# NATURAL FEATURES

## INTRODUCTION

The natural features section of the Master Plan uses the environmental criteria of topography, soils, and water resources to evaluate the town's land area and its potential for various types of development. Although natural features can often enhance a particular development site, they just as often pose significant barriers to development; this can be seen by examining locations where existing development has occurred. It is true that transportation routes are another factor in the location of development; however, to a great degree, the natural features of the land also determined the location of roads and the railroads.

This section enables the Planning Board to address areas of the town that are most suitable for development and high intensity land uses, and evaluate the existing limitations of the land that would have to be accommodated. Environmental limitations may include steep slopes, seasonally wet soils, wetlands, floodplains, shallow bedrock, and aquifers.

This section also identifies the areas of town that deserve special protection due to the environmental function of the land, for example, a specific wetland area that provides flood water storage during times of heavy rain. In addition, this section notes specific areas the town may wish to conserve for future community use due to their aesthetic or historic qualities. Not all open spaces need to be steep slopes or wetlands. Some areas may be prime lands set aside for future school sites, parks, intensive farming operations, or other limited low intensity land uses that add value to the overall community.

Jaffrey has many natural features that make the town a very desirable place to live. Jaffrey is still quite rural, with fields, streams, and woods. As development pressures mount, however, there will be more pressure on the Planning Board to allow smaller lot sizes in parts of Town. This section will aid the Planning Board and the residents in deciding where they want growth to occur while at the same time preserving the natural environment that is critical to a high quality of life.

## TOPOGRAPHY

Jaffrey has a land area of 38.4 square miles or 24,576 acres. Jaffrey's natural features create a diverse and appealing landscape, dominated by Mount Monandock, the several great ponds in town: Thorndike, Gilmore, Cheshire, Mountain, Contoocook Lake and the Contoocoook River. Mount Monadnock rises to an elevation of 3,165 feet.

Topography is an important consideration when assessing the development potential of land. Soil conditions are directly related to topography, with slope and drainage features having a determining influence. While slope is only one of many factors influencing the soil type of a particular site, it is the primary component of topography. The following discussion defines slope and addresses the influence slope has on the development potential of land.

## SOILS

Soils information is an important consideration in land use planning since the various characteristics of soils – such as steepness, wetness, flood susceptibility, etc - have such an impact on land use opportunities. Soil information for Jaffrey was obtained from the following sources:

1. Soil descriptions and mapping: Soil Survey of Cheshire County, New Hampshire, published by the US Department of Agriculture Soil Conservation Service, 1982.

2. Soil development capability: Soil Potential Ratings for Development; Cheshire County, NH, prepared by the Cheshire County Conservation District in 1984.

The soils of Jaffrey are characteristic of the Monadnock Regions. Wetland soils encompass approximately 1,210 acres. Steep slopes in excess of 25% occupy approximately 1,529 acres. Soils on steep slopes are usually thin with exposed bedrock or a shallow depth to bedrock. Floodplain soils tend to be fine and sandy with wetland conditions. Floodplain areas often have rich, developed topsoil making them desirable for certain agricultural uses. There is an estimated 4,427 acres located within the floodplain. It is important to note several parcels of land fall within several of these aforementioned categories. For example, a parcel can be located in both a wetland and within the floodplain.

### STEEP SLOPES

Generally speaking, the steeper the land the greater the possibility for erosion and sedimentation, and the more problems can be encountered in siting wells and septic systems.

Steepness is measured in terms of slope, which is defined as the change in elevation (vertical distance) over horizontal distance; the more abrupt the change in elevation, the steeper the slope. Slope is measured and expressed as a percentage that represents the relationship between elevation and horizontal distance.

Typical categories that might be seen on a slope map are 0-8%, 9-15%, 16-24%, and over 25%. Land in the 0-8% slope category is generally preferred for all types of development. Gradual slopes are most favorable for building roads and public water and sewer facilities can be installed at the least cost to the community. Also, excavations for most structures can be done at a minimal cost and the erosion associated with such work can be reduced easily on-site. The exceptions to this would be wetland areas and floodplains because they occur primarily in the 0-5% slope range. An examination should be made as to the environmental function of such wetland and floodplain areas, as well as the risks that might be inherent in development before such lands are utilized for building sites.

As slopes increase to 8-15%, the land is more suited to less intensive forms of development. Carefully placed residential dwellings and some agricultural uses (orchards and field crops) may be suitable for this terrain. As development approaches a 15% gradient, it requires more careful consideration for all types of development. Once a slope exceeds a 15% gradient, all forms of development are considered unsuitable, although it is really at the 25% slope and above that development becomes very problematic. Areas having 25% or greater slope have benefits as conservation areas for low intensity recreational uses and wildlife habitats. Also, their disturbance can create serious erosion problems, washing out topsoil and even roadways downhill. Forestry practices on such slopes must be confined to low-impact operations, with proper erosion controls in place. Other important controls for forestry uses include minimal basal area cutting, and skid roads designed for steep slope harvesting.

