

## 5 | **Natural Resources**

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### 5 | A **Vision & Purpose**

Lebanon's natural environment shall be widely considered a community asset, comprised of public and private ownership, whose conservation is essential to our continued health, quality of life, and the health of all species. It shall be recognized as in the public interest to encourage the preservation of open space, thus providing a healthful and attractive outdoor environment for the work and recreation of the City's citizens, maintaining the character of the City's landscape, and conserving its land, water, forest, agricultural, and wildlife resources.

Significant public and private investment shall improve the quality of our water, air and soils and shall have ensured the clarity of the night sky. A concerted combination of land protection, responsible stewardship and creative site planning shall conserve significant natural areas and important natural systems for the benefit of current and future generations while respecting and preserving the rights of property owners. Conservation areas, other open spaces, and greenbelts shall be linked with the City's built environment to provide "green infrastructure" (a network of natural lands, working landscapes and other open spaces that conserves ecosystem values and functions and provides associated benefits to people) supportive of convenient public access and compatible recreation, viable waterways, and thriving wildlife populations.

The City of Lebanon shall identify its significant natural resources and promote the preservation, conservation, responsible management, and harmonious use of those resources for current and future generations.

### 5 | B **Issues & Priorities**

#### 5 | B-1 **Balancing Resource Protection and Growth**

Lebanon, as the regional center of the Upper Valley, will continue to face demand for growth and development. The City will need to change how it grows and develops if we are to retain the open spaces and rural character that residents value.

#### 5 | B-2 **Healthy Environment, Healthy Community**

Without clean air, water and soil, Lebanon will not be a place people want to live or work. For example, protecting the quality of the water in the Mascoma River is a paramount issue for Lebanon, which depends on the river as a municipal water supply. However, connections between public health and the health of the natural environment go beyond concerns about pollution. Healthy, functioning ecosystems provide many benefits to human communities, and degraded ecosystems can create hazards.

### 5 | C **Existing Conditions & Trends**

Among the City of Lebanon's greatest assets is the abundance and high quality of its existing natural resources, including, but not limited to: clean air and water, wildlife habitat, undeveloped natural vistas, agricultural and

#### [key points](#) | [vision & purpose](#)

- Recognize that conservation of the natural environment is essential to maintaining the City's quality of life and economic vitality
- Conserve open space and maintain the functions of natural systems while respecting the rights of property owners
- Establish a connected network of open spaces, conservation lands, greenbelts, and working farm and forest land that is accessible to City residents

#### [key points](#) | [issues & priorities](#)

- Seek a balanced approach to protecting the City's natural resources while accommodating anticipated growth and maintaining the City's role as a regional center
- Maintain the healthy, functioning natural systems that contribute to the City's quality of life and economic vitality

## key points | existing conditions & trends

- Clean air and dark night-time skies should not be taken for granted as the City continues to grow and develop.
- Lebanon’s hillsides and ridgelines are defining characteristics of the landscape, and are especially vulnerable to poorly planned development.
- The City’s water resources (rivers, streams, lakes, ponds, wetlands, floodplains) serve multiple functions, and their health is critical to Lebanon remaining an attractive place for people to live and work.
- While a large percentage of Lebanon remains undeveloped, a relatively small amount of open space is permanently protected from future development. Open space, scenic views and rural character contribute significantly to the City’s quality of life.
- There is a diversity of plant and animal species living in the City in a variety of habitats. Biodiversity is a hallmark of the health of the City’s natural environment.
- Nearly all the energy consumed in the City is imported.



forestry enterprises, and open space. The 2010 Lebanon Phase II Natural Resource Inventory (NRI) provides a detailed description of Lebanon’s natural resources and a foundation for future planning efforts. The following sections provide a general description of natural resource features.

### 5|C-1 Air and Sky

Clean air contributes to public health and clear skies. Air pollution is a technically complex problem, but it is vital that high standards for air quality be enforced in planning Lebanon’s growth. The primary threats to the region’s air quality are our own automobiles, compounded by New England’s geographic and meteorological position as ‘America’s tailpipe’. Emissions from industrial manufacturing and power generation well to our west reach New Hampshire as acid rain, which has rendered lakes and ponds void of life, leached minerals and nutrients out of forest soils, and accelerated weathering of stone structures. High levels of ground ozone affect the breathing process and aggravate asthma in chronic sufferers.

As development has expanded in Lebanon in recent decades, the use of outdoor lighting has grown, particularly on Route 12A. While some lighting certainly is needed for visibility and security purposes, excessive lighting of commercial and industrial developments, parking lots, and streets can alter the character of a community. Excessive lighting wastes energy and causes glare, can impair vision, and cause accidents. Sky glow, which is reflected light visible in the night sky over large developments, reduces one’s ability to see celestial elements at night. Additionally, excessive lighting can negatively affect wildlife, particularly local and long-distance bird and amphibian migration, as well as the biorhythms of fish.

### 5|C-2 Landform

Lebanon’s landform is defined by the ridgelines and undulating hills that rise from the river valleys. The ridgelines are the most visible element in our scenic landscape and very much define the City’s character. As is intrinsic to northern New England, much of Lebanon has steep slopes.

