NATURAL RESOURCES AND CONSERVATION
Natural Features and Constraints on Development

The Natural Resources chapter of the Master Plan reviews environmental criteria such as topography, soils, natural communities, and water resources to inform deliberations regarding the potential for various types and densities of development in Jaffrey. Although natural features can enhance site-specific or area-wide development potential, they just as often pose significant barriers to development. Moreover, while the location of roads and highways is an important factor in the location of development, the natural features of the land may be more fundamental to all aspects of development patterns and private land use choices.

Remove paragraph

In today's conservation community, minimizing further disturbance of the physical landscape and avoiding further fragmentation of the unique mosaic of plant and animal communities are considered essential. Protecting the persistence and integrity of natural communities as well as extractive resources (e.g. timber, water, agricultural production, and construction materials) and the fundamental natural processes (e.g. the hydrologic cycle, ecological succession, biodiversity, and even photosynthesis) on which our economic and physical welfare depends is imperative.

Jaffrey has exceptional natural features and resources that make the town a very desirable place to live, and the Town has maintained a typical New England character with its historic Jaffrey Center and its 19th Century down town "mill town." These are surrounded by a rural countryside of fields, homes and businesses dispersed along back roads, and by thousands of acres of forested backcountry. This Master Plan chapter will serve to inform and assist the community and its Planning Board in establishing where growth should occur while preserving the natural environment that the residents currently enjoy.

I. JAFFREY'S HISTORY OF CONSERVATION EFFORTS

Much of what defines Jaffrey's unique rural character is found in its natural resources: its forests, farmland, lakes and ponds, and – of course – its famous mountain. The people of Jaffrey are stewards of the landscape that identifies our Town.

This was recognized early on by the Town Fathers who in 1883 claimed the summit of the mountain for public ownership and protection. Ever since, individuals and groups alert to threats of commercialization and development have worked tirelessly to conserve large tracts of land on Mount Monadnock and neighboring Gap Mountain. Today over

5,824 acres of conservation land is owned both publicly and privately. Most of it is open to the public for recreational use.

The State of New Hampshire has five tracts that comprise 1,346 acres. The largest tract is Monadnock State Park, which is 650 acres. The remainder is state forest property. The Society for the Protection of New Hampshire Forests owns approximately 2,580acres, 80% of which may be found along the southern flank of Mount Monadnock. This land is located north of Route 124 and west of Dublin Road. The remainder of the SPNHF parcels is located east of Thorndike Pond, along Old Fitzwilliam Road, and Old County and Gap Mountain roads.

The Town of Jaffrey owns four parcels that comprise approximately 520 acres. Two of these parcels are located on Mount Monadnock, and a third – Carey Park (which is one of the Town's forests) – is located along the eastern bank of the Contoocook River and approximately one mile south of the downtown area. The fourth parcel (also a Town forest) is the 4.3 – acre Lacey Lot located on Lacy Road. The Town also owns water rights around Mountain Brook Reservoir, and these "rights" extend to an elevation of 1,022 feet or to the 1,022 contour line that surrounds the reservoir. The land included in this water area is approximately 120 acres.

Total Town-protected acreage is 634 acres. The remainder of the protected lands is under private conservation easements (600 acres), and the Town of Troy has a161-acre reserve for its town reservoir, well, and adjacent watershed.

As of 2006, much of the northwest quadrant of Jaffrey is protected from future development. Moreover, most of the unprotected land in the extreme northwest corner adjacent to Troy and Marlborough is unsuitable for development due to steep slopes, poor soil conditions, or lack of access. Consideration should be given to adding these lands to the adjacent protected parcels. A particularly attractive area is Perkins Pond, which is located at the base of Mount Monadnock, straddling the Troy/Jaffrey town line, and which offers a broad view of the mountain.

In the years ahead, greater priority should be given to conservation and land protection in other parts of Jaffrey's Rural District, particularly to the north, northeast, and southwest of the downtown area. These lands have received less attention than the mountain has to date. Yet they contain rich ecosystems that are under increasing stress along with an extraordinary beauty which complements that of the mountain itself while also contributing to the rural character of Jaffrey so prized by its citizens.

Conservation easements and the Current Use Tax Incentive program are two means by which open land can be maintained.

The Society for the Protection of NH Forests and the Monadnock Conservancy encourage landowners to place permanent conservation easements on their land. Easements maintain land in private ownership; yet, protect the land from any future development.

Easements conserve unfragmented acreage and thus assure open views to and from Mount Monadnock, continuous forest, and ponds and lakes encircled by woods.

Under the land Use program, land parcels over ten acres are taxed on their present use rather than their potential use. An additional 20% tax relief is given when that land is kept open for public recreational use. However, when the use of that land is changed, such from farmland or forestry to house lots, a 10% tax penalty based on the value of the land at that time is imposed.

As noted by Paul Bofinger, former President/Forester of the Society for the Protection of NH Forests, "If you're going to use anything as a role model for how you protect other good things, (Mount) Monadnock is the best example." With this in mind, the Town of Jaffrey has a unique opportunity, in its new Master Plan Update, to take the lead in conserving its other valuable resources – open water sources, aquifers, views and vistas, and valuable farmlands.

The pages that follow review Jaffrey's natural resources and indicate why many of them are appropriately regarded as constraints on further development. Three themes – fragility, fragmentation, and density – recur in the discussion and are assessed in the conclusion.

II. JAFFREY'S NATURAL LANDSCAPE

Terrain

The terrain of most of the land area in Jaffrey, while irregular, has relatively low relief. The average vertical change in elevation over the distance of a mile is approximately 180 feet. In contrast, Jaffrey's most prominent landmark, Mount Monadnock, is also the namesake of a kind of geomorphic feature: "a mountain of rocky mass that has resisted erosion and stands isolated in an essentially level area."1 This combination of landforms results in Jaffrey's having the greatest range of elevation within any of the 36 Southwest Region towns. Within Jaffrey, elevation ranges from less than 880 feet above sea level at the point where the Contoocook River flows into Peterborough to 3,165 feet at the peak of Mount Monadnock. Mount Monadnock and the ridge of uplands that bridge Monadnock and Gap Mountain in Troy (a landform known as a saddle: two high points connected by a lower ridge) are distinctly different from the low-relief hills elsewhere in Jaffrey that are pocked with ponds, lakes, and wetlands. That saddle also creates a watershed boundary between the Ashuelot River to the west and the Millers and Contoocook Rivers to the south and east, respectively.

