



**LEBANON CONSERVATION COMMISSION**  
**MARCH 9, 2023 - 6:30 PM**  
**COUNCIL CHAMBERS, CITY HALL OR**  
**REMOTE VIA VIRTUAL PLATFORM**  
**LEBANONNH.GOV/LIVE**

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- 1. Call to Order**
  - 2. Approval of Minutes**
    - A. February 9, 2023
  - 3. Open to the Public**
  - 4. Permit Review**
    - A. None
  - 5. Study Items**
    - A. Master Plan Chapter Update (revised Chapter 5)
  - 6. Committee Reports**
    - A. Biodiversity Group (Invasives)
    - B. Stewardship
      - Ranger
      - Trail Coordinator
      - Monitors and Stewards
    - C. Wild about Lebanon
    - D. Amphibian Crossings
    - E. LUCT/Current Use
    - F. Other Subcommittees
  - 7. Other Business**
    - A. FYIs
    - B. Follow Up
    - C. Workshops and Educational Opportunities
  - 8. Future Agenda Items**
  - 9. Adjournment**

**The order of agenda items is subject to change.**

Meetings are open for in-person and remote attendance. Members of the public that wish to attend remotely may do so by going to [LebanonNH.gov/Live](https://LebanonNH.gov/Live) where you will find instructions on how to enter the meeting. Members of the public will be able to participate and ask questions through the City's virtual platform or by phone. Please note: Should technical difficulties occur during the meeting that disrupts virtual or phone connection(s), the meeting will continue without remote access capabilities.

DRAFT

**CONSERVATION COMMISSION  
REGULAR MEETING MINUTES  
Remote Via Microsoft Teams  
LebanonNH.gov/Live  
February 9, 2023  
6:30 PM**

**MEMBERS PRESENT:** Sarah Riley (Chair), Bruce James (Vice Chair), Ernst Oidtman, Chris Johnson, Barbara Hirai (Alt.), Erling Heistad, Susan Almy

**MEMBERS ABSENT:** Donald Lacey, Sean Dittrich (Alt.)

**STAFF PRESENT:** Mark Goodwin (GIS Coordinator)

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1 **1. CALL TO ORDER – Chair Riley called the meeting to order at 6:30 PM.**

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3 *Ms. Hirai sat for Mr. Lacey.*

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5 **2. APPROVAL OF MINUTES: January 12, 2023**

6 *Mr. Oidtman MOVED to approve the January 12, 2023 minutes, as amended.*  
7 *Seconded by Mr. James.*

8  
9 *\* The Vote on the MOTION was approved (7-0-0).*

10  
11 **3. OPEN TO THE PUBLIC**

12  
13 **4. PERMIT REVIEW**

14 None.

15  
16 **5. STUDY ITEMS**

17 **A. Zoning Amendments Ballot Amendments concise statements**

18  
19 **Amendment #1 (Cottage Developments):**

20 The Commission approves of and endorses the adoption of the proposed zoning amendment, as it  
21 supports the overall goals and desired outcomes of the Lebanon Master Plan. Allowing  
22 residential developments with smaller and more energy efficient dwelling units will enable the  
23 development of needed housing in a more compact form that supports a sustainable community  
24 and promotes efficient land use while ensuring compatibility with surrounding neighborhoods.

25  
26 **Amendment #2 (Manufactured Housing)**

27 The Conservation Commission has determined the proposed Zoning Amendment has limited  
28 conservation implications.

29  
30 **Amendment #3 (Accessory Uses in the Rural Lands Three (RL-3) District**

1 The Conservation Commission has determined the proposed Zoning Amendment has limited  
2 conservation implications.

3  
4 **Amendment #4 (Accessory Dwelling Units)**

5 The Conservation Commission has determined the proposed Zoning Amendment has limited  
6 conservation implications.

7  
8 **B. Goals for 2023**

9 The Commission engaged in a lengthy discussion regarding desired goals for the coming year, as  
10 summarized via the following outline:

11  
12 **Property Stewardship**

- 13 • Forest Management Plans (review existing and determine gaps) and more engagement  
14 related to recommended action/activities
- 15 • Review gaps and needs for infrastructure, e.g., footbridges, etc.
- 16 • Signage/Kiosks/Map resources
- 17 • Trail Maintenance (ongoing care of existing trails)

18 **Education / Outreach**

- 19 • Workshop for ConCom to increase awareness of aquifer/water resource status, including  
20 future plans.
- 21 • Increased ConCom knowledge of general topic of water resource (internal education for  
22 ConCom members)
- 23 • Continued support for Wild About Lebanon

24 **Land Conservation**

- 25 • Add to existing 2,000 acres, for land acquisition
- 26 • Review and modify as needed existing regulations related to OS protection (e.g.,  
27 ridgeline, aquifer, steep slopes, etc.)
- 28 • Increased awareness and encouragement for land protection
- 29 • As part of the Wetland Permit process, have mitigation projects in the hopper to offer

30 **Miscellaneous**

- 31 • Increased communication regarding DPW maintenance activities, future well plans,  
32 stormwater initiatives (e.g., LID techniques, water quality protection, etc.)
- 33 • LOST Fund Investment Strategies
- 34 • Collaboration / Communication between ConCom and proposed redevelopment plans for  
35 West Lebanon

36 **C. Ticknor Property – site walk recap**

37 The Commission reviewed the site walk notes from December 12.

38  
39 **6. COMMITTEE REPORTS**

40 **A. Conservation Committee Reports:**

1 Ms. Hirai provided an update on the Elm Planting project and interest from USFS personnel to  
2 continue to engage in monitoring.

