

Coordinated Review of Land Use Planning Documents with respect to Wildlife Habitat, Natural Resources, and Smart Growth Principles: Laconia, NH



January 2010

Prepared by the Lakes Region Planning Commission
and the Audubon Society of New Hampshire Conservation Department
in consultation with the Laconia City Planner and Laconia Planning Board.
Support for the project was provided by the Samuel P. Pardoe Foundation.

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Introduction

History

“Smart Growth” is a set of planning principles that guide Planning Boards toward mixed uses, greater development density, walkable, involved communities, and a working landscape with a healthy environment. The concept of Smart Growth has been around for many years, and in many ways is exemplified by the traditional New England village. In 2003 New Hampshire officially adopted eight Smart Growth Principles. Since 2006 the Lakes Region Planning Commission (LRPC) has been working with local planning boards throughout the region to conduct assessments of their planning documents with respect to these adopted Smart Growth Principles. These efforts by LRPC have been funded through the NH Department of Environmental Resources, Resource and Environmental Protection Program (NH DES REPP).

Historically, New Hampshire has depended on natural resources to support its economy – from agriculture to forest products to tourism. Aquifers, productive soils, flood storage areas, productive forest lands, and high quality wildlife habitat are not distributed evenly across the landscape. As development affects increasing areas of New Hampshire land, it becomes increasingly important to identify and protect the natural resource values on which our economy and quality of life depend.

The N.H. Fish & Game Department completed the State’s first Wildlife Action Plan in 2005, with goals of restoring declining species and keeping common species common. Engaging municipalities in this effort is a critical component of the plan, since the vast majority of land use decisions are made at the local level. To that end, the Department contracted with the Audubon Society of New Hampshire (ASNH) and The Jordan Institute in 2007 to develop tools that would aid municipalities in efforts to protect important wildlife habitat and other natural resources. The process for reviewing land use planning documents with respect to wildlife habitat and natural resources is one of the products of that contract. The Jordan Institute has since focused their work on energy-efficient buildings, and ASNH has continued to adapt and apply the review process for communities across the State.

LRPC and ASNH worked collaboratively with the town of Bristol in 2008 and the city of Franklin in 2009 to produce a “Coordinated Review of Land Use Planning Documents with respect to Wildlife Habitat, Natural Resources, and Smart Growth Principles.” NH DES REPP provided funding for the Smart Growth reviews and the Samuel P. Pardoe Foundation provided funding for the Wildlife Habitat and Natural Resources review. The Samuel P. Pardoe Foundation has funded the entirety of this Smart Growth, Natural Resources, and Wildlife Habitat review for the city of Laconia.

We believe these two reviews complement one another, and provide an efficient and effective road map for improving the municipal planning process. The two ‘crosswalks’ that immediately follow this introduction illustrate the relationships between the smart growth principles and the habitat and natural resource topics addressed in this document.

Introduction

Summary of Findings

The Future Land Use Chapter and most of the goals put forth in the 2007 Laconia Master Plan are consistent with the Smart Growth Principles. There are several recommendations resulting from the Smart Growth Assessment which identify tools and practices to assist the city in implementing these goals. They include requiring Cluster Development in the Rural Residential District, delineation and adoption of an Urban Service District, enhancing connectivity of both roads and green spaces, development of parking limitations, adoption of stormwater management rules, and a careful review of the development needs of the city.

The strongest recommendation from the Wildlife Habitat and Natural Resources review is to adopt an urban growth boundary. Application of this planning tool would enable the Planning Board to constructively guide development patterns within the city, providing both economic and environmental benefits. Other major recommendations include overlay districts to protect aquifers, agricultural lands, and steep slopes. We also strongly recommend mandatory pre-application design review in selected zoning districts, which makes it possible to identify important resources on a parcel and strategies for their protection *before* survey and engineering investments commit a developer to a specific site plan.

Document Description

This report is divided into several sections; Sections 2-4 address Smart Growth in Laconia, Sections 5 and 6 address Wildlife Habitat and Natural Resources, Section 7 synthesizes recommendations from the two analyses, and Section 8 provides voluntary practices to protect wildlife habitat features and a supplementary list of resources.

How to use this document

The intended use of this document is two-fold. First, it should serve as a reference for community leaders as they review and revise municipal planning documents with such questions as, “Are we working towards Smart Growth and doing the best we can to protect our natural resources?” and “Are our land use planning documents consistent with one another?”. This should also be a “living document”; as policies are adopted and documents revised, these changes should be reflected in this document.

This document is also intended to be a resource, and contains references to additional resources and model ordinances. In particular, we refer frequently to *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for both Smart Growth and natural resource issues. This reference, compiled by the NH Department of Environmental Services, NH Association of Regional Planning Commissions, NH Office of Energy and Planning, and NH Municipal Association in 2008, is a critical reference for New Hampshire planning boards. We also strongly recommend use of *Integrated Landscaping: Following Nature's Lead* to advise developers on landscaping strategies.

In the end, however, there is no substitute for direct assistance and advice. Laconia is fortunate to have a knowledgeable, experienced City Planner whose role includes supporting the Planning Board in the implementation of changes and helping to ensure consistency among the city's planning documents. The city can also draw upon the Lakes Region Planning Commission for assistance in drafting changes to ordinances and regulations.

Crosswalk between Smart Growth Principles and Habitat and Natural Resource Topics

Smart Growth Principle	Habitat/Natural Resource Topic
1. Compact settlement patterns	Energy Efficiency Growth Management and Sprawl Urban Growth Boundary Village District
2. Human scale of development	Growth Management and Sprawl Village District
3. Mix of uses	Village District
4. Working landscape	Agriculture and Productive Soils Forests and Forestry Green Infrastructure Natural Services Network
5. Transportation choices and safety	Energy Efficiency Growth Management and Sprawl
6. Environmental quality	Stormwater Management and Erosion Control Floodplains Forests and Forestry Green Infrastructure Groundwater Impervious Surfaces Landscaping and Natural Vegetation Light Pollution Natural Hazards Natural Services Network Shorelands, Surface Waters, and Wetlands Steep Slopes and Ridgelines Terrain Alteration Watersheds Wildlife Habitat
7. Community involvement	All
8. Work with neighboring towns	Groundwater Natural Hazards Natural Services Network Steep Slopes and Ridgelines Watersheds

Introduction

Habitat/Natural Resource Topic	Smart Growth Principle
Agriculture and Productive Soils	4. Working landscape
Energy Efficiency	1. Compact settlement patterns 5. Transportation choices and safety
Floodplains	6. Environmental quality
Forests and Forestry	4. Working landscape 6. Environmental quality
Green Infrastructure	4. Working landscape 6. Environmental quality
Groundwater	6. Environmental quality 8. Work with neighboring towns
Growth Management and Sprawl	1. Compact settlement patterns 2. Human scale of development 5. Transportation choices and safety
Impervious Surfaces	6. Environmental quality
Landscaping and Natural Vegetation	6. Environmental quality
Light Pollution	6. Environmental quality
Natural Hazards	6. Environmental quality 8. Work with neighboring towns
Natural Services Network	4. Working landscape 6. Environmental quality 8. Work with neighboring towns
Shorelands, Surface Waters, and Wetlands	6. Environmental quality
Steep Slopes and Ridgelines	6. Environmental quality 8. Work with neighboring towns
Stormwater Management and Erosion Control	6. Environmental quality
Terrain Alteration	6. Environmental quality
Urban Growth Boundary	1. Compact settlement patterns 6. Environmental quality
Village District	1. Compact settlement patterns 2. Human scale of development 3. Mix of uses
Watersheds	6. Environmental quality 8. Work with neighboring towns
Wildlife Habitat	6. Environmental quality

Smart Growth Assessment: Laconia, NH

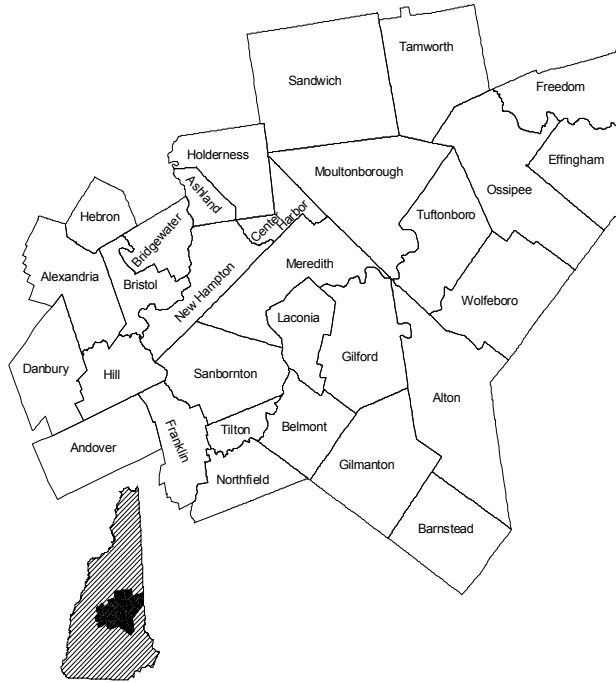


*Mixed Use and Pedestrian-Friendly Development
Elm Street - Lakeport*

January 2010

Prepared by the Lakes Region Planning Commission in consultation with the Laconia City Planner and Laconia Planning Board. Support for the project was provided by the Samuel P. Pardoe Foundation.

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I. What is Sprawl?

Since 1999, New Hampshire has grown at a rate of more than 16,000 people each year¹. Economically, this growth is often perceived as good for New Hampshire; it brings new jobs, new people, and new ideas. At the same time, however, it also brings new challenges.

Unmanaged, growth can become sprawl, which threatens to destroy the very qualities that make New Hampshire a great place to live.

“Sprawl is a pattern of development that results when:

- we use more and more land for various human activities;
- the places where we conduct activities are farther apart, and tend to be in homogeneous rather than mixed-use groupings; and
- we rely on automobiles to connect us to those places.

Development or change in land use contributes to sprawl when:



- it increases the need or demand for motor vehicle trip miles per housing unit in the community;
- it increases the per-person or per-unit amount of land space devoted to cars; and
- it otherwise increases the per-person or per-unit consumption or fractionalization of land areas that would otherwise be open space.”²

<http://www.mercola.com/ImageServer/Public/2005/september/9.16sprawl.jpg>

“Sprawling growth moves away from our town centers, leaving downtowns struggling. It spreads residential development across the rural landscape on large lots, eliminating the farms and woodlots of the working landscape - the pieces that are the very essence of rural character. The resulting pattern of development leaves islands of single uses widely spread apart from each other. In many areas the automobile becomes the only logical way of reaching these far-flung districts. Instead of the traditional mixed use patterns of development, where at least some residential development was directly accessible to downtowns that provided a variety of commercial, industrial, and institutional activities, we have residential subdivisions and office parks far outside of downtown. Instead of small-scale retail centers, we have stores and retail complexes hundreds of thousands of square feet in size, surrounded by acres of parking. In doing so, we are losing any traditional, distinctive New Hampshire character.”³

¹ NH Office of Energy and Planning webpage, <http://nh.gov/oep/programs/DataCenter/Population/PopulationEstimates.htm> (visited 11/13/09).

