

# **TOWN OF FRANCONIA, NEW HAMPSHIRE**

## **NATURAL RESOURCES INVENTORY**

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## INTRODUCTION AND OBJECTIVES

The Town of Franconia, New Hampshire contains approximately 65.7 square miles (42,048 acres) of total land and 0.1 square miles (640 acres) of inland waters. Out of these 65.7 square miles of land approximately 47.5 square miles are part of the White Mountain National Forest and the Franconia Notch State Park leaving roughly 18.2 square miles (11,633 acres) or 27.7% of the land in Franconia not tied up in Federally and State owned land. This project focuses on the 11,633 acres that are controlled directly by the Town of Franconia. In the 2004 census Franconia had a population of 924 residents ranking 186<sup>th</sup> out of New Hampshire's incorporated cities and towns. Franconia has seen a steady population growth in its recent past, but has been below the statewide average over 3 of the last 5 decades. About half of Franconia's working population commutes to other towns for employment (estimated at 55%) such as Littleton and Lincoln.

Franconia was incorporated in 1772 as Morrystown. Previous to that it was first granted as Indian Head in 1764. In 1782 the Town received its current name of Franconia, many believe, because of its resemblance to the Franconian Alps in Germany. In the year of the first census (1790) 72 residents were recorded living in Franconia. During the time of Franconia's settlement, as was true for much of New Hampshire, farming and logging were common landuse practices. However the driving industry causing the Town's initial growth was iron production. This industry flourished during the first half of the 19<sup>th</sup> century, but all production had halted by the end of the century. These industries caused a great deal of land clearing, as occurred in much of New England during this era. Nonetheless the majority of Franconia has returned to forest with limited remaining open fields.

The majority of Franconia's business currently is centered on tourism. Franconia is very scenic with numerous outdoor recreation opportunities. Encompassing portions of the White Mountains, vast forested lands, and waterbodies such as Echo and Profile Lakes, the Gale and Pemigewasset Rivers, Meadow Brook, and the Ham Branch, hiking, swimming, fishing, boating (dominantly kayaking and canoeing), hunting, rock and ice climbing, bicycling, skiing (alpine and nordic), snowmobiling, snowshoeing, and scenic viewing opportunities exist. The WMNF and Franconia Notch State Park also draw people to Franconia. Within these two areas are natural attractions such as the Flume, the Basin and Cascades, Cannon Cliffs, Cannon Mountain Aerial Tramway and Ski Area, Echo and Profile Lakes, the Old Man of the Mountain Historic Site, and a portion of the Appalachian Trail. Other attractions that exist in Town are the Robert Frost Museum, New England Ski Museum, the Franconia Historical Museum, and the Abbie Greenleaf Library (the building is on the National Historic Register). To account for these recreational opportunities and attractions, much of Franconia's businesses are designed to cater to the tourism industry. Over a dozen lodging facilities from Hotels to Bed & Breakfasts operate in Franconia along with four restaurants, and seven stores. In spite of this constant influx of visitors, Franconia has managed to retain its rural small town charm.

Franconia contains a wide variety of ecological habitats due to the great diversity in its landscape. A range of habitat types and natural communities were observed such as, steep slopes, forested mountainsides and valleys, regenerating clear-cuts, riparian habitat, and various wetland complexes. Most of the land in Franconia, that is not part of the residential and commercial areas, is forested. Only a small acreage of land is currently farmed and few permanent openings exist. Franconia's drier sandier soils allow for a significant amount of white and red pine and oak and beech stands, but do not accommodate for a large amount of wetlands.



Over half of Franconia's Land (72%) is owned by the State and Federal Governments (Franconia Notch State Park and the White Mountain National Forest). These lands aid in promoting Franconia's important tourism industry.

The largest river in Franconia is the Gale River, which flows across the northern half of Town, including the downtown area. The Ham Branch is another significant river in Franconia flowing along Route 116 and emptying into the Gale River. The Town contains a large amount of other smaller mountain streams and brooks that empty into these two larger systems, but there are no major bodies of water outside of the State and Federal lands. Numerous wetland and riparian habitats occur along the Town's watercourses, but they do not make up a large percentage of the land cover.

The Town contains an abundance of scenic vistas and conservation land. As mentioned before, well over half of the land in Franconia is Federal and State conservation land. Outside of these areas Franconia has eight additional parcels of conservation land. Scenic vistas can be found at almost any location within Town. Views of the area's mountains, rivers, wetlands, and other scenic natural resources are available from most of Franconia's roads and hiking trails.

Due to this abundance of scenic beauty and recreation opportunities more and more people are looking to build homes in and around Franconia. The Town's hillsides and ridgelines are becoming popular locations for these developments because of the views they offer. This ongoing issue will need to be addressed in the near future, with careful planning focused on natural resources to maintain the Town's unique characteristics and rural environment.

This project provides a base Natural Resource Inventory (NRI) with digital data that can be integrated with the existing Franconia GIS database, other studies, and future data. Newly digitized data from this project, such as permanent openings and dense softwood cover, is in NH

## Natural Resource Inventory for Franconia, NH

State Plane Coordinates, North American Datum (NAD) 83, and compatible with existing Franconia GIS data.



Higher elevation developments are beginning to become common practice in Franconia. The Town's spectacular views and drier soils make its hillsides popular building sites. Throughout Town, houses are dotting the scenic hillsides and the pressures to build are sure to continue increasing.

One of the goals of this project is to provide inventory, management recommendations, and planning tools for the Town through incorporation into a Master Plan update. Another goal of the project is to integrate all existing data for Franconia, with new 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 Franconia with new accurate, standardized coverages that will integrate with the Town's future GIS coverages.
2. Incorporate natural resource features, scenic vistas, historic resources 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.

## METHODS

Franconia’s Planning Board (FPB) chair, Bernadette Costa, 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; she also participated on one of the fieldwork days. Lib Welch, a Franconia Conservation Commissioner, assisted with landowner contact and permission for fieldwork sites.

It is important to note that for this Natural Resource Inventory, the Town determined that the White Mountain National Forest and Franconia Notch State Park were considered to be adequately protected and were not included in this project. These areas comprise approximately 30,415 acres of Franconia, or 72.3% of the Town. Most, if not all of the GIS analysis and resultant acreage and percentages derived from this report reflect this and do not include these lands.

### ***Field Work***

Fieldwork was conducted, first to get an overall view of Franconia and secondly with a focus on previously identified target areas. This work included inventories and assessments on several wetland complexes, beaver ponds, portions of the Gale 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 Franconia and was delivered on CD-ROM(s) with hardcopy formats where appropriate.

### ***Gather Existing Digital Data***

Existing maps and data for the Town of Franconia were collected. The Town has some digital data including parcel data, commonly known as Tax Maps. 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**

<b>Data</b>	<b>Source</b>	<b>Ratio</b>	<b>Scale</b>	<b>National Mapping Standard Accuracy</b>
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

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<b>Data</b>	<b>Source</b>	<b>Ratio</b>	<b>Scale</b>	<b>National Mapping Standard Accuracy</b>
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
GPS Points	Garmin III plus	N/A	N/A	Generally within 30' but dependent upon satellite availability, PDOP <sup>1</sup> , 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 Franconia 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

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<sup>1</sup> PDOP stands for Positional Dilution of Precision. It is a figure describing the geometrical configuration of satellites in the sky. When visible satellites are close together in the sky, the geometry is said to be weak and the DOP value is high; when far apart, the geometry is strong and the DOP value is low. Thus a low DOP value represents a better GPS positional accuracy due to the wider angular separation between the satellites used to calculate a GPS unit's position.

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include: permanent openings, dense softwood stands, and field verified wetlands. Potentially significant wildlife habitat areas were noted.

Wetlands were reviewed and analyzed using the DOQs, National Wetland Inventory (NWI), and 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 hydrophytic<sup>2</sup> vegetation. When soils maps alone are used, they could potentially over-estimate the number of wetlands throughout the Town. This is particularly true given that up to 35% of a soil classification can be inclusions (for example, upland areas within NRCS hydric soil units or wetland areas within NRCS upland units). On the other hand, examining the NWI data alone would under-represent the number of wetlands, due to the U.S. Fish and Wildlife Service's method of using aerial photography to identify wetlands. Open water, emergent, and scrub-shrub wetlands can readily be identified using aerial photography alone, but forested wetlands are often missed. Some types of wetland delineations require extensive fieldwork 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 Franconia were determined using the NRCS soils map data. Data was displayed in ArcView and queried so only those soils classified as important farmland was 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 Grafton 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

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<sup>2</sup> 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

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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, forbs<sup>3</sup>, 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 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 Franconia 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 will be conducted in April, 2007 as part of this project for Select Board, Planning Board, Library, and Conservation Commission members that had an interest in providing GIS access for the Town of Franconia. Future training will be 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 on March 27, 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.

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<sup>3</sup> A Forb is a non-wooded, broad-leaved plant other than a grass, especially one growing in a field or meadow.

## RESULTS

### ***Rivers, Streams, and Large Waterbodies***

Franconia contains about 0.1 square miles of inland waters. The Town's two largest waterbodies, Echo Lake and Profile Lake, both lie within the Franconia Notch State Park and are protected. Echo Lake's cool water temperatures and State operated beach make it a popular swimming spot. Profile Lake is a unique waterbody with excellent access for anglers and is a popular fly fishing spot, heavily stocked with trout by the New Hampshire Fish & Game Department. Garfield Pond and Eagles Lake are in the White Mountain National Forest, also protected from development, as are several other small unnamed waterbodies. A few wetland complexes contain small unnamed ponds, but as a whole, Franconia contains a modest number of small waterbodies.

Franconia contains many small streams which are the headwaters to larger rivers including the Gale River, Upper Pemigewasset River, the East Branch Pemigewasset River, and Ammonoosuc River. The Gale River is the largest river or stream in Franconia and is also a public Drinking Water Supply for the Towns of Littleton and Bethlehem. Many of the streams and brooks in Franconia are named, including many of the tributaries, but there are also many unnamed small streams and brooks. Please refer to the chart below and the Subwatershed Map at the end of the report for a better understanding of the network of flowing waters in Franconia.