Construction, cutting and filling, and loss of vegetation on steep slopes can reduce soil stability, increase runoff and erosion, degrade water quality, compromise wildlife and plant habitat, and diminish the City’s natural landscape. Locating development on steep slopes can also increase maintenance costs for infrastructure such as roads and sewer/septic systems. The City currently has a steep slope overlay district in order to prevent development on slopes in excess of 25 percent. The Steep Slope District currently includes all areas having slopes in excess of 25 percent that are located within the RL-3 zone.

Lebanon’s ridgelines create corridors through which wildlife can move, provide habitat for species like raptors and bobcats, and sustain many plants and animals not found at lower elevations. Some of the City’s exemplary natural communities, including those defined by the New Hampshire Natural Heritage Bureau as rare or exceptional, are found on ridgelines. The City’s ridgelines contribute greatly to Lebanon’s scenic character due to their current undeveloped state. The ridgelines are highly visible from many vantage points around the City, so a small development or even a single house on a ridgeline could be visible for miles.

As Lebanon has grown, the availability of flat dry land suitable for development has decreased. As a result, new development increasingly occurs in less suitable areas, such as those that have thin soils over bedrock, or

outright ledge. Blasting may be required to make such land suitable for building. On the other hand, blasting may negatively affect underground water resources in bedrock faults and fissures, in addition to degrading the City's naturally scenic resources.

#### 5|C-3 **Water Resources**

Lebanon's water resources include more than 130 miles of rivers and year-round streams, as well as floodplains, wetlands, vernal pools and other hydrologically connected features as described in great detail within the NRI.

#### 5|C-3a **Surface Waters.** Major surface waters in Lebanon include: the Connecticut and Mascoma Rivers, and their many tributaries (Hardy Hill Brook, Great Brook, Stoney Brook, Blodgett Brook, among others); and Mascoma Lake, Boston Lot Lake and a number of smaller ponds.

Similar to many communities in New Hampshire, the terrain in Lebanon has resulted in roadways having been built in close proximity to surface waters. This has increased the vulnerability of these surface waters to pollution and spills. As described in the Community Facilities and Services chapter of this plan, the Mascoma River is Lebanon's public drinking water supply. As such, the City has particular concern for safeguarding the river's water quality. However, most of the river's watershed, its tributaries and headwaters, are outside the City.

In 2011, the Mascoma River became the sixteenth protected river in the New Hampshire Rivers Management and Protection Program (RMPP). The designation formalizes a local and state partnership for the management of the River. A local advisory committee will coordinate the development and adoption of a river corridor management plan.

The New Hampshire Shoreland Water Quality Protection Act is a regulatory measure that offers limited protection to the Mascoma River, as well as other surface waters in the City (Mascoma Lake, Bloods/Trues Brook, Great Brook and Boston Lot Lake). Within the 250-foot protected shoreland of these water bodies, various protection measures apply.

In 1998, the Lebanon Planning Board adopted the recommendations in the Connecticut River Corridor Management Plan of the Connecticut River Joint Commission (CRJC) regarding the protection of the Connecticut River and its watershed. The CRJC advises that preserving vegetated buffers along waterways, including smaller streams, is the most effective protection for water resources. Buffers filter polluted runoff, stabilize banks, regulate stream flow, recharge aquifers, and provide important habitat, among other benefits.

#### 5|C-3b **Floodplains.** The floodplains along the City's surface waters have experienced substantial development during the past 40 years, most notably, significant portions of the developed area on the west side of Route 12A. Floodplain development reduces flood storage capability, increasing the likelihood of greater flooding including areas not previously affected and increasing the threat to life and property posed by flooding. Floodplain development also reduces the scenic and habitat value of the river valleys. Since 1980, the City has been in compliance with the National Flood Insurance Program, which is administered by the Federal Emergency Management Agency. This program prohibits development in the actual floodway, but permits it in the 100-year floodplain if the developments are flood-proofed.



mascoma river

Property	Acres
Alana Cole Conservation Area	18
Bakers Crossing Conservation Area	5
Boston Lot	439
Chambers Memorial Reserve	20
East Wilder Boat Launch	2.5
Farnum Hill Reserve	864
Goodwin Conservation Area	105
Jackson Property	15
Lebrun Meadow	23
Mill Parcel	4
Signal Hill Conservation Area	220
Starr Hill Natural Area	36
Ticknor Conservation Area	76
Trues Brook Natural Area	2
Two Rivers Conservation Area	24
Zeev Darer Memorial Natural Area	21
<b>Total</b>	<b>1,874.5</b>

conserved land

- 5|C-3c **Wetlands.** Within Lebanon, there are an estimated 1,500 acres of wetlands. The small, incremental filling and degradation of wetlands over the years continues to add up to a significant loss of wetland acreage and function. Some wetland ecosystems in the City have become increasingly isolated islands surrounded by development, which decreases their ecological value, particularly as habitat. The NRI provides descriptive information related to the functions and values of Lebanon’s wetlands, as well as a priority ranking of their importance.

The value of wetlands for groundwater and stream recharge, flood attenuation, pollution abatement, and wildlife habitat is still vastly under-appreciated. Wetlands and their valuable functions essentially do the work of engineers free of charge, saving us money and effort in pollutant and flood mitigation.

5|C-4 **Land Resources**

- 5|C-4a **Open Space.** Lebanon residents have a long history of expressing their appreciation for and desire to maintain open space. Open space helps define community character, is home for wildlife and plants, protects drinking water supplies, and provides opportunities for recreation.