² NH Office of State Planning, *Annual Report to the General Court and the Governor on Growth Management*, December 2001 p.2.

³ NH Office of State Planning, *Report to Governor Shaheen on Sprawl*, December 1999. p. 1.

The NH Department of Environmental Services has studied the pattern of land use in New Hampshire and has this to say about its impact on the state's environment, "Sprawl describes a pattern of development characterized by increasing amounts of developed land per person, scattered, low-density development, and the fragmentation and loss of open space. Sprawl and other poor development practices impose significant negative impacts on air and water quality, reduces the quantity and quality of wildlife habitat, and limit recreational opportunities for area residents."⁴

Sprawl is expensive because it increases the cost of municipal services and thus taxes; it destroys the traditional land uses of forestry and agriculture; it makes us more dependent on the automobile, thus increasing traffic, congestion and air pollution; it increases water pollution through increased pavement; and it destroys the small town, rural character that is so important to many of New Hampshire's communities.

This type of development occurs not because of the ill will of developers or the ineffectiveness of government. Developers respond to market forces within the rules established by state and municipal governments. At times, however, the rules are not coherent, consistent, or logically linked to the goals they are intended to realize. Sometimes rules designed for one desirable purpose have unintended, undesirable consequences. For example:

- Two acre zoning intended to preserve a rural setting results in the fragmentation of wildlife habitat;
- Land use regulations regulating odors intended to protect health in a residential area results in limits on farming that hastens the loss of large tracts of working open space.

The term 'smart growth' is sometimes substituted for policies and techniques that prevent or counteract sprawl. The central focus of a Smart Growth Assessment is to provide a useful link between the Principles of Smart Growth and their application in municipal land use practice. This report is a step in providing that link for the city of Laconia, NH. It is intended to be a guide as the city updates its regulations, ordinances, and master plan.

⁴ Smart Growth webpage, NH Department of Environmental Services, <http://www.des.state.nh.us/wmb/was/smartgrowth.htm> (visited November 13, 2009).

II. Patterns in Laconia

A. Population and Demographics

Laconia is a small city, with just over 17,000 residents; it has by far the largest population in the Lakes Region. Like most Lakes Region communities, Laconia serves a sizable seasonal population, most noticeably in the summer.

In the 1980s the population of New Hampshire increased by 20% with an additional 11% increase in the 1990s. The Lakes Region population grew at 17.6% in the 1980s and 15.8% in the 1990s. During the 1980s Laconia's rate of growth (1.0%) was far lower than both the state and region and was still significantly lower than both areas in the 1990s (4.2%).⁵ According to the NH Office of Energy and Planning (NH OEP), Laconia's 2008 estimated population was 17,233. NH OEP projects that the state population will grow at a rate of 14.6% from 2010 through 2030. Laconia's population is projected to increase by approximately 1.6% during the next two decades, much lower than the Belknap County projection of 14.9%. This level of growth would result in 280 additional residents in Laconia.⁶

Laconia also has the greatest density of residents in the Lakes Region with an estimated 849 persons per square mile (p/sq. mi.) in 2008. The estimated density for Belknap County for the same time period was 152 p/mi². Tilton (321 p/ sq. mi.) and Franklin (312 p/ sq. mi.) are the next highest communities in the Lakes Region in terms of estimated population density. NH OEP demographic projections are only available at the state and county levels, therefore comparisons between communities cannot be made.⁷ Statewide, the percent of the population over 64 years of age is projected to triple between 2000 and 2030, while the number of people under 25 is predicted to experience slow growth. In Belknap County the number of residents over 64 years of age is projected to more than double, while the number of people under 25 years old is expected to drop slightly. The percentage of Belknap County residents over age 64 is projected to increase from 16% to 38% while the proportion of residents under age 25 is expected to drop from over 26% to about 19% of the county's population by the year 2030.

B. Housing

In the 1980s Laconia increased the number of housing units by 20.5% from 6,801 to 8,201. By 2000 Laconia had 8,554 housing units, an increase of 4.3% from 1990, while the number of housing units in the Lakes Region and the state were growing at 6% and 8.6%, respectively.

Laconia's seasonal housing stock doubled during the 1980s from 608 to 1,216 then added an additional 261 units or 21.5% in the 1990s. In 1980 less than nine percent of the units in

⁵ *Lakes Region Demographic Profile*, Lakes Region Planning Commission, 2003.

⁶ <http://www.nh.gov/oep/programs/DataCenter/Population/documents/MunicipalPopulationProjections2010-2030.pdf>, visited Nov. 13, 2009.

⁷ <http://www.nh.gov/oep/programs/DataCenter/Population/documents/populationforcountiesbyageandsex.pdf>, visited December 10, 2009.

Laconia were seasonal, by 1990 this figure was 15% and in 2000 the seasonal housing figure was 17.3%; lower than the Lakes Region average of 29.8% but higher than the state average of 10.3%.

In Laconia, one finds less manufactured housing than the Lakes Region as a whole (2.7% vs. 7.9%) and about three times as much multi-family housing (31.6% vs. 10.5%). Duplexes comprise 10.5% of the city's housing stock. Single family housing represents 55% of the housing stock, significantly lower than the Lakes Region average of 78%⁸.

Between 2000 and 2007, Laconia granted an average of 105.5 residential permits a year, with a peak of 166 permits in 2004 and a low of 65 granted in both 2001 and 2007. This represents a growth of 9.9% in eight years, more than twice the rate of the previous ten years and much closer to that of other communities in Belknap County. During the same time period, the average number of commercial permits approved by the city was 2 per year.⁹

More than 90% of the housing built in the 1960s, '70s, and 80s was multi-family; by 1990 the amount of multi-family housing had doubled since 1960 and there was more multi-family housing than there was single family housing. In the 1980s most of these multi-family units were condominiums¹⁰. By 2000 the percentage of single family housing units was up to 49% of the housing stock (multi-family was at 44%). While this is a higher percentage of single-family housing than found in Laconia in 1990, this is substantially lower than Belknap County (71%) or the Lakes Region as a whole (90%)¹¹. The development trend in Laconia during the past two decades has been towards single family homes.

C. Land Use

How a community guides development impacts the amount and type of land uses seen. Utilizing aerial photography, input from community planners, and standard guidelines a classification of features on the landscape have been conducted for Laconia for differing periods of time and comparisons can be made.

Land Use interpretations for Laconia were conducted by LRPC for 1998 and 2009 (See Appendix A for methodology). The data show that 757 acres or 6% of the land in Laconia have been converted from undeveloped to developed land during that time frame. This represents a 20% increase in in the amount of developed land in Laconia over an 11 year period.

	1998		2009	
	Acres	% Land	Acres	% Land
Developed	3,848	30.27%	4,605	36.19%
Undeveloped	8,865	69.73%	8,119	63.81%
Land Total	12,713		12,724	

⁸ *Lakes Region Demographic Profile*, Lakes Region Planning Commission, 2003.

⁹ *Development Activities in the Lakes Region: 2009 Annual Report*, Lakes Region Planning Commission.

¹⁰ Laconia Master Plan, 1991, Section 5.

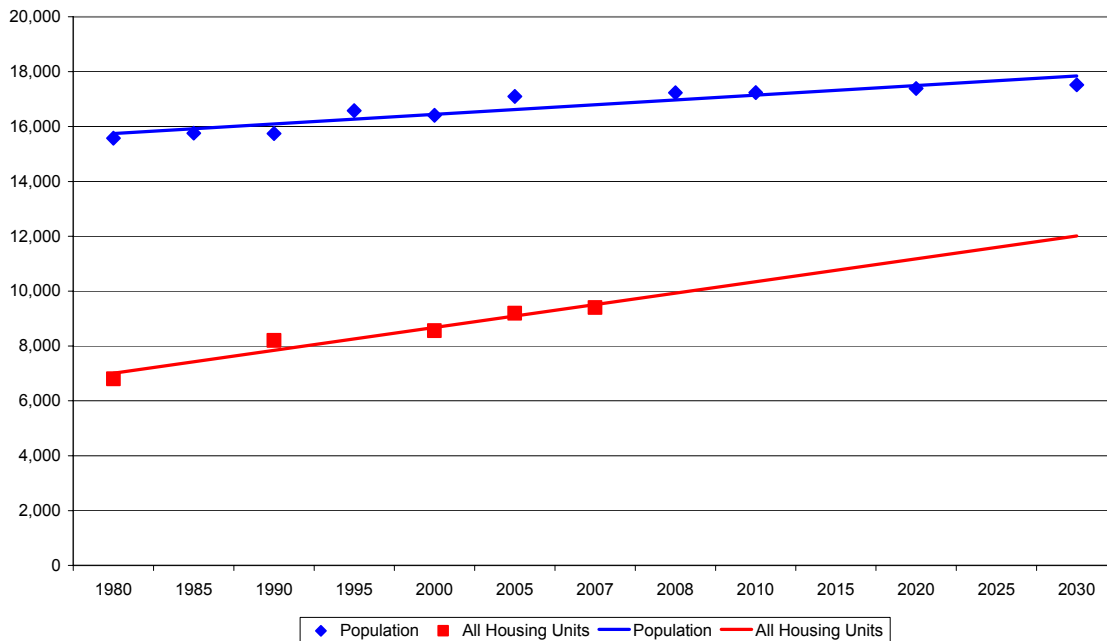
¹¹ Lakes Region Demographic Profile, 2003 p. 21.

D. Summary

While the population of Laconia grew by 1% in the 1980s, the housing stock grew by more than 20%. During the 1990s the rate of population growth had climbed to slightly more than 4% and the housing stock grew at just over 8%. The rate of population growth since 2000 is projected to be 5%. Building permits issued through 2007 indicate that the growth rate of residential units was nearly 10%. Between 2000 and 2009 the amount of developed land increased nearly 20%. In the 25 years from 1980 to 2005, Laconia's housing stock increased by 35% while its population only grew 10%.

Rate of Growth	1980-90	1990-2000	2000-2005	1998-2009	2000-2010
Population	1.08%	4.24%	4.20%		5.05%
All Housing Units	20.59%	8.15%	8.05%		
Developed Land				19.67%	

**Number of Residents and Housing Units
with Trend Lines:
Laconia**



As noted in the beginning of this report, NH OEP characterization of sprawl includes an increase in the per person consumption of land areas that would otherwise be open space. The Population, Housing, and Land Use trends apply to the city as a whole; they do not distinguish between particular areas of the community. However, the trend of the data do point towards a pattern of growth in Laconia that permits the construction of housing units and converts undeveloped land into developed land at significantly higher rates than the city's population is growing.

III. What is Smart Growth?¹²

Change is occurring in New Hampshire - more people, more traffic, changing jobs, higher taxes, and various stresses on the environment. Given these pressures, it is understandable that taxpayers and communities often respond with a loud “STOP!” Growth management, tax caps, and budget cuts are all natural responses to situations that appear overwhelming.