Fn.1 Excerpted from The American Heritage Dictionary of the English Language, Third Edition (Houghton Mifflin, 1996).

The landforms of Jaffrey are artifacts of the interaction of glaciation and the granite bedrock. Some of the many small hills of central and eastern portions of Jaffrey are

small promontories of granite covered with glacial till (a dense mixture of sand, silt, clay, and stones). Others are mounds of till called 'drumlins," that were created by the slow-motion turbulence of the flowing glaciers which had carried sand, silt, clay, gravel, and stones southeasterly over Jaffrey for hundreds of thousands of years before melting away only 12, 000 years ago.

Almost all of Jaffrey is covered with a layer of glacial till, varying in thickness from fractions of an inch to several yards. The exceptions are areas of exposed bedrock, e.g. the summit and ridges of Mount Monadnock, and the sand and gravel deposits of the Contoocook Valley. It is understood that the deep sand and gravel throughout most of New Hampshire's river valleys are deposited by melt water running out of the melting glaciers. Geological material sorted by running water is known as "stratified drift." Some stratified drift deposits were formed in streams and lakes that formed on or within the massive glaciers as they melted, and were finally laid on the land as the ice vanished. The deposits in Jaffrey are continuous and have hydrological connections with deposits in Rindge, Sharon and Peterborough; and they extend continuously northward in the Contoocook Valley to the village of Contoocook. The extent of these deposits is widely believed to be the extent of an ancient shallow lake: Glacial Lake Contoocook. (Redundant sentence removed) The Lake drained when the natural dam of till and ice impounding it was finally eroded. Today Jaffrey's extensive stratified drift is well known as an important source of both groundwater and sand and gravel for construction materials. Stratified drift can often be identified on the landscape by the flat topography and dense stands of white pines that thrive in the sandy soil where other species cannot.

Missing is description of sand, gravel, and road fill deposit information – excavations site map –these are not in Part I, 1997 Update or Land Use Chapter.

Remove Paragraph

Scenic Views Taken in part from the 1997 Update

Jaffrey's most prominent physical feature is Mount Monadnock, located in the extreme northwest corner of the Town. With a height in excess of 3,100 feet, the mountain peak is visible from numerous locations throughout the Town. The distinct profile of the mountain provides many scenic views, and these views -- whether they are uninterrupted vistas of the mountain from key locations such as Perkins Pond or fleeting glances through the trees as one travels the numerous roads in Jaffrey -- are an important part of Jaffrey's heritage. So too are foreground features such as lakes, swamps, streams, forest, and rolling countryside, which – even when viewed alone – are a delight to the eye.

Special vistas, views and scenic areas contribute significantly to a community by enhancing the quality of life and increasing the value of property, while also creating a desirable place to live and work. Consequently, it is important that these views and vistas be protected for future generations and to perpetuate the Town's scenic majesty.

The following is adapted from "Development Potential", a section we have broken up and relocated.

Farmland

Although Jaffrey's farmland is relatively small, it is visually attractive while also being commercially attractive as prime real estate for alternative uses.

Agricultural production is a special category of land use that, together with timber management, requires sustaining the physical and chemical properties of the soil as the basis for economic gain – more so than with other developed land uses. The Cheshire County Soil Survey classifies 89 acres (0.3%) of Jaffrey as "prime farmland soil", consisting of seven different soil types in 149 discrete patches. (footnote here)

Fn. See Appendix __ for these oil types. The designation is based on the soil's ability to (1) perennially support pasture, forage, or tilled crop production with little or no nutrient or other soil supplement inputs, and (2) sustain physical management practices (e.g. machinery or livestock) without loss of the soil's physical properties important to agricultural production.

The prime farmland soils in Jaffrey occur at elevations below 1,320 feet, which excludes them from the slopes of Mount Monadnock and the Monadnock – Gap Mountain saddle. Prime farmland soils are most abundant in a crescent extending from the Jaffrey-Rindge line south of Mountain Brook Reservoir and Gilmore Pond northerly to between Jaffrey Center and downtown, diminishing toward the eastern side of Thorndike Pond. The largest concentration of contiguous prime farmland soil units is found on the Sawyer farm, bounded by Old Sharon Road, Witt Hill Road, and Route 124.

Farmland poses two issues that are in conflict. One issue is the value to the community of preserving farmland as open space, a small but meaningful – and strategically located – component of Jaffrey's scenic splendor. The second issue is the economic incentive to convert farmland into other forms of developed use, an issue hardly unique to Jaffrey but one that has salience here, as elsewhere.

How Jaffrey resolves the inexorable decline of agriculture and attendant pressures to develop agricultural land with new housing and commercial enterprise will help define the Town's character in coming decades. To do nothing is to lose that land by default. Yet attempts to save farmland as open space may prove costly and also counterproductive to the local economy. This is especially so in light of the several constraints on development analyzed in Section III of this chapter, which constraints significantly limit opportunities for future land development in Jaffrey. The result is a thorny dilemma.

Put table in the appendix

Symbol	Soil Type	Characteristics
24B	Agawam	Very fine sandy loam, 3-8% slope
72B	Berkshire	Fine sandy loam, 3-8% slope
76B	Marlow	Fine sandy loam, 3-8% slope
108	Hadley	Silt loam, very level
142B	Monadnock	Fine sandy loam, 3-8% slope
168B	Sunapee	Fine sandy loam, 3-8% slope
513B	Ningret	Fine sandy loam, 3-8% slope

Streams and Water Bodies

The irregular topography<[1]> (suggest deleting the footnote; it is meaningless.) and dense glacial till of Jaffrey create a high density of streams, wetlands, ponds, and lakes typical of the Monadnock Highlands. Of the 25,565 acres bounded by Jaffrey's town line, 1,142 acres (4%) are water bodies. The U.S. Geologic Survey (USGS) identifies 103 separate water bodies in Jaffrey with a total of 42 miles of shoreline. Please refer to Section III for a description of Jaffrey's major water bodies (10 acres or more) presented in Table __: " Great Ponds in Jaffrey." Some of these larger water bodies have heavily developed shorelines; others are remarkably pristine. All are quite shallow. Jaffrey's many smaller ponds are also shallow, not much less developed, and emergent vegetation is quite common.