3  
4 Mr. Oidtmann shared an update regarding downed trees on the Aspinwall trail.

5  
6 Mr. Johnson provided an update on recent trail clearing that he engaged in at Two Rivers.

7  
8 Chair Riley shared details regarding the upcoming Wild About Lebanon event that will occur on  
9 February 21, to be led by Ron Baily along the Hall and Hall School Class A trails.

10  
11 **7. OTHER BUSINESS**

12 Chair Riley shared an update regarding the FYI notices the ConCom had received, including the  
13 Edwards property, and the Hanover Street bridge replacement project. Council Rep. Heistad  
14 described the design of a bridge in Plainfield, and noted that the bridge designer, Bill Knight, is  
15 offering to share the design plans.

16  
17 **8. FUTURE AGENDA ITEMS:**

18  
19 **9. ADJOURNMENT:**

20  
21 **The meeting was adjourned at 9:27 PM.**

22  
23 Respectfully submitted,  
24 Kristan Patenaude  
25 Recording Secretary

### 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

### 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 healthy, functioning natural systems that contribute to the City's quality of life and economic vitality
- Support efforts to reduce greenhouse gas emissions, implement mitigation and adaptive measures, and continue to monitor impacts

## – key points | existing conditions & trends

- Lebanon's natural resources, among its greatest assets, have been diminished over time and are increasingly under threat.
- Clean air and a dark night sky 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, vernal pools and other wetlands, floodplains) serve multiple functions, and their protection and health is critical to Lebanon remaining an attractive place for people to live and work.
- A large percentage of Lebanon remains undeveloped, however only a small amount of open space is permanently protected from future development. Open space, scenic views, working lands, and rural character contribute significantly to the City's quality of life.
- The biodiversity in Lebanon's many ecosystems, including its varied forests and urban trees, enriches the community by providing environmental, economic, and social benefits, but is under threat from invasives and climate change.

## key points | future challenges and opportunities

- As Lebanon faces growth pressures, careful planning and better protection are needed to ensure that the City preserves its important natural resources. The City will need to implement mitigation and adaptation measures to minimize the effects of climate change on natural ecosystems.
- Lebanon needs to act, in concert with the state and federal governments, to prevent air pollution and preserve a dark night sky 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 develop and implement watershed protection plans, particularly for the Mascoma River, in coordination with neighboring communities and the state.
- Lebanon needs to implement the 2021 Open Space Plan to maintain open spaces and working lands for future generations.
- Lebanon should seek professional guidance to protect the biodiversity of its ecosystems and improve the quality of wildlife habitat on public lands, which are under threat from invasives and climate change.
- There should be greater coordination among City Departments, staff and volunteers to increase the effectiveness of Lebanon's efforts to protect natural resources.

## Natural Resources

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### 5 | A Vision & Purpose

Lebanon's natural environment, comprising lands and waters under both public and private ownership, is a community asset whose conservation is essential to our continued health, quality of life, and the health of all species. It is recognized to be in the public interest to encourage the preservation of open space, thus providing a healthful and attractive outdoor environment for the City's residents, maintaining the character of the City's landscape, and conserving its land, water, forest, agricultural, and wildlife resources.

The City of Lebanon shall identify its significant natural resources and promote their preservation, conservation, responsible management, and harmonious use for the benefit of current and future generations. Public and private investment improves the quality of our waters, air, and soils and shall ensure the clarity of the night sky. A concerted combination of land protection, responsible stewardship, creative site planning, and climate change mitigation and adaptation measures 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, greenbelts, working farms and forests, and other open spaces are 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

### 5 | B Issues & Priorities

#### 5 | B-1 Balancing Resource Protection with Growth

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Lebanon, as the regional center of the Upper Valley, will continue to face demand for growth and development. The City needs to implement plans that allow development, protect the natural environment, and retain the open spaces and rural character that residents value.

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

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Clean air and water and healthy soil are essential for Lebanon to remain a place people want to live and 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 | B-3 Climate Mitigation & Adaptation

Climate change is already impacting the natural resources of Lebanon. Extreme weather events cause erosion and flooding. Changes in temperature and precipitation patterns impact water quality, forest health, and the viability of working farms. The effects of climate change on Lebanon's natural environment include the proliferation of invasive species, increased stress at both the species and natural community levels; and other impacts on biodiversity and wildlife habitat. Increases in tick populations and associated tick-borne diseases impact our health and our relationship with nature. Seasonal changes also affect how we experience nature, i.e., hiking, birding, hunting, skiing, snowshoeing, viewing fall foliage, nature tourism, and other types of outdoor activities.

It is necessary to identify other impacts and to better understand the effects of a changing climate on the natural environment. It is imperative that the community works to reduce greenhouse gas emissions associated with human activity and to protect the natural environment that plays an important role in sequestering carbon. Mitigation and adaptation measures will be necessary to lessen the impacts of a changing climate.

## 5 | C Existing Conditions & Trends

The abundance and high quality of Lebanon's existing natural resources, including clean air and water, undeveloped land and natural vistas, agricultural and forestry enterprises, open spaces, and wildlife habitat are among the City of Lebanon's greatest assets.

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 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. Numerous environmental impacts result from development, often driven by regional pressures. Small environmental impacts may not be immediately visible or dramatic, but over time the impacts accumulate and can be damaging in the long term.