In addition to the numerous ecological benefits that it provides, studies have demonstrated the high economic value contributed by open space land. Open space is a “fiscal winner” for the City, as it brings in more money in taxes than it uses in services. Open space also increases the value of nearby developed land. It is vitally important to attracting and retaining businesses, and is also the foundation of the agriculture, forestry, tourism, and recreation industries.

The City still has a considerable amount of undeveloped (open/forested/agricultural) land. The NRI identifies 19,274 acres within Lebanon as undeveloped or natural habitat, representing approximately 72% of the City’s land area, in addition to 635 acres of agricultural land. Approximately 15,000 acres of open space lands are in Current Use, a reduced-rate property tax classification that is intended to help preserve the land base for forestry, agriculture, and other traditional uses.

- 5|C-4b **Conserved Land.** Approximately 2,100 acres of land within the City are conserved and protected from future development. These conservation lands offer many beautiful and accessible areas that provide important habitat for plants and wildlife; protect water and air quality; and fulfill resident’s needs for recreational opportunities, an experience of nature close to home, and outdoor solitude. ADA access is provided where feasible and has been incorporated into the management policies of the City’s conservation lands.

There are more than 21 miles of trails on the City’s conservation lands, as depicted on the 2010 Lebanon Trails map. Additionally, there are ongoing efforts to identify and plan for additional linkages to a community wide trail network. The City employs a seasonal ranger to help maintain the City’s conservation lands, including the trails, and has recently stepped up efforts to recruit volunteers to assist as well.

- 5|C-4c **Working Land.** Agriculture and forestry play an important role in the regional and state economies, as well as in stewardship of our natural resources and scenic landscape.

Increased development pressures and decreased profitability of small farms (partially due to higher tax burdens) have gradually diminished the rural and agricultural character of Lebanon’s outlying areas. However, the working farms and orchards that remain continue to contribute to our economy, and the City’s remaining

undeveloped prime agricultural soils leave the door open for continued farming in the future. Local farms provide fresh, high-quality food directly to the community and the region, eliminating the need for energy- and cost-intensive shipment and travel. They contribute directly and also indirectly to the economy by providing the quality of life that attracts companies and their workforce as well as tourists.

Forest lands are a dominant feature of Lebanon’s landscape and ecosystem. Much of Lebanon is still wooded, and the City’s productive forests are an important renewable resource. Several forest-based commercial enterprises (logging, milling, maple sugaring) rely upon the availability of healthy woodland. Forest fragmentation and conversion to other uses have many ecological, economic, and social impacts, such as reduced water quality, habitat loss, and declining traditional recreational opportunities

## 5|C-5 Plants and Animals

5|C-5a **Biodiversity.** Biodiversity enriches the community by providing environmental, economic, and social benefits. A diverse ecosystem can better survive disease and disturbance; can maintain essential biological services such as natural recycling of nutrients and wastes; and can provide models and resources for human advances in agricultural, medical, and other endeavors.

Lebanon is home to a wide variety and abundance of plants and animals, including more than 40 rare or endangered species. The 2010 Natural Resource Inventory provides a tremendous amount of information related to Lebanon’s biodiversity, identifying 73 “Significant Ecological Areas” (SEAs) within the City’s borders.

5|C-5b **Urban Forests.** Trees in residential and commercial neighborhoods serve many important roles in the City of Lebanon. Among other benefits, urban trees provide shade, beauty, windbreak, cleaner air, privacy, and higher property values. When planted in the proper location, trees can help decrease summer cooling and winter heating bills. Also, the leaves, branches and trunks of trees catch rainwater before it reaches the pavement, reducing runoff, erosion, pollution, and other stormwater effects.

5|C-5c **Invasive Species.** Through the efforts of the Connecticut River Joint Commissions, the New Hampshire Department of Agriculture Invasive Species Program, and other organizations, the City has been learning about problems associated with invasive exotic plants in Lebanon and in the region. The Conservation Commission regularly recommends that developers eliminate or limit the spread of such plants in the course of their work, and the Planning Board’s Site Plan Review Regulations include a list of invasive exotic species that cannot be used to satisfy the landscaping requirements. However, broader coordinated efforts are needed. Purple loosestrife, buckthorns, honeysuckles, barberries, Japanese knotweed, as well as other invasive plants, occur and are spreading on all city-owned conservation lands, along roadsides and power-line cuts, as well as on private land throughout Lebanon.

## 5|C-6 Energy

Lebanon’s energy future is tied to policies and economic forces at the state, national, and international levels. Most of the City’s energy sources are imported from outside of the region, although wood remains an important fuel for many residents. Approximately four percent of the energy demand is satisfied by energy generated within the region (UVLSRPC Regional Plan, 1998). The Lebanon Energy Advisory Committee (LEAC) is

## key points | future challenges & opportunities

- As Lebanon faces growth pressures, careful planning and better protection are needed to ensure that the City preserves its important natural resources as it grows as a vital economic center.
- Lebanon needs to act, in concert with the state and federal governments, to prevent air pollution and preserve dark nighttime skies as the City continues to grow and develop.
- Lebanon needs to expand its regulations applying to development on steep slopes to cover the entire City and to address the related issues of ridgeline development and the potential ecological damage caused by blasting.
- Lebanon needs to be actively developing and implementing watershed protection plans, particularly for the Mascoma River (the City's water source), in coordination with neighboring communities and the state.
- Lebanon needs an open space plan to identify key open space resources, and identify strategies and techniques to maintain open space for future generations.
- Lebanon needs to seek out the information and expertise needed to more effectively protect plant and animal species, and improve the quality of habitat on public lands.
- City government should lead by example through its efforts to conserve energy in City operations and increase use of renewable, local energy sources.
- There should be greater coordination among City departments, staff and volunteers to increase the effectiveness of Lebanon's efforts to protect natural resources.



currently developing an energy master plan, which will address energy conservation as well as other related measures.