There are approximately 40 miles of perennial streams in town. The Contoocook River is Jaffrey's largest stream. The Contoocook originates in Rindge as Contoocook Lake, which in turn was created by a dam located in Jaffrey. While (the) only 6 miles of the Contoocook run through the southeast corner of Jaffrey, the River was a formative force in the development of Jaffrey's downtown as a 19th Century mill town and a regional employment and population center. The Contoocook is unusual among rivers in New England in that it flows northward for its 71-mile run to the Merrimack in Concord, NH. The Contoocook is one of fourteen rivers enrolled in the New Rivers Management and Protection Program. This status has resulted in the development of a Contoocook River Management Plan by the Contoocook & North Branch Local Advisory Committee. That Plan can be viewed at the NH Department of Environmental Services' "Rivers Program" website.

(Move table to appendix; portions used in Section III under Surface Water.)

Pond	Acres (in Jaffrey)	Maximum Depth	Impoundment Status *
Ainsworth Pond	15	- na -	- na -

[1] elevation, slope, and aspect – i.e. compass bearing (what is the meaning/utility of this? Suggest delete)

Black Reservoir	10	- na -	AI
Cheshire Pond	27	- na -	AI
Contoocook Lake	215	22 ft.	RD
Cummings Meadow	42	4 ft.	AI
Frost Pond	56	12 ft.	NL
Gilson Pond	12	3 ft.	RD
Gilmore Pond	115	21 ft.	RD
Hodge Pond	14	- na -	NL
Mountain Brook Reservoir	194	3 ft.	RD
Parker Pond	20	6 ft.	NL
Thorndike Pond	224	12 ft.	RD

* AI = Artificial Impoundment; NL = Natural Level; RD = Natural, but Raised by Dam

Wetlands

Wetlands are a valuable, environmentally sensitive resource. They provide an important means of flood and erosion control and pollution filtration. Additionally, they are a source of water, serve as a wildlife habitat, support recreation, and esthetically enhance Jaffrey's rural ambiance.

The Cheshire County Conservation District describes wetland soils as those soils that are poorly drained or very poorly drained, including muck and peat. They are difficult to quantify given the several disparate sources of electronic data about wetlands, a fact which warrants brief explanation. Wetlands appearing in the USGS topographic maps were delineated from aerial photographs in the 1980s and typically include only non-forested wetlands. The U.S. Fish & Wildlife Service developed the National Wetland Inventory (NWI) in the early 1990s also using aerial photography. The NWI data tend to match the USGS wetlands and also include some additional forested wetlands. The USDA Natural Resources Conservation Service (formerly the Soil Conservation Service) uses a soil classification "hydric soils" to identify soils that are "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic [lack oxygen] conditions in the upper part." Due to technical aspects of soil mapping, the hydric soils delineations tend to overstate the extent of actual jurisdictional wetlands, defined by the State and Federal governments as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

The acreages of wetlands identified in Jaffrey by these three sources (are) range from 917 acres (USGS) to 2,056 acres (NWI), and 3,931 acres (USDA). In summary, wetlands are

common in Jaffrey. The actual amount of land area occupied by wetlands is somewhere between 917 acres and 3,931 acres – probably more accurately between 2,056 and 3,931 acres - and the USGS wetlands data also indicate 94 separate occurrences.

The State of New Hampshire allows communities to designate "Prime Wetlands." This designation means that the NH Wetlands Bureau, when receiving applications for dredging or filling wetlands, will apply an extra layer of rules defined by state law to applications involving wetlands designated by the town as "prime." The first step in the designation process is an inventory and assessment of the town's wetlands using the "NH Method." (Do we have any "prime wetlands" in Jaffrey?)

Forest Lands

The landscape in Jaffrey is further typified by the prevalence of forest cover. The mosaic of soil and topographic conditions in Jaffrey supports a variety of natural communities of plants and animals, (comprising myriad types and species) from microbes and algae to white pine and moose. Most of the forest (here) is likewise a mosaic of distinct plant community types. A Hemlock-Hardwood-Pine "matrix forest habitat" is the dominant forest habitat for approximately 45% of New Hampshire[2] and most of Jaffrey. The communities comprising this larger habitat are diverse, ranging from red maple-sphagnum moss swamps and dense hemlock forest to blueberry thickets and hillside forests of sugar maple, American beech and red oak. These occur throughout Jaffrey with the exception of the steepest slopes and top of Mount Monadnock. Despite the prevalence of the Hemlock-Hardwood-Pine forest habitat, the NH Fish & Game Department considers it to be one of the State's "most at-risk habitats." This is due primarily to the habitat's occurring in areas that are also suitable for residential and commercial development and due <the habitats as well> to invasions of non-native plant and invertebrate species. Preserving the integrity of matrix forest habitats is a necessary, over-arching goal in conservation planning.

The second most abundant matrix forest habitat occurring in Jaffrey is Lowland Spruce-Fir Forest. This group of communities tends to be found in western Jaffrey, with concentrations on the southeastern slopes of Mount Monadnock through a range of elevations and slope steepness, but away from the Contoocook River. This habitat occurs in relatively small patches throughout the Monadnock Highlands and Wapack Mountains of southwestern New Hampshire northerly through the Sunapee Highlands. (is a dominant forest cover in large tracts of the White Mountains and northernmost reaches of the Connecticut River) The forest communities here are characterized by wet and seasonally flooded, acidic soils and coniferous tree species, although northern hardwoods and alders also occur.

[2] Source of habitat descriptions throughout: NH Fish & Game Department. 2006. New Hampshire Wildlife Action Plan. Note: This may not be the second footnote.

Two other matrix forest habitats occur only on Mount Monadnock: Northern Hardwood-Conifer Forests on the steep and rocky slopes below the peak of Monadnock, especially on the Pumpelly Ridge, and High Elevation Spruce-Fir Forests at the top of Monadnock among the outcrops and boulders. While the Northern Hardwood-Conifer matrix forest habitat increases in prevalence northward through Dublin to the Sunapee Highlands and dominates medium elevations in the White Mountains, Mount Monadnock, Little Monadnock Mountain in Fitzwilliam and the ridgeline of the Wapack Range west of the Contoocook Valley are the southernmost occurrences in New Hampshire. The summit of Monadnock hosts the lone example of High Elevation Spruce-Fir Forest in Cheshire County, one of five probable locations south of the White Mountains, and the most southerly example in New Hampshire. The communities in this relatively rare habitat are dominated by fir trees, spruce trees, and sphagnum moss in wet, rocky terrain.