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

5 | C-1a **Air Quality.** Lebanon, like the Upper Valley in general, has historically enjoyed clean and healthy air. Maintaining this good air quality and preventing air pollution are vital to planning Lebanon's growth. Some well-known sources of air pollution include motor vehicles, power plants, industries, wood smoke, and commercial/institutional and residential activities. Air pollutants from these sources can be emitted locally, or they can be transported over great distances from upwind regions. This pollution can have health impacts such as aggravation of asthma and other respiratory illnesses; environmental impacts such as acid deposition and eutrophication of water bodies; and other impacts such as accelerated weathering of stone structures and property damage from climate change effects.

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The Clean Air Act (CAA) as amended in 1990 directs the U.S. Environmental Protection Agency and the states to regulate air quality. If air quality in an area is in non-attainment, i.e., does not meet the National Ambient Air Quality Standards (NAAQS), the state must come up with a plan to bring that area back into attainment. This is done via state-wide regulation by state environmental agencies such as NHDES and other state and federal agencies.

Ozone (O<sub>3</sub>) and particulate matter less than 2.5 microns (PM<sub>2.5</sub>) are two critical pollutants for assessing a community's air quality. Since 2007, their levels have generally trended downward in Lebanon and have been well below the levels of the NAAQS.

Virtually all air pollutants deposit onto ground and water surfaces to some extent, through either wet or dry deposition. The most significant contributors to acid deposition are sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>). Other compounds such as mercury and perfluorinated compounds (including PFAS) have been found to deposit and affect the food chain and water quality. The trends for acid and nitrogen deposition in NH are improving, supported by decreases in emissions of NO<sub>x</sub> and SO<sub>2</sub> in both NH and the US overall.

Carbon emissions continue to be a significant threat to the earth's ecosystems and to Lebanon's natural resources and infrastructure. Lebanon's municipal greenhouse gas emissions have been routinely inventoried and measured since 2010 and show a trend of significant reduction. A community scale inventory has yet to be conducted and so it is unknown whether increases in technological efficiencies are offsetting the increased development trend in the City.

5 | C-1b **Dark Sky**. As development has expanded in Lebanon in recent decades, the use of outdoor lighting has grown, particularly on Route 12A, and along the Mt Support and Route 120 North corridor. While some lighting 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 can cause glare, 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. Excessive lighting has been shown to have adverse effects on humans, wildlife, and the environment. Negative impacts include disruptions to a person's biological clock, animal species migration, and nesting patterns.

The City continues to amend development regulations to guide the types of lighting fixtures permitted, favoring cut-off and other style fixtures. However, the sheer volume of new development is increasing sky glow, as does the increased lighting from single and multi-family homes and other types of development exempt from development regulations.

## 5 | C-2 Landform

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Lebanon's landform is defined by undulating hills and steep slopes that rise from its river valleys. The ridgelines are the most visible elements in our scenic landscape and help define the City's character.

5|C-2a **Steep Slopes**. Construction, blasting, excavation, and loss of vegetation on steep slopes can reduce soil stability, increase runoff and erosion, degrade water quality, compromise wildlife and plant habitat, reduce carbon sequestration, 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 District to prevent development on slopes in excess of 25 percent. The Steep Slope District currently is limited to the RL-3 zone. However, the RL-3 zoning district contains a relatively small percentage of Lebanon's land area. Therefore, potential adverse impacts occurring on steep slopes continue to warrant monitoring and prevention measures as needed.

5|C-2b **Ridgelines**. 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. Ecologists and climate scientists have highlighted the emerging additional importance of these higher elevation habitats as species adapt to warming temperatures and migrate to suitable habitats.

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.

5 |C-2c **Bedrock**. As Lebanon has grown, the availability of flat dry land suitable for development has decreased. 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 but 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

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

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

The terrain in Lebanon, as in many New Hampshire communities, has resulted in roadways 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, much of the River's watershed, tributaries, and headwaters are upstream of Lebanon.

In 2011, the Mascoma River became the sixteenth protected river in the New Hampshire Rivers Management and Protection Program (RMPP). This designation formalizes a local and state partnership for the management of this river. A local advisory committee, with assistance from the Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC), is coordinating the development and adoption of a river corridor management plan.

The New Hampshire Shoreland Water Quality Protection Act (NH SWQPA) is a regulatory measure that offers protection to the Connecticut and Mascoma Rivers, as well

as other surface waters in the City (Mascoma Lake, Bloods/Trues Brook, Great Brook, and Boston Lot Lake). Various protection measures apply within the 250-foot protected shoreland of these water bodies.

In 2014, the Lebanon Zoning Ordinance was amended to include the Riverbank Protection District. This includes additional protection measures for water bodies regulated by the NH SWQPA, as well as other water bodies outside of the jurisdiction of the NH SWQPA.

The Connecticut River Joint Commission (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 since the 1970s, 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.

5 | C-3c **Wetlands.** Within Lebanon, there are an estimated 1,500 acres of wetlands. 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, carbon storage, and wildlife habitat is still vastly under-appreciated. Wetlands and their valuable functions save us money and effort in pollutant and flood mitigation.

The land surrounding wetlands is critical for maintaining the functions and values of the wetland itself. In 2014, the City amended the Zoning Ordinance to include the Wetlands Conservation District. The essence of the regulation is to restrict development from occurring within this buffer area to provide additional protection measures to high value wetlands.

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.