River	Stream/Brook ← Flowing into	Named tributaries ← Flowing into	Number of unnamed ← Flowing into
Gale River	North Branch Gale	Unnamed	8
	South Branch Gale	Thompson Brook	2
		Spruce Brook Burnt Brook Scarface Brook Coppermine Brook	9
	Ham Branch Wiseman Brook Unnamed Meadow Brook	Unnamed Beaver Brook Lafayette Brook	3 Black Brook 2-Jordan Brook & Shookumchuck 1
Ammonoosuc River	Unnamed	Unnamed	2
Upper Pemigewasset River	Dry Brook Walker Brook	Unnamed	2
East Branch Pemigewasset River	Franconia Branch	Lincoln Brook Twin Brook Redrock Brook Hellgate Brook	21

Franconia's running water system flows in all directions, north, south, east and west, dependent on topography and aspect, reflective of its rugged terrain. These cold water systems are generally pristine with little to no turbidity, and very picturesque. With a few exceptions, water bodies and streams are well buffered with excellent riparian corridors.

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A portion of the Gale River in the northern Franconia. In many cases riparian buffers continue for 1,000 feet and more providing high water quality and excellent wildlife travel corridors.



One of many small unnamed perennial streams found throughout Franconia.

## ***Riparian Habitat***

With miles of streams, brooks, and rivers, Franconia contains the characteristics to provide a significant amount of excellent riparian habitat. There are over 127 miles of rivers and streams flowing through the Town and just over 544 acres of wetlands creating great opportunities for large amounts of adjacent riparian habitat. Franconia contains several riparian habitat types including floodplain forests, scrub-shrub, grasslands, and meadows, with a majority of forested zones.



This photograph illustrates riparian habitat providing edge, grassland, and aquatic habitat along with excellent cover for a multitude of wildlife species. There was fresh beaver activities observed in this area.

Riparian lands are an extremely significant and beneficial habitat type. These habitats are the plant and wildlife communities that 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 terrestrial and aquatic habitats. Riparian lands are rich in bird species; songbirds, raptors, ducks, herons, and others are commonly found utilizing the scrub-shrub, grasslands, meadows, and forests that make up these areas. Aquatic and terrestrial mammals such as muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), river otter (*Lutra canadensis*) and other weasel species, moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), raccoons (*Procyon lotor*), bats, red (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and many others also rely heavily upon these habitats. Riparian areas provide important birthing, mating, feeding, and resting sites for these species. They are also commonly used as travel corridors. In many cases wildlife species may not linger within these habitats, but they are a relatively well protected mode for travel linking various uplands.

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A specific riparian habitat type is floodplain forests which are relatively narrow strips of land in much of Franconia. Floodplain forests are also found near ponded waters along some of the wetland complexes, particularly in western portions of Franconia. 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. In general, forested floodplains exhibit greater species richness and support a greater diversity of wildlife. Migratory and breeding bird populations associated with floodplain forests include downy (*Picoides pubescens*) and hairy woodpeckers (*P. villosus*), American robins (*Turdus migratorius*), gray catbirds (*Dumetella carolinensis*), warbling vireos (*Vireo gilvus*), and song sparrows (*Melospiza melodia*). Eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula lutea*), maple (*Acer spp.*), spruce (*Picea spp.*) and balsam fir (*Abies balsamea*) are abundant along the Franconia drainage network, and are dominant tree species in much of the riparian zone.



This thick, rich floodplain forest is situated near the Profile Golf course along Black Brook, a tributary of Beaver Brook. These habitats are important offering unique conditions for many species of wildlife.

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 that the constant moving water and flooding situations could potentially cause. By reducing erosion, relative stream bank stabilization and sedimentation are controlled. Riparian habitats also slow and hold floodwaters reducing far reaching damage and can work as a filtration system removing nutrients and toxicants from the water (an example of this is road salt and sand). Riparian vegetation can also provide habitat structure to aquatic systems through dead or broken limbs (or sometimes whole trees) that fall into the water.



As this photograph shows, even small trees provide significant amounts of shade allowing the stream to maintain cooler water temperatures.

For all these reasons and more, conserving riparian areas is a vital part of conserving Franconia's natural resources. In Franconia's case there have been some areas of significant development, particularly along Rte. 18, and as a result, a reduction in riparian habitats for some aquatic systems has occurred; yet the riparian habitats as a whole are still relatively intact.

### ***Wetlands***

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



This bog wetland is a unique wetland type observed in Franconia. It is a relatively small part of a large wetland complex, dominated by forested wetland, which lies along Route 116 just north of the Franconia Airport. This wetland represents the diversity commonly found within wetland complexes. This opening is dominated by grasses, such as cotton grass, blue-flag, heaths, such as sheep laurel, and sphagnum mats. This opening provides a unique habitat for plant and wildlife species when compared to the surrounding spruce, fir, tamarack, and birch forested wetland.

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

Along with providing important plant, wildlife, and fish habitat, wetlands are also an important protector of water sources. Due to the hydrophytic vegetation and mucky hydric soils wetlands are able to store significant amounts flood/run-off water minimizing serious damage in times of high water. They are also important contributors to groundwater recharge. This ability to retain water allows wetlands to act as a filtration source. As moving water is slowed and

stored in wetlands, suspended sediments and particles settle to the mucky substrate and plant roots are given a chance to absorb excess nutrients and toxicants. These functions make wetlands an important source in maintaining the health of our aquatic systems.



This vernal pool located at the base of a steep hillside (to the left) and in the floodplains of the Gale River, extends a couple hundred feet along the River.

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, 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
- Severe weather changes – an increase in rain will increase the wetland area, whereas a drought may diminish the area

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- The cyclic movements of beaver as hardwood saplings regenerate in early succession. In Franconia there is abundant sign of beaver activities in most of the wetland complexes, large waterbodies, and streams
- Human activities such as logging and landscape alteration can dredge out wetland areas or increase the amount of runoff into wetlands



Though beavers are not currently active in this section of the large wetland complex along Route 142 near the Franconia-Bethlehem town line, their impact is long lasting. The amount of open water is now less than when the beavers were living in this pond, and currently eutrophication is occurring, which is allowing plant communities common to wet meadows to become dominant. Moose, deer, muskrat, bear, and duck activity was observed in and around this area.

New Hampshire requires that three parameters be met when identifying and delineating wetlands; hydrophytic vegetation (vegetation adapted for growing in saturated conditions), hydric soils (very poorly and poorly drained soils), and sufficient hydrology. The United States Fish and Wildlife Service, through mapping techniques, have developed National Wetland Inventory (NWI) data. This data represents the location, size, and types of wetlands throughout the country. NWI data is an extremely helpful tool, but generally tends to under represent the size and number of wetlands that actually exist. The NRCS hydric soils data is another excellent tool for identifying wetlands, but this source tends to over represent the number and size of wetlands in an area. In Franconia, for example, NWI data indicates there are 291 acres of wetlands while NRCS hydric soils data indicates there are 1,805 acres. Through the use of NWI, NRCS hydric soils data, and field observations approximately 544 acres of wetlands are documented in Franconia. This makes up only 4.7% of the 11,633 acres of land in Town.

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Despite the low percentage of wetlands in Franconia there is still a significant amount of diversity within the existing wetlands. NWI data describes numerous types of ponded, emergent, shrub-shrub, forested, and riverine wetlands. Franconia contains a significant amount of drier sandier soils and a very large amount of steep slopes reducing the Town's potential for containing high amounts of large wetlands. These conditions make Franconia's existing wetlands a very important natural resource for the Town to work towards conserving.



This small spruce/fir forested sphagnum wetland provides unique habitat and important functions of water retention and filtration to the surrounding area. Adjacent to this wetland on one side is a much larger scrub-shrub wetland with areas of open water while the opposite side is an upland sandy soiled regenerating forest. Forested wetlands such as this one tend to be overlooked by NWI data and field observation is needed for their documentation.

The 544 acres of wetlands probably under represents the actual amount of wetlands. This project was not designed to focus solely on wetlands; therefore complete field delineation of all the wetlands present in Franconia was not conducted. Nine potential wetlands were observed in the field where at least 2 of the required New Hampshire wetland parameters were met, but could not be included in the Town's wetlands acreage because they were not field delineated. Their locations are provided to the Town through map and GPS locations. Most of these potential wetlands are forested hillside wetlands making them difficult to verify and delineate through mapping techniques without extensive fieldwork. These hillside wetlands play an important ecological role, because of the functions they provide for the waterbodies, wetlands, and communities that exist in the adjacent valleys below. They are important wetlands for Franconia to be aware of due to the increasing amount of residential development occurring on the Town's hillsides. Future field determinations will be necessary to accurately delineate all wetlands in the town. These can be incorporated over time with additional field verification.



Hillside forested wetlands, as this one below Ridge Road, are an important natural resource in Franconia.

Due to Franconia's mountainous topography and large areas of drier sandier soils, large expansive wetland complexes are not common. Even small wetlands are still important sources of water retention, filtration and wildlife habitat. These wetlands are often found along the hillsides which are currently in high demand for residential development sites. Future field verification should be considered to assess and delineate their locations.

### ***Permanent Openings***

Permanent openings tend to be taken for granted when evaluating and managing habitat for plant and wildlife species, in part because historically they were such a common feature throughout the landscape. As farming was found to be more productive in areas such as the mid-west, it became less common in Northern New England. As a result, most of New Hampshire has experienced a loss of working farms. This is not the case in the eastern portion of Franconia where the rugged terrain of Franconia Notch and the White Mountain National Forest lands never experienced the effects of the agricultural era. The western portion of Franconia with its flatter terrain had several farms. There are some remaining agricultural practices, commercial crops and equine, but on a small scale involving less of the potential farmland acreage in Town. This overall loss of working farms has caused a significant decrease in the percentage of non-developed, permanent openings over the past 50 years, and biologists in New Hampshire are encouraging landowners to create or maintain permanent openings as important wildlife habitat.

