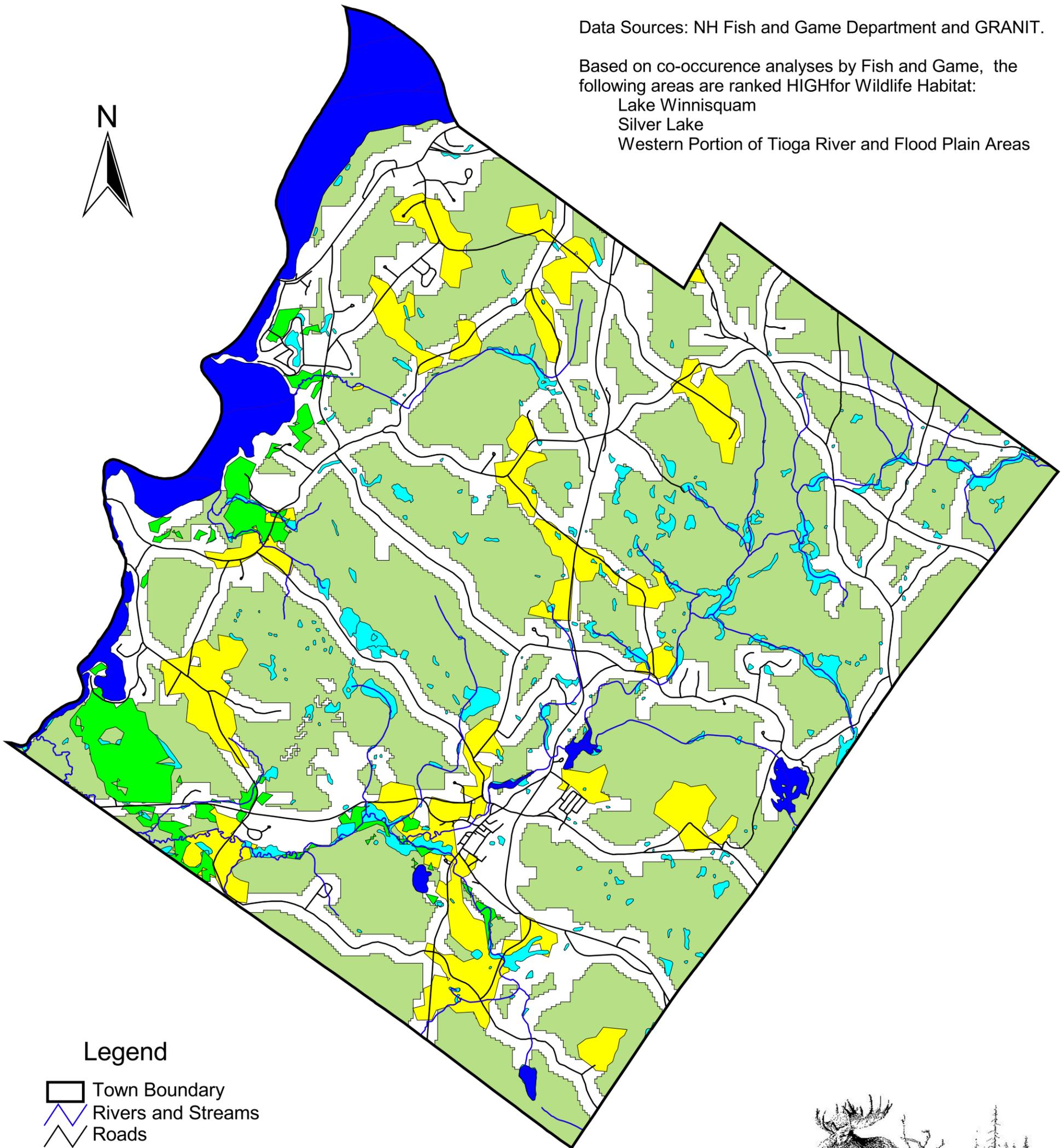
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Belmont Natural Resource Inventory
 Wildlife Action Plan Data
 Wildlife Habitat Types and Unfragmented Land
 May 2007
 Map #9

Data Sources: NH Fish and Game Department and GRANIT.

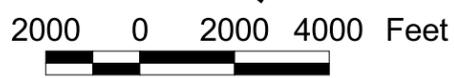
Based on co-occurrence analyses by Fish and Game, the following areas are ranked HIGH for Wildlife Habitat:

- Lake Winnisquam
- Silver Lake
- Western Portion of Tioga River and Flood Plain Areas



Legend

- Town Boundary
- Rivers and Streams
- Roads
- Lakes and Ponds
- Pitch Pine Stands
- Peat Lands
- Marshes
- Grasslands
- Unfragmented Land - Roadless Areas



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