Large trees such as the one shown on the left are important mast producers. The center photo shows a red pine which has been used as a marking tree for black bears for years, and the photo to the right shows bear claw marks on a beech tree as bear climb the tree to forage for beech nuts in the fall.

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 Lyme as well as most all of New England. This process formed the rivers and lakes that we see today. We often forget that the soil variations found throughout a given area, such as in the Town of Lyme, exist because of the parent material (or bedrock) that lies beneath the surface and the deposits of materials left by the retreating glaciers. These parent materials influence the land formations, hydrology, and vegetation occurring above them. Ledge and rock outcrops are very common, with several sheer drops such as Holts Ledge, Winslow Ledge, Lamberts Ridge, Smarts Mountain, areas on Bear Hill and Post Hill, and numerous other unnamed ledge drops. These formations provide very unique wildlife and plant habitats such as bear and bobcat den sites and peregrine falcon nesting sites.

One type of rock formation that was sculpted by the glacial erosion is located in western central Lyme approximately one half mile east of the Connecticut River and one half mile west of Post Hill. This is know as a sheepback or roche moutonnee due to its elongated, rounded, asymmetrical, bedrock knob shape with a gentle slope on its up-glacier side and a steep to vertical face on the down-glacier side. In this process, the glacier abrades the smooth slope that it flows along, while rock is torn loose from the downstream side and carried away in ice, a process know as ‘plucking.’ Rock on this side is fractured by combinations of forces due to water, ice in rock cracks, and structural stresses (Reference.com, 2007). During fieldwork, two potential vernal pools were identified on the gentle slope or ‘up-glacial side.’ There are surficial bedrock formations assigned with codes such as Oalx (Bimodal volcanic rocks), Op (Partridge Formation- sulfidic-graphitic slate or schist) , DI (Iron bond mountain formation- interbedded gray phylite, in places feldspathic metasandstone), Sfc (calcite-ankerite-muscovite granofels and interbedded gray metapelite), Db2b (Granite- Bethlehem Granodiorite), Oo2-3A (Granodiorite to tonalite), and Oo1b (Granite-Biotite granite). Although the mapping was done at a large scale and is coarse, it is available for download from the GRANIT data system. Further details about NH geology are available through the State Geologist – www.des.nh.state.us/geology/ and www.nhgeology.org.

This fractured ledge provides unique plant habitat and den sites for animals.

There are areas in New Hampshire where bedrock contains traces of calcium deposits and calcareous seeps occur, causing higher pH soil conditions and unique habitat for rare plants. They are generally inclusions and not the majority of bedrock found in New Hampshire. There are some unique geological bedrock codes in Lyme with inclusions of calcites and limestone within the bedrock that provide a higher pH in the bedrock, soils, and water in these areas.

Lyme has a mesic temperature regime indicating that the mean annual temperature ranges from 45 to 52 degrees Fahrenheit – the frost free season ranges from 105 to 180 days. It is important to consider that some of the ridge tops in Lyme approach conditions found in the frigid temperature regime where mean annual air temperature ranges from 41 to 46 degrees F and the frost-free growing season ranges from 90 to 160 days. Temperature differentials can be roughly calculated to change 5.8 degrees Fahrenheit for every 1000 feet of elevation change (colder the higher the elevation and warmer the lower elevation). These varying temperature regimes in conjunction with the unique bedrock formations can support conditions for rare plant communities and habitat for rare and endangered plant and animal species in New Hampshire.

Some of the erratics found in Lyme are impressive in size.

Numerous nooks and crannies are offered beneath snow covered boulder fields.
(Photo provided by the Lyme Conservation Commission)

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.

Lyme is made up of a significantly large amount of well to 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 Occum fine sandy loam, occasionally flooded, and Hadley silt loam, frequently flooded soils are found along the Connecticut River in Lyme. These soils are very deep, well drained loamy soils formed in alluvial sediments (deposited by water). They are nearly level soils on flood plains, subject to common flooding.

Throughout the forested areas of Lyme, 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.

A unique soil formation found in the Connecticut River Valley and in Lyme, is named varves. In this area, they are most often associated with the ancient glacial Lake Hitchcock, formed during the Pleistocene ice ages. A varve is a layer of sediment deposited annually from warm summer melt flows and settling to the bottom of the lake during the cooler winter months. Commonly several varves or layers can be found on top of each other indicating several years of formation. These soils are important chronological measuring tools and indicators of former climate change trends. Due to their structure, varves are often considered unstable soils for development uses.

A parameter sometimes overlooked in soils is that of pH. New Hampshire soils are commonly slightly acidic due to the influence of granite, referencing the term ‘The Granite State.’ There are several areas in Lyme 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. Many of the rare plant and plant communities located in Lyme are in these higher pH soils.

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

Farmland

An old abandoned horse drawn mower left beside the Connecticut River from an era gone by.

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.

Out of the 35,215.8 acres of land that make up the town of Lyme 1,423 acres (4.0%) of land have been classified as USDA prime farmland, 1,698 acres (4.8%) have been classified as farmland soils of statewide importance, and 4,939 acres (14.0%) have been classified as farmland soils of local importance. Most of the soils that make up these three categories are located in the western portion of the Town, particularly parallel to the Connecticut River and in the central area of Town. Some of this prime farmland has been lost, but most has not been developed yet.

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

Locally important farmland soils are fairly abundant in Lyme, but remain in jeopardy, as easily accessible upland soils tend to be flatter and more manageable for building. These lands could potentially see further losses in the future if land use is not managed.

Lyme contains some gentle sloped prime farmland for crops, such as hay in the center of the photograph.

The western portion of Lyme has a high potential for agricultural land use with 22.9% 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.

One of the last remaining working dairy farms in Lyme as viewed from the Connecticut River.