When developing steep terrain, the potential for environmental damage increases as the slope gradient increases. Overly steep slopes consisting of sands and gravels left after the excavation of an area will quickly gully and erode. Erosion control barriers should be in place at the time of excavation and prompt reseeding and re-grading should take place afterwards. Surface water run-off rates and erosion factors increase as the slope steepens. This will cause sedimentation of the surface waters down slope and will clog stream channels and rivers if no erosion controls are in place.

Jaffrey has seven soil types associated with steep slopes, which are primarily found on the sides of hills, along ridgetops, and as rocky outcrops void of soil cover:

**Steep Slope Soil Types**

| Symbol | Soil Type | Characteristics | Slope |
|---|---|---|---|
| 36E | Adams | Loamy sand, | 15-50% |
| 60D | Tunbridge-Berkshire | Stony fine sandy loam | 15-25% |
| 61C | Tunbridge-Lyman | Rock outcrop | 15-15% |
| 61D | Tunbridge-Lyman | Rock outcrop | 15-25% |
| 161E | Lyman-Tunbridge | Rock outcrop | 25-50% |
| 365E | Berkshire & Monadnock | Stony fine sandy loam | 25-50% |
| 399 | Rock outcrop | | |

SOURCE: SOIL SURVEY OF CHESHIRE COUNTY, NEW HAMPSHIRE, 1982

These soils are found on the sides of hills, along ridges and as rocky outcrops void of soils. Ranging in slope from 8% to 50%, these soils are classified by the SCS as having low and/or very low development potential because of steep slope, exposed or shallow bedrock and the lack of adequate corrective measures capable of increasing the development potential of such sites.

## WETLAND SOILS

Wetland soils in Jaffrey are those that the soil survey categorizes as being poorly drained or very poorly drained (including muck and peat). Jaffrey has a very scattered pattern of wetland soils, accounting for only 8% of the total land area, or 1,896 acres. The Wetlands Map shows many small patches and a few rather large sections of wetlands in the Town.

The soil types and characteristics that make up the wetland soils are described below:

**Wetland Soil Types**

| Symbol | Soil Type | Characteristics | Suited For | Not Suited For |
|---|---|---|---|---|
| 15 | Searsport Muck | Nearly level and very poorly drained | Habitat for wetland wildlife. Probable source of sand for construction | Building site development, septic systems, recreation development, and farming |

| | | | | |
|---|---|---|---|---|
| 197 | Borohemists, ponded | Nearly level and very poorly drained | Habitat for wetland wildlife | Most uses |
| 214 | Naumberg Find Sandy Loam | Nearly level and somewhat poorly drained and poorly drained | Habitat for openland, woodland, and wetland wildlife. Probable source of sand for construction | Building site development, septic systems, recreation development, and farming |
| 295 | Greenwood Mucky Peat | Nearly level and very poorly drained | Habitat for wetland wildlife | Most uses |
| 341B | Stissing | Stony silt loam | | |
| 347B | Lyme Moosilauke | Very stony | | |
| 395 | Chocorua Mucky Peat | Nearly level and very poorly drained | Habitat for wetland wildlife. Probable source of sand for construction | Most uses |
| 414 | Moosilauke | Fine sandy loam | | |
| 495 | Ossipee | Mucky peat | | |
| 533 | Raynham | Silt loam | | |
| 547B | Lyme | Stony fine sandy loam | | |
| 646B | Pillsbury Fine Sandy Loam | | | |
| 647B | Pillsbury Stony Loam | Nearly level to gently sloping, somewhat poorly drained and poorly drained | Habitat for woodland wildlife | Building site development, septic systems, and recreation development |

SOURCE: SOIL SURVEY OF CHESHIRE COUNTY, NEW HAMPSHIRE, 1982

### AGRICULTURAL SOILS

The Cheshire County Soil Survey also designates prime farmland, which is land of major importance in meeting the nation's needs for food and fiber. Of the nine soil types that are considered to be prime farmland, seven of them are found in Jaffrey, although it is possible these soils may exist in formations that are too small or inaccessible for crop farms. The LESA (Agricultural Lands Evaluation and Site Assessment) manual should be consulted when a choice needs to be made regarding the use of one particular farmland over another, depending on whether the use is for farming or general development.