Smart Growth says, “First, decide on your vision. Then explore the possible ways to achieve it.” In practical terms, Smart Growth consists of evaluating and shaping all new development and re-development initiatives according to the following eight principles:

1. Maintain traditional **compact settlement** patterns to efficiently use land, resources and infrastructure investments;
2. Foster the traditional character of New Hampshire downtowns, villages, and neighborhoods by encouraging a **human scale** of development that is comfortable for pedestrians and conducive to community life;
3. Incorporate a **mix of uses** to provide a variety of housing, employment, shopping, services and social opportunities for all members of the community;
4. Preserve New Hampshire’s **working landscape** by sustaining farm and forest land and other rural resource lands to maintain contiguous tracts of open land and to minimize land use conflicts;
5. Provide **choices and safety in transportation** to create livable, walkable communities that increase accessibility for people of all ages, whether on foot, bicycle, or in motor vehicles;
6. Protect **environmental quality** by minimizing impacts from human activities and planning for and maintaining natural areas that contribute to the health and quality of life of communities and people in New Hampshire;
7. **Involve the community** in planning and implementation to ensure that development [supports] and enhances the sense of place, traditions, goals, and values of the local community; and
8. Manage growth locally in the New Hampshire tradition, but **work with neighboring towns** to achieve common goals and address common problems more effectively.

¹² Text in Sections I and II is adapted from *GrowSmart NH Tool-Kit Project*, 2002, NH Office of Energy and Planning and Planning Decisions, Inc. http://nh.gov/oep/programs/SmartGrowth/docs/chester_report.pdf pp.3,4.

IV. What is a Smart Growth Assessment?

A Smart Growth Assessment evaluates where the community stands regarding the Smart Growth Principles. To accomplish this several steps must be taken:

- Trends in the municipality's population and development are compiled along with projections for these patterns.
- The community reviews the eight NH Smart Growth Principles and identifies which of these they support.
- The most recent Master Plan goals and objectives are reviewed for statements that support the Smart Growth Principles,
- The current local land use ordinances and regulations are reviewed for consistency with each of the city-supported Smart Growth Principles.
- Suggestions are made regarding what steps the community might take to better implement the identified Smart Growth Principles.

This assessment is based upon the most current documents available for Laconia, including the *Master Plan, 2007*, *Hazard Mitigation Plan, 2005*, *Zoning Ordinances, 2009*; *Subdivision Regulations, 2009*, *Site Plan Review Regulations, 2009*. Also consulted for this plan were the *Natural Resources Inventory (2009)*, *Planning Study for Weirs, Paugus Bay, Opechee Bay, and Winnepesaukee River Watersheds, 2000* and the *Final Report: Laconia Smart Growth Implementation Assistance (2007)* by the US EPA, the *Master Plan, 1991*, and conversations with the City Planner.

V. Smart Growth in Laconia

A. Laconia's Smart Growth Principles

The Laconia Planner reviewed the eight Principles of Smart Growth outlined by the NH OEP that apply to New Hampshire communities. The City Planner agreed that all of the Principles apply to Laconia.

B. Smart Growth Checklist and Laconia's Planning Documents

The intent of this Smart Growth Assessment is to provide the city of Laconia and especially the Laconia Planning Board with tools for understanding how the city stands in its efforts to embrace and implement Smart Growth identifying any impediments to implementation that might exist.

One method of assessing a community's progress towards Smart Growth is a Smart Growth Checklist. Over the years several checklists have been developed by a variety of public and private organizations, some analyzing planning documents exclusively, others focusing on patterns and community actions¹³. LRPC staff recognized the desire of the Planning Board to have a review of their documents for consistency as well as the need to take into account

¹³ <http://www.epa.gov/dced/scorecards/>, visited August 13, 2009

patterns and local actions. As a result a compilation of several checklists was developed that has a 60/40 ratio of references to planning documents versus patterns and actions (Section 2).

This checklist asks the reviewer to choose which of three phrases best characterize the documents/patterns/actions. A number '1', '2', or '3' is associated with each phrase, with '3' corresponding to the phrase that best reflects "Smart Growth". The points under each principle can then be totaled to give an indication of where the community currently stands in terms of implementing each of the Smart Growth Principles.

Section 3 (Checklist Answers & Documentation) addresses each of the questions with statements from the Master Plan, Hazard Mitigation Plan, Zoning Ordinance, Regulations (Site Plan and Subdivision), identified patterns, or observations from the City Planner. Those statements which contradict the principle are in **red text**. The Smart Growth Assessment Checklist (Sections 2 and 3) should be updated annually to reassess the city's progress.

The section which immediately follows this text builds upon the information in Section 3, analyzing how closely the guiding documents of the municipality are aligned with each Principle. Where appropriate, the analysis addresses some of the impediments to implementing Smart Growth and makes suggestions for improvement.

Efforts were made to link each reference's individual goal, objective, ordinance, or regulation with one Principle; however, some repetition was necessary. Due to the interrelated nature of the Smart Growth statements, there are some statements that play an important role in shaping the town's ability to implement multiple Principles. Many foster the Smart Growth Principles; in a number of cases the Laconia Master Plan has statements supportive of a Principle and there are no statements contrary to the Principle, but in other documents they are merely silent on the topic.

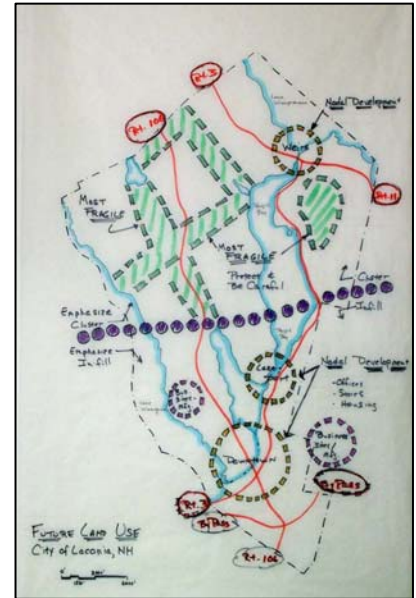
Smart Growth Principle 1:

Maintain traditional compact settlement patterns

Maintain traditional compact settlement patterns to efficiently use land, resources and infrastructure investments.

Description:

The City of Laconia can be divided into three distinct areas: Downtown, Lakeport, and the Weirs. There is certainly compact development within each of these areas, with a reduction in permitted land use density as one moves away from the city/village center. Laconia's public buildings and facilities are concentrated in the downtown and village areas, making them accessible and limiting infrastructure costs. There is an interconnecting road grid in each of the three downtown/village areas. New residential growth is occurring in two areas, around the Weirs and just south of the NH 11 and US 3 Bypass. The first is within the "village" area, the second is not. There are numerous statements in the 2007 Master Plan which point towards "in-fill development", "neighborhood/village districts", and focusing the more dense development in the southern portion of the city's boundaries. This is tempered by the city's willingness to extend sewer and water services to meet the needs of developers.



Future Land Use Map

Analysis:

Due to expanding commercial development along Union Ave., the lines dividing the three nodal areas are not clear. From the fact that most commercial growth is occurring along roads connecting Lakeport to the Weirs, several conclusions may be drawn: this is a moderate form of sprawl as these do little to enhance the downtown/village areas and are accessed primarily by vehicle, and these new businesses are not near most residential areas.

Some of the desired patterns of development expressed in the Master Plan already exist based on the historic development pattern; many others have yet to be achieved. Two large issues to address are the policy of sewer expansion and Cluster Development. Both are useful tools for protecting the quality of land and water but if not used thoughtfully, they may actually work against some aspects of good land use.

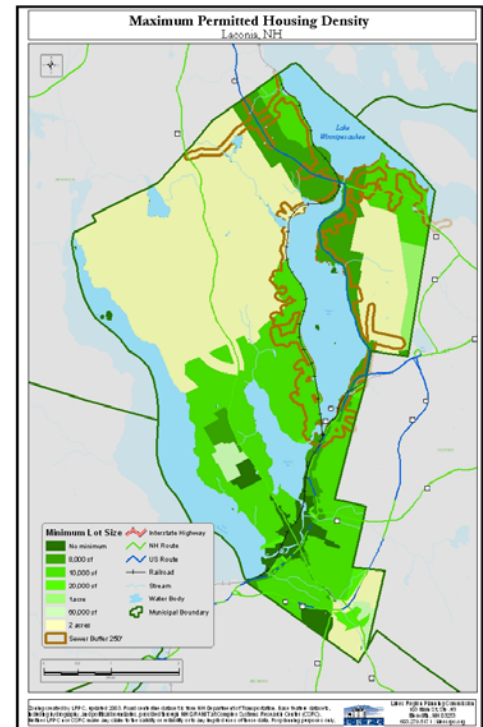
While expansion of the sewer line may be useful for protecting against direct contamination of water supplies, it encourages sprawl (unless coupled with requirements of reduced lot sizes for sewer services). The Density Table of the Zoning Ordinance does allow greater densities in the designated village areas, especially when linked to sewer and water services (See Land Use Density Map). However, it does also enable a great deal of development in regions outside the designated nodal areas.

The city does have a newly revised Cluster Development ordinance which can lead to efficient use of the land; this sort of development concentrates buildings, reduces land and

infrastructure costs, and preserves some open space. However, unlimited sewer line expansion reduces the likelihood of this option being utilized by applicants. Additionally, Cluster Subdivision requires a Conditional Use permit in all residential districts. This should be permitted in most residential districts and required in some.

The Future Land Use map in the 2007 Master Plan calls for residential development to be concentrated in the southern portion of Laconia, near the Downtown and Lakeport areas. Some mixed messages are being sent with the siting of a couple of recent residential developments. One large development has been proposed in the Weirs area; this is good, so long as it can be tied in to the Weirs network. The other development is in the southern part of the city but is outside the By-Pass, expanding the footprint of the city.

While the road networks in the downtown and village centers are interconnected (a good use of transportation infrastructure) roads in the less dense areas tend to be more of the cul-de-sac variety (prompting sprawl). Most of Laconia's public buildings are located in the Downtown/Lakeport areas and little new construction is anticipated. This is a good concentration of resources; it limits the need for additional infrastructure.



The Laconia Master Plan notes that the DPW has had to significantly reduce the size of its staff. At the same time there have been substantive increases in the demands on the department. The Master Plan also points to very large increases in the calls placed to both the Police and Fire Departments. Similar patterns have been associated with growth and sprawl in Maine and other parts of the country¹⁴.

Recommendations:

In an effort to direct residential development and bring it into concert with the Master Plan, the city should consider limiting the expansion of sewer lines in the northern portion of Laconia and requiring Cluster Development throughout the Rural Residential District. To help concentrate growth in the areas of the city identified in the Future Land Use section of the Master Plan the city should consider developing an Urban Service District, one of the tools from the *Innovative Land Use Planning Techniques*¹⁵ handbook.