## 5 | D **Future Challenges & Opportunities**

### 5 | D-1 Impact of Development on Natural Resources

Lebanon's natural resources have degraded over time as the City has grown and changed. Many formerly open fields, including some of the Northeast's richest soils, have been covered with shopping centers, houses, and other types of development. Some of the City's most significant floodplains and wetlands were drained or filled in before the advent of protective regulations, and development pressure continues to affect these resources. In the uplands, wooded ridges and hillsides are being fragmented by roads and rural development. Increasing vehicle emissions, fertilizers, pesticides, road salt and other pollutants threaten air and water quality even in rural areas of Lebanon.

Most current environmental impacts result from development, often driven by regional pressures. New parking lots, stores, offices, industries, medical facilities and services attract more people and stimulate demand for more development. Small environmental impacts may not be immediately visible and dramatic, but over time the impacts accumulate and can be damaging in the long term. As Lebanon faces growth pressures, careful planning and better protection are needed to ensure that the City preserves its vital natural resources as it grows as a vital economic center. Without proper protection through local regulations, incentives and educational efforts, the City could lose the very assets that have made this community a desirable a place to live and do business.

### 5 | D-2 Air and Sky

5 | D-2a **Air Pollution.** Local sources of air pollution, such as emissions from vehicles and industries, and dust from construction sites, should be monitored by the City as well as by the state. The Clean Air Act of 1970 directs the states to regulate air pollution under guidance from the federal Environmental Protection Agency. When air quality in a region declines and causes an area to be in non-attainment (non-compliance), the Clean Air Act requires that pollution-control programs be implemented to reduce the pollution concentrations to within allowable limits. Now that portions of New Hampshire no longer meet Clean Air Act standards, the City cannot take clean air for granted. Detailed information on air quality, including regulations and solutions, can be obtained from the NHDES Division of Air Resources.

5 | D-2b **Outdoor Lighting.** Outdoor lighting installations should be designed to provide the minimum light levels needed for adequate visibility while avoiding over lighting and its associated problems such as glare, sky glow and light trespass. For instance, down-lit fixtures, cut-off lighting, timers and motion detectors can be used.

### 5 | D-3 Landform

5 | D-3a **Steep Slopes.** To avoid adverse impacts from development on steep slopes, the City should consider expanding the existing steep slope overlay district to apply appropriately to all zoning districts. The steep slope district

should be reviewed and modified as needed to incorporate appropriate measures such as performance or review process techniques.

5 | D-3b **Ridgelines.** As recommended in the 1986, 1993 and 2006 Lebanon Master Plans, a ridgeline conservation overlay district should be incorporated into Lebanon’s Zoning Ordinance, in order to ensure proper siting of development that would minimize impacts to the existing landscape and scenic qualities of the ridgelines. Adopting a ridgeline conservation overlay district would assist with maintaining the functions and values of these ecologically sensitive areas. The overlay district could include regulating the siting and design of telecommunications towers, wind turbines and associated facilities.

5 | D-3c **Bedrock and Blasting.** Examining the effects of blasting on groundwater, as well as on the viewsheds of Lebanon, should be part of the development review process. Ideally, City staff should confer with experts in hydro-geomorphology. The New Hampshire Department of Environmental Services Geology Unit is actively mapping bedrock geology in partnership with municipalities, and also is interested in conducting a comprehensive study of the effects of blasting on water quality and quantity. The City should participate in these projects.

#### 5 | D-4 Water Resources

5 | D-4a **Watershed Protection.** As Lebanon is dependent on the Mascoma River for its drinking water and is the most populous community in the watershed, it would make sense for the City to take the lead in planning efforts for the watershed. The development and adoption of a water resources management plan would lay the groundwork for appropriate ordinances to protect Lebanon’s surface and ground waters. Elements of the plan should include techniques or methods to address water quality degradation resulting from non-point source pollution, erosion, runoff, etc., such as:

- Implementing measures into the development review process (e.g. Low Impact Development)
- Limiting the amount of impervious areas
- Preserving vegetated stream buffers
- Reducing herbicides, pesticides and road salt near waterways.

Other elements could include landowner education and outreach, a water quality testing program, waterway clean-up events, aquifer and source water overlay districts, and land conservation techniques (e.g. easements, acquisition). The Water Treatment Plant sub-watershed would be the logical starting point for defining the scope of a water resources management plan but Lebanon residents would benefit from having a plan include all of the community’s water resources.