Permanent openings are dominated by grasses, forbs, wild flowers, brambles and/or fruiting shrubs. It is estimated that they provide required habitat for about 22% of New England's wildlife species and are seasonally important for nearly 70% of species. Insects are not accurately incorporated into these figures, but a large number of these species occupy or utilize openings. White-tailed deer, black bears, rodent species, such as deer mice (*Peromyscus maniculatus*) and woodchucks (*Marmota monax*), commonly feed on the vegetation present in these habitats, and carnivores from weasels to coyotes in turn feed on these species. Permanent openings are heavily used by bird species as feeding and nesting sites, including the eastern bluebird (*Sialia sialis*) and northern harrier (*Circus cyaneus*), both species of concern in New Hampshire. They also create important edge habitat utilized by many species. Wherever an

## Natural Resource Inventory for Franconia, NH

open area meets the forest, the area of transition will attract the largest diversity of species, both plant and animal. Generally, there will be species adapted to permanent openings, those adapted to forested habitat, and those who specialize in the transition zone area, who will frequent these edge habitats. For example, many bird species that feed in openings are known to frequently nest within the edge habitat because there is typically more structural diversity and cover.



With the decline of agricultural practices in Franconia and throughout all of New England, large open fields such as this one off of Route 116 are in short supply. These permanent openings are a frequently utilized habitat type by an assortment of plant and wildlife species and biologist are encouraging landowners to create and maintain them.

As previously stated, there are very few working farms in Franconia today. Most of the larger permanent openings are found as remnants of former dairy farms. In a few cases, hayfields continue to be maintained. Agricultural fields are not the only source of permanent openings in Franconia. Two non-traditional areas in Town that provide open habitat are the Franconia Airport (about 23 acres), and the Profile Golf Course (about 31 acres). Both areas provide the characteristics of an open area and are surrounded by forested and wetland habitats, making them attractive for a diversity of wildlife species. Currently Franconia has about 543 acres of permanent openings which make up 4.7% of the Town's landscape. This percentage is less than New Hampshire's State average of 10% for permanent openings. A total of 104 different openings were documented during this project ranging in size from less than  $\frac{1}{4}$  of an acre to just under 61 acres in size. Diversity in sizes is a good feature to maintain in permanent openings because varying sizes are preferred by different species. For example, northern harriers prefer larger openings while feeding, yet snowshoe hare (*Lepus americanus*) are more likely to feed in smaller openings where cover is more readily available. There are other permanent openings throughout Franconia that are too small to be mapped into the Town's overall acreage of

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permanent openings, such as lawns near homes and seeded woods roads. These openings, especially those in more isolated parts of Town are still important habitat and help maintain Franconia's plant and wildlife diversity. A goal to retain, and ideally increase, permanent openings would be beneficial to the diversity of wildlife and vegetation throughout the Town.



Fruiting shrubs and trees, such as apple trees, along with various forbs and grasses are commonly found in and along permanent openings. These provide important and unique food sources for a wide variety of wildlife species that are not as plentiful in other habitat types.



This clover dominant opening along the fire pond on Aspen Road is a small area, but is still an important feature in the landscape for plants and wildlife.

## **Forested Lands**

Roughly 90% of the 11,633 acres of land in Franconia is forested lands, (not including the almost completely forested WMNF and Franconia Notch State Park). The remaining 10% 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 Franconia's forests, but is not one of the larger businesses in Town. Common tree species that make up these forested lands are white pine (*Pinus strobes*), eastern hemlock (*Tsuga canadensis*), red oak (*Quercus rubra*), yellow birch, white birch (*Betula papyrifera*), red maple, sugar maple (*Acer saccharum*), american beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), poplar (*Populus spp.*), red spruce (*Picea rubens*), american basswood (*Tilia americana*), and balsam fir.



This grove of eastern hemlock was crisscrossed with numerous well worn wildlife trails.

Forested areas include hardwood stands, softwood stands, and mixed hardwood and softwood stands. Just over 1,488 acres of forested land, approximately 12.8% of Franconia's land mass, are dense softwood stands. These stands range in size from an acre to about 65 acres. Most of these stands are small, averaging between 10-15 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 (*Tamiasciurus hudsonicus*), snowshoe hares, ruffed grouse (*Bonasa umbellus*), and white-tailed deer are often found utilizing them during the winter months. White-tailed deer are not well adapted for traveling in deep snow conditions and hence require dense softwood stands in order to survive New Hampshire's harsher winters. When they congregate in these stands they are referred to as winter deer yards. For the stand to be considered a deer yard two basic elements must be met: (1) A core area is identified by

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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 is an important part of conserving the entire State's natural resources. Even though Franconia does not contain a large amount of dense softwood stands there is a significant amount of spruce and balsam fir with some eastern hemlock thriving throughout the entire Town. With proper management Franconia has the potential to significantly increase its amount of potential winter deer yards.



Large cavity trees like the one in this photograph are used by a variety of wildlife species and should be integrated whenever possible to increase a forest's habitat diversity.

Another forest dwelling ungulate is the moose (*Alces alces*) which has made a comeback over the past 30 years to the point of being fairly abundant and common throughout northern NH. There is a recreational value in both hunting and wildlife viewing that occurs in Franconia. Increasing populations has also led to increasing number of automobile collisions with moose often causing injury and sometimes death to humans and moose. One of the highest rates of these accidents is along I-93 between Franconia Notch and Exit 37.

Franconia 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, spruce, balsam fir, and hemlock are the most common tree species observed throughout Town. All of these tree species; especially oak, maple, beech, hemlock 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 (*Sitta spp.*), chickadees, squirrels, and eastern chipmunks (*Tamias striatus*) to white-tailed deer, black bears, turkeys (*Meleagris gallopavo*), and wood ducks (*Aix sponsa*) rely heavily on mast as a source of feed. Hard mast produced by oaks and beech is

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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. Franconia's soils, topography and hydrology make it a suitable environment for a wide variety of mast producing trees and shrubs. By actively managing Franconia's forests and woodlots for these plant species an important step will be taken in managing the Town's wildlife species.



A dense softwood stand is only one of the required characteristics for an adequate deer yard. These stands are vital for deer populations' survival of New Hampshire's harsh winters.



This photograph was taken at the toe of slope along the Gale River floodplain. The sandy soils and the surrounding upland area are dominated by spruce, balsam fir, and hemlock with a significant amount of red maple, yellow birch and some beech regeneration. This area is consistently utilized by wildlife (as illustrated by the den site seen in the center of the photograph) because of these tree species role in providing cover and food, because of the adjacency to Gale River, and because of an extensive tract of undeveloped land.

## **Bedrock Geology**

The familiar pattern of a general southwest to northeast direction of the receding glaciers of over 12,000 years ago can be seen in Franconia 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, such as in the Town of Franconia, exist because of the parent material (or bedrock) that lies beneath the surface and the deposits of materials left by the retreating glaciers. These parent materials influence the land formations, hydrology, and vegetation occurring above them. In Franconia, particularly in the White Mountains, ledge and rock outcrops are very common, with the most well known example being the former 'Old Man of the Mountain'. This particular example is also proof that geological changes are dynamic, but on an expanded timeframe when compared to our life spans.

There are some unique geological bedrock formations in the WMNF and Franconia Notch State Park area and this report, though focused on the portions of Franconia not in this area and ownership, would be remiss not to mention them. There are bedrock formations assigned with codes such as Jc1b, J4hx, J1hx, Jmv, and Jo1h which indicate Alkali Granites and Felsic Volcanics (moat volcanics 'Jmv').

Unique temperature regimes also exist due to the range of elevation heights in this area. These range as follows:

- from **mesic** (the mean annual temperature ranges from 45 to 52 degrees F - the frost free season ranges from 105 to 180 days);
- to **frigid** (mean annual air temperature ranges from 41 to 46 degrees F and the frost-free growing season ranges from 90 to 160 days)
- to **cryic** (Soil temperature at or below 32 degrees F for two or more years in succession and in presence of sufficient interstitial soil water, evidence of cryoturbation, frost heave, cryogenic sorting, thermal cracking, or ice segregation),

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

Geological bedrock formations found in the eastern portion of the Town of Franconia and within the focus area of this project, are more common types found within New Hampshire, the Granite State, and include: Oo1b (Granite- Biotite granite), Oalx (Mafic Rocks- Ammonoosuc Volcanics), Db2b (Granite- Bethlehem Granodiorite), and an narrow band of Dlvs (Mafic Rocks- Littleton Formation). There are areas in NH where bedrock contains traces of calcium deposits and calcareous seeps occur, causing higher pH soil conditions and unique habitat for rare plants. Though there could be inclusions within the rather course geological mapping for Franconia, none are highlighted in this portion of Town.

Historical use of natural resources related to bedrock geology was the mining of iron ore in the 1800's to smelt pig iron using a large iron furnace built of granite. This practice also required charcoal, created by cutting down large amounts of trees and burning them. Another example of related geological bedrock materials was the Peckett copper mine, with its source of material determined to be a hydrothermal vein deposit, most likely located on a fault. (Please refer to the Cultural Resources section of this report.)

## **Soils**

The nature of soil has a profound effect on plant growth. Whether it is rich with organic material, very poorly drained, or sandy, will affect the type of vegetation adapted to grow in those conditions. Scientists can learn much about the soil type by examining the vegetation. At the same time, examining the soil will predict the type of vegetation that can grow in the area. Because soils affect the vegetation that will grow in an area they also influence the habitat types and therefore the wildlife species that will occur in particular areas. As a result, understanding soil conditions and characteristics can be excellent indicators of critical areas such as wetlands, agricultural lands, forestlands, and wildlife habitat. In descriptions of soil types, the NRCS evaluates soil types according to their capacity for agriculture, woodland, community development, recreation, and wildlife habitat.

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. Certain soils are better suited for certain land uses such as agriculture or residential development. For example, residential development should be located away from areas with unstable soil conditions such as high water tables, and slow percolation rates, due to constraints for building foundations and septic system placement.