Studies have demonstrated that in addition to numerous ecological benefits, open space land is of high economic value. 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 2021 Open Space Plan identifies 21,293 acres as undeveloped or natural habitat, representing approximately 81% of the City’s land area. Approximately 18,000 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 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 could be 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 property maps generated by the City. Additionally, there are ongoing efforts to identify and plan for additional linkages to a community wide trail network. The City employs a seasonal conservation ranger to help maintain the City’s conservation lands, including the trails, and to help recruit and organize 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, orchards, and woodlots that remain continue to contribute to our economy, and the City’s remaining undeveloped prime agricultural soils could provide opportunities 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 indirectly to the economy by providing the quality of life that attracts companies, their workforce, and tourists.

Forest lands are a dominant feature of Lebanon’s landscape and ecosystems 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. Conversion to other uses has many ecological, economic, and social impacts, such as reduced water quality, forest fragmentation, habitat loss, fewer traditional recreational opportunities, and reduced carbon sequestration.

## 5 | C-5 Plants and Animals

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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 **Invasive Species.** Invasive exotic plants and insects are impacting the health of trees, forests, and wildlife, as well as ecosystem biodiversity in Lebanon and surrounding areas. With guidance from the New Hampshire Department of Agriculture, the NH Invasive Species Committee, and other organizations, the City is making efforts to reduce these impacts. The Conservation Commission regularly recommends that developers eliminate or limit the spread of known invasive plant species in the course of their work, and the Planning Board's Site Plan Review Regulations include a list of invasive species that cannot be used to satisfy landscaping requirements. However, broader coordinated efforts are needed. Purple loosestrife, buckthorns, honeysuckles, barberries, and Japanese knotweed are just a few of the invasive species spreading on City-owned conservation lands, along roadsides and power-line cuts, as well as on private land throughout Lebanon. Invasive insects such as Emerald Ash Borer, are impacting the health of our urban and rural forests.

5 | C-5c **Forests.** Forests are valuable assets that provide habitat for wildlife and opportunities for recreation, sequester carbon, and purify our air. Development, forest fragmentation, climate change, invasive species, and deer overabundance, among other threats, are impacting the health of our forests.

It was often cost prohibitive to construct and maintain lengthy driveways to serve residences. The preference was often to locate the home as close as possible to an existing maintained road. A current trend in the Upper Valley, including Lebanon, is to locate house sites in remote locations served by driveways that can exceed 1/2 to 1 mile in length. These features fragment undeveloped blocks of land, resulting in increased predation, the spread of invasive species, disruption to migration patterns, and other adverse effects on the natural environment.

5 | C-5d **Urban Trees.** Trees in residential and commercial neighborhoods serve many important roles in the City of Lebanon. Among other benefits, urban trees provide shade and windbreak, cleaner air, shelter and food for wildlife, privacy, beauty, 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. Development, construction, improper placement, planting, or maintenance, climate change, and invasive insects such as the Emerald Ash Borer are serious threats to the health of the City's urban forest.

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

Development pressures and climate change will continue to impact Lebanon's natural resources. Careful planning, conservation efforts, and better protections are needed to ensure that the City retains its vital natural assets while allowing opportunities for future growth. Without proper protection through local regulations, incentives, educational efforts, and good stewardship the City could lose the very assets that have made this community a desirable place to live and work.

The 2010 Natural Resource Inventory, the 2016 Wildlife Corridor Analysis, and the 2021 Open Space Plan form the basis of Lebanon's Conservation Program. Associated planning tools and protections such as the City's Wetlands Conservation District, Steep Slope District, and Riverbank Protection District, and the Shoreland Protection Act should inform future planning decisions and be utilized to guide future development. Future protections such as a blasting ordinance, an urban tree ordinance, an expanded steep slope overlay district, and a watershed management plan are needed to better guide future development and ensure additional protections of natural resources.

The challenge of addressing issues associated with a warming planet can be daunting, but implementing both mitigation and adaptation measures is imperative to minimize disruptions of natural ecosystems. The technological solutions currently exist to mitigate some of the impacts of climate change; but political will is needed to fully engage in the necessary deployment of these technologies.

### 5 | D-1 **Air and Sky**

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#### 5 | D-1a **Air Pollution**

Maintaining good air quality is essential to making the City and the Upper Valley a great place to live and work. Even though all of New Hampshire is currently in attainment with the National Ambient Air Quality Standards (NAAQS), Lebanon cannot take clean air for granted. Localized sources of air pollution, such as wood smoke, tailpipe emissions from idling vehicles and equipment, and emissions from businesses can impact both the health and enjoyment of residents in some areas of the City.

Opportunities for Lebanon to contribute to maintaining good air quality include procuring low and zero-emission vehicles such as battery electric and plug-in hybrid cars and trucks as older City-owned vehicles are retired; specifying clean vehicles and equipment when making procurements (e.g., requiring electric trash trucks and school buses in bids/contracts); improving the efficiency of city-owned building stock and incorporating renewable energy sources such as solar, conducting education and outreach

to businesses and residents to ensure they are aware of the options available to them; and improving infrastructure to support less polluting vehicles in both the public and private sectors. A potential opportunity for the City to help inform state actions could include community science monitoring of PM<sub>2.5</sub> to help identify hyper-local levels of PM<sub>2.5</sub> due to wood burning and other activities.

A present and future challenge is building community resilience, especially in neighborhoods that may be disproportionately impacted by air pollution and climate change. The heat island effect results in significantly hotter summer air temperatures, increased air pollution and health risks in locations dominated by impervious surfaces and inadequate tree canopy.