Any watershed protection efforts in both the Mascoma River and Connecticut River watersheds should be coordinated with other watershed communities. Continued participation in the Upper Valley Lake Sunapee Regional Planning Commission, the Mascoma River Local Advisory Committee, and Connecticut River Joint Commission’s (CRJC) Upper Valley River Subcommittee will offer opportunities for regional information sharing and collaborative solutions to common challenges. Partnerships with private organizations to achieve water resource objectives can be beneficial, as evidenced by examples such as the Lebanon Rotary Club’s String of Pearls project, which seeks to preserve some of the remaining green areas along the Mascoma River.



boston lot lake



wetland outlines south of Lebanon high school

A comprehensive community campaign to clean up Lebanon’s waterways would enhance water quality and scenic resources. As these natural assets improve, the City will benefit greatly from increased property values and quality of life. The Lebanon Rotary Club has performed a considerable public service by organizing a biennial clean-up of the Mascoma River. This event could be augmented by other local civic, neighborhood, or school groups, and supported by the City, to bring further attention to the river.

5 | D-4b **Wetland Conservation.** The Lebanon Zoning Ordinance does have a wetlands conservation overlay district to prevent the destruction of wetlands. Designation of wetlands as “prime” is an added layer of protection in the state dredge-and-fill permitting process. *Buffers for Wetlands and Surface Waters: A Guide for New Hampshire Municipalities* (Audubon Society of New Hampshire and New Hampshire Office of State Planning, revised 1997) recommends 100 feet as a reasonable minimum buffer width to protect the values of wetlands under most circumstances. The Lebanon Conservation Commission has historically promoted the idea of including a variable wetland buffer within the Lebanon Zoning Ordinance.

5 | D-5 **Land Resources**

5 | D-5a **Open Space Planning.** Since responsible growth is so important to the City’s livelihood and vitality, it is critical to identify and implement planning techniques that encourage respectful development while preserving important landscapes. An open space plan should be developed to identify key open space lands; natural, scenic, and historic resources; as well as important strategies and tools for implementing the plan. A primary goal for developing this plan should be to maximize the size of connected open space areas in order to improve possible public access, and to conserve and prevent further fragmentation of wildlife habitat. Without proactive techniques in place to identify key parcels before a landowner makes the decision to sell or develop a parcel, Lebanon’s rural landscapes will remain at risk. The other important step in this process is to conduct an outreach and education program, so that members of the public can learn more about and participate in the benefits of land conservation and the resources available.

A forward-looking land conservation program, based on an open space plan, should be generated to purchase or accept gifts of property, conservation and public access easements, and development rights from willing landowners for important properties. Priorities for selection of these properties should come from the open space plan but should include:

- Drinking water supply protection lands
- River & lake access, Significant Ecological Areas from the NRI, greenways, and key wildlife corridors & crossings
- Geologic features such as Rix Ledges, Devil’s Kitchen, Tipping Rock, and Granite Flumes

The Land and Community Heritage Investment Program (LCHIP) could be one source of funding for high-priority projects, if the state legislature continues to fund it. Money received from Land Use Change Tax penalties (for removing land from the New Hampshire Current Use program) should continue to be used to conserve new lands, as well as to maintain previously acquired ones. The City should continue to dedicate 100 percent of its Current Use penalty receipts to the Lebanon Open Space Trust fund, as recommended in Land Use chapter of this Master Plan.

Besides purchasing open space or protective easements, there are many innovative land use controls that can be used to preserve more open space areas, such as conservation design and transfer of development rights. Generally speaking, conventional subdivision design creates residential developments in which all land is divided into house lots and streets, with the only open space typically being the yards around single-family homes. On the other hand, conservation design provides greater flexibility for the design of a development to encourage the preservation of valuable open land and natural features and to promote more efficient use of land, community facilities, services and utilities. As a result, the same number of homes can be built in a less land-consumptive manner. This technique allows the balance of the property to be permanently protected and added to an interconnected network of community green spaces. Conservation design is an equitable way to balance both conservation and development objectives.

As recommended in the Land Use chapter, the City should require conservation design where appropriate with incentives to ensure that conservation design is a financially favorable alternative for developers. The chapter also recommends that the City apply conservation design principles to industrial and commercial development.

The City should also study transfer of development rights and other methods to protect important open space. These innovative techniques could help the City attain a pattern of development that matches the overall vision of this Master Plan. The timely development of a comprehensive open space plan will provide a guide for this process, by helping the City identify important natural, historical, and cultural features that it wishes to preserve, and prioritize its opportunities.

As potential trail linkages are identified, the City should work with willing landowners, land trusts, and other conservation and recreation groups to acquire trail easements when feasible. The City also should negotiate with developers of large or strategically located parcels to protect existing trails and/or set aside additional land, if feasible, for a trail system or connection.

City-owned conservation properties should continue to be guided by management plans developed by professional land stewards, with policy oversight from the Lebanon Conservation Commission. Implementation of management recommendations could be achieved by a combination of professional staff and volunteer assistance, with outreach to neighbors of these properties.

5 | D-5b **Working Lands.** Since agriculture is an important contributor to Lebanon's scenic, historic, and cultural quality of life, incentives should be created or continued to ensure that farmlands will remain open and viable in the future. For instance, the City can allow flexibility in regulations and policies to accommodate the unusual needs of agricultural businesses, such as expanding agricultural uses in some zoning districts. The community also should continue to actively support the Lebanon Farmer's Market and marketing of Lebanon's agricultural resources, and target with farmers the fiscal, regulatory, and practical obstacles to sustaining local agriculture.