Franconia is made up of a significantly large amount of excessively drained sandy soils. These soils tend to be forested with vegetation well adapted for drier conditions such as pines, oaks, and beech trees.

Several factors exert a major influence on soil development. These include climate, time, topography, parent material, biota, and human activities. Studying soil can also lead to an understanding of how that soil was formed. For example a great deal of Chocorua mucky peat and Rumney fine sandy loam are found along the southern part of the Ham Branch in Franconia.

These soils have been formed by sediments being 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). Throughout the forested areas of Franconia, 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 iron oxides. The spodosols are relatively young soils.

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

Franconia contains a wide variety of soil types, about 40 different classified types, and therefore a variety of habitat types and conditions such as mucky peats forming wetlands and rocky outcrops along the summits of the higher mountains. The dominant soil conditions found in Franconia however are excessively to well drained stony, sandy soils. These soil types make up just over 70% of Town. These soils most often are forested with both hardwoods and softwoods, with some agriculture and residential development also found under these conditions. Residential development tends to be difficult because of a lack of stability within the surface layers and then extremely stony conditions below the surface. These soils tend to also be very fine and because they are excessively drained, they have a high permeability reducing the soils filtration capabilities and causing potential problems with sewage construction and runoff pollutants. With adequate planning these are limitations that can be overcome.

ArcView compatible shape files of the NRCS soils map and the USGS geologic bedrock of the Town of Franconia 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***

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

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temperature changes provides a mini-climate within the floodplain area, offering cooler temperatures in the extreme heat of summer and warmer temperatures (including the formation of fog) in the cooler fall temperatures extending the growing season.

Out of the 11,633 acres of land that make up the town of Franconia (excluding the WMNF and Franconia Notch State Park), 443 acres of land have been classified as USDA prime farmland, 631 acres have been classified as farmland soils of statewide importance, and 4,225 acres have been classified as farmland soils of local importance. Some of this prime farmland has been lost, but most has not been developed yet.

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

Locally important farmland soils are fairly abundant in Franconia, but remain in jeopardy as easily accessible upland soils. Due to development pressures, these lands could potentially see further losses in the future if land use is not managed.



Franconia contains some flat prime farmland for crops, such as hay in the center of the photograph.

The western portion of Franconia has a high potential for agricultural land use with 45.5% 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**

Groundwater is a critical natural resource for the state of New Hampshire. Approximately 98% of public water systems rely on ground water. There are three types of groundwater aquifers: Stratified-drift, till, and bedrock. The basic difference is that stratified drift and till aquifers are composed of unconsolidated glacial deposits (loose earth materials), while bedrock aquifers are fractured rock. In stratified drift aquifers, the materials are sorted sand and gravel. In till aquifers, the material is a gravel, sand, silt and clay mixture. In bedrock aquifers, the 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. They typically are the most productive sources of groundwater and therefore the most high yielding public water supply wells tap these aquifers. Approximately 14% of land surface in the State is underlain with Stratified-drift aquifers. In the western portion of Franconia, they consist of stratified, sorted, principally coarse-grained sediments (sands and gravels) deposited by glacial melt-water during the time of deglaciation, where rivers and streams still flow.

Approximately 2,709.14 acres or about 23% of the area in western Franconia is underlain with stratified-drift aquifers, above the State average. The majority lie along the Gale River, Ham Branch, and Meadow Brook. In Franconia the large majority of the aquifers are made up of sand material with a very small amount made up of glacial till material. Stratified drift aquifers consisting of sand material tend to be more porous and have a higher potential for quicker transmissivity and recharge. Franconia is fortunate to have these potential drinking water sources.



Springhouse under power lines on Wallace hill. Historically Wallace Hill has been a source of water for Franconia.

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Franconia currently has two wells (Franconia Village Water, and Mittersill Water) in Town drawing from bedrock aquifers. The Franconia Village Water system has approximately 350 hookups while the Mittersill Water system has about 150 hookups. These used and unused aquifers should be protected to insure their future quality and availability for Franconia.

### **Slope**

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

Slopes provide opportunities for panoramic views and for this reason tend to be sought out areas for residential development. This is currently the case in Franconia. Slope has limitations for building such as structural problems and a greater chance of erosion. The consequences of erosion are loss of soil resulting in sedimentation of surface waters and loss of the productive capacity of the land. Slope is traditionally expressed as a percent and represents the amount of rise or fall in feet for a given horizontal distance. For example a 15% slope means that for a 100 foot horizontal distance, the rise or fall in height is 15 feet. As slope becomes steeper the expenses associated with building increase. In general, slopes between 15% and 25% are considered areas where development would be restrictive and slopes greater than 25% are considered too steep to provide adequate sites for structures such as roads, homes, and septic systems.



Steep hillsides and rock or ledge faces are common throughout Franconia's landscape. These areas create unique habitats for plants and wildlife along with potentially beautiful view sheds.

The NRCS soils data incorporates slope for each soil type. This data was used to determine areas in Franconia with slopes equal to and greater than 15%. Using this method, approximately 4,133 acres or 35.5% of the land in Franconia contains slopes that are over 15%. Of that, approximately 1,933 acres or about 16.6% of Franconia land mass contains slopes over 25%. These are high percentages for a town and are a unique feature of Franconia. These areas provide unique habitat for plant and wildlife species such as peregrine falcons (*Falco peregrinus*). They also contribute to the Town's tourism industry. These slopes attract hikers, rock and ice climbers. There are two alpine skiing areas (Cannon Mountain and Mittersill).

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Excellent views have attracted people to build on hillsides and ridges. New homes are starting to dot the ridgelines of Franconia with many more sites in the preparation stage.



Steep slopes in Franconia provide opportunities for view sheds and have therefore become popular sites for residential homes. This photograph was taken from a future building site and overlooks an existing home. The panoramic views and allure of these building sites are countered by potential structural and environmental problems.

### ***Rare Species and Exemplary Natural Communities***

The Town of Franconia has numerous occurrences of rare species and communities well documented within the WMNF and Franconia Notch State Park area



Though not rare or endangered, species like this closed gentian (*Gentiana clausa*) require certain conditions of soil, moisture, and habitat to grow and are not found 'just anywhere' in the landscape.

With its large area of mostly unfragmented forestland and diverse habitat types, the western portion of Franconia has potential for containing rare and endangered plant and wildlife

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species while potentially providing suitable habitat as well. The proximity and adjacency to the WMNF and Franconia Notch State Park area increase this potential exponentially. Some examples could be american marten (*Martes americana*), canada lynx (*Lynx canadensis*), peregrine falcon, northern harrier, bicknell's thrush (*Catharus bicknelli*), and boreal chickadees (*Poecile hudsonica*).

Though no rare or endangered species were found during fieldwork for this project, it would be well worth the effort for the Town to consider conducting a comprehensive botanical search in the future.

A bird study that was done in parts of Franconia in 2001 could be built upon and expanded in the future is referenced as: Williams T. C., J. M. Williams, P. G. Williams, and Pl Stokstad, 2001. *Bird Migration thorough a Mountain Pass*, studied with high resolution radar, ceilometers and census. *Auk* 118 (2): 389-403).



Interesting niche habitats exist throughout Franconia such as on and around this well vegetated boulder located behind the Profile Golf course bordering a small floodplain area.

New Hampshire is home to more than 500 species of vertebrate animals. Many of these animals live in Franconia 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 Game Department maintains a list of Endangered or Threatened animal species in New Hampshire, which is shown below. Minimal information is available relative to their occurrence in Franconia, but their habitats, when identified should be protected.

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**Endangered and Threatened Wildlife in New Hampshire**

**ENDANGERED**

Common Name	Scientific Name
<b>MAMMALS</b>	
Canada lynx	<i>Lynx canadensis</i>
Small-footed bat	<i>Myotis leibii</i>
<b>BIRDS</b>	
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>
<b>FISH</b>	
Sunapee trout	<i>Salvelinus alpinus</i>
Shortnose sturgeon*	<i>Acipenser brevirostrum</i>
<b>REPTILES</b>	
Timber rattlesnake	<i>Crotalus horridus</i>
<b>AMPHIBIANS</b>	
Marbled salamander	<i>Ambystoma opacum</i>
<b>INVERTEBRATES</b>	
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 hauer dragonfly	<i>Williamsonia lintneri</i>

\* = federally Threatened or Endangered

**THREATENED**

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

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Common Name	Scientific Name
Arctic tern	<i>Sterna paradisaea</i>
Common nighthawk	<i>Chordeiles minor</i>
Three-toed woodpecker	<i>Picoides tridactylus</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
<b>REPTILES</b>	
Eastern hognose snake	<i>Heterodon platyhinus</i>
<b>INVERTEBRATES</b>	
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), or the Nongame and Endangered Species Program of the NH Fish and Game Department (271-2461).



This thick, rich, histosol soil covered with several moss species, mostly shaded in dense softwood forest with pit and mound micro-topography, is unique habitat with potential for rare or endangered species to exist.

### **Scenic Resources**

Franconia is known as one of New Hampshire's premier scenic town's because of its mountainous topography, highlighted by the WMNF and Franconia Notch State Park. Tourists travel to Franconia to visit various view points located at the bases and tops of mountains in the Town of Franconia

## Natural Resource Inventory for Franconia, NH

Forest and Park. High points like Scrag Hill and Cole Hill offer views of the White Mountains and almost every road throughout Franconia.

Franconia's mountains are not the only scenic resources the Town has to offer. The Gale River, Ham Branch and other smaller rivers and streams that run through Town are picturesque in themselves. Two of Franconia's larger wetlands are scenic viewing areas. The wetland on the Franconia/Bethlehem town boundary can be accessed by following old skid roads that extend to Route 142. These skid-roads lead to the wetland which contains old beaver ponds and wet meadows surrounded by large mountains. Another scenic outlook can be accessed from a wetland on the Wells Road. There are areas along the road with views of the wetland and impressive backdrop of mountains behind. Franconia's fields and permanent openings are also scenic, especially along the southern part of Route 116. The Franconia Airport offers residents the ability to have a "bird's-eye-view" of their Town from an airplane or glider.