Detailed information on air quality and how it is regulated in New Hampshire can be obtained from the NHDES Air Resources Division. The latest edition of the State of New Hampshire Air Quality Report is a valuable reference for additional trends.

5 | D-1b      **Dark Sky.** Lebanon would likely not qualify as a dark sky community as certified by the International Dark-Sky Association, but should commit to improving dark sky conditions and improve opportunities for star and planet gazing.

Within the development review process, and in all City municipal operations, 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, light trespass, and biological impacts on both humans and wildlife. For instance, down-lit fixtures, cut-off lighting, timers, and motion detectors can be used.

## 5 | D-2 Landform

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5 | D-2a      **Steep Slopes.** To avoid adverse impacts from development on steep slopes, the City should expand the existing Steep Slope District to apply 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-2b      **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 to ensure proper siting of development and to 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-2c      **Bedrock.** Examining the effects of blasting on groundwater, as well as on the viewsheds of Lebanon, should be part of the development review process, with City staff consulting a hydrogeologist as needed. To further protect groundwater quality and hydrology, the City should consider adopting a blasting ordinance, such as those described in the NH DES 2019 publication Rock Blasting and Water Quality Measures That Can Be Taken To Protect Water Quality and Mitigate Impacts.

5 | D-3a **Watershed Protection.** As Lebanon is dependent on the Mascoma River for its drinking water and is the most populous community in the watershed, the City should be involved 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 techniques or methods could include:

- adding measures to the development review process (e.g., Low Impact Development);
- limiting the extent of impervious areas;
- preserving vegetated stream buffers;
- reducing herbicide, pesticide, and road salt use near waterways;
- 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 that includes all of the community's water resources. Any watershed protection efforts in the Mascoma 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 and should be explored as part of the watershed planning effort.

Comprehensive community campaigns to continue the clean up of Lebanon's waterways will enhance water quality and scenic resources. As these natural assets continue to 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 or directly coordinated by other local civic, neighborhood, or school groups, and supported by the City, to bring further attention to the River.

One threat to our water resources is the increased frequency of toxic cyanobacterial blooms. These algal blooms are occurring more often in part because longer ice-free seasons result in more time for surface waters to warm up and for blooms to develop. To limit the likelihood of toxic blooms, it is important that the City and its residents work to control phosphorus inputs from impervious runoff, lawn clippings, fertilizer, wastewater,

and septic systems. Protecting shorelands is also key - native plants have deep roots. Land conservation, outreach to homeowners, preventing the clearing of steep slopes, adopting larger shoreland buffer zones, requiring larger buffer zones for septic systems, improving stormwater management by increasing infiltration and improving culverts are additional steps to further protect our surface waters.

5 | D-3b **Floodplains.** Development has decimated the extent of functioning floodplains in the City. The increased frequency of extreme weather events has underscored the importance of floodplains to mitigating floodwaters. Every effort should be made to protect Lebanon's remaining floodplains and valuable floodplain forest communities.

5 | D-3c **Wetland Conservation.** Incremental filling and degradation of wetlands is continuing to contribute to a significant loss of wetland acreage and function. Efforts to avoid wetland impacts should continue. In situations where temporary or permanent impacts are unavoidable, the functions and values of each wetland should be the focus of the permitting review process. In situations where impacts exceed the requisite threshold and mitigation is required, the parties associated with the proposed impacts should prioritize mitigation opportunities on site, within proximity, or within the community, in that order.

The Lebanon Zoning Ordinance includes the Wetlands Conservation District to prevent the destruction of wetlands. This district includes a buffer for high and very high value (as categorized in the 2010 NRI) wetlands. *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 City should consider expanding its wetlands overlay district to include buffers for all wetlands, including vernal pools.

## 5 | D-4 Land Resources

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5 | D-4a **Open Space Planning.** Responsible growth is critical to the City's livelihood and vitality. It is necessary to identify and implement planning techniques that encourage respectful development while preserving important landscapes. The Lebanon Open Space Plan, completed in 2021, provides useful information on desirable open space characteristics and articulates the City's long-term vision for land conservation. The plan's prioritization framework sets open space benchmarks and identifies key components of the landscape that warrant conservation protection measures. It also provides useful information on the tools and processes for managing the ecological integrity of open space.

Innovative land use controls, such as conservation design and transfer of development rights, can be used to preserve more open space areas. 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 continue to require conservation design where appropriate with incentives to ensure that conservation design is a financially favorable alternative for residential, 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 Open Space Plan provides a guide for prioritizing important natural features that the City should protect, including Significant Ecological Areas, valuable natural resources identified in the Natural Resource Inventory, Wildlife Crossing Analysis, Wetlands Conservation District, or the NH Wildlife Action Plan, and other natural areas. Lebanon should use the Open Space Plan to guide development; maximize the size of connected open space areas; conserve and prevent further fragmentation of wildlife habitat; and increase the visibility and functionality of the Lebanon Conservation Program.

5 | D-4b **Land Conservation.** The Lebanon Conservation Program should work to preserve and protect Lebanon's open space and valuable natural resources, as prioritized in the Open Space Plan. Outreach and education are needed so that City residents and property owners understand Lebanon's conservation goals; can participate in and appreciate land conservation; and have the opportunity to become engaged stewards of natural Lebanon. Protection measures to be used include purchasing or accepting gifts of property, conservation and public access easements, and development rights from willing landowners for priority areas as detailed within the Open Space Plan.