Two other terrestrial habitat types are known to occur in Jaffrey: Grasslands, and Rocky Ridges and Talus Slopes. Grasslands occurring in Jaffrey and most of New Hampshire are, of course, man-made. Existing grasslands are associated with current or past land uses such as agriculture, airports, sand and gravel mining, and recreation. In Jaffrey, grassland habitat is found in the farm fields north and east of Downtown Jaffrey and the airport.

Like the High Elevation Fir-Spruce Forest habitat, Rocky Ridges and Talus Slopes are restricted to Mount Monadnock and very small isolated occurrences on the topographic saddle to Gap Mountain. Talus slopes are steep slopes often at the base of rock outcrops that are strewn with fallen rocks ranging in size from large stones to small boulders. While Talus Slopes often host a great variety of hardwood and coniferous tree species, and some plant and animal species found nowhere else, they can be unstable and prone to rock slide.

Plant and Wildlife Habitats

The many wetlands, streams, lakes, and ponds in Jaffrey provide aquatic habitats and create riparian habitats on their shores. Wetlands habitats in Jaffrey and throughout central New England are broadly categorized as being Marsh and Shrub Wetlands, Peatlands, or Vernal Pools. Marsh and Shrubland Wetlands include a variety of plant communities and hydrologic conditions. These range from wet meadows of grasses and sedges, cattail marshes, and alder-dogwood-arrow wood thickets in standing water, to red maple forests flooded periodically each year. Moreover, all of these can occur at the edge of waterbodies, in the course of streams wending through the forest, or isolated from other surface water in low spots on the landscape. Most of the many small and large wetlands observed in Jaffrey are Marsh and Shrub Wetlands Habitats.

Peatlands are characterized by acidic water chemistry. The special plant and animal communities associated with that often include sphagnum moss and carnivorous plants, but also a wide variety of herbaceous plants, shrubs and trees. Their assemblages are peculiar to Peatland habitats. Peatland wetlands are not uncommon in Jaffrey, but tend to

be smaller and are considerably less common than Marsh and Shrub Wetlands, and as such can be considered at risk.

Vernal Pools are essentially depressions where water ponds form in the spring during snow melt and spring rains due to topography and soil conditions. The duration of ponding is sufficient to support the aquatic phase of the life cycles of a number of invertebrates and amphibians – and, in fact, are essential to the same. In the glacial till uplands of New England, vernal pools are many and small, often only several square yards in area. While the water table may be sufficiently near the surface in and around vernal pools throughout the year to support indicator plant species, it more often is not, leaving the location of vernal pools difficult for the untrained eye to identify when not flooded.

The aquatic habitats of Jaffrey's lakes, ponds and streams are classified as part of a larger group: the Southern [NH] Upland Watersheds, which begin with the land draining to the South Branch Ashuelot River in Fitzwilliam and Troy, Lake Monomonac in Rindge, and the Gridley River in New Ipswich. They extend northward through the Monadnock and Sunapee Highlands and beyond. These include riparian habitats along stream channels and the near-shore and open water habitats of and lakes and ponds. Riparian habitats are transitional between water and upland and often support unique species. Riparian habitats may extend only a few feet from the water's edge or hundreds of yards (e.g. floodplains) and in general are easily lost to development.

Considering the earlier estimates of 42 miles of waterbody shoreland and 40 miles of perennial streams, and assuming a conservative average width of 25 feet for riparian habitats adjacent to streams, lakes and ponds, Jaffrey could have something on the order of 488 acres of riparian habitat. Of course, much of this shoreland is developed today, particularly on the Great Ponds and the Contoocook River in the downtown area.

For a more detailed inventory of habitats refer to the Appendix "Natural Communities Expected to Occur in the Town of Jaffrey" excerpted from "Natural Communities of New Hampshire" published by the NH Natural Heritage Inventory Bureau. (Make this into a footnote or incorporate into the appendix.)

Wildlife

The landscape in Jaffrey is also teaming with animal life, from microscopic invertebrates living in the film of water between soil particles to moose and black bear ranging across thousands of acres of forest. It is important to remember that the land, water and plants are not inert media in which animals live but rather that each is a part of the whole, an interactive system that is at once constant and yet is constantly being changed by what happens next.

The animals found in Jaffrey are typical throughout central New England. Mammals inhabit or use all habitats in Jaffrey. Some are far ranging and can use or require parts of

many different habitats in the course of their year and lives, such as moose, black bear, bobcat, coyote, and fisher (fishercat?). Others have smaller home ranges and more limited preferences or requirements of habitat conditions, such as white-tailed deer, otter, porcupine, fox and other fur-bearers, including beaver, muskrat, mink, and weasel. Rodents can have broad habitat requirements, such as white-footed deer mice and other species of woodland mice, meadow voles, chipmunk, and red and gray squirrels. Still others have more limited requirements of habitat conditions, such the northern flying squirrel, red-backed bole, and several species of bat. And so it goes for the variety of bird species, reptiles, amphibians, fishes, and the myriad of invertebrates from snails and insects to crayfish and freshwater mussels.

The NH Natural Heritage Inventory Bureau reports that one reptile species, two insect species, seventeen plant species, and two plant communities that are considered endangered, threatened or warranting monitoring in New Hampshire are known or suspected to occur in Jaffrey. Half of these are associated with Mount Monadnock and Gap Mountain. Reported or suspected occurrence of the others is widely dispersed. The Bureau prohibits publishing the names of species and communities of concern by geography in order to protect the resource from disturbance or collection. It should also be noted that some of the reported occurrences date from the 19th Century and have not been corroborated since then, and that the Bureau's inventory is not the result of systematic area-wide research and therefore under-represents the numbers and variety of species and communities of concern in Jaffrey.

The NH Fish & Game Department published in 2006 the "New Hampshire Wildlife Conservation Action Plan" which provides a description of habitats which are at risk or are associated with plant and animal species at risk in New Hampshire. **[NOTE: GIS data from that report will be available for use in local planning during summer 2006.]** See the NH Natural Heritage Inventory Bureau and NH Fish & Game Department for inventories and further information about plant and animal species of concern. (Use this as a footnote)

The variety, distribution and requirements of plants and animals across Jaffrey's varied terrain points to the urgency of preserving the entire mosaic of landscape conditions in as intact a condition as possible to accommodate the full range of changes through seasons and years. The goal must be to avoid or minimize further fragmentation of the natural landscape by development and other disturbances, such as pollution and invasive species.