The Fire and Police Departments have done much to improve their ability to respond to the needs of the city. The Planning Board could take steps to help the city make better use of its

¹⁴ *The Cost of Sprawl*, Maine Office of State Planning, 1997
<http://www.maine.gov/spo/landuse/docs/sprawlandsmartgrowth/costofsprawl.pdf>.

¹⁵ *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* (2008). Compiled by NHDES, NHARPC, NHOEP, NH Municipal Association.

resources by developing a road network plan and putting in requirements for road connectivity. The more development that is permitted along “non-interconnected” roads, the more pressure is placed on municipal services. Additionally, the Planning Board could work with the Police and Fire Departments to incorporate elements of the CPTED (Crime Prevention Through Environmental Design¹⁶) into the planning process. Many of these elements are consistent with Smart Growth Principles.

¹⁶ <http://www.thecptedpage.wsu.edu/Intro.html> (Accessed December 22, 2009).

Smart Growth Principle 2:

Foster a human scale of development

Foster the traditional character of New Hampshire downtowns, villages, and neighborhoods by encouraging a human scale of development that is comfortable for pedestrians and conducive to community life.

Description:

Residents of Laconia live in and around each of the identified centers as well as scattered throughout other parts of the city. There is a good deal of language in the master plan about neighborhoods and some language about making connections between neighborhoods. The master plan also speaks to the scale and façade of commercial development in Laconia. Once in Downtown, Lakeport, the Weirs, or many of the neighborhoods in the Single Family or General Residential Districts, it is easy to get around. While sidewalks are required with all new developments, connections to other developments or services are not required. Green space is required of all new developments, the percentage varies by zone; open space is reserved for Cluster Development. There are a number of parks in Laconia; most are readily accessible to pedestrians. There are some neighborhood stores throughout the city.

Analysis:

While the requirement of an Architectural Plan is included in Site Plan Review and Section 6.6 of the Site Plan Regulations states it “shall indicate the relationship in bulk and height to other existing structures in the vicinity”, there are no other guidelines for the Planning Board or Planning staff to follow. It requires a diligent and dedicated staff to interpret and ensure that such broad guidelines are implemented.

The city does have several parks and playgrounds throughout city, including several beaches. Most are within walking distance of residents. The green space requirement for all new developments is a positive element in terms of building community life, especially in the zones closer to the center of downtown/village area.



One of the comments relayed by the City Planner was that some have a concern that grocery shopping in the city is limited to one downtown establishment and a number of small markets or corner stores. While some of these markets are associated with neighborhoods, many are simply along one of the main routes through the city. Corner stores are permitted by Special Exception in most residential districts. Residents should be able to meet their basic shopping needs in the city. Those in downtown can but for those living anywhere else in the city, a bus, car, or taxi is required to get to a market. There are three much larger supermarkets just outside the city limits.

There are sidewalks throughout the downtown area and these do extend out along the major roadways (North and South Main Streets, Union Ave., Court Street, Elm Street) about a mile

beyond the centers of both downtown and Lakeport. While few have the aesthetic appeal of those found along a small section of Elm Street in Lakeport (see photo below), they do provide basic walkable connectivity in these areas. Some developments may have sidewalks but do not have connectivity to the rest of the city. According to the City Planner, there are plans to develop a sidewalk along Weirs Boulevard between Union Ave. and the Weirs.

Recommendations:

Providing incentives to link green spaces would further enhance the Green Space requirement. Incentives typically take the form of a tax incentive, a density bonus, or an expedited permit process. Being linked to green spaces can often lead to increased property values. Revenues from the higher taxes associated with these properties can frequently pay for municipal green spaces¹⁷.



It is important that future development activity in the downtown and neighborhoods be on a human scale. This includes bicycle traffic; there should be ample bicycle parking available to encourage the use of bicycles for recreation and everyday usage. Traffic calming measures such as trees and narrow roads can be used to give a sense of pedestrian safety along streets. Adequate funding should be directed to a planned sidewalk maintenance and expansion program.

The section on Pedestrian Oriented Development in the *Innovative Land Use Planning Techniques*¹⁸ handbook has guidelines related to building location, scale, and façade that the Planning Board might incorporate into its Site Plan Regulations.

¹⁷The Trust for Public Land, http://conserveland.org/lpr/download/9964/parks_for_people_Jan2004.pdf (visited December 21, 2009).

¹⁸ *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* (2008). Compiled by NHDES, NHARPC, NHOEP, NH Municipal Association.

Smart Growth Principle 3:

Incorporate a mix of uses

Incorporate a mix of uses to provide a variety of housing, employment, shopping, services and social opportunities for all members of the community.

Description:

As the Belknap County seat, many services are provided for residents in Laconia. There are a variety of housing options in Laconia, including several workforce and elderly housing projects. The city has fifteen different zoning districts, six of which are primarily residential. Residential uses are, however, permitted in most of the business and commercial districts. Residences are not permitted in the industrial districts.

Downtown Laconia has a mix of commercial, industrial, and residential uses. Residents of downtown can meet many of their daily needs there; however, outside of the downtown area, grocery shopping is limited.



Workforce Housing and Mixed Use complex

Analysis:

People looking to make a home in Laconia will find a variety of housing options ranging from accessory apartments and townhouses to multi-family, single-family, and lakefront homes. This mix includes several redevelopment projects intended to meet the needs of those on limited incomes. There are incentives in the Housing Redevelopment Overlay which encourage more affordable housing closer to the center of the city.

The mixing of residential uses in business, professional, and commercial districts has led to variety within the community. Even with this mix, there are some gaps in the goods and services available to Laconia residents. There are limits on where establishments are permitted; for example, farmer's markets and restaurants are not permitted in residential districts. There are incentives in parts of Laconia to encourage both the business and residential community to locate in certain parts of Downtown. For example, there are reduced parking requirements for businesses within 1,000' of the parking garage and two Brownfields Redevelopment projects, with residential as the primary use, have been completed in the past five years. Laconia seems to be promoting infill development fairly well.

The Laconia Master Plan projects that the number of year-round housing units needed by 2020 will be 7,400. It also points out that approximately 2,000 single family units alone had already been approved by the Planning Board. Also noted was that there was an abundance of housing stock at the very high end of the market¹⁹. The number of residential permits

¹⁹ *City of Laconia Master Plan* (2007), p. 50-51.

granted between 2000 and 2007 was 844 or a rate of more than 100 per year²⁰; this is greater than twice the rate necessary to meet the needs of the community according to the master plan.

According to the 2000 Census, more than 50% of the working adults living in Laconia also worked in Laconia, one of the highest rates of living and working in the same community of any Lakes Region community²¹.

Recommendations:



Workforce Housing in Laconia

Continuing to provide a mix of uses is healthy for Laconia; it gives people options for housing, work, and transportation. The Planning Board has stated that it is contemplating a revision of the Zoning Ordinance. As it moves forward with this process, the board should maintain the policy of allowing mixed uses in the downtown, Lakeport, and Weirs areas. Board members should also take steps to encourage infill redevelopment in these areas.

The city should periodically make an unbiased assessment as to whether residents in downtown, Lakeport, and the Weirs can meet their daily shopping needs within the neighborhood. If the assessment reveals gaps in the availability of services, steps should be taken to bring this into balance. This might be done through organizations such as Laconia Main Street, Belknap County Economic Development Council, or the various Chambers of Commerce.

There does appear to be a disconnect between the number and types of residential units that the city's residents need and what is being approved and developed. When the results of the 2010 Census are available, the Planning Board should carefully explore what it reveals about Laconia's population and their existing and projected needs; then compare this with the existing housing stock.

²⁰ *Development Activity in the Lakes Region* (2009), Appendix p. 3.

²¹ *Lakes Region Demographic Profile* (2003), Table 30.

Smart Growth Principle 4:

Preserve New Hampshire's working landscape

Preserve New Hampshire's working landscape by sustaining farm and forest land and other rural resource lands to maintain contiguous tracts of open land and to minimize land use conflicts.

Description:

The city of Laconia has limited agricultural activity; and there seems to be limited interest in protecting or managing what does exist as a working landscape. Some evidence of timber harvesting can be seen on aerial photos along with some agricultural lands. Laconia has pockets of soils designated as prime and statewide agricultural importance, both of which have good potential for agriculture or silviculture (forestry). Many of the prime soils appear in the area along NH Route 106 north and west of Opechee Bay as well as along White Oaks Road.



Analysis:

Much of the southern portion of the city of Laconia is developed while some portions of the northern section have not been developed. There are nearly a dozen tracts of land in conservation in this undeveloped section, totaling approximately 950 acres.

According to the City Planner, there is little reference to the presence of Agricultural Soils when reviewing development proposals. Such soils are mentioned in the master plan but only in the context of “Community Character”, “Open Space”, and tourism. The 2009

Natural Resources Inventory (NRI) does show the location of Agricultural Soils.



Farmer's Market

<http://www.citizen.com/apps/pbcs.dll/article?AID=/20090719/GJNEWS02/707199913>

In the summer of 2009, there were two Farmer's Markets in Laconia, one downtown and the other at Prescott Farm²².

Recommendations:

The Planning Board should reference Agricultural Soils maps when considering applications for development, identify areas where agriculture and silviculture are being practiced, and encourage the development of Farmer's Markets in the Downtown and Village areas.

²² Foster's Daily Democrat,, April 2, 2009.

<http://www.fosters.com/apps/pbcs.dll/article?AID=/20090402/GJNEWS02/704029782/0/CITNEWS>.

Smart Growth Principle 5:

Provide choices and safety in transportation

Provide safety and choices in transportation to create livable, walkable communities that increase accessibility for people of all ages, whether on foot, bicycle, or in motor vehicles.

Description:



Bicycle and Footbridge in Laconia

Laconia does provide some options for transportation, although the automobile is a required part of the transportation picture. There is some bus transit within the city and to neighboring communities. There is an effort to revive seasonal train transportation. The Winnepesaukee Transit System makes three runs throughout Laconia and three to Franklin each day Monday – Saturday. Downtown Laconia is walkable, with an interconnected series of roads but connections in other parts of the city are limited. The Winnepesaukee/Opechee/Winnisquam (WOW) Bike/Ped Trail is under construction in some sections (<http://www.wowtrail.com>). The Master Plan mentions that several of Laconia's schools have vehicle congestion problems. While some initial inquiries were made regarding the Safe Routes to Schools walking and bicycling program, no action has been taken by the city. While on-street parking is allowed in downtown, there

is frequent mention in the Zoning Ordinance to exemptions linked to proximity to the parking garage.

Analysis:

The street network in Laconia varies; in Downtown, Lakeport, Weirs Beach, and most of the General Residential District roads are interconnected, beyond these areas road segments are quite long or they dead end. Several times the Master Plan mentions congestion and traffic patterns as problems that need to be addressed; the city does not appear to have a road network plan.

The standard right of way width in the City Code and the Subdivision Regulations is 50'; some variation may occur upon approval from the DPW Director. The Cluster Development Ordinance does allow for a 40' right of way and 18' road widths but nowhere else are smaller road widths, an important element of traffic calming, encouraged in the city's planning documents.