There are many opportunities to view the White Mountains throughout Franconia. Many roads such as Route 142 and Wells Road run almost parallel to the WMNF and Franconia Notch State Park with views of the mountains.

There are opportunities for scenic vistas throughout the entire town of Franconia. The following are some scenic vista points identified by the residents and fieldwork of this project:

- Scrag Hill
- Gale River
- Cole Hill Road
- Wells Road Wetland
- Ridge Road
- Profile Golf Club

In recent years, development and population growth throughout the State and region have caused people to increase their appreciation of the natural scenery New Hampshire has to offer. Franconia has a high density of scenic opportunities and should consider this an important natural resource to maintain.



Franconia has diverse scenic opportunities from views of the surrounding mountains as seen from Cole Hill (photo on left), to views of cobbly rivers and brooks as seen from the picnic area on the Gale River (photo on right)

### ***Conservation Land***

As previously discussed, 73% of Franconia is well protected as conserved land with the White Mountain National Forest and Franconia Notch State Park. Conservation lands in the remaining 27% of the Town account for 3.4% or 398 acres of land. All inclusively, the town of Franconia has 76.4% of all land in conservation; an extremely high percentile for any NH town.

The current conservation lands in Franconia are as follows:

- WMNF (27,131 acres)
- Franconia Notch Park (3,284 acres)
- Fox Hill Park (94.62 acres)
- River Bend Trail (5.68 acres)
- Gale River Easement (3.8 acres)
- Franconia Village Water Land (8.92 acres)
- Frost Place (6.98 acres)
- Town Forest (40.67 acres)
- Butterhill Partners (49.09 acres)
- Fobes (188.29 acres)
- Dow Field (8 acres)
- McKenzie Easement

There are several ways to conserve land. A conservation easement on private land 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. Other methods of obtaining and conserving land are ownership by the State, Federal Government, or the Town.



This old beaver pond, located north of Route 142 just before the Bethlehem Town line, now a wet meadow within a large wetland complex, has a perennial brook flowing through it, transitions into scrub/shrub, then dense softwood forest, and eventually into upland hardwood forest. This site contains diverse habitats and is an excellent candidate for conservation.

## ***Cultural Resources***

As is the case in most New England towns, Franconia 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. In the western portion of the Town, many acres of the land were cleared for croplands and pastures. Farming is far less common today, and in Franconia, there are few working farms, with the exception of haying,. It has been expressed as an overall goal of the community to preserve these sites. There is still evidence of old farms and grange homes with miles of stonewalls to be found, often out in (what is now) the forest, and old stone cellar-holes scattered throughout Town. Forestry and logging continue and are still a part of Franconia's culture, though tourism and associated shops and service businesses are now the main businesses.

Franconia was one of many New England communities to produce iron utilizing the abundance of iron ore and trees (burned to produce charcoal) by smelting in an old stone furnace. Franconia sits on a large source of iron ore; iron itself is usually found in the form of magnetite ( $\text{Fe}_3\text{O}_4$ ), hematite ( $\text{Fe}_2\text{O}_3$ ), limonite or siderite. Hematite is also known as "natural ore". The name refers to the early years of mining, when certain hematite ores containing 66% iron that were fed directly into blast furnaces. The Franconia furnace-smelter was built of granite as a stacked non-mortared structure and rebuilt several times with the final structure being 32 feet high. It was lined with fire brick and clay filler between the fire brick and granite walls. It used to take approximately 4 tons of bog ore and 20 tons of charcoal per day to produce 2.5 tons of pig iron. A smaller proportion of limestone was added for flux. Around 1865, as the natural resources (ore and trees) diminished and iron production in Pennsylvania utilizing coal was

## Natural Resource Inventory for Franconia, NH

cheaper, the furnace was abandoned. For extended information on this fascinating era please refer to the Franconia Heritage Museum and the Iron Furnace Interpretive Center.



Open fields, fencing, and an old farm house are all indicators of a past working farm.



Willow Cemetery located on Easton Road (Rte. 116) near the Franconia airport. Many of the burials date back to the 1800's.

A dam was built near the Iron Furnace site, and a blacksmith shop, store, saw mills, and a gristmill operated during this era. The Franconia Foundry produced cannons used during the Civil War and later products such as the popular Franconia stove.



The only 'blast' furnace still standing in New Hampshire is located in Franconia on the banks of the Gale River. This iron works used to produce pig iron using iron ore and charcoal in the 1800s. (Photo courtesy of the Franconia Heritage Museum)

### ***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. Invasive species are plant and wildlife species that are not native to an area, but take up residency and can out-compete the native species. These species tend to be more common in wet areas such as lakes, wetlands, and riparian habitats. They can also be found at old farm sites where people have planted various fruiting and ornamental plants for agricultural purposes. Without counting plantings on people's lawns and gardens, four species were observed and documented during fieldwork for this project; Japanese barberry (*Berberis thunbergii*), tartarian honeysuckle (*Lonicera tatarica*), purple loosestrife

## Natural Resource Inventory for Franconia, NH

(*Lythrum salicaria*), and coltsfoot (*Tussilago farfara*). There are areas in Franconia where these plants have established themselves in quantities sufficient to be a concern. Purple loosestrife was observed along portions of Highway 93, Japanese barberry and tartarian honeysuckle in old farming areas along Ridge Road, and coltsfoot was observed in several locations. This NRI was not designed to be an all inclusive search and documentation of invasive species in Franconia and there may be other species and locations where invasives occur in Town.



Purple loosestrife is an invasive plant that is becoming more and more common throughout New Hampshire. It has an attractive bright purple flower, but will out-compete native plants.

Franconia residents may want to consider seeking assistance from the Conservation Commission, 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 invasive species. For further information on Invasive Species, and an update of the increasing list of these species, review the IPANE website at [nbin.ciesin.columbia.edu/ipane/ipanespecies/ipanespecies.htm](http://nbin.ciesin.columbia.edu/ipane/ipanespecies/ipanespecies.htm).

**Habitat Area Summary Table**

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

<b>Habitat Type</b>	<b>Number of Acres</b>	<b>Number of Square Miles</b>	<b>Percentage of Town Land Mass</b>
Franconia Town Boundary	42,048	65.7	100%
White Mountain National Forest & Franconia Notch State Park	30,415	47.5	72.3%
Focus area of this Project	11,633	18.18	27.7%
Dense Softwood Cover	1,488.87	2.33	12.8%
Wetland Complexes (from National Wetland Inventory data)	291.3	0.46	2.5%
Hydric Soils (classified by NRCS as poorly and very poorly drained soils)	1,822.8	2.85	15.7%
Wetland Analysis and Fieldwork results	544.2	0.85	4.7%
Aquifers	2,709.14	4.23	23.3%
Permanent Opening	543	0.85	4.7%
Prime Farmland	443	.69	3.8%
Farmland of Statewide Importance	631	.99	5.4%
Farmland of Local Importance	4,224.8	6.6	36.3%
Steep slopes – 15% and greater	4,132.5	6.45	35.5%
Steep slopes – 25% and greater	1,933.2	3.02	16.6%
Conservation Lands (Excluding WMNF & Franconia Notch Park)	486.5	0.75	4.2%

## **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 Franconia, 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 Franconia 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 Franconia.

It is anticipated that results from this study will help the Town of Franconia 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. Perhaps the most powerful advantage of this project is that future studies and events can be integrated to build upon this database indefinitely.

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

1. There are several wetland complexes adjacent to brooks and their tributaries, and along some hillsides. The importance of conserving these wetlands cannot be over emphasized. It is hoped that the Town will continue to pursue ways to further inventory the functionality and vulnerability of these wetlands with a ranking system, and a long-term goal of Prime Wetland Designations.
  - a. An in-depth inventory of vernal pools throughout Franconia 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 Franconia, there is not likely to be an overabundance of vernal pools.
  - b. Compile previously delineated wetlands, documented wetland locations, and other areas containing wetlands; conduct future expanded wetland delineations according to the Routine Onsite Determination Method of the U.S. Army Corps of Engineers in the 1987 manual. This method meets New Hampshire requirements for standardized wetlands delineations.
2. Based on the locations and large area with underlying aquifers in Franconia, and the gravelly/sandy nature of the soils, it is important that steps be taken to protect the groundwater, brooks, and aquifers in Franconia. They are:
  - a. Implement Best Management Practices (BMPs) within aquifer areas.
  - b. Monitor septic system plumes with a focus on parcels adjacent to brooks, wetlands, and aquifers.
  - c. Monitor the placement of future septic systems keeping in mind the typically high permeability of many of Franconia's soils.
  - d. Work with the State and Town road crews to reduce the application of road salt and sand where possible, as well as promote best management practices during road construction and drainage, to prevent erosion and maintain vegetative ground cover.
3. Franconia's mountainous topography and abundance of steep slopes are directly related to the Town's tourism industry, scenic beauty, and assortment of natural resources

## Natural Resource Inventory for Franconia, NH

(wetlands, streams, rivers, wildlife, plants, soils, etc.). Research and considerations should be made towards developing ridgeline zoning ordinances in Franconia to conserve these unique and important natural features.