III. DEVELOPMENT CONSTRAINTS

Landscape conditions can impose limitations on development by requiring extraordinary costs for engineering, construction and/or maintenance of developed land uses. Development under some landscape conditions may also jeopardize or diminish public interest in natural resource values, such as water supply, clean air, and productive farm land, or more esoteric matters such as scenic qualities and biodiversity.

Physical conditions that may render areas less desirable for development include steep slopes, seasonally wet soils, wetlands, floodplains, and soils that are shallow to bedrock or water table. The Soil Survey of Cheshire County, New Hampshire, published by the US Department of Agriculture Soil Conservation Service, 1982 and the Soil Potential Ratings for Development; Cheshire County, NH, prepared by the Cheshire County Conservation District in 1984 are reliable, comprehensive source of information regarding development constraints.

In addition to difficult or sensitive landscape conditions, other conditions to be considered here include important farmland soils, stratified drift aquifers, and properties that are legally protected from development (a.k.a. conservation lands). **Approximately 68% of Jaffrey is subject to one or more development constraints.**

Steep Slopes

Slope is a major consideration for Jaffrey's future development. 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%, 16-25%, 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 9-15%, 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 <scrutiny?> for all types of development. Once a slope exceeds a 15% gradient, all forms of development are considered unsuitable, and slopes greater than 25% are especially problematic. Steepest slopes often harbor special plant and animals communities as well. Disturbance of steep slopes by deforestation or excavation, and even timber harvest, can create erosion problems. Forestry practices on such slopes must be confined to low-impact operations,

including minimal basal area cutting and skid roads designed for steep slope harvesting with proper erosion controls in place.

When developing steep terrain, the potential for environmental damage increases as the slope gradient increases. 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 re-seeding and re-grading should take place afterwards. Surface water run-off rates and erosion factors increase as the slope steepness increases. This will cause sedimentation of the surface waters down slope and will clog stream channels and rivers if no erosion controls are in place.

We suggest moving the text and table below (bounded in blue XXXX) to the appendix in favor of the text that follows in red.

XXXX The soils listed below are the fourteen soil types occurring in Jaffrey that are associated with excessively steep slopes:

Symbol	Soil Type	Characteristics	Slope
22E	Colton	loamy fine sand,	15-50%
60D	Tunbridge-Berkshire	stony fine sandy loam	15-25%
61C	Tunbridge-Lyman	rock outcrop	8-15%
61D	Tunbridge-Lyman	rock outcrop	15-25%
72D	Berkshire	fine sandy loam	15-25%
73D	Berkshire	stony fine sandy loam	15-25%
76D	Marlow	fine sandy loam	15-25%
77D	Marlow	stony fine sandy loam	15-25%
77E	Marlow	stony fine sandy loam	25-50%
143D	Monadnock	stony fine sandy loam	15-25%
161E	Lyman-Tunbridge	rock outcrop	25-50%
365E	Berkshire & Monadnock	very stony fine sandy loam	25-50%
399	Rock outcrop	rock outcrop	8-50%
526E	Caesar	loamy sand	15-50%

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 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. XXXX

The text below is adapted from the 1997 Update, page 3, and is intended to add Jaffrey-specific references to the existing text of Part 2 following the general information provided on pages 8-9.

In terms of development, slope is a significant limiting factor in Jaffrey. Approximately 7,800 acres (30% of the Town's total area) consist of slopes that are 15% or greater, indicating a limited capacity for development or, above a 25% gradient, virtually no capacity. Moreover, while Mount Monadnock accounts for more than half of this total, there are steep slopes throughout the Town, notably along its eastern perimeter and in the southwestern quadrant. Map # X ("Steep Slopes" or, if revised, "Slope Gradients") shows the location of these slopes.

It bears emphasizing that the principal conservation issue concerning steep slopes is not soil quality but soil erosion. Many of the Town's steep sloping areas contain soil properties that are rated high in terms of development potential. Many areas along the Town's side slopes contain deep, well drained soil deposits. Despite having favorable soil properties, these areas should still be considered unsuitable for development due to their erosion potential. In effect, slopes and soils are not proxies for each other. And where steep terrain and soils with low infiltration rates combine together to produce high surface water runoff rates, the erosion potential is especially severe.

To be sure, there are several large land areas scattered throughout Jaffrey that have both good soil properties and minimal slopes. These lands are located primarily in the southern half of Jaffrey. However, much of this land is already developed; and the prospects for future development are limited by the fact that abutting the Town's existing road network are many wetland areas and hills with steep slope gradients.

The situation described above makes the issue of hillside development a critical one for Jaffrey. Hillside development should be evaluated in terms of potential soil erosion, septic system placement, water well placement, roadway and driveway construction, surface water runoff, and general aesthetics. In such areas, the presence of municipal water and sewer can be a slightly mitigating factor in terms of construction impact. However, other aspects of construction (e.g., driveways, lot preparation) still present the potential for erosion; therefore, strict erosion controls need to be in place. Soil properties should be considered in conjunction with slope gradients when evaluating a site's erosion potential.

Wetland Soils (Unsuitable Soils?)

Part 2 on soils unsuitable for development (pp. 8-9 in the original) focuses only on wetland soils, contains almost no text, and is dominated by a table on wetland soil types that -- given its detail -- probably belongs in an appendix.

We have the following observations and suggestions based on an examination of the 1997 Update, Part 1 of the current update, and the various maps at our disposal.

We suggest calling this subsection "Unsuitable Soils" or "Sensitive Soils", the latter in keeping with the new map of this title (but see the caveat below).

We suggest drawing from the 1997 Update to mention unsuitable soils and locate them in a **new map** (more below). The appendix can identify these soils by name and technical properties.

There would seem to be three types of unsuitable soil:

1. certain steep soils (1997 Update, p.3 bottom paragraph)

2. seasonally wet soils (mentioned in Part 2 text, original p.7; but no text unless original p.10, paragraph 3)

3. wetland soils

Wetland soils clearly warrant the most discussion. The 1997 Update, p.5 is serviceable for this purpose.

Note: One of the new maps refers to "Hydric Soils", but this term is not in the Part 2 text, nor in the 1997 Update. What it refers to is, therefore, a bit unclear.