In conducting silvicultural activities, sound forestry practices should be followed, especially on ridgelines, steep slopes, and adjacent to waterways, to prevent sedimentation and erosion that contribute to the degradation of water quality. The New Hampshire Division of Forests and Lands has a publication entitled *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire* (2000) that is a good reference for anyone working in the woods, along with *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire* (2010).

5 | D-6 **Plants and Animals**

- 5 | D-6a **Urban Forests and Greenways.** As people become more aware of the benefits of trees, they realize the importance of maintaining the health of existing trees and the desirability of planting new ones. It is very important that native and site-suitable species be planted in the right places, in order to keep maintenance costs low and reduce impacts from natural hazards such as ice storms.

The City may want to consider contracting with a forester or developing a volunteer tree board to inventory important trees, especially those in the Lebanon and West Lebanon downtowns, and to develop a tree preservation plan outlining proper care and maintenance. Alternatively or additionally, the City could re-create the tree warden position to encourage tree-planting in municipal rights-of-way. Such an effort might even produce valuable input for greening locations such as the Route 120/I-89 (Exit 18) interchange. Public education is also important in regards to timber and woodlot management, as well as residential trees. To this end, the City should continue observing Arbor Day and maintain its Tree City USA status.

- 5 | D-6b **Biodiversity.** The NRI offers the basis for proposing changes to zoning, site plan, and/or subdivision regulations so as to minimize any adverse impacts from new development. Several state agencies and other organizations can offer the City practical, research-based suggestions in this regard, such as the NHDES interdepartmental fact sheets on minimizing development impacts on wildlife, and on habitat-sensitive site design and development practices. When large parcels are developed near important natural areas, existing wildlife corridors should be identified and preserved, including road crossings and fish-friendly culverts constructed with the advice of wildlife biologists. Conservation design and other innovative zoning techniques (elaborated upon in the Land Use chapter of this Master Plan) might also be utilized to provide or protect habitat. The NRI can serve as the foundation for an Open Space Plan, which in turn will provide guidance and specificity as to maintaining the existing biodiversity that Lebanon enjoys.

- 5 | D-6c **Invasive Species.** It is time to inventory infestations of invasive species in Lebanon, and develop plans to control these plants and increase awareness of the damage that can be done when they are left unchecked. City workers and private landowners and contractors alike should follow best-management practices for removal and disposal of invasive species. Roadside mowing, for example, should be done prior to seed development and the blades should be scrupulously cleaned before leaving the mowing site.

5 | D-7 **Energy Conservation**

While the City is limited in the influence it can have on a global scale, it can exert some control over local energy choices. LEAC's Energy Master Plan, currently being written, will detail Lebanon's energy use, choices and priorities. The City should make a shift toward greater local reliance on renewable resources such as geothermal, solar, wind, clean wood, and hydro power. Examples worth serious consideration include converting public streetlights to solar power, recovering methane from the Lebanon landfill, and installing wood-chip-fired boilers or geothermal heat pumps in new public building projects such as new schools. Incentives should be given to large commercial projects for doing the same.

City government can provide leadership to the community by reducing its own energy use while reducing budget costs over the long term. Many energy conservation upgrades were made throughout City Hall several years ago, following an energy audit by an independent firm. Audits should be periodically carried out for all

City buildings and operations. The City also can play an important role in encouraging energy conservation for transportation, by encouraging cluster development on residential, commercial, and industrial sites. Mixed-use development, as well as encouraging alternatives to automobile use, will help decrease multiple automobile trips and save energy. In addition to directing development patterns, the City can encourage energy-efficient site designs. For instance, situating buildings with southern exposure, as well as planting trees for winter wind buffers and summer shade, can effectively reduce energy costs over the long term.

5 | D-8

### Coordination

Development and growth are inevitable and welcome, but it is imperative that the City direct development in order to preserve its open land and scenic resources. This can best be achieved through a comprehensive municipal open space plan; coordinated zoning, site plan, and subdivision regulations; and the Capital Improvement Plan.

The Conservation Commission and related staff play a pivotal role as stewards of the City's natural and scenic assets and, along with the Recreation Commission and related staff, its recreational assets. As volunteers, Conservation Commissioners have an important job to do with limited time and resources. Accordingly, City staff and Conservation Commission members should continue to keep one another apprised of ongoing opportunities for training and education, so that they can be better-informed and more effective decision-makers. Communication should be improved among the City's boards, departments, and citizens, to ensure that the policies and actions of one body are not inconsistent with those of others, and that Lebanon's treasured natural resources are not compromised. Efforts to partner with local and regional organizations, neighboring towns, and state agencies (along with private landowners themselves) also should continue on behalf of conservation.

Through successive master plans, land conservation efforts, municipal elections, partnerships with the private sector, and other processes, the people of Lebanon have sustained an interest in protecting the City's natural resources and scenic character. The Conservation Commission should continue to engage the public in conservation, with multiple partners in the schools, in scouting and other service organizations, in recreational contexts, and in neighborhoods by sponsoring community educational events, outings, workdays, and celebrations.

## Outcomes & Strategies

### OUTCOME 1 Seek a balanced approach to protecting the City's natural resources while accommodating anticipated growth and maintaining the City's role as a regional center.