The community does not have a plan for future streets. There appears to be no variation in the width of streets.

All new subdivisions require sidewalks and there are a few design standards for sidewalks; the City Planner noted that most plans also include trails as part of an “amenities package”. While the Subdivision Regulations speak a great deal about the benefits of interconnected sidewalks, these regulations could do more to encourage connectivity between trails, sidewalks, the WOW Trail, and destinations such as schools, parks, and shopping.

There do not appear to be any incentives for developing housing or businesses near transit stops.

There is a seasonal train (Winnepesaukee Scenic Railway) that is based in Meredith and runs north on scenic tours. The infrastructure exists to run south and it has made runs through Weirs Beach, through Lakeport and into the Downtown for special events such as Bike Week. Reviving this service was a key recommendation of the EPA report²³.

The Commercial Core Parking Overlay District (CCPOD) is an asset to the Downtown area in that the provisions associated with the public parking garage eliminate the need for developers to provide off-street parking. This enhances Smart Growth.

Recommendations:

Encourage more variation in street widths, where appropriate; this can reduce traffic speeds, making it safer for pedestrians. If variations in street widths are regularly permitted by the DPW Director, then documenting the guidelines upon which such decisions are made would be useful.

One method for addressing vehicle congestion associated with schools is to promote more walking and biking to school by students through the Safe Routes to Schools program²⁴. This can fund both planning and infrastructure efforts. Planning studies can help the city more clearly understand how many children do walk and bike to school and what the obstacles are for those who do not. Infrastructure can include crosswalks, sidewalks, and bike paths.

City planners may wish to consider maximum parking ratios to limit the amount of pavement associated with developments; both from an environmental as well as a traffic flow perspective. The EPA report has several recommendations regarding parking including a reduction in street-front surface parking and better management of on-street parking²⁵. It points out that by utilizing these tools the “pedestrian shed” or walkable area (and tax base) of Downtown could be expanded a great deal beyond its current size.

In an effort to address congestion problems along US 3/NH 11 the city should consider Transit Oriented Development and Access Management strategies, several of which are



The Winnepesaukee Transit System provides limited service between Laconia and Belmont, Franklin, and Tilton.

²³ US EPA Smart Growth Implementation Assistance for Laconia, New Hampshire, 2007. p. 46, Appendix E.

²⁴ <http://www.nh.gov/dot/org/projectdevelopment/planning/srts/index.htm>.

²⁵ US EPA Smart Growth Implementation Assistance for Laconia, New Hampshire, 2007. Appendix F.

outlined in the *Innovative Land Use Planning Techniques (ILU Handbook)*²⁶. These include the development of a Corridor Management Plan and identifying a site for a commuter Park and Ride.

To further enhance pedestrian and cyclist activity, the Planning Board should consider adopting several elements of the Pedestrian Oriented Development and Landscaping section of the *ILU Handbook* into the Subdivision and Site Plan Regulations, especially those related to pedestrian flow, parking lots, and vegetative buffers.

²⁶ *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* (2008). Compiled by NHDES, NHARPC, NHOEP, NH Municipal Association.

Smart Growth Principle 6:

Protect Environmental Quality

Protect environmental quality by minimizing impacts from human activities and planning for and maintaining natural areas that contribute to the health and quality of life of communities and people in New Hampshire.



Description:

A large part of Laconia's economy depends on the quality of the environment, especially the lakes.

Many provisions have been included in the master plan and zoning ordinance to protect water quality. The language associated with other natural resources is far more general.

Analysis:

Laconia has developed strong protections for streams, shorelines, and wetlands including the Wetlands Conservation and Water Quality Overlay District and Water Supply Lands Overlay District. A steep slopes ordinance is being developed currently; this will help in controlling severe cases of erosion. More can be done to manage stormwater and control erosion throughout the city. The recent Cluster Development Ordinance identifies a number of natural resource elements to acknowledge during the planning process. Protections for natural resources that are not water-based are limited in Laconia.

While Laconia does insist on green space in most of their zoning districts, only applicants under the optional Cluster Development are required to conserve open space. Density bonuses are awarded for projects that conserve more than the required amount of open space. Connectivity between open spaces or other conserved lands does not play a role in the planning process; while it is important to protect wildlife habitats, it is far better to ensure that there is connectivity between various habitats. The Cluster Development process does provide density bonuses for buildings developed under LEED design guidelines. There are not incentives to employ open space conservation or energy efficiency outside of Cluster Development.

While Cluster Development is an option for applicants with at least ten acres of land in residential and the Commercial Resort District, it does require a Conditional Use Permit. The 1991 Master Plan recommended requiring Cluster Development in portions of the Rural Residential (RR1) District²⁷.

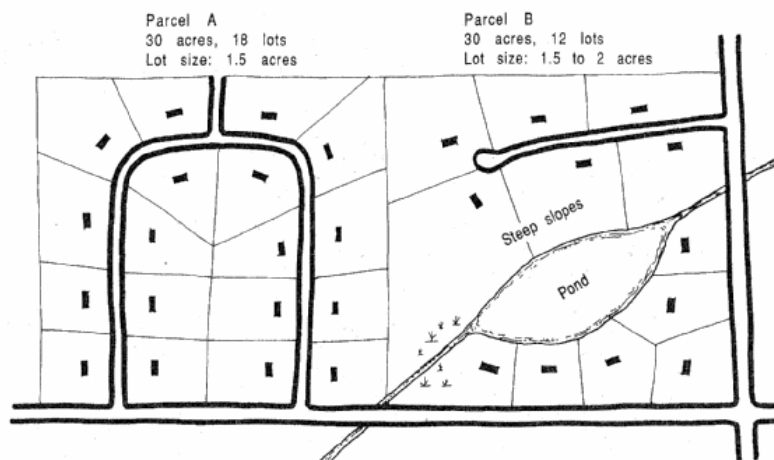
Recommendations:

While the city has greatly improved its Cluster Development Ordinance, it should take two additional steps to limit the impact of development on the existing natural resources, curb sprawl, and reduce the costs associated with development. The Cluster Development Ordinance should be required in the RR1 District and expansion of the sewer system should

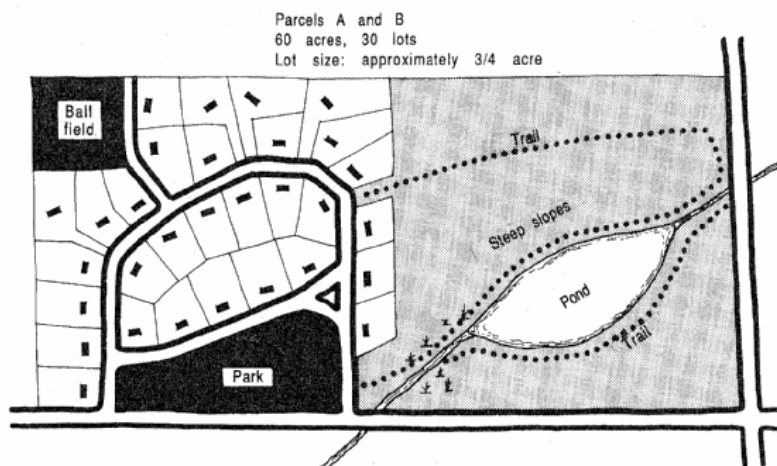
²⁷ Laconia Master Plan, 1991. Future Land Use Map, Map 13-1.

be limited through the development of an Urban Service District. It should be noted that because the recently revised Cluster Development Ordinance requires that open space be permanently protected, this type of development is often referred to as Conservation Subdivision (See diagrams below²⁸).

To better manage stormwater in the city and reduce the impacts of erosion, it is recommended that city planners review and implement elements of the Stormwater Management Section of the *ILU Handbook*²⁹. The model ordinance and two presentations on this subject can also be found at the ILU Warehouse on the LRPC website http://www.lakesrpc.org/services_repp.asp.



Example of Conventional Subdivision



Same area as above as a Conservation Subdivision

²⁸ *Rural by Design*, Arendt, R. (1994), p. 245. American Planning Association.

²⁹ *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* (2008). Compiled by NHDES, NHARPC, NHOEP, NH Municipal Association. Section 2.1.

Smart Growth Principle 7:

Involve the community

Involve the community in planning and implementation to ensure that development retains and enhances the sense of place, traditions, goals, and values of the local community.

Description:

The Laconia Planning Board meetings are open to the public; their schedule, agenda, and minutes are available at the city's website. The update of the Master Plan was published in 2007 and involved dozens of volunteers and several forums over a multi-year period. Other recent planning efforts were a Build-Out Analysis in 2005 and an EPA Smart Growth Implementation Assistance (SGIA) project in 2007; each of these relied upon local input.

A Heritage Commission has recently been formed to inventory historic buildings. Recent efforts in Downtown Laconia have led to a sense of place revolving around the Belknap Mill and the riverfront. A number of events throughout the year bring the community together to celebrate a variety of events and cultures.

Analysis:

Several historic buildings in Laconia have been well cared for or restored, including the Belknap Mill, the downtown library, and the Laconia Courthouse; some are awaiting attention. The Heritage Commission's inventory of historic buildings should enable prioritization and focusing of future efforts in this arena.

Aside from the Downtown Riverfront (DR) District, there is not a set of guidelines aimed at developing a sense of place for public spaces, streets, and buildings. The DR District does encourage continuity and it seems that there is a great deal of reliance upon the interpretation, good judgment, and vision of the Planning Department staff to ensure that there is continuity and a sense of place.

In Laconia citizens will turn out for special events, especially cultural events. These range from church bazaars to car and boat shows, from Multicultural Day to the United Way's Turkey Plunge.

While many were involved in the development of the Laconia Master Plan and there were good turnouts at meetings associated with the EPA Smart Growth Implementation Assistance project, there is far less interest by residents in being involved in the regular, day-to-day discussion, development, and refinement of planning issues and documents. Laconia is fortunate to have a full time planning staff that reviews proposals, works with applicants



Laconia Courthouse

and other city departments to ensure that once proposals reach the Planning Board, they meet the various city requirements.

Recommendations:

The city should encourage the Heritage Commission to continue with its work of cataloguing historic building. The successes in the Downtown Riverfront District should be replicated in other parts of the city. The city should make a concerted effort to utilize and promote public spaces such as parks and playgrounds. Holding public meetings and listening sessions in the voting ward buildings can enhance input and involvement from neighborhoods.

Smart Growth Principle 8:

Manage growth locally

Manage growth locally in the New Hampshire tradition, but work with neighboring towns to achieve common goals and address common problems more effectively.

Description:

Many of Laconia's departments work with neighboring municipalities in an effort to offer services at the best available rate. Examples include municipal water and waste (Gilford and Belmont), police and fire mutual aid, and the Winnepesaukee River Basin Program (regional sewage treatment facility).

The community supports and is involved with a number of regional planning efforts: the Lakes Region Transportation Advisory Committee, LRPC, Belknap County Economic Development Council, Lake Winnepesaukee Watershed Management Plan Project, and the WOW Bicycle/Pedestrian Trail.