Note: One of the new maps shows "Sensitive Soils". These would seem to include both good (farmland) soils and unsuitable (highland slope) soils; i.e., apples and oranges in terms of the original structure of Part 2, which deals first with development constraints and then with development potential. For clarity/punch we suggest separating them out, as we have done by merging the “Development Potential” section into “Jaffrey’s Natural Landscape” (Section II above). We also suspect that "sensitive soils" is the wrong organizing principle.

The 1997 Update contains a "soil matrix" (p.7), but the text about it is not very clear or, we think, useful. By contrast, the ranking of soil potential and development (also p.7) just might be a potent summary. Perhaps there should be a **new map** showing the five categories across the Jaffrey landscape.

The 1997 Update, p.8 top, contains good summary observations. Part 1 of the current update, p.5, does too.

Finally, the discussion of Floodplains in Part 2 is separate from soils because (it would seem) floodplain soils are actually quite good from a development perspective, yet warrant protection for other reasons. Is this correct?

We suggest moving the paragraph and table below (bounded in XXXX) to the appendix.

XXXX Wetland soils in Jaffrey are those that the soil survey categorizes as being poorly drained or very poorly drained (including muck and peat).

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 Fine Sandy Loam	Nearly level and somewhat poorly drained and poorly drained	Habitat for open land, 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
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	Habitat for woodland wildlife	Building site development, septic systems, and recreation

		poorly drained		development

XXXX

Floodplains

Floodplains are land areas that are characterized by annual or periodic flooding. Floodplains are special ecological communities and also present a particular community development situation a particular dilemma concerning their development?. Preserving floodplains in a natural state preserves the plant and animal communities there and provides natural storage of floodwater, thereby avoiding or minimizing downstream flooding and erosion. However, due to floodplains' typically being level ground with sandy loamy soils, they are also often suitable for development, at an earlier time for cropland and today for residential and commercial uses. Yet development on floodplains displaces natural communities, displaces natural flood storage and puts buildings, infrastructure and people in harm's way in the event of a flood.

Floodplains actually have two parts: the floodway and the 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. Would it be possible to identify uses – ok and not ok – for floodway fringes?

The Federal Emergency Management Agency (FEMA) maps floodplains for municipalities. The boundaries of the floodplains are estimated by interpolated between data associated with cross sections of stream channels, based on observations of past 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), and an area of 500-year floodplain (a 1 out of 500 chance of flooding in any given year).

New Flood Insurance Rate Maps (FIRM) for Jaffrey became effective May 23, 2006. Jaffrey participates in the National Flood Insurance Program by adopting the FIRM and a local Floodplain Development Ordinance, thereby qualifying homeowners in the floodplain to purchase federal flood insurance for their property. The Ordinance requires that the lowest enclosed floor in new construction or substantial improvements to homes located in the Special Flood Hazard Area must be at or above the base flood elevation.

Floodplain soils comprise about 1,019 acres in Jaffrey, or 4% of the Town's land area. (See Appendix __ for soil types and characteristics.) Although found throughout the Town, there are four major concentrations of floodplain soils, as revealed in Map __: "Water Resources": (1) at the northern end of Contoocook Lake and along the Contoocook River, both below and above downtown Jaffrey; (2) just north of the Black

Reservoir <actually not so indicated on the map>; (3) along Mountain Brook above Laban Ainsworth Pond and between it and the northern inlet of Mountain Brook Reservoir <not mentioned in the 1997 Update but clear on the map>; and (4) between White's Pond and Bailey Pond. We think the text should mention the extent to which these concentrations have already been developed and/or are vulnerable to future development.

The USDA soil survey also qualifies identifies? soils that are prone to flooding, typically during spring run-off, and that are also created by annual or periodic flooding. They consist of fine particles of sand, silt and organic matter deposited by floodwater and are almost always level ground. These same soils often excellent agricultural soils by virtue of their structure and nutrient content. The text is not clear what soils "prone to flooding" refers to (the "seasonally wet soils" mentioned on p.7 of the original?). Also unclear is their significance. Perhaps delete this paragraph if it is only inventory.

We suggest putting this table into the appendix.

Symbol	Soil Type	Characteristics
5	Rippowam	Fine sandy loam, frequent flooding: biennial
6	Saco	Mucky silty loam, frequent flooding: biennial
107	Rippowam-Saco	Fine sandy loam and mucky silt, biennial flooding

Given the development potential and cost of floodplain areas, it might be worth commenting on the adequacy of the Floodplain Development Ordinance in Jaffrey's current Land Use Plan. As we read it, that ordinance specifies conditions to be met in developing floodplain areas but does not restrict development there.

Aquifers

The text of Part 2 is broadly descriptive and quite similar to Part 1 (pp.4-5). Unfortunately, it says virtually nothing about the significance of aquifers for development or of development for aquifers. In effect, this subsection contains information without a message. Given that the section is about "Development Constraints", how/why aquifers constrain, or should constrain, development should be emphasized.

The 1997 Update is more detailed, including the number and location in Jaffrey of high-, medium-, and low-yield aquifers. The text mentions that Jaffrey's principal high- and medium-yield aquifers are located in the Town's southeastern corner, where -- interestingly enough -- the bulk of residential, commercial, and industrial development has occurred. The map "Stratified Drift Aquifers" confirms this. In effect, development and aquifers in Jaffrey are intimately connected, however unintentionally. What is the effect of this?

We suggest (1) that the detailed information in the 1997 Update be incorporated into an appendix;

(2) that the text reference the aquifers **map**;

(3) that the text include a discussion of why aquifers are a development constraint (in general and Jaffrey-specific); also how development over/near aquifers can threaten their health, and the significance of this for the community (in general and Jaffrey- specific). A skeptic might argue that Jaffrey proves that development is no real threat to aquifers. If this inference is wrong, the text should say so in no uncertain terms.

Aquifers are geologic formations (either sand and gravel, referred to as stratified drift, or bedrock) 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 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.

Aquifers of low to high value 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. 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 good aquifers. The U.S. Geologic Survey and the NH Department of Environmental Services completed a comprehensive study of the extent and aquifer potential of stratified drift in the State in 1993. While the USGS study can be enhanced with further site- or area-specific investigation, the findings are considered reliable and much more accurate than previous reconnaissance studies.

The USGS study indicates extensive stratified drift deposits throughout southeastern Jaffrey. These deposits are continuous with stratified drift “upstream” or, more accurately, up-gradient in Rindge and Sharon and “downstream” in Peterborough. Potential yields from the deposits in Jaffrey range from low to medium. Aquifers are described by a unit of measure “transmissivity”, reported as “feet-squared-per-day”, which accounts for both the amount of water stored in an aquifer available for withdrawal and the ease with which the removed water will be replaced. The transmissivity of Jaffrey’s stratified drift deposits is estimated to range from less than 1,000 to 4,000.