STRATEGIES	ACTIONS
1 Guide development into existing areas as designated in the Land Use chapter to protect outlying rural areas and open space lands.	1 Develop an Open Space Plan, with public participation, that will inventory natural and cultural features, and recommend green space corridors for continued wildlife habitat and for the benefit of residents.
2 Guide new development away from wildlife habitat areas that have been identified in the Natural Resources Inventory.	2 Explore voluntary land protection measures on Tipping Rock, Rix Ledges, Devil's Kitchen, and Granite Flumes to protect the unique geological features of those areas.
3 Investigate innovative land use regulations such as transfer of development rights to preserve open space, natural resources and important wildlife habitat and corridors, taking into consideration the rights of property owners and abutters.	3 Apply for Land and Community Heritage Investment Program (LCHIP) and other funding sources for land conservation projects.
4 Require open space or conservation design for all ecologically important land.	4 Adopt a policy whereby the Recreation Department and Conservation Commission as well as the School Board are notified when the City acquires or decides to sell property, or when land is offered to the City.
5 Purchase easements or property for conservation throughout the City, particularly in critical habitat areas as identified in both the Natural Resource Inventory and Open Space Plan.	5 Authorize the Conservation Commission to periodically review all city-owned property and to recommend what land should have conservation easements.
6 Encourage the creation of a private conservation council to act with no personal benefit to acquire easements or purchase property in situations where the City may not be able to respond quickly to a priority parcel because of legal or other constraints.	6 Conduct education and outreach to members of the public about the benefits of land conservation and options for conserving land.
7 Develop a land acquisition/conservation easement program to protect scenic views.	7 Create incentives in the Zoning Ordinance for agricultural businesses and expand the importance of maintaining and increasing agricultural activity within the City.
8 Include City gateways in open space planning.	8 Contract with a licensed forester to work with the Conservation Commission in developing forest management plans.
9 Support efforts to establish more scenic roads.	9 Adopt and implement appropriate logging guidelines to encourage best management practices (BMPs) for logging in the city-owned forested areas.
10 Discourage exterior area illumination of prominent physical features and landscapes that dramatically impact the nighttime landscape.	10 Place protective third-party easements on city-owned land with important habitat areas.
11 Review lighting design elements of development proposals to ensure that adequate minimal lighting is planned, but over lighting is avoided.	11 Work with the NH Department of Transportation to develop landscaping plans for Route 120 between Exit 18 and Hanover Street.
12 Require the use of renewable energy in heating and cooling systems in new construction of public buildings.	12 Create a scenic corridor overlay district to protect the City's highway corridors from inappropriate development and visual blight, and landscaping standards for all major entry corridors to the City.
13 Continue to support land use patterns that promote alternatives to single occupancy vehicles, such as public transit, park-and-ride facilities, sidewalks, and bikeways/bike paths.	13 Develop recommended landscaping guidelines for distribution to landowners, regarding such issues as the protection of existing trees and landscaping, choosing plant species native to the region, and planting to screen utility facilities and equipment.
14 Encourage the use of energy conservation measures through site plan review, such as orienting buildings to take advantage of natural light and heat, and providing vegetation for summer shading and wind buffers.	14 Adopt a ridgeline ordinance to protect ridgelines from poorly sited development and consider including hillsides and wildlife corridors to lowlands
15 Continue to encourage mixed-use growth centers rather than strip-type sprawling development patterns.	15 Adopt lighting standards that minimize sky glow and glare.
16 Encourage and support transportation alternatives to single-occupancy vehicles, including mass transit, pedestrian and bicycle paths and facilities, ride-sharing, etc.	16 Develop and approve a wind turbine ordinance to enforce the appropriate siting and design of wind turbines.

## OUTCOME 1

Seek a balanced approach to protecting the City's natural resources while accommodating anticipated growth and maintaining the City's role as a regional center.

### STRATEGIES

- 17 Encourage recycling citywide, including in city-owned facilities.
- 18 Encourage the use of renewable energy resources and provide information on these resources to residents on the City website and in the City newsletter.

### ACTIONS

- 17 Develop and approve a telecommunications ordinance to enforce the appropriate siting and design of telecommunications towers.
- 18 Conduct periodic energy audits of all City buildings, infrastructure (including streetlights) and operations to identify areas of energy waste and recommend cost-effective energy conservation measures.
- 19 Establish a citywide recycling program to include periodic household hazardous waste days.

## OUTCOME 2

Maintain the healthy, functioning natural systems that contribute to the City's quality of life and economic vitality.

### STRATEGIES

- 1 Enforce stormwater and erosion control standards and conditions during and after construction, perhaps by requiring a bond, to ensure that there is no increase in surface water flows after development.
- 2 Make impervious surface reduction a goal of parking policies and regulations in the Zoning Ordinance.
- 3 Educate landowners regarding best management practices, such as proper household hazardous waste disposal, recycling, and composting through materials disseminated at City Hall, and through the City website and newsletter.
- 4 Acquire or seek donations of parcels, conservation easements, development rights, and rights-of-way adjacent to important bodies of water for protection of public access, water quality, public water supplies, floodplains, wetlands and wildlife habitat.
- 5 Support the Rotary Club's biennial clean-ups of the Mascoma River and encourage other groups to adopt other water bodies for cleanup.
- 6 Seek outside funding or volunteers to clean up sites in coordination with the regional planning commission.
- 7 Continue alliances with neighboring communities and regional organizations, such as the Mascoma Watershed Conservation Council, to foster cooperation in protecting water bodies and watersheds.
- 8 Develop and disseminate public education materials regarding the importance of protecting our water supply sources.
- 9 Investigate and consider utilizing recent innovations in stormwater management and groundwater recharge systems (ex. low-impact development) in critical locations where more traditional techniques prove inadequate.
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### ACTIONS