## FLOODPLAINS

Floodplains are land areas that are susceptible to flooding. These areas actually have two parts: the floodway and floodway fringe. The floodway includes the channel and an additional area that often carries excess flow. The floodway fringe (more commonly known as the 100-year floodplain or the Special Flood Hazard Area) is a broader area over which floodwater may spread, but where the flow velocity is slower. This is an important distinction for land use planning, since some uses can safely occur in the Special Flood Hazard Area, but not in the floodway.

The Federal Emergency Management Agency (FEMA) has mapped the floodplains for all relevant municipalities; the boundaries of the floodplains were computed at cross sections interpolated between cross sections, based on hydraulic information and past experience of flooding. Flood Insurance Rate Maps define the 100-year floodplain (meaning there is a 1 out of 100 chance of flooding in any given year; over long periods of time, base floods will occur on the average once every 100 years), and an area of 500-year floodplain (a 1 out of 500 chance of flooding in any given year).

The Flood Insurance Rate Map for Jaffrey became effective June 2, 1993; an updated map will become effective on May 23, 2006. The Town entered the Federal Emergency Management Agency's National Flood Insurance Program (NFIP) through emergency entry in 1978 and regular entry in 1993. Property owners that live in flood prone areas are typically required by financial lenders to purchase flood insurance. The NFIP permits property owners in participating communities, whether they live in the floodplain or not, to purchase federally subsidized insurance for their property.

Participation in the NFIP requires that the Town sign a resolution of intent to participate and adopt a Floodplain Management Ordinance as well as requirements in the Subdivision and Site Plan Regulations. The Program requires the town to keep track of all development in the Special Flood Hazard Areas (SFHA) and ensure that if any new construction or substantial improvements (commercial or residential) are proposed in the SFHA, that the construction comply with the requirements of the NFIP.

The purposes of this requirement are to minimize the potential for flood damage, to avoid damage-prone uses in the floodplains, and to reduce development pressure of flood hazard areas. Communities that do not maintain and/or enforce their floodplain regulations may be suspended from the insurance program, which could have serious consequences for any landowners required to have flood insurance. For these reasons, it is very important for the town to keep the floodplain management ordinance up to date by amending it as necessary, and to monitor all development within these areas.

## WATER RESOURCES

Jaffrey has a land area of 24,576 acres or 38.4 square miles. Only 5% of this total area consists of surface water. Jaffrey has 25 water bodies dispersed throughout the Town. There are numerous streams flowing throughout the Town. A description of the town's watersheds, waterbodies, watercourses, and aquifers is presented below.

### WATERSHEDS

A watershed is the land area made up of a series of connecting higher ridges that drain surface water to the lowest point, which is where a stream or a river flows out of the watershed.

The Town of Jaffrey falls entirely within the Ashuelot, Contoocook and Millers River Watersheds. The Ashuelot River Watershed consist of approximately 282,900 acres in portions of Swanzey, Lempster, Washington, Marlow, Alstead, Stoddard, Gilsum, Surry, Nelson, Sullivan, Harrisville, Roxbury, Keene, Dublin, Marlborough, Richmond, Winchester, Hinsdale, and Troy. The map also shows all perennial watercourses and waterbodies in the Town.

### WATERBODIES, RIVERS AND STREAMS

Refer to *Part 1 of the Jaffrey Natural Resources Inventory*.

## AQUIFERS

Aquifers are geologic formations (either fractured bedrock or sand and gravel) that by virtue of their physical structure and location on the landscape can provide water through drilled wells in sufficient quantities to support human uses. Characteristics of high-value aquifers include being situated down stream in a watershed, being in a watershed with a preponderance of natural forested land cover, and having a physical structure that is highly permeable – open spaces between particles of sand and gravel or open fissures and interconnected networks of cracks in bedrock - to both store and transmit water. Aquifers are re-supplied primarily by water falling as precipitation. Rain and snow melt move downward through soil, sand and gravel and/or cracks in bedrock to a saturated zone where the spaces between particles and cracks in rock are filled with water. It is very important that the surface of the earth be able to transmit water so that a certain percentage can be stored underground. Excessive compaction or extensive covering of the land surface reduces the volume of groundwater which affects the supply of water to wells.

Aquifers of medium to high potential occur in southwestern New Hampshire as unconsolidated deposits of sand and gravel, or in bedrock fractures. The unconsolidated deposits in this region are principally stratified drift deposits (sand and gravel sorted and deposited by running water from the melting glaciers) that are usually in valley floors or on adjacent hill slopes. These materials have abundant pore space to store water, and pore space may amount to more than 30 percent of the total volume of the deposit. Consequently, stratified deposits at the bottom of watersheds are significant aquifers.