Transmissivity less than 1,000 is considered marginal for public or commercial wells. Jaffrey's existing municipal wells are located in the medium yield deposits.

The situation of the stratified drift extending throughout parts of Jaffrey, Rindge and Sharon creates a water management issue for Jaffrey in that, while water in Jaffrey's aquifer may be contributed from land area in the other towns, Jaffrey does not have land use authority in the neighboring towns.

Protecting groundwater in aquifers for individual private wells or public wells requires protection of environmental quality throughout the contributing watershed(s). This includes pollution prevention (including septic system maintenance) and minimizing impervious surfaces (rooftops, pavement and compacted earth) or otherwise ensuring a natural regimen of stormwater run-off versus infiltration to groundwater.

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 yield vast amounts of water and sometimes transmit great volumes of water over many miles. Bedrock aquifers are more difficult to characterize, requiring labor-intensive, site- or area-specific technological study. At present there is little detailed information about the qualities of bedrock as an aquifer in New Hampshire. However, the USGS is currently conducting a geologic study of bedrock aquifers in the State, which will provide information similar to the 1993 stratified drift study.

Glacial till will typically provide very low yields of water to a well. The high content of very fine particles of clay and silt in till creates a situation where till can absorb a tremendous volume of water, like a sponge. However, electro-chemical interaction between water molecules, silt and clay essentially trap water in till. While the water in till is available to the flora and fauna of soil and plant growth above ground, till is a very poor aquifer.

Surface Water

The draft text and table below are intended to be a new subsection under "Development Constraints". They are derived, in part, from earlier text in this document and from the Committee's understanding of the issues involved.

Of Jaffrey's total land area of 25,565 acres, 1,142 acres (4%) are bodies of water. The U.S. Geological Survey (USGS) identifies 103 separate water bodies in Jaffrey, with a total of 42 miles of shoreline.

Jaffrey's 12 Great Ponds – water bodies 10 acres or greater in size – are prominent natural features (Table __ ; see also Map __ on Water Resources). These ponds and shorelands are cherished as home sites and for their recreational and habitat values.

Table __: Great Ponds in Jaffrey

Pond	Acres (in Jaffrey)	Maximum Depth (in meters)	Mean Depth (in meters)
Ainsworth Pond	15	NA	NA
Black Reservoir	10	1.5	0.6
Cheshire Pond	27	3.0	1.0
Contoocook Lake	215	6.4	2.2
Cummings Meadow	42	1.8	0.6
Frost Pond	56	3.7	2.1
Gilmore Pond	115	13.1	3.7
Gilson Pond	12	1.0	0.4
Hodge Pond	14	NA	NA
Mt. Brook Reservoir	194	3.4	1.0
Parker Pond	20	2.3	1.4
Thorndike Pond	224	7.0	3.4

Source: NH Department of Environmental Services
(<http://www.des.nh.gov/wmb/lakes/lake water/trophic reports.html>)

Surface water is not commonly regarded as a constraint on development. However, there are three reasons why Jaffrey should treat the protection of its surface water as a priority concern having potential significance for further development along and near the shorelines of its Great Ponds, in particular.

(1) Jaffrey's surface water is the most likely (only?) source of water to meet the Town's future needs for an expanded water supply.

(2) Jaffrey's Great Ponds are uniformly shallow, making them especially vulnerable to pollution caused by over-development of their shorelines (Contoocook Lake being a prime example).

(3) Measures to protect long-term water availability and quality are necessary in the short term lest more of these bodies be compromised and their future use as water sources be impaired or rendered more costly.

All of this is underlined by the fact that much of Jaffrey's shoreland development consists of seasonal residences on small-sized lots with on-site septic systems. This type of development poses a potential threat to the water quality of the water bodies affected. As more of these seasonal residences are converted to year-round homes, there will be increasing incidents of septic system failure, thus increasing the threat of contamination. One solution to this problem would be greater setback requirements for septic systems and structures. (This paragraph is adapted from the 1997 Update, p.10.)

In sum, Jaffrey would be wise to take immediate and permanent action to safeguard its future water supply, as recommended in the *Final Report* of the Town's Ad Hoc Water Study Committee (September 17, 2004). Implementing water protection overlay zoning and other protective measures is especially recommended for Mountain Brook Reservoir. Moreover, the Town would be well advised to revisit the existing Shoreland Overlay District to ensure its adequacy in the face of increasing pressures for perimeter development of all Great Ponds in the years ahead.

SECTION SUMMARY

There isn't one. We think there is a need to add a brief -- and potent -- summary assessment of the five development constraints analyzed, referencing the **map** "Development Constraints" (which, alas, is perhaps too cluttered to be compelling). The introductory text (p.7 of the original) notes that approximately two-thirds of Jaffrey is subject to one or more development constraints, implying a significant degree of environmental fragility. Yet this has not impeded development to date, especially in the case of floodplains and aquifers. Can this go on? Or is Jaffrey playing Russian roulette with the natural resources on which it ultimately depends?

Figure 4 in the current Land Use chapter might be used here as well, along with appropriate text.

We also strongly recommend that the themes of fragility, fragmentation, and density of development (particularly in the Rural District) be reiterated here and at the end of the chapter.

We recommend deletion of the section below. Portions of the text have been incorporated into section I and II above, while the more technical information and tables would be better placed in the appendix.

XXXX

III. Development Potential

The Soil Potential Ratings for Development; Cheshire County, NH, prepared by the Cheshire County Conservation District in 1984 qualifies soils based on suitability for developed land uses, including the excavation for and construction of roads, buildings and septic systems. Ratings are based on structural properties of the soil, slope and hydrology. The soils listed in the table below are rated as having a "high potential" for supporting development without damage to the soil or other resources (such as might be caused by erosion), or extraordinary requirements in terms of cost, engineering, construction, or maintenance of developed land use. Approximately 9,056 acres of Jaffrey's land area is classified as having high soil potential for development. There are

only a few dozen acres of these soil types occurring above 1,500 feet in elevation and almost none above 1,700 feet.