- 1 Review site plan and subdivision regulations and update with the following components incorporating standards from the Stormwater Management and Erosion and Sediment Control Handbook: erosion/sedimentation control; on-site stormwater treatment; proper road design; minimize impervious surfaces.
- 2 Develop and adopt a variable width buffer zone along select streams and rivers.
- 3 Develop and adopt a Water Resources Management Plan.
- 4 Create source water overlay for existing drinking water sources based on the Model Rule for the Protection of Water Supply Watersheds and the 1999 Mascoma Watershed study.
- 5 Develop and adopt an aquifer protection overlay district to more strictly regulate development adjacent to potential drinking water sources.
- 6 Conduct land use and environmental constraints studies of the Mascoma River, Stoney Brook, Hardy Hill Brook, and Blodget Brook corridors to guide appropriate development in order to protect drinking water supplies.
- 7 Provide ditches, treatment swales, detention ponds, and catch basins that will prevent road run-off and accidental spills from discharging into water bodies, especially public water supply sources.
- 8 Develop an ordinance more stringent than that developed by Federal Emergency Management Agency to restrict development or filling in of floodplains to provide flood storage, water quality protection, and wildlife habitat adjacent to waterways.
- 9 Request updated flood hazard mapping by FEMA, as recommended in the 2002 Connecticut River Corridor Management Plan.
- 10 Inventory and legally designate prime wetlands for special protection.
- 11 Adopt a variable width wetland buffer zone, as appropriate, based on functions and values as recommended by *Buffers for Wetlands and Surface Waters: A Guidebook for NH Municipalities*.

## OUTCOME 2

Maintain the healthy, functioning natural systems that contribute to the City's quality of life and economic vitality.

### STRATEGIES

- 12 Continue educational programs to promote public awareness of the conservation lands, appreciation of their natural features, and appropriate activities on those lands.
- 13 Coordinate local volunteers to continue the care, maintenance, promotion, and appropriate use of conservation lands.
- 14 Continue to plan and publicize a program of nature walks in the City's conservation lands to enhance public appreciation of them.
- 15 Work with local land trusts to acquire trail easements when feasible, with an eye to linking to existing trails to provide a comprehensive network.
- 16 Negotiate with developers to protect existing trails and/or set aside additional land for a trail system.
- 17 Encourage volunteer help and hire a Park Ranger to implement park education (such as Adopt-a Park and Junior Ranger programs) and to build and maintain trails.
- 18 Investigate and recommend appropriate measures to ensure handicapped accessibility on conservation lands where feasible.
- 19 Continue participation in the "Tree City USA" program to call attention to the City's natural resources.
- 20 Continue to celebrate Arbor Day to raise awareness of the importance of trees to all residents.
- 21 Encourage Dartmouth College to continue working with the City through the Landmark Lands Committee to inventory and evaluate Dartmouth College Lands before development is proposed.
- 22 Protect existing wildlife corridors, such as the one across Route 120 and Mt. Support Road, with guidance from wildlife biologists.
- 23 Educate landowners about the importance of preserving wildlife habitat on their own land.
- 24 Raise awareness of invasive species by sponsoring educational lectures and field trips.
- 25 Continue formal cooperative planning among adjacent communities through the Upper Valley Lake Sunapee Regional Planning Commission and other organizations like the Mascoma Watershed Conservation Council.
- 26 Take the lead on developing a Mascoma Watershed Plan to protect our drinking water source.
- 27 Identify opportunities for training and information sharing on natural resource issues for the Conservation Commission, Planning Board, and other volunteer boards.
- 28 Identify opportunities for training and information sharing on natural resource issues for the Conservation Commission, Planning Board, and other volunteer boards.
- 29 Encourage City board members & administration to pursue on-going dialogue in areas of mutual interest.
- 30 Continue to work with the School Board to provide a curriculum within the schools that involves education about and access to the waterways within Lebanon, and the City's conservation lands.

### ACTIONS

- 12 Explore the expansion of the Steep Slope Overlay District.
- 13 Hire a licensed forester to develop management plans for city-owned conservation areas together with the Society for the Protection of New Hampshire Forests, UNH Cooperative Extension, and other similar organizations.
- 14 Update maps of existing trails and make them available to the public.
- 15 Identify selected Class VI Roads as part of the green infrastructure trail system.
- 16 Resume and publicize the "Wild about Lebanon" program and its regularly scheduled volunteer-led informational walks to City parks.
- 17 Identify parks and recreational facilities through publicity and signage that includes a brief history of who donated the land, interesting facts about the property, and existing trails and/or flora in the area.
- 18 Develop and adopt an urban tree ordinance to protect urban and residential trees.
- 19 Develop master landscaping plans for the central business districts and gateways, identifying and recommending appropriate street tree and other planting opportunities in consultation with a Garden Club and/or a landscape architect.
- 20 Develop a wildlife habitat overlay zone for critical habitat areas, including deer yards, bear habitat, vernal pools and wildlife corridors.
- 21 Inventory areas that have been impacted by invasive species and develop a plan to address these areas.
- 22 Hold annual tours of City parks and conservation lands for City Council members and all other City boards.
- 23 Eradicate invasive species from city-owned land.