Fractured bedrock can be highly-productive aquifers, especially when overlaid by a layer of sand gravel, which allows the recharge to occur directly from above. Most domestic water wells in Jaffrey are drilled into bedrock – and while many have low yields, bedrock fractures can be staggeringly water rich – and sometimes transmit great volumes of water over many miles.

In contrast, a till aquifer will typically have a lower-yielding well life due to its mixture of clay, silt, gravel and boulders that tend to compact. The transmission and storage of water is greatly decreased in this type of aquifer. The water table (the top of the saturated zone) can fluctuate, depending on the volume recharge to aquifer material.

Groundwater in saturated soils is generally vulnerable to pollution because surface contamination can infiltrate directly into it. It is possible, however, to trace the source of pollution by finding the watershed boundary. Once a pollutant enters an aquifer, it may remain in place for an indeterminate period of time. While pollutants can enter an aquifer easily because sand and gravel are porous and transmit water rapidly, once in the aquifer their movement is then governed by groundwater flow, which moves very slowly through the tiny pore spaces of the glacial till.

Sources of potential aquifer pollution are frequently located on the ground surface directly above or contiguous to the aquifer: septic tank effluent, landfill refuse, leakage from sewer lines or ruptured fuel tanks, agricultural fertilizers and pesticides are among the many possible sources of pollution for an aquifer. In addition to these potential contaminants are the materials such as fuels, lubricants or other toxic materials associated with earth excavation, an activity that is, of course, directly associated with sand and gravel aquifers.

The US Geological Survey provides aquifer delineation maps for the entire state. The map is essentially a surficial geology map, showing the distribution of unconsolidated (not bedrock) geologic material on the land surface. Bedrock aquifers do exist, but these were not part of this particular study. This study

identifies areas of sand and gravel and measures the rate of transmissivity - that is, the speed with which water passes through the materials, in increments of 1,000 feet squared per day. The *Aquifer Map* for Jaffrey shows the locations of soils that are commonly associated with concentrations of groundwater (aquifers).

## OPEN SPACE

Providing open space is an important aspect of town planning. Open space provides many benefits to a community:

- Maintenance of rural character and pleasant scenery.
- Provides buffers between developments.
- Wildlife habitat protection.
- Groundwater protection, water retention, and groundwater recharge.
- Flood control.
- Food production.
- Air purification and the production of oxygen.
- Recreational opportunities.

### FEDERAL, STATE AND LCHIP PROPERTIES

The following table shows the amount of federal and state owned open space lands, as well as all parcels protected under the Land and Community Heritage Investment Program (LCHIP) in Jaffrey and surrounding towns.

**NEIGHBORING OPEN SPACE COMPARISONS**

| TOWN | OPEN SPACE IN ACRES | % OF TOTAL AREA | % OF SUBREGIONAL TOTAL |
|---|---|---|---|
| JAFFREY | 1,010 | 8.9% | 5.1% |
| Marlborough | 846 | 6.4% | 4.3% |
| Jaffrey | 11,343 | 44.1% | 57.6% |
| Fitzwilliam | 1,298 | 5.6% | 6.6% |
| Richmond | 3,011 | 12.5% | 15.3% |
| Swanzey | 2,187 | 7.5% | 11.1% |
| **Total** | **19,696** | **100%** | **100%** |

SOURCE: SOUTHWEST REGION PLANNING COMMISSION GIS

Jaffrey has a low percentage of Federal, State and LCHIP lands in terms of both the total area of the town and the subregional total (8.9% and 5.1% respectively). The Town of Jaffrey has the highest percentage of open space (44.1% and 57.6%).

### CURRENT USE

The Current Use Taxation program was enacted in 1973 to promote the preservation of open land in the state by allowing qualifying land to be taxed at a reduced rate based on its current use value as opposed to a more extensive use. The minimum land area currently needed to qualify is ten acres. The price of this

favorable treatment is a 10 percent penalty tax (10% of the sale price) when the property is later changed to a non-qualifying use.

Of the Town's 24,576 acres of total land area, 7,050 acres are in current use, as of 2005. The current use designation, authorized by RSA 70-A, provides the town other benefits as well: it encourages landowners to maintain traditional land-based occupations such as farming and forestry; promotes open space, preserving natural plant and animal communities, healthy surface and groundwater; and provides opportunities for skiers, hikers, sightseers, and hunters.

In comparing conservation easements to current use taxation, easements are permanent, while current use may be reversed by change to a non-qualifying use and payment of the Use Change Tax. Thus, current use may satisfy the goals of a landowner who cannot afford to permanently abandon future development value, but desires current property tax relief. If it becomes financially necessary to subdivide, the use change tax becomes an element of the development costs.