Symbol	Soil Type	Characteristics	Slope
14B	Sheepscot	loamy sand	0-5%
22A	Colton	loamy fine sand	0-3%
22B	Colton	loamy fine sand	3-8%
22C	Colton	loamy fine sand	8-15%
36A	Adams	loamy sand	0-3%
36B	Adams	loamy sand	3-8%
36C	Adams	loamy sand	8-15%
72B	Berkshire	fine sandy loam	3-8%
72C	Berkshire	fine sandy loam	8-15%
73B	Berkshire	stony fine sandy loam	3-8%
73C	Berkshire	stony fine sandy loam	8-15%
73D	Berkshire	stony fine sandy loam	15-25%
76B	Marlow	fine sandy loam	3-8%
76C	Marlow	fine sandy loam	8-15%
77B	Marlow	stony fine sandy loam	3-8%
77C	Marlow	stony fine sandy loam	8-15%
79B	Peru	stony fine sandy loam	3-8%
142B	Monadnock	fine sandy loam	3-8%
142C	Monadnock	fine sandy loam	8-15%
143B	Monadnock	stony fine sandy loam	3-8%
143C	Monadnock	stony fine sandy loam	8-15%
143D	Monadnock	stony fine sandy loam	15-25%
169B	Sunapee	stony fine sandy loam	3-8%
169C	Sunapee	stony fine sandy loam	8-15%
365C	Berkshire-Monadnock	stony fine sandy loam	8-15%
365D	Berkshire-Monadnock	stony fine sandy loam	15-25%
526A	Caesar	loamy sand	0-3%
526B	Caesar	loamy sand	3-8%
526C	Caesar	loamy sand	8-15%

XXXX

Note: The text, table, and map below should probably be worked into Section I. The committee did not have time to do this prior to submission.

IV. Open Space

Providing for the preservation of 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.

LAND CONSERVATION

"Land conservation" referring to a variety of legal methods that limit or prevent development of individual properties. The most common means of land conservation are 1) by way of public or institutional ownership for the purposes of conservation, such as state parks or federal flood control lands, and 2) by conservation easement. In the case of protection by ownership, it is important to note that public ownership does not necessarily limit or prevent future development.

Conservation easements typically involve a second party acquiring through purchase or donation by the owner, the development rights to the property while the owner retains ownership of the property. A conservation easement will usually stipulate the kinds of land uses or activities allowed on the property – ranging from no human activity to allowing forest management, recreation or even limited development. The duration of an easement may also vary from *in perpetuity* to some specified number of years. The conditions of the easement are developed by the owner and the easement holder and are attached to the deed.

Land conservation is a development constraints – it is a legal barrier to development if individual properties.

The following table presents the numbers of properties and acreage of land subject to some manner of "protection" from development in Jaffrey and its neighboring towns, which are depicted in the figure following the table:

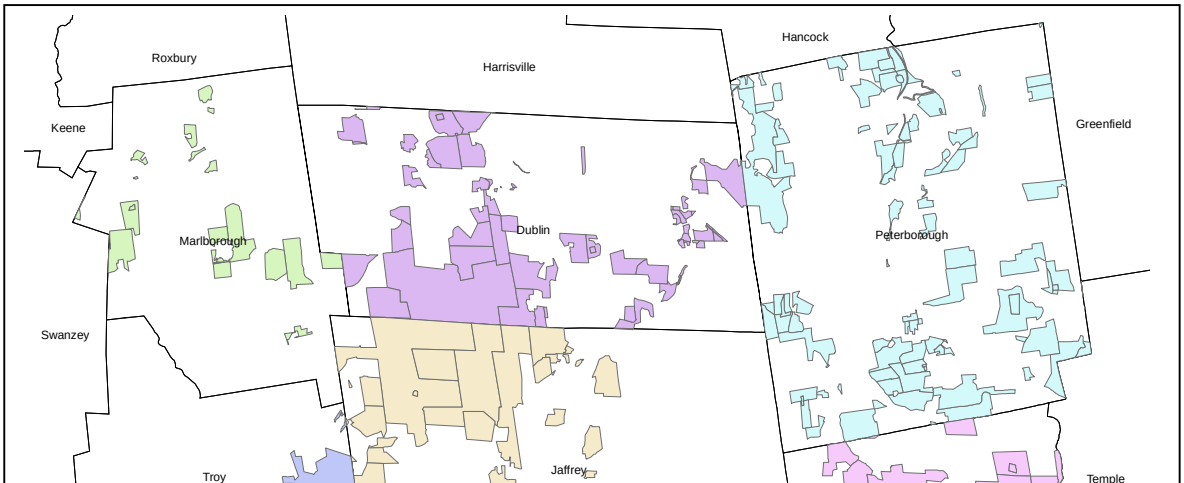
TOWN	Number of Protected Properties	Acres of Protected Land	Acres contiguous with Jaffrey *	Percent of Town by Area
Jaffrey	56	5,824	- na -	23%
Dublin	70	4,824	1,903	26%
Fitzwilliam	18	1,260	0	5%
Marlborough	23	1,128	66	9%
Peterborough	102	5,606	72	23%
Rindge	34	3,579	2,163	14%
Sharon	42	4,036	181	40%
Troy	11	1,584	816	14%
Total	**356**	**27,842**	**5,201**	**18%**

*****

Acres contiguous with Jaffrey quantifies only properties immediately adjacent to Jaffrey, rather than groups of conservation properties.

The 5,824 acres of conservation land is Jaffrey are augmented by more than 22,000 acres of conservation in the neighboring towns. There are some general trends in the distribution of protected, and in Jaffrey and neighboring communities: 1) most protected land is at elevations above 1,100 feet, 2) there is very little land conservation near or adjacent to major rivers and streams, and 3) almost half of the land conservation in this subregion is clustered around Mount Monadnock.

The first two trends are typical in New Hampshire – most land conservation is found in higher elevations. Much of the land conservation activity to-date has resulted from a rather random coincidence of property owner interests and the availability of an easement holder, rather than on a planning process that might consider variables such as ecological integrity, special habitats, soil resources, or community character, or recreational opportunities. The exception to the "accident of connecting willing sellers and willing buyers" has been land conservation driven by popular interest in protecting special places such as Mount Monadnock, Gap Mountain and Little Mount Monadnock.



SUMMARY AND CONCLUSION (new Section IV)

The chapter would benefit from a summary and conclusion along the lines of the 1997 Update but more focused on the constraints to development. Again, the Land Use chapter might be serviceable here. The themes of fragility, fragmentation, and density should be reiterated and assessed in light of the analysis.