There are a variety of funding sources and partners for land conservation efforts in Lebanon. The Department of Environmental Services Aquatic Resource Mitigation (ARM) Fund is one potential source of funding, and has been used successfully in Lebanon for past open space protection projects. The Land and Community Heritage Investment Program (LCHIP) is another 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 the Land Use chapter of this Master Plan.

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.

Stewardship of 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 should be achieved by a combination of professional staff and volunteer assistance, with outreach to neighbors of these properties.

5 | D-4c **Working Lands.** Agriculture is an important contributor to Lebanon's scenic, historic, and cultural quality of life. The municipality should continue to support such uses and try to meet the needs of the local agricultural community.

Sustainable local food production has a positive economic impact, saves energy on transportation, can promote healthy habits among local residents, and has the potential to be regenerative to the soil and to ecosystems. The community should continue to actively support the Lebanon Farmer's Market and the marketing of Lebanon's agricultural resources, and the City should work with farmers to target the fiscal, regulatory, and practical obstacles to sustaining local agriculture.

Local working forests supporting active commercial harvests provide local economic benefits, as well as a sustainable source of building products. A well-managed working woodlot can support sequestration measures by restoring the forest closer to its natural condition.

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 *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire* (2016) 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-5 Plants and Animals

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5 | D-5a **Biodiversity.** It is important to maintain diverse ecosystems in Lebanon that can better survive disease and disturbance and can maintain essential biological services. The Natural Resource Inventory, Open Space Plan, and Wildlife Corridor Analysis provide the basis for proposing changes to zoning, site plan, and/or subdivision regulations to minimize adverse development impacts on Lebanon's diverse plant and animal communities. Several state agencies and other organizations can offer the City practical, research-based suggestions, such as NHDES fact sheets on minimizing development impacts on wildlife, and on habitat-sensitive site design and development practices; the 2015 New Hampshire Wildlife Action Plan; and numerous planning tools from NHDES, NHF&G, and UNH Extension.

When parcels are developed near important natural areas, existing wildlife corridors should be identified and preserved, including road crossings and wildlife-friendly culverts constructed with the advice of wildlife biologists. Conservation design and other

innovative zoning techniques (elaborated on in the Land Use chapter of this Master Plan) might also be utilized to provide or protect habitat.

Efforts should be made to mitigate the impacts of climate change on plants and local and migratory animals and to develop and implement strategies for adaptation.

5 | D-5b **Invasive Species.** The proliferation of invasive plant species is having a negative impact on plant diversity as well as wildlife habitat in the City. The City should inventory infestations of invasive species in Lebanon, develop plans to control these plants, and increase awareness of the damage that can be done when they are left unchecked. City staff, private landowners, and contractors 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. Invasive insects including Asian Longhorned Beetle, Emerald Ash Borer, Spotted Lanternfly, Spotted-Wing Drosophila, and Brown Marmorated Stink Bug pose various risks to local agriculture, urban trees, and forests.

5 | D-5c **Forests.** Lebanon's forests, one of its most defining natural features, are important wildlife habitat, sources of forest products, and are central to much of our local recreation and nature economy.

Forest fragmentation and conversion to other uses have many ecological, economic, and social impacts, such as reduced water quality, habitat loss, fewer traditional recreational opportunities, and reduced carbon sequestration. The City should implement road and driveway standards to reduce further fragmentation of undeveloped blocks of land by private roads and lengthy driveways. Other steps the City should take to further protect forest blocks are expanding the Steep Slope District; implementing a ridgeline ordinance; and continuing to pursue the Lebanon Conservation Program's conservation goals of permanent land protection through conservation easements, purchases, and donations.

Among the many threats to the City's forests are invasive insects such as the Emerald Ash Borer. In the next few years Lebanon will experience a dramatic shift in the health and composition of its forests as ash trees succumb to this insect. The City should prepare for future impacts of other invasive insects, in combination with the impacts of climate change, on our forest health and composition.

Deer overabundance inhibits the regeneration of native tree species, reduces the regeneration and diversity of native forest understory species, and leads to the spread of invasive plant species. The City should encourage doe hunting in areas showing signs of overbrowse to better manage deer populations.

Resident and visitor use of Lebanon's natural areas has increased significantly in recent years, putting pressure on our trails and the quality of wildlife habitats. Trail use has physiological and behavioral impacts on wildlife, and can impact reproductive success and predation. For example, the upland forest surrounding vernal pools is essential for the

successful life cycle of many amphibians, who in turn are an important component in the forest ecosystem. A trail's corridor of influence - how far in either direction our presence can be detected by wildlife - might be 60 feet for amphibians, but is about 400 feet in both directions for larger animals. The City should evaluate its trail network using guidelines such as those from the NH Trails for People and Wildlife Program.

Maintaining healthy forests is an important climate mitigation measure as forests naturally store carbon, absorb rainwaters, and filter pollutants. Programs to provide financial incentives to landowners to engage in forest carbon sequestration are beginning to emerge and could be an attractive option for Lebanon landowners.

- 5 | D-5d **Urban Trees and Greenways.** The City is losing urban trees to development, disease, and damage faster than it is replacing them. Lebanon's estimated urban (places served by sidewalks) tree canopy is below 30% and falling, while many American cities are striving for 40% or greater. 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 properly planted in appropriate places, to keep maintenance costs low and reduce impacts from natural hazards such as ice storms.