Analysis:

In its role as the seat of Belknap County government and home to nearly one-third of the county's residents, Laconia does provide many services to its residents. Many of these services are also shared with neighboring communities. The population of most of Laconia's neighbors is growing at a much faster rate than Laconia's, which could put pressure on the city's limited resources.

Activities within the city can have an impact on its neighbors; the most recognizable example of this is the annual Bike Week events, drawing tens of thousands of visitors to the area.

Natural resources and transportation corridors are rarely limited by municipal boundaries. Maintaining connections between wildlife areas is critical to sustainable natural resource habitats. Keeping abreast of local and regional transportation patterns and needs is important to ensure that congestion is minimized and travel networks are built and maintained appropriately.

Recommendations:

It is vital to maintain communication and involvement with neighboring communities on environmental issues and development proposals. It also benefits the city to work with neighboring communities on other issues that could have mutual benefits. The WOW Bicycle-Pedestrian route development, as well as other recreation projects, will connect Laconia with neighboring communities.

City officials, such as the Planning Department and Conservation Commission should coordinate their land preservation and planning efforts with adjacent communities to ensure that such efforts are done effectively.

Laconia should continue to collaborate with surrounding towns on projects such as road construction and infrastructure needs. Furthermore, should there be a development of regional impact proposed in the future the Planning Board should notify surrounding communities as per RSA 36: 54-57. This notification will allow neighboring communities and the regional planning commission to engage in discussion of the proposal as abutters and will give them a voice in the development process.

Appendix A: Comparison of Land Use / Land Cover: 2000 & 2009

Data notes

This table compares land use/land cover data developed in 2000 and 2009 by Lakes Region Planning Commission. The year 2000 classification was primarily based on 1998 black & white aerial photography, while the year 2009 classification was primarily based on 2006 color photography. The earlier project used a simpler classification scheme of only 14 classes, while the 2009 project used a classification scheme of 58 classes. To help with the comparison of these somewhat different data sets, some intermediate subtotals were calculated (e.g., Residential Sum, Commercial Sum). To make the comparison of Developed vs. Undeveloped Land, water was subtracted out. Developed Land includes Residential, Commercial, Services, Institutional, Industrial, Transportation and Utilities, Outdoor (ball fields and cemeteries) and Vacant Land Uses. All other Land Uses, including Agricultural, Forested, and Wetlands were classified as Undeveloped.

Data sources included:

2009 Land Use/Land Cover

Town	Date of data development	Data Sources
Laconia	2009	2006 color photos, 2008 color photos, town parcel data, zoning, local knowledge

2000 Land Use/Land Cover

Town	Date of data development	Data Sources
Laconia	1998	1998 black and white photos

Data Limitations

In some places, the differences between 2000 & 2009 classifications are the result of land use conversion (for example, a new residential development in what had been forest or agricultural land). Also, the 1998 black and white aerial photography used as the basis for the 2000 classification has much lower resolution than the 2006 1-foot color photography used for most of the 2009 data. As a result, the analyst developing the 2009 data was more likely to be able to see and capture scattered residential development such as individual houses.

Smart Growth Assessment:

Checklist Questions

This checklist asks the reviewer to choose which of three phrases best characterize the documents/patterns/actions. A number '1', '2', or '3' is associated with each phrase, with '3' corresponding to the phrase that best reflects "Smart Growth". The points under each principle are then totaled to give an indication of where the community currently stands in terms of implementing each of the Smart Growth Principles.

Smart Growth Principle 1:

Maintain traditional compact settlement patterns

Maintain traditional compact settlement patterns to efficiently use land, resources and infrastructure investments.

A. How visible is the edge of your downtown/village center (or centers, if your municipality has more than one)?

It is clearly visible.

 3 pts

The edge of the downtown/village center is still recognizable, but it has begun to blend with outlying development.

 √ 2 pts

There is no distinction between the downtown/village center and outlying development.

 1 pt

B. Where is most commercial and industrial growth occurring?

Within the downtown/village center.

 3 pts

Both in and outside the downtown/village center

 √ 2 pts

Outside the town center, in strip patterns along roads and/or on large lots.

 1 pt

C. Where is most new residential growth occurring?

Mostly within the downtown/village center.

 3 pts

Partly within the downtown/village center and partly in outlying areas, often in clustered developments.

 √ 2 pts

Mostly in areas outside the downtown/village center, on large lots.

 1 pt

D. Does your master plan include specific language that describes a desired pattern of development? If so, what does this language say?

Yes. The master plan describes a desired pattern of development that includes one or more compact centers, with primarily low-density cluster development in surrounding areas.

 √ 3 pts

The master plan is not specific on the desired pattern of development.

 √ 2 pts

The master plan calls for growth throughout town; or there is no master plan.

 1 pt

E. Is there a distinct pattern to densities in local zoning — from higher densities in compact centers to lower densities in outlying areas?

Yes.

 √ 3 pts

Yes, but zoning densities in downtown/village center districts are significantly lower than among older lots in similar locations. Outlying areas also have low densities.

 √ 2 pts

No. Lot sizes are the same throughout all districts in the community; or they are mixed in size throughout all areas of town.

 1 pt

Smart Growth Assessment:

Checklist Questions

F. If your community provides public sewer and/or water, how are line extensions managed?

The sewer and water service area is defined and consistent with the downtown/village center. Line extensions outside this area are prohibited. 3 pts

The sewer and water service area is defined and consistent with the downtown/village center — but some line extensions are approved outside this area. 2 pts

The sewer and water service area is not defined. √ 1 pt

G. Where are your community's public buildings (including schools and post offices), and where are they planned?

Most existing and planned public buildings are in community core area. √ 3 pts

Most existing public buildings are in the community core area, but some planned buildings are on the edge of town. 2 pts

Most existing and planned public buildings are on the edge the community. 1 pt

H. Does development along state roads occur in a node or strip pattern of development?

Development along state roads is focused into nodes. 3 pts

Development is a mix of nodes with a strip pattern in between. √ 2 pts

Development along state roads is in a strip pattern. 1 pt

I. Do land use regulations establish minimum densities to promote efficient use of lands designated for higher densities?

Yes. Minimum densities are required. 3 pts

No, but we find that many developers take advantage of the opportunity to have increased or varying densities. 2 pts

No. √ 1 pt

J. Do subdivision regulations allow the planning board to require the connection of subdivision streets to existing streets and the stubbing of streets to allow connections to future subdivision developments? What about the provision of interparcel connections between individual developments, where compatible?

Yes. Interconnections between subdivisions to reduce reliance on arterial roads can be required by the planning board. 3 pts

No. The planning board cannot require this but does suggest it on occasion. 2 pts

No. Road connectivity is not considered as part of a subdivision application. √ 1 pt

Smart Growth Principle 1 Score* 19

Smart Growth 30-26

In Transition 25-17

Needs Your Attention 16-10

*Note: Where two answers have been checked under one question, the points have been averaged.

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 2:

Foster a human scale of development

Foster the traditional character of New Hampshire downtowns, villages, and neighborhoods by encouraging a human scale of development that is comfortable for pedestrians and conducive to community life.

A. What scale of commercial and industrial growth is permitted?

We limit the size of new commercial and industrial buildings, to fit with the community's character and the local market. ☒ 3 pts

We limit the size of new commercial/industrial buildings in the town center, but not outside. ☐ 2 pts

We do not limit the size of buildings anywhere. ☐ 1 pt

B. Do townspeople have easy walking access to public parks and playgrounds?

Yes. Parks and playgrounds are available in all larger neighborhoods, and can easily be reached by walking from other parts of the community. ☒ 3 pts

We have some parks and playgrounds, but they cannot be easily reached by walking from all parts of the community. ☒ 2 pts

No. We have very few parks and playgrounds. ☐ 1 pt

C. How do local regulations provide for open space in new developments?

New developments must conform to the community's open-space plan, creating additional open space and connections to adjacent open spaces (either existing or planned, such as a planned park or recreation trail). ☐ 3 pts

Larger developments must provide open spaces, with access to them. But regulations do not give guidelines for types and locations of these open spaces. ☒ 2 pts

There are no provisions for open space with new developments. ☐ 1 pt

D. Do the future land use plan and zoning ordinance allow for compatible, small-scale neighborhood commercial uses (e.g., corner stores) adjacent to or within residential neighborhoods?

Yes. There is opportunity for a mix of commercial and residential. ☒ 3 pts

Yes, but it is not utilized much. ☐ 2 pts

No. Most commercial and residential uses are separated. ☐ 1 pt

E. Do all (or most) zoning districts require a minimum open space ratio (i.e., percentage of land area for each development that must be open space)?

Yes. ☐ 3 pts

A few zoning districts require a minimum open space ratio. ☒ 2 pts

None of the zoning districts require a minimum open space ratio. ☐ 1 pt

Smart Growth Principle 2 Score* 12.5

Smart Growth 15-13

In Transition 12 - 9

Needs Your Attention 8 - 5

*Note: Where two answers have been checked under one question, the points have been averaged.

Smart Growth Assessment: Checklist Questions

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 3:

Incorporate a mix of uses

Incorporate a mix of uses to provide a variety of housing, employment, shopping, services and social opportunities for all members of the community.

A. Where are commercial/industrial and residential uses located in relation to each other?

The downtown/village center allows commercial, industrial, and residential uses. ☒ 3 pts

We have mixed-use districts, but they are scattered around the community. ☐ 2 pts

No mixed uses are permitted. Commercial/industrial and residential uses are segregated. ☐ 1 pt

B. Can townspeople meet most daily shopping needs (groceries, hardware, etc.) in the community?

Yes. We can meet everyday needs at a diversity of local businesses. ☐ 3 pts

We can buy some goods in the community, but must travel outside town for others. ☒ 2 pts

No. We have to travel outside of the community to meet most everyday needs. ☐ 1 pt

C. How does local zoning encourage business development in the downtown/village center?

It provides for a variety of businesses in the downtown/village center, including those that meet people's daily needs; and it offers regulatory incentives, such as reduced parking and setbacks. ☒ 3 pts

Zoning encourages a mix of downtown business types - but regulations, such as lot size, setbacks and parking, make such a mix of development unlikely. ☐ 2 pts

It does not encourage a mix of downtown business types - and regulations require lot sizes, setbacks, and parking provisions that can't be met in the downtown/village center. ☐ 1 pt

D. Which option best describes the mix of housing types in your community?

We have a mix of housing types, including affordable housing to buy, multi-family rental housing, and senior housing that reflects the composition of our community. ☒ 3 pts

We have a limited mix, including some affordable housing. ☒ 2 pts

We have very little diversity in housing, and/or very little affordable housing. ☐ 1 pt

E. How has your community planned for future housing needs, especially in and around your downtown?

Our community plan projects the amounts and types of housing that will be needed over the next 10 years or has established housing goals. We also work with local and regional housing groups to meet these needs within or adjacent to our community. ☒ 3 pts

The community plan includes a preliminary evaluation of future housing needs, but does not specify how to meet them. ☐ 2 pts

We have not discussed future housing needs. ☐ 1 pt

Smart Growth Assessment:

Checklist Questions

F. Do local regulations enable your community to meet diverse housing needs and ensure long-term affordability?

Yes. New developments are required to include housing targeted at more than one segment of the market – for example, apartments along with single-family homes, or affordable homes along with market-rate housing. 3 pts

New developments have the option of including a mix of housing, but are not required to. √ 2 pts

No. New developments are not required to include a mix of housing – and in some cases, they are prohibited from doing so by regulations. 1 pt

G. Does your community provide incentives to support affordable housing (density bonuses, fee waivers, higher density zones, fast tracking)?