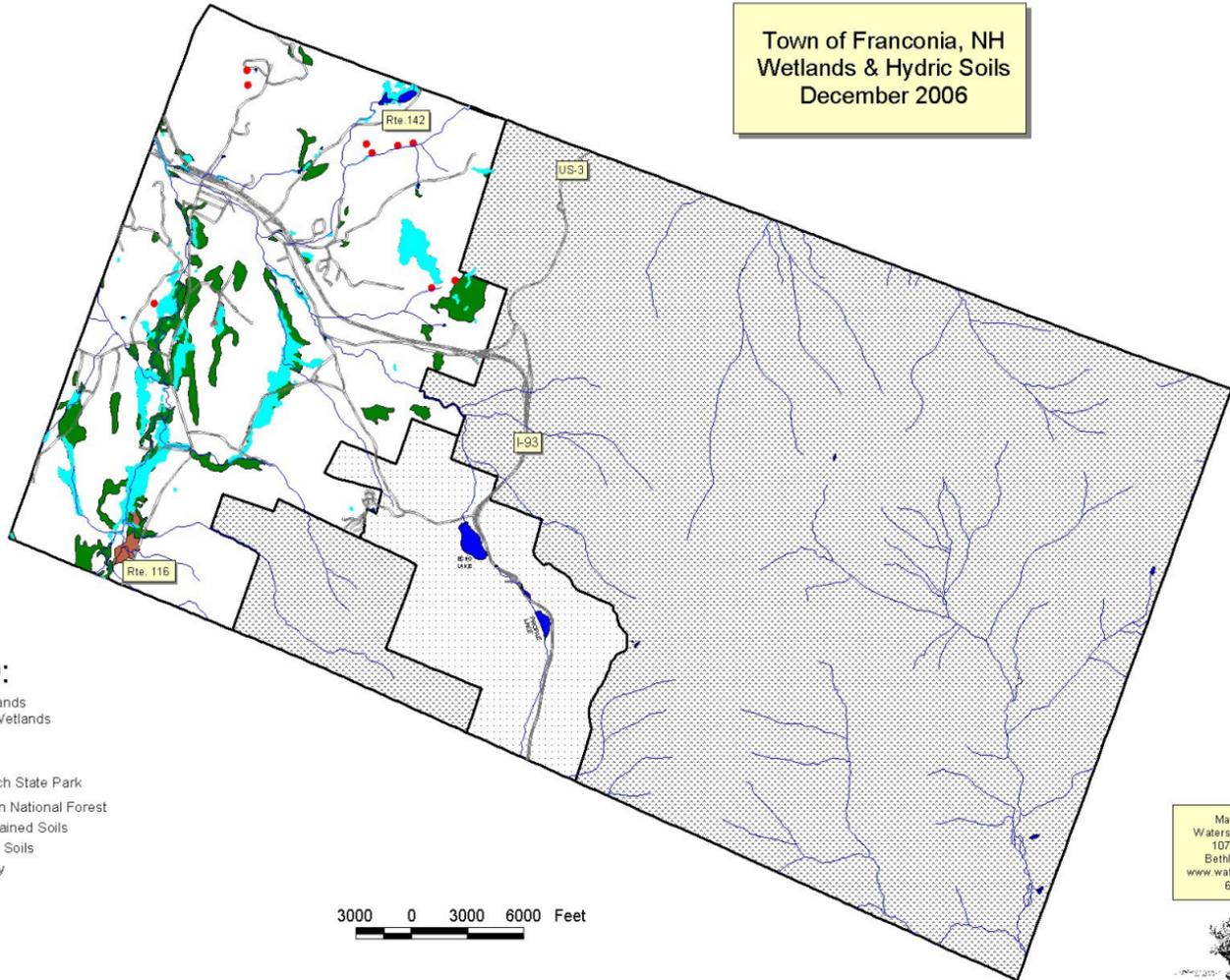
4. Based on results from this project, there is a relatively small amount of dense softwood stands when compared to the overall amount of forested land in Franconia. This suggests that maintaining the existing stands for the benefit of the deer, moose and other wildlife populations is very important. 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/or riparian buffers.
5. Even though such a high percentage of Franconia's land is already Conservation Lands, continuing to explore for lands to potentially add will further benefit the Town's natural resources. Focusing on connectivity between already conserved parcels or looking at habitat types that are not currently well represented in conservation lands such as wetland complexes, permanent openings, and dense softwood areas. Franconia should also encourage placement of land into Conservation Easements where possible, 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.
6. 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.
7. The existing USGS based tax map and parcel data currently digitized in NH State Plane, NAD 27 coordinates using AutoCAD software which conforms to other GIS data, provides limited accuracies and needs to be converted into NAD 83 coordinates to be compatible with other existing datasets, including those used for this project. The Town would be wise to continually update these databases and consider a new flight and remapping of the tax map parcels at sometime in the future. This would be of particular benefit in determining impacts of future subdivisions on natural resources, specifically wetlands and wildlife travel corridors.
8. Encourage developers to retain as much of the natural setting as possible, perhaps incorporating buffers between lots. Increase riparian buffers whenever possible.
9. It is hoped that Franconia 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.

## Natural Resource Inventory for Franconia, NH

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**

Town of Franconia, NH  
Wetlands & Hydric Soils  
December 2006



**LEGEND:**

- Potential Wetlands
- Documented Wetlands
- Road
- Rivers
- Franconia Notch State Park
- White Mountain National Forest
- Very Poorly Drained Soils
- Poorly Drained Soils
- Town Boundary

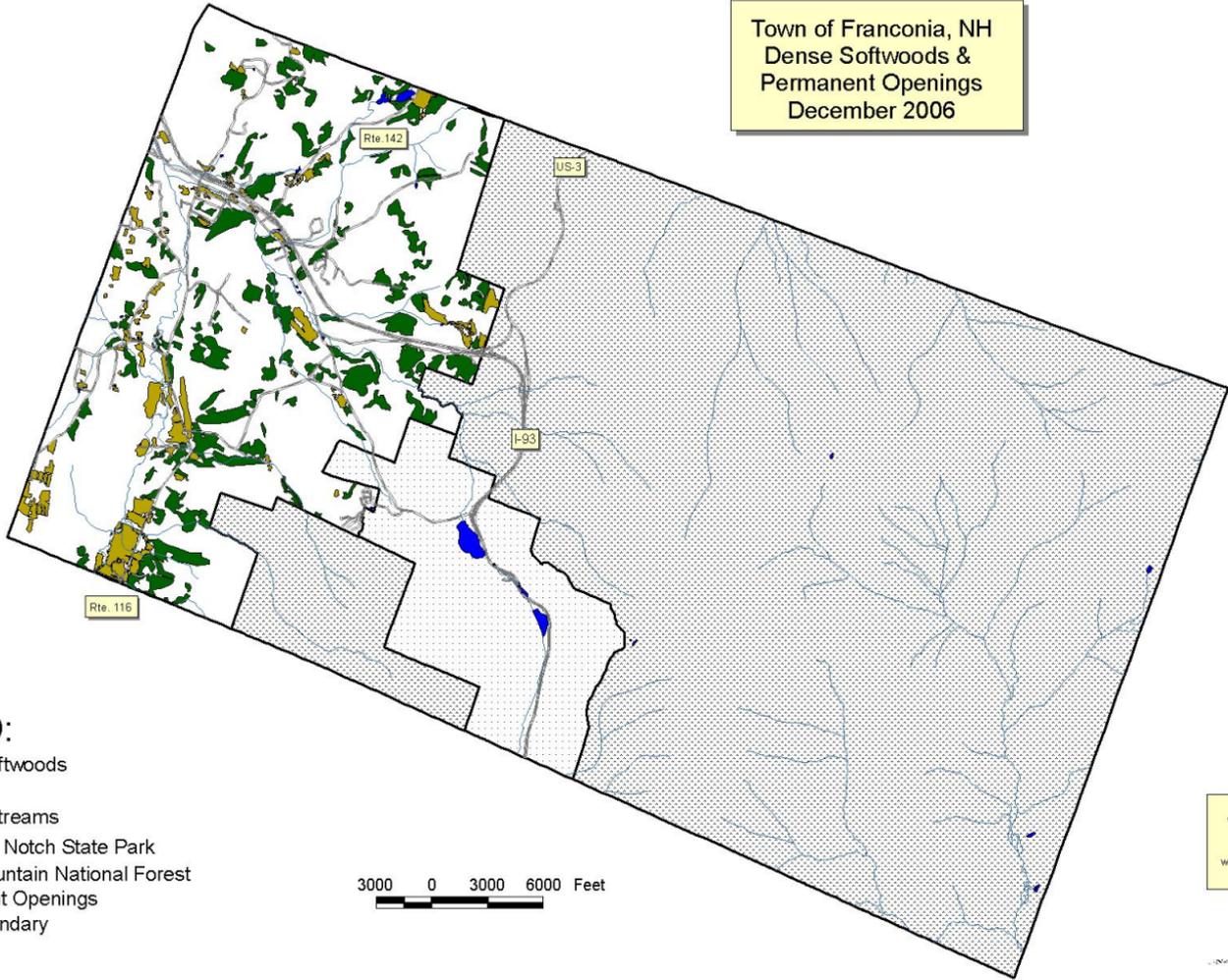


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[www.watershedtowildlife.com](http://www.watershedtowildlife.com)  
603-444-0000





Town of Franconia, NH  
Dense Softwoods &  
Permanent Openings  
December 2006



**LEGEND:**

-  Dense Softwoods
-  Roads
-  Rivers - Streams
-  Franconia Notch State Park
-  White Mountain National Forest
-  Permanent Openings
-  Town Boundary