The City should continue to support the recently established Tree Advisory Board's efforts to inventory important trees, especially those in the City's urban centers, and to develop a tree ordinance outlining proper tree planting, care, and maintenance. The City should hire a tree warden as defined in RSA 231:139 to help plant, maintain, and protect shade and ornamental trees and shrubs in urban public spaces and along 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 the proper choice, placement, and care of residential, public, and other street trees. The City should continue observing Arbor Day, maintain its Tree City USA status, and utilize the resources available through the State's Urban and Community Forestry program and the UNH Extension County Forestry program to promote the health and appreciation of its urban tree canopy.

The City needs to diversify its urban forest. History has shown us the risks of overreliance on one or a few main species in the urban forest. When a species-specific pest or disease inevitably attacks, the impacts on the urban forest canopy are dramatic. This has happened with the American Elm and is soon to happen in Lebanon with species of ash, which line many roads, parking lots, and developments across the City. Lebanon currently has an overreliance on maples in the urban forest, and should encourage the planting of other tree species to diversify its urban tree canopy.

It is imperative that the City manage development to preserve its open land and scenic resources. This can best be achieved by implementing the Open Space Plan; coordinating zoning, site plan, and subdivision regulations; and using 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 Department, 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 residents, 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, state agencies, and private landowners 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, with its partners in schools, scouting, other service organizations, neighborhood groups, and other conservation and natural resource organizations, should continue to engage the public in conservation by encouraging participation in the Stewardship Program and by sponsoring community educational events, outings, workdays, and celebrations.

| Section - Topic               | ID     | Action                                                                                                                                                                                                                                                    |
|-------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OUTCOMES                      | O.1    | A balanced approach to protecting the City's natural resources                                                                                                                                                                                            |
|                               | O.2    | Healthy, functioning natural systems that contribute to the City's quality of life and economic vitality                                                                                                                                                  |
| Air & Sky - Air Pollution     | 5.1a.1 | Adopt practices that reduce air pollution and the heat island effect.                                                                                                                                                                                     |
|                               | 5.1b.1 | Maintain existing dark sky conditions by using and promoting lighting design standards (e.g., in site plan regulations) that ensure adequate lighting, but avoid over lighting, sky glow, and impacts on wildlife.                                        |
| Landform-Steep Slopes         | 5.2a.1 | Expand regulations applying to development on steep slopes to cover the entire City.                                                                                                                                                                      |
| Landform-Ridgelines           | 5.2b.1 | Adopt regulations that enforce appropriate siting and design of both telecommunication towers and wind turbines.                                                                                                                                          |
|                               | 5.2b.2 | Adopt a ridgeline ordinance to protect ridgelines, adjacent hillsides, and wildlife corridors from poorly sited development.                                                                                                                              |
| Landform-Bedrock              | 5.2c.1 | Develop a blasting ordinance to protect groundwater.                                                                                                                                                                                                      |
| Water Resources - Protection  | 5.3a.1 | Develop and adopt water resource management plans to protect surface waters, groundwater, aquifers, and drinking water sources.                                                                                                                           |
|                               | 5.3a.2 | Utilize current innovations in stormwater management, e.g., low-impact development (LID), for both City and private development projects.                                                                                                                 |
|                               | 5.3a.3 | Regularly update subdivision and site plan regulations to include current innovations in stormwater management.                                                                                                                                           |
|                               | 5.3a.4 | Develop and implement policies that reduce herbicide, pesticide, fertilizer, phosphorous, and road salt use near waterways, wetlands, and surface waters.                                                                                                 |
|                               | 5.3a.5 | Make impervious surface reduction a goal of parking policies and regulations in the Zoning Ordinance.                                                                                                                                                     |
|                               | 5.3a.6 | Enforce stormwater and erosion control standards and conditions during and after construction.                                                                                                                                                            |
|                               | 5.3a.7 | Support volunteer clean-ups of the Connecticut and Mascoma Rivers, as well as other water bodies.                                                                                                                                                         |
| Water Resources - Floodplains | 5.3b.1 | Protect Lebanon's remaining floodplains and work to restore the valuable floodplain forest communities.                                                                                                                                                   |
|                               | 5.3b.2 | 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.       |
|                               | 5.3b.3 | Request updated flood hazard mapping by FEMA.                                                                                                                                                                                                             |
| Water Resources - Wetlands    | 5.3c.1 | Periodically assess and update surface water, wetlands, and stream buffer regulations, making adjustments as needed to ensure the health of the resource.                                                                                                 |
|                               | 5.4a.1 | Establish a connected network of open spaces, conservation lands, greenbelts, working farms, and forest lands, as informed by the Lebanon Natural Resource Inventory and Open Space Plan, -to preserve the ecological integrity of the Lebanon landscape. |
|                               | 5.4a.2 | Use the Open Space Plan to guide development; maximize the size of connected open space areas; conserve and prevent further fragmentation of wildlife habitat; and increase the visibility and functionality of the Lebanon Conservation Program.         |