Yes, we have a range of incentives to encourage more affordable housing production. √ 3 pts

We offer some incentives, but don't actively promote them as an option. 2 pts

No. We do not offer any incentives. 1 pt

H. If the community has a downtown, are residential uses allowed in the central business zoning district?

Yes. √ 3 pts

No. Mixing of residential and commercial is only permitted outside of the downtown area. 2 pts

No. All commercial and residential uses are separated. 1 pt

I. Do the provisions within at least some of the residential zoning districts allow for a wide range of housing types by right (versus requiring a conditional use permit or special exception)?

Yes. There is opportunity for a mix of housing types by right and utilized. √ 3 pts

Yes, it is allowed by right but it is not utilized much. √ 2 pts

No. Most zoning districts specify a limited range of housing types. 1 pt

J. Does the zoning ordinance allow for “accessory apartments” within single-family residential (SFR) zoning districts?

Yes. Accessory apartments are permitted in RS districts and utilized. 3 pts

Yes. Accessory apartments are permitted in RS districts but few actually exist. √ 2 pts

No. 1 pt

Smart Growth Principle 3 Score* 26

Smart Growth 30-26

In Transition 25-17

Needs Your Attention 16-10

*Note: Where two answers have been checked under one question, the points have been averaged.

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 4:

Preserve New Hampshire's working landscape

Preserve New Hampshire's working landscape by sustaining farm and forest land and other rural resource lands to maintain contiguous tracts of open land and to minimize land use conflicts.

A. Where is most development in your community located?

Within or close to the downtown/village center.

✓ 3 pts

In outlying areas, but not on farmland.

 2 pts

In outlying areas, including farmland.

 1 pt

B. What strategies does your master plan have for protecting farmland?

A comprehensive, specific set of strategies and policies.

 3 pts

Some specific strategies.

 2 pts

Vague or no strategies.

✓ 1 pt

C. Does your master plan map the location of farms and prime agricultural soils?

Yes.

 3 pts

Yes, but in a vague or incomplete way.

 2 pts

No.

✓ 1 pt

D. Is there local support for farming and/or forestry through tax abatements, and/or a dedicated town fund to help purchase or protect prime working land?

Yes — we offer tax abatements and/or a dedicated fund.

 3 pts

We have, or are working on, a plan to offer tax abatements and/or a dedicated fund.

✓ 2 pts

No, we offer neither.

 1 pt

E. Does the zoning ordinance zone much of the fringe land as exclusively agricultural (i.e., a holding category) or with a substantial minimum lot size that discourages single-family tract housing and preserves large sites for viable farm use?

The Rural/Agricultural District does have a large minimum lot size, more suitable for agricultural use.

 3 pts

The Rural/Agricultural District permits agricultural use but the minimum lot size is two acres.

✓ 1 pt

Smart Growth Principle 4 Score 8

Smart Growth 15-13

In Transition 12 - 9

Needs Your Attention 8 - 5

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 5:

Provide choices and safety in transportation

Provide safety and choices in transportation to create livable, walkable communities that increase accessibility for people of all ages, whether on foot, bicycle, or in motor vehicles.

A. Which of these options best describes the layout of local streets?

- Streets are interconnected, in a clear pattern for getting around the community. ☐ 3 pts
The downtown/village center has a network of streets — but in outlying areas, streets are disconnected, with no clear pattern for getting around. ☒ 2 pts
Streets are disconnected, with no clear pattern for getting around. ☐ 1 pt

B. How has your community planned for future streets?

- We have a street network plan. ☐ 3 pts
We have begun working on a plan for future streets. ☐ 2 pts
We have no plan for future streets. ☒ 1 pt

C. How does your community regulate the width of new streets?

- Regulations allow different street widths, depending on the character of the area, the projected volume of traffic, and/or the desired speed of traffic. ☐ 3 pts
Regulations allow some variation in street widths, but only under limited circumstances. ☒ 2 pts
No variation in the width of streets is permitted. ☐ 1 pt

D. What provisions has your community made for pedestrians and cyclists?

- We have a good network of sidewalks and pedestrian/bike paths, interconnecting much of the community. ☐ 3 pts
We have some sidewalks, and a plan for pedestrian/bike paths to connect specific areas of community. ☒ 2 pts
We have only some limited sidewalks, and no plan for pedestrian/bike paths. ☐ 1 pt

E. Does your community offer public transportation?

- Yes. We have a transit system supported by dedicated revenues. ☐ 3 pts
Yes, but local support for the service is discretionary from the general fund. pts ☒ 2 pts
No. ☐ 1 pt

F. Do you require sidewalks and trails in new developments?

- Yes. As part of our community ☒ 3 pts
Yes. We require sidewalks and trails in new residential and commercial developments, but we do not have design standards. ☐ 2 pts
No. We have limited requirements for sidewalks. ☐ 1 pt

G. Does your street design enable pedestrian traffic?

- Yes. We have a good network of sidewalks and pedestrian/bike paths connecting much of the community including safe and convenient crossings of major roads. ☒ 3 pts
Yes. We have some sidewalks, and a plan for pedestrian/bike paths to connect to specific areas of town. ☐ 2 pts
We have only some limited sidewalks, and no plan for pedestrian/bike paths. ☐ 1 pt

Smart Growth Assessment:

Checklist Questions

H. Has your community designated or established safe routes for children to walk or bike to school?

Yes. We have established safe routes to school from all parts of our community that include accessible and readily-visible means of crossing or getting around major barriers such as busy roads. 3 pts

We are aware of the concept, but have not established any safe routes to school. √ 2 pts

No. We had not established any safe routes to school. 1 pt

I. Do land use regulations include maximum parking ratios (i.e., a cap on the number of parking spaces that can be built in a particular development) in addition to minimum parking requirements?

Yes. There is a cap on the number of parking spaces 3 pts

No, but most developments don't go overboard with parking. √ 2 pts

No, there is no cap and developments end up with a wide expanse of asphalt. 1 pt

J. Is on-street parking allowed in places where it can be safely provided, such as in downtown areas and pedestrian retail districts?

Yes. There is on-street parking in the downtown area and it seems to work for both pedestrians and drivers. √ 3 pts

Yes. There is on-street parking in the downtown area but there are problems for both pedestrians and drivers. 2 pts

No. There is no on-street parking in the downtown area. 1 pt

Smart Growth Principle 5 Score 22

Smart Growth 30-26

In Transition 25-17

Needs Your Attention 16-10

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 6:

Protect Environmental Quality

Protect environmental quality by minimizing impacts from human activities and planning for and maintaining natural areas that contribute to the health and quality of life of communities and people in New Hampshire.

A. What action is your community taking to protect natural areas?

We have strong provisions to protect natural areas — including wetlands, wildlife habitat, and sites for rare plants — in site-plan review and/or subdivision regulations. ___ 3 pts

We have made provisions to protect some, but not all, natural areas in site-plan review and/or subdivision regulations. √ 2 pts

We have made no provisions to protect natural areas in site-plan review or subdivision regulations. ___ 1 pt

B. Has your community identified its natural assets (rivers, mountains, wetlands, open space, agricultural lands, viewsheds, agricultural lands) and taken steps to restore or protect them?

Yes, we highlight our natural assets in our master plan and have taken steps to restore/protect them (e.g., water and energy efficiency programs, conservation easement programs, urban service boundaries, etc.) √ 3 pts

Yes, we highlight our natural assets, but we have not taken any steps to restore/protect them. ___ 2 pts

No. We do not highlight our natural assets in our planning efforts. ___ 1 pt

C. Do land use regulations require developers to consider connecting open spaces and greenways to existing destinations and open space reservations?

Yes. This is a requirement.** √ 3 pts

This is not a requirement but we offer incentives for those that do. ___ 2 pts

No, this is not considered as part of the review process.** √ 1 pt

D. Do local land use regulations provide for “conservation subdivisions” or “cluster subdivisions” as a matter of right (versus requiring a conditional use permit or special exception)?

Yes. There are very few hurdles in the conservation/cluster subdivision process. ___ 3 pts

Conservation/cluster subdivisions are permitted but there are obstacles for the applicant. √ 2 pts

Conservation/cluster subdivisions are not permitted or there are numerous obstacles including that they are permitted only by conditional use or special exception. ___ 1 pt

E. Have the community’s development regulations been revamped recently to encourage or require best management practices (BMPs) for water quality?

Does this include a water-quality or aquifer ordinance?

Yes. ___ 3 pts

Our ordinances do address water quality issues but there are some gaps in them. √ 2 pts

No. ___ 1 pt

Smart Growth Assessment:

Checklist Questions

F. Does the community have guidelines and incentives for designing development sites and buildings for energy efficiency?

Yes. This is a requirement.

 3 pts

This is not a requirement but we offer incentives for those that do.

 √ 2 pts

No, this is not considered as part of the review process.

 √ 1 pt

Smart Growth Principle 6 Score* 12.5

Smart Growth 18-15

In Transition 14-10

Needs Your Attention 9 - 6

*Note: Where two answers have been checked under one question, the points have been averaged.

**Note: This is only required in Cluster Development.

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 7:

Involve the community

Involve the community in planning and implementation to ensure that development retains and enhances the sense of place, traditions, goals, and values of the local community.

A. Which of these options best describes the conditions of historic buildings in your community?

- Most are in use and well-maintained. ☒ 3 pts
Most are in poor condition, but they are in use. ☐ 2 pts
Most historic buildings are vacant or have been demolished ☐ 1 pt

B. Does your community have a set of clear design guidelines so streets, buildings, and public spaces work together to create a sense of place?