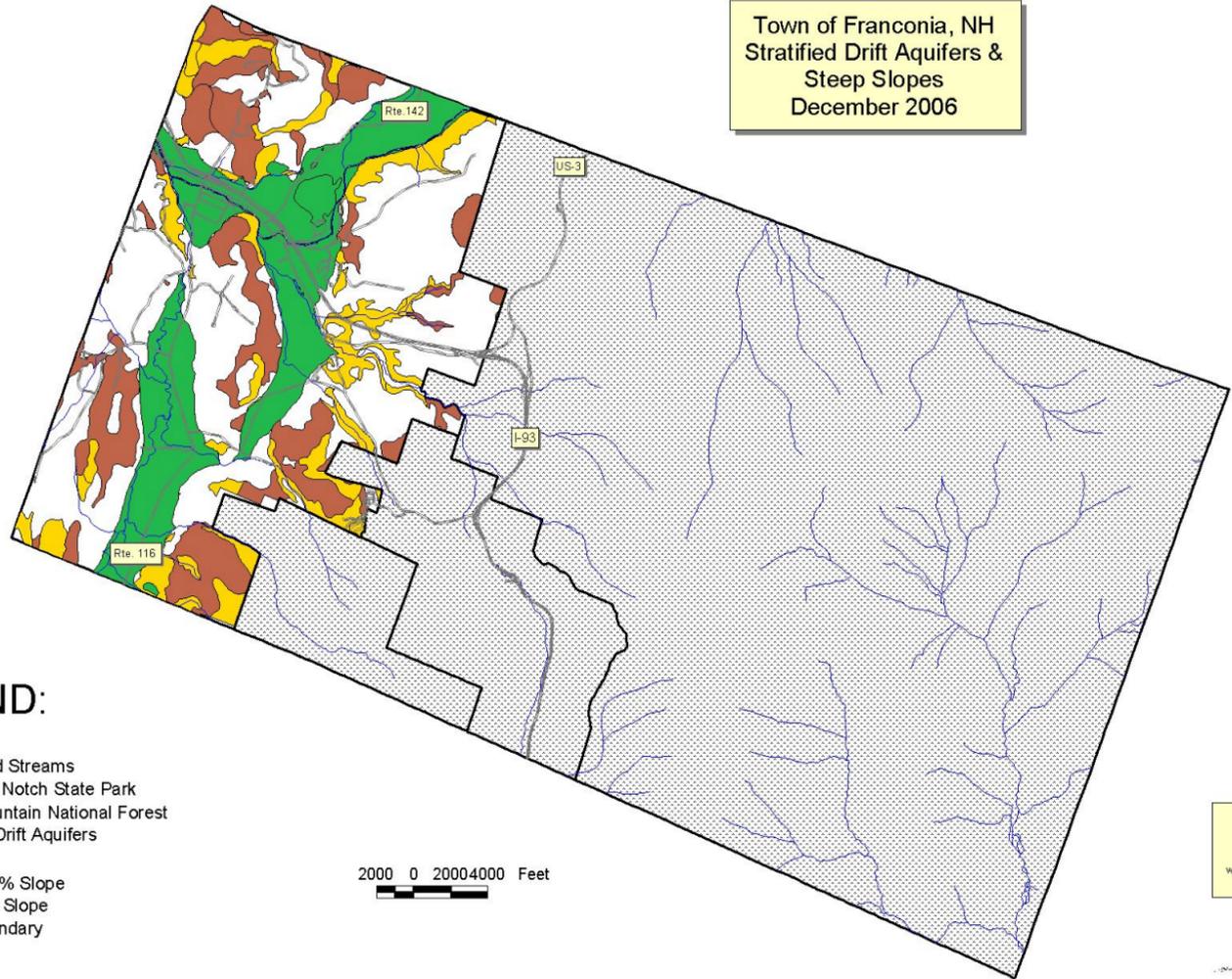
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Town of Franconia, NH  
Stratified Drift Aquifers &  
Steep Slopes  
December 2006



**LEGEND:**

-  Roads
-  Rivers and Streams
-  Franconia Notch State Park
-  White Mountain National Forest
-  Stratified Drift Aquifers
- Steepslopes-
-  15% to 25% Slope
-  Over 25% Slope
-  Town Boundary

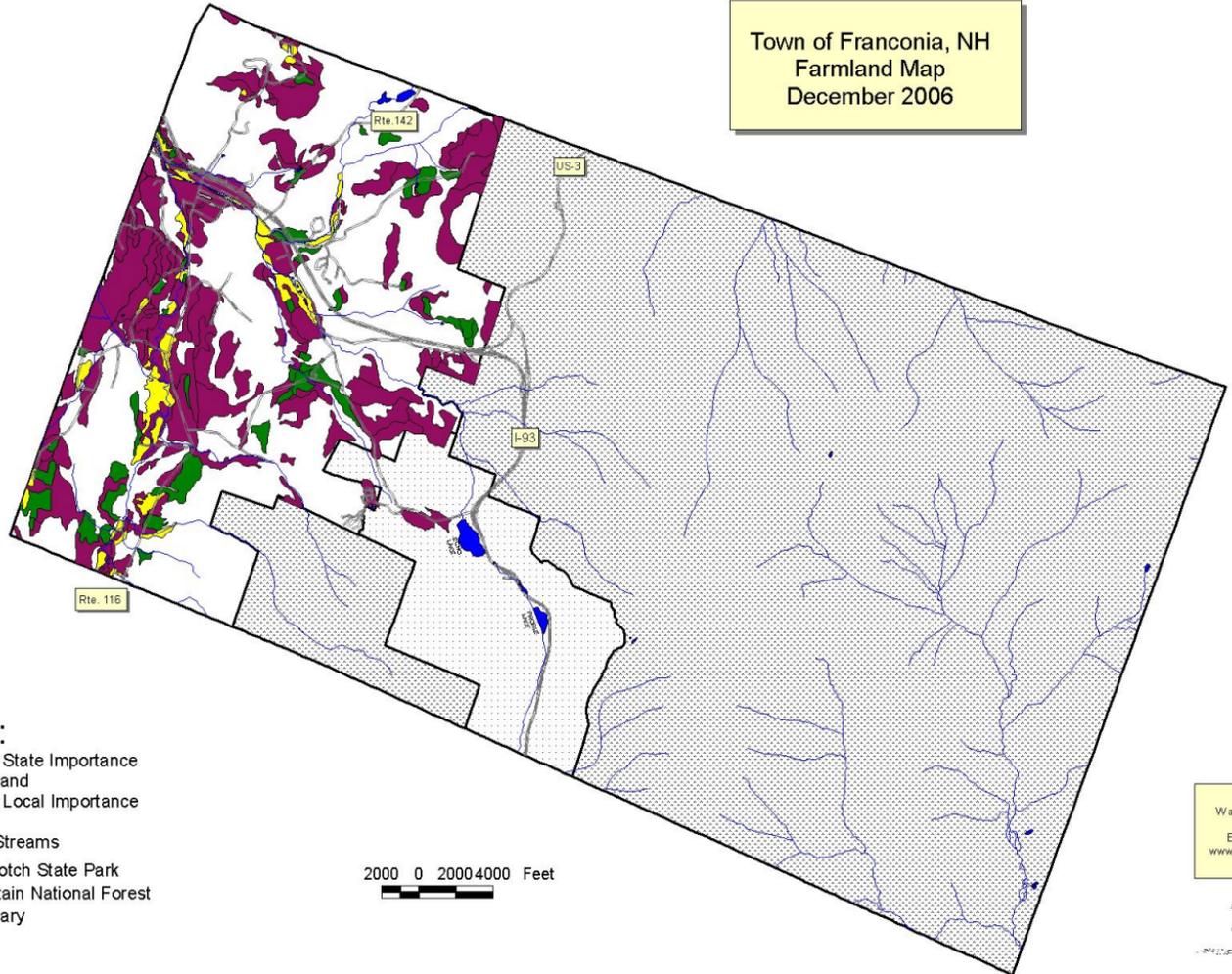


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Town of Franconia, NH  
Farmland Map  
December 2006



**LEGEND:**

-  Farmland of State Importance
-  Prime Farmland
-  Farmland of Local Importance
-  Roads
-  Rivers and Streams
-  Franconia Notch State Park
-  White Mountain National Forest
-  Town Boundary

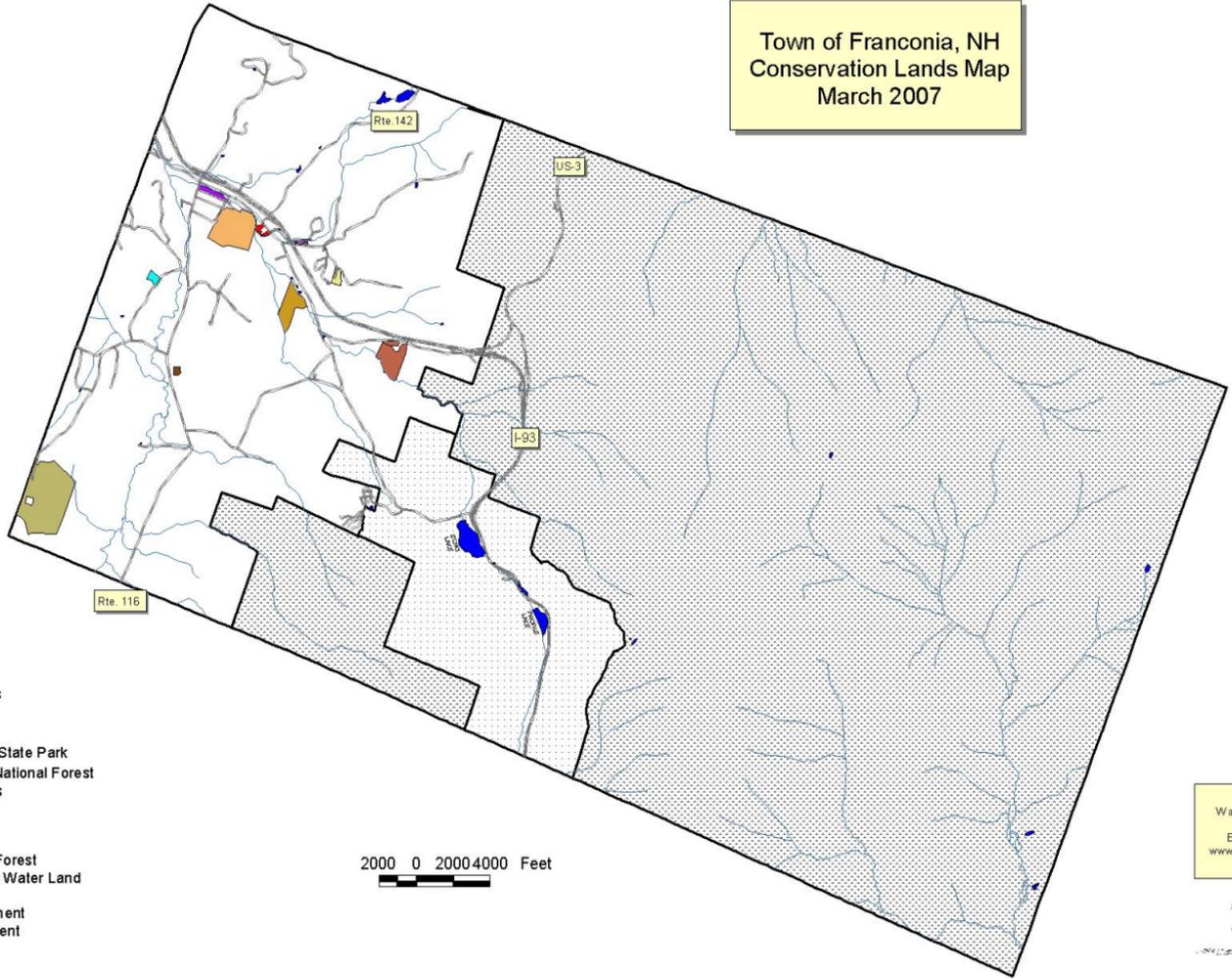


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Town of Franconia, NH  
 Conservation Lands Map  
 March 2007