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| Land Resources - Open Space Planning | 5.4a.3 | Support conservation throughout the City, particularly in critical habitat areas as identified in the Natural Resource Inventory and Open Space Plan, using measures including the purchase of easements or property, donations of land, and an informed development review process. |
|                                      | 5.4a.4 | Work with Dartmouth College to protect the Landmark Lands.                                                                                                                                                                                                                           |
|                                      | 5.4a.5 | The Conservation Commission should periodically review all City-owned property and <del>to</del> recommend what land should have third-party conservation easements.                                                                                                                 |
| Land Resources - Land Conservation   | 5.4b.1 | Manage conservation land for habitat protection and wildlife habitat whenever possible.                                                                                                                                                                                              |
|                                      | 5.4b.2 | Review and implement recommendations within existing management plans, and develop management plans for remaining City-owned conservation properties.                                                                                                                                |
|                                      | 5.4b.3 | Continue to highlight the City's conservation properties through publicity and improved signage and maps that includes historical and ecological information about the property                                                                                                      |
|                                      | 5.4b.4 | Continue to employ a Conservation Ranger to help maintain the City's conservation lands, including the trails, and to help organize volunteers.                                                                                                                                      |
|                                      | 5.4b.5 | Recruit and coordinate local volunteers to continue the care, maintenance, promotion, and appropriate use of conservation lands.                                                                                                                                                     |
|                                      | 5.4b.6 | Work with developers, private landowners, and local land trusts to enhance the existing city-wide trail network to provide public access while protecting the wildlife habitat and ecologically sensitive areas.                                                                     |
|                                      | 5.4b.7 | Follow guidelines from NH "Trails for People and Wildlife" when evaluating a trail or designing a trail system.                                                                                                                                                                      |
|                                      | 5.4b.8 | Provide ADA accessibility on conservation lands where feasible.                                                                                                                                                                                                                      |
| Land Resources - Working Lands       | 5.4c.1 | Support opportunities for sustainable agricultural activity in the City.                                                                                                                                                                                                             |
|                                      | 5.4c.2 | Support the local agricultural community by continuing to promote the Lebanon Farmer's Market and the marketing of local agricultural products.                                                                                                                                      |
|                                      | 5.4c.3 | Promote land stewardship, including best management practices (BMPs) for logging.                                                                                                                                                                                                    |
| P&A - Biodiversity                   | 5.5a.1 | Guide new development away from wildlife habitat areas that have been identified in the Natural Resources Inventory and the Wildlife Corridor Analysis.                                                                                                                              |
|                                      | 5.5a.2 | Implement the recommendations from the existing wildlife corridor reports.                                                                                                                                                                                                           |
|                                      | 5.5a.3 | Identify and protect reptile and amphibian breeding areas, habitat, and migration corridors.                                                                                                                                                                                         |
|                                      | 5.5a.4 | Evaluate existing protections for vernal pools, including their buffers, and recommend protection measures.                                                                                                                                                                          |
|                                      | 5.5a.5 | Identify and support efforts to protect bees and other pollinators.                                                                                                                                                                                                                  |
|                                      | 5.5b.1 | The City should prepare for future impacts of invasive insects and climate change on our forest health and composition.                                                                                                                                                              |

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| P&A - Invasives   | 5.5b.2  | Inventory areas that have been impacted by invasive species and develop plans to remove or reduce impacts, where possible.                                                                                                                     |
|                   | 5.5b.3  | City staff, private landowners, and contractors should follow best management practices for removal and disposal of invasive species.                                                                                                          |
| P&A-Forests       | 5.5c.1  | Develop policies and practices to reduce forest fragmentation and promote healthy forests and ecosystems.                                                                                                                                      |
|                   | 5.5c.2  | Encourage landowners to engage in practices that promote forest health, wildlife habitat, and carbon sequestration.                                                                                                                            |
|                   | 5.5c.3  | Continue to celebrate Arbor Day and participate in the Tree City USA program to raise awareness of the importance of trees.                                                                                                                    |
|                   | 5.5c.4  | Encourage doe hunting in areas showing signs of overbrowse to better manage deer populations and improve ecosystem health.                                                                                                                     |
| P&A - Urban Trees | 5.5c.1  | Develop and adopt an urban tree ordinance to protect urban and residential trees.                                                                                                                                                              |
|                   | 5.5c.2  | Support the efforts of the Tree Advisory Board and Tree Warden to promote the health and diversity of the urban tree canopy, reduce air pollution, and reduce heat islands.                                                                    |
|                   | 5.5c.3  | 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 proper tree planting and care techniques |
| Coord/Outreach    | 5.6a.1  | Pursue partnerships with local and regional organizations, neighboring towns, state agencies, and private landowners regarding natural resource protection and conservation initiatives.                                                       |
|                   | 5.6a.2  | Continue formal cooperative planning and alliances with regional organizations and neighboring communities to protect water bodies and watersheds.                                                                                             |
|                   | 5.6a.3  | Increase training, information sharing, and coordination on natural resource issues for City staff, the Conservation Commission, the Planning Board, other volunteer boards, and the public.                                                   |
|                   | 5.6a.4  | Conduct education and outreach to members of the public about the benefits of land conservation and options for conserving their land, for example with conservation easements.                                                                |
|                   | 5.6a.5  | Promote public awareness of the importance of conservation lands and other natural areas and their appropriate use by continuing to host nature programs, such as Wild about Lebanon, workshops, and digital outreach.                         |
|                   | 5.6a.6  | Promote the benefits of viable functioning habitats and-provide guidelines for good stewardship.                                                                                                                                               |
|                   | 5.6a.7  | Develop and disseminate public education materials regarding the importance of protecting our water supply sources.                                                                                                                            |
|                   | 5.6a.8  | Increase involvement in invasive plant species control and removal by providing educational materials, hosting workshops, and sponsoring community work events.                                                                                |
|                   | 5.6a.9  | Educate City staff and the public regarding the proper choice, placement, and care of residential, public, and other street trees.                                                                                                             |
|                   | 5.6a.10 | Work with schools to increase students' connections to the natural world.                                                                                                                                                                      |
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