**LEGEND:**

-  Rivers & Streams
-  Water Bodies
-  Road
-  Franconia Notch State Park
-  White Mountain National Forest
-  Butterhill Partners
-  Dow Field
-  Fobes
-  Fox Hill Park
-  Franconia Town Forest
-  Franconia Village Water Land
-  Frost Place
-  Gale River Easement
-  McKenzie Easement
-  River Bend Trail
-  Town Boundary

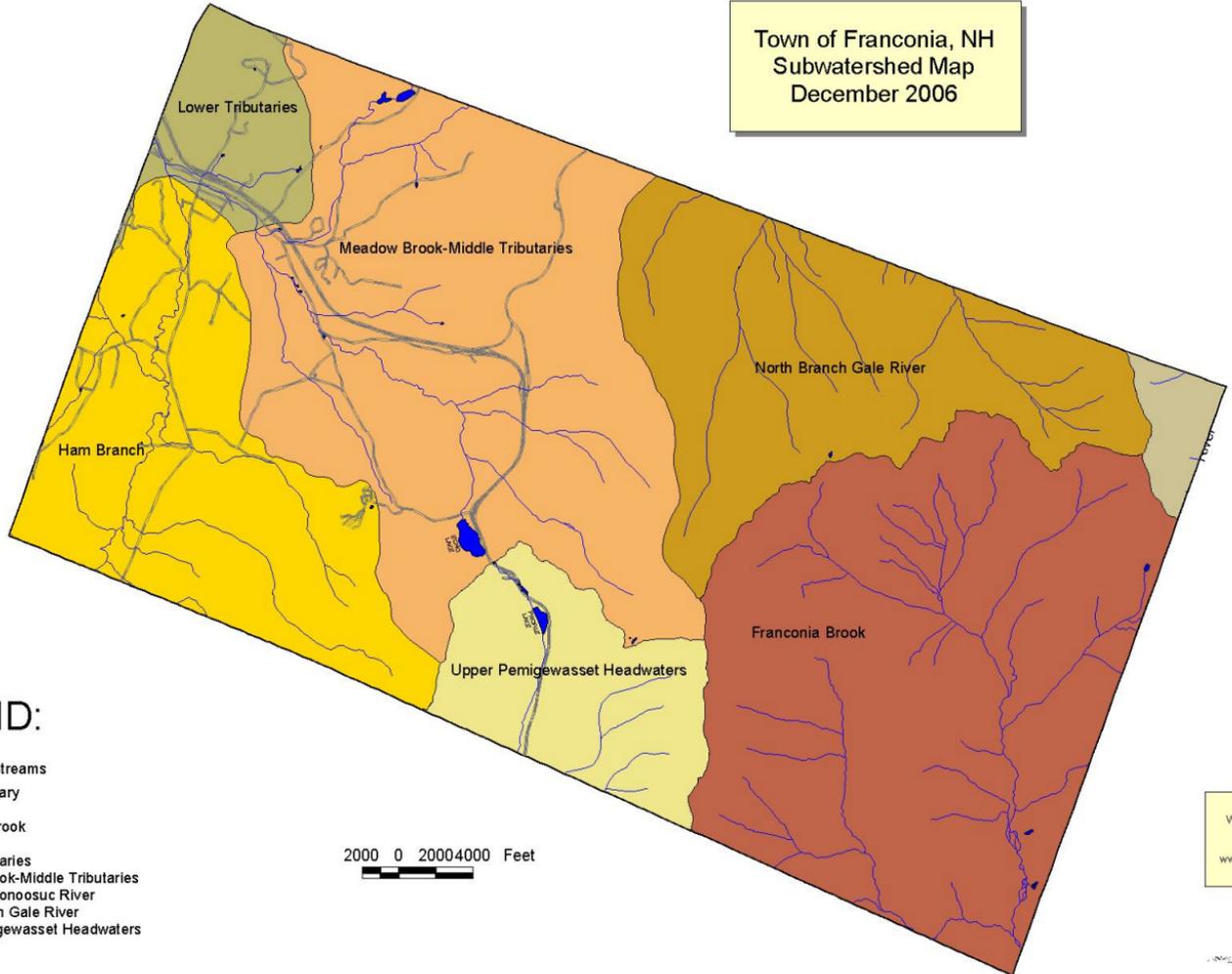
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Town of Franconia, NH  
Subwatershed Map  
December 2006



**LEGEND:**

-  Roads
-  Rivers and Streams
-  Town Boundary
- Subwatersheds-**
-  Franconia Brook
-  Ham Branch
-  Lower Tributaries
-  Meadow Brook-Middle Tributaries
-  Middle Ammonoosuc River
-  North Branch Gale River
-  Upper Pemigewasset Headwaters

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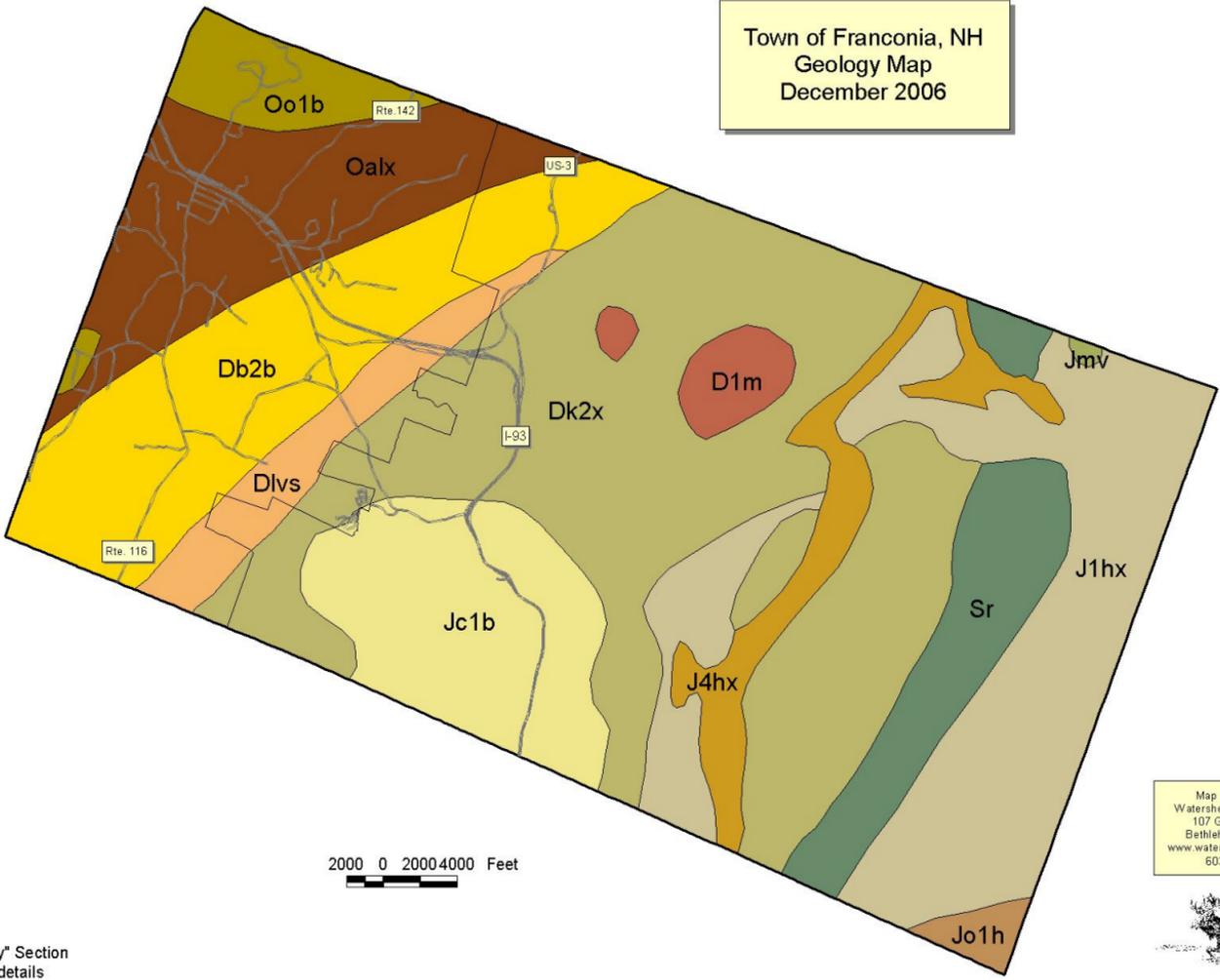


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Town of Franconia, NH  
Geology Map  
December 2006



LEGEND:

-  Roads
-  Town Boundary
- Geologic Code-
-  D1m
-  Db2b
-  Dk2x
-  Dlvs
-  J1hx
-  J4hx
-  Jc1b
-  Jmv
-  Jo1h
-  Oalx
-  Oo1b
-  Sr

2000 0 2000 4000 Feet



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Please refer to 'Geology' Section  
in Report for Code details