- Yes. We have a set of design guidelines that connect our street, buildings, and public spaces ☐ 3 pts
Yes, but our design guidelines are vague or confusing. ☒ 2 pts
No. We do not have a set of design guidelines. ☐ 1 pt

C. Does your community sponsor events to celebrate its cultural heritage, natural assets or community character?

- Yes. We have a number of fairs, concerts, events celebrating our community heritage, natural assets, or character. ☒ 3 pts
Yes, we have one or two events celebrating our community heritage, natural assets, or character. ☐ 2 pts
No. We do not have such events. ☐ 1 pt

D. What action is your community taking to protect historic buildings and other features?

- We have a defined historic district, along with guidelines for development within it. ☐ 3 pts
We have highlighted the importance of historic buildings and other features, but we have no specific measures to maintain or enhance them. ☒ 2 pts
We have taken no action on historic buildings and features. ☐ 1 pt

E. To what extent was the public involved in developing your most recent the community plan?

- There was a lot of public involvement – committee, workshops, survey work, and well attended public meetings. ☐ 3 pts
Some public meetings were well attended, but overall there was not a lot of public involvement in developing the plan. ☒ 2 pts
Only the required number of public hearings were held. ☐ 1 pt

F. Are citizens active in community planning, development, and resource protection?

- Yes. Many are involved at the municipal level; there are also citizen groups working on specific areas. ☐ 3 pts
There is some local participation in a few aspects of community planning. ☒ 2 pts
No. There is no local community development organization, downtown organization, historical society, community planning, organization, or land trust. ☐ 1 pt

Smart Growth Assessment: Checklist Questions

Smart Growth Principle 7 Score	<u>14</u>
Smart Growth	18-15
In Transition	14-10
Needs Your Attention	9 - 6

Smart Growth Assessment:

Checklist Questions

Smart Growth Principle 8:

Manage growth locally

Manage growth locally in the New Hampshire tradition, but work with neighboring towns to achieve common goals and address common problems more effectively.

A. Do elected and appointed board members and staff in nearby communities have opportunities to meet and network with each other on a regular basis?

Yes. There are a number of regular forums and meetings in which elected and appointed board members and staff have opportunities to meet and network with each other on a regular basis. ___ 3 pts

Staff members from different communities in the region meet periodically, but elected and appointed board members from different communities hardly ever meet. √ 2 pts

No. Elected and appointed board members and staff from different communities rarely meet. ___ 1 pt

B. Do the towns, cities, and counties in your area have any formal cooperative agreements on issues such as land use, transportation, housing, infrastructure, emergency services, other services, revenue sharing, or economic development?

Yes. Local governments in our region have intergovernmental agreements in at least three of the following areas: land use, transportation, housing, infrastructure, emergency services, other services, revenue sharing, or economic development. √ 3 pts

Local governments in our region have intergovernmental agreements in one or two of the following areas: land use, transportation, housing, infrastructure, emergency services, other services, revenue sharing, or economic development. ___ 2 pts

No. We have no formal agreements between local governments on planning issues in our area. ___ 1 pt

Smart Growth Principle 8 Score 5

Smart Growth 6

In Transition 5 - 3

Needs Your Attention 2

This checklist was adapted from the following sources:

The Vermont Smart Growth Scorecard (2000),
<http://www.epa.gov/dced/scorecards/VTscorecardvtffonsprawl.pdf>

The Colorado Smart Growth Scorecard (2003),
http://www.epa.gov/dced/scorecards/Colorado_Scorecard.pdf,

Comprehensive Smart Growth Checklist - Prepared by Nashua Regional Planning Commission Adopted for use in Preparing A Master Plan CD-ROM (2004),
<http://www.nh.gov/oep/resourcelibrary/referencelibrary/m/masterplan/preparingamasterplan/documents/smartgrowthchecklist.pdf>.

Smart Growth Assessment:

Checklist Answers and Documentation

This Section addresses each of the checklist questions with statements from the Master Plan, Hazard Mitigation Plan, Zoning Ordinance, Regulations (Site Plan and Subdivision), identified patterns, or observations from the City Planner or Planning Board. Those statements or parts of statements that contradict the principle are in **red text**.

1) Compact Settlement Patterns

- A) **How visible is the edge of your downtown/village center (or centers, if your municipality has more than one)?**
- a) [Patterns] Reflecting the current zoning districts, downtown increases density and commercial activity as one moves closer to the center of the city.
 - b) [Patterns] Development in Lakeport also gets denser and more commercial towards the center of the village.
 - c) [Patterns] **They are joined by Union Ave., which is commercial development. This blurs the dividing line between Downtown and Lakeport.**
 - d) [Patterns] The Weirs is fairly clearly defined by the extent of the sidewalks.
 - e) [Patterns] **The Weirs is connected to Lakeport with a great deal of pre-existing Commercial Resort development along with Commercial development and is an area of recent & planned development.**
- B) **Where is most commercial and industrial growth occurring?**
- a) [Planner] Along Union Ave. and Court St.
- C) **Where is most new residential growth occurring?**
- a) [Planner] Mainly along Weirs Blvd. and in the South End (about 350 new units here).
- D) **Does your master plan include specific language that describes a desired pattern of development? If so, what does this language say?**
- a) [MP p.10] Current residential unit density according to LRPC BOA (2003):
 - (1) 25% in the city,
 - (2) 26% in the Weirs
 - (3) 9% in rural portions
 - b) [MP p22] Simplify zoning in the commercial villages (Downtown, Lakeport, and the Weirs) to allow mixed use incentives for small businesses and “infill” development.
 - c) [MP p22] Allow for a series of density and lot size options to encourage consideration of specific characteristics such as scenic views and/or vistas, valuable habitat and/or wetlands, rural areas, or historic areas.
 - d) [MP 3.1.a] Establish “neighborhood/village” zoning districts to encourage the development of mixed residential/commercial use, singlefamily and multi-family housing, and amenities like parks, playgrounds, village greens/parks, sidewalks, and pedestrian ways.
 - e) [MP 3.1.b] Amend the zoning ordinance and subdivision regulations to promote the development of mixed housing types/cluster development with an emphasis on maximizing high quality and function-rich green-space and natural resources.
 - f) [MP 3.2.c] Adopt and implement a strategic City-wide plan for the upgrading of existing public utilities and the extension of public utilities into areas where development of compact “village plan” growth is encouraged.
 - g) [MP 3.3.d] Develop and implement incentives for the rehabilitation and maintenance of existing housing units in developed commercial areas.
 - h) [MP 3.3.f] Encourage and possibly offer incentives for “in-fill” development in existing urban and densely populated residential zones.
 - i) [MP 5.4.b] Identify areas for higher density development and direct the expansion of water and sewer to those areas.
 - j) [MP 5.4.c] Encourage and provide incentives for “in-fill” development.

Smart Growth Assessment: Checklist Answers and Documentation

- k) [MP 5.4.d] Encourage development that conserves high-value natural areas, wetlands, and other natural resources, and preserves the function of those natural resources.
- l) [MP 7.1.e] Prioritize construction of new sewer infrastructure in areas within the Paugus Bay watershed.
- m) [MP 7.1.f] Investigate the needs and ramifications of expanding the municipal water system to unserved areas within the City.
- n) [MP 7.2.d] Continue to provide funding for sewer system expansions as needed including the high priority stations on Pendleton Road and Route 11B; Hilliard Road, Pickerel Cove and Moulton Cove; and Eastman Shore Road and Leighton Ave.
- o) [MP 7.2.f] Prioritize new sewer infrastructure in areas within the Paugus Bay Watershed including the pump station at Moulton Cove.
- p) [MP Objective 7.9] Support and maintain comprehensive strategic planning for the City - Balance the needs of the community with smart growth concepts, redevelopment, revitalization and resource conservation to maintain quality of life. [Not followed by Smart Growth Actions other than Cluster Development and enhanced permitting process]
- q) [MP p 126-127] Future Land Use Map – Identifies portions of the city with a line bisecting Laconia into the densely populated [southern] area of existing infrastructure where “in-fill development” and redevelopment is encouraged and northern section where clustering is to be encouraged.
- E) **Is there a distinct pattern to densities in local zoning — from higher densities in compact centers to lower densities in outlying areas?**
 - a) Yes. [ZO Dimensional Standards Table] Except that very high density is allowed in the CR district, which includes the area along US Rt. 3 – eastern side of Paugus Bay.
- F) **If your community provides public sewer and/or water, how are line extensions managed?**
 - a) [Planner] If the developer will pay for an extension, then it will be built.
- G) **Where are your community’s public buildings (including schools and post offices), and where are they planned?**
 - a) [Planner] Almost all existing facilities are in downtown areas
 - b) MP does not refer to a need for future facilities.
 - c) [Planner] No new buildings are planned.
- H) **Does development along state roads occur in a node or strip pattern of development?**
 - a) [Planner] Development occurs in nodes where possible (example: at the Weirs development is focused in the area served by sidewalks). However, other areas may see strip development.
- I) **Do land use regulations establish minimum densities to promote efficient use of lands designated for higher densities?**
 - a) It does not appear to under ZO Article VI, Dimensional Standards.
- J) **Do subdivision regulations allow the planning board to require the connection of subdivision streets to existing streets and the stubbing of streets to allow connections to future subdivision developments? What about the provision of interparcel connections between individual developments, where compatible?**
 - a) [MP 4.1.f] Complete a City-wide comprehensive study of traffic flows and intersection movements. Analyze high accident locations and determine draft design specifications for safety upgrades and improvements.
 - b) [Subdivision] No references to this concept were found.

Smart Growth Assessment: Checklist Answers and Documentation

2) Human Scale

- A) **What scale of commercial and industrial growth is permitted?**
- a) [MP 1.3.a] Recognize the aesthetic aspects of sight, sound, touch, and smell in developments by incorporating review procedures for façade and architecture matters, site arrangement for sound/noise management, aesthetically pleasing textures in building materials, and effective waste control system. Work to preserve and enhance aspects of the City's "small-town" characteristics and architecture.
 - b) [MP 1.3.h] Commission a façade study of commercial corridors including Union Ave, Elm Street, Downtown, and Weirs Beach, and recommend suggested improvements and regulation modifications.
 - c) [SPR 6.6] [While not a guideline,] the Architectural Plan "shall indicate the relationship in bulk and height to other existing structures in the vicinity".
 - d) [ZO p.27 Districts established] The intent of this [BCI] district is to permit expansion of both industrial and commercial uses.
 - e) [ZO] No statements regarding scale of a commercial or industrial district.
- B) **Do townspeople have easy walking access to public parks and playgrounds?**
- a) [Planner] This characteristic could use some work in the Weirs.
- C) **How do local regulations provide for open space in new developments?**
- a) [ZO Article II: Definitions] Both Open Space and Green Space are defined. Open Space is defined as, "Any area of land, within a cluster subdivision...", i.e. limited to cluster subdivisions.
 - b) [ZO Article IV: Overlay Districts]
 - (1) Open Space is referenced in the Purpose and Intent of the Wetlands Conservation and Water Quality Overlay District.
 - (2) A minimum of 25% of green space is required on lots in the Housing Redevelopment Overlay District.
 - c) [ZO Article V: Dimensional Requirements]
 - (1) Minimum Green Space requirements are established for each District ranging from 0 -65%. Most commercial and industrial districts require 20-25% and the rural and residential districts require at least 60%.
 - (2) In the Downtown Riverfront District land dedicated to public access and use may be substituted for up to 50% of the Green Space requirement.
 - (3) Connectivity is not addressed.
 - d) [ZO Article VII: Supplementary Provisions, B. Cluster Development]
 - (1) References Open Space in the Purpose and Intent
 - (2) Three types of Open Space are defined: Active Use/Common Area, Limited Use, and Conservation
 - (3) A minimum of 50% Open Space is required.
 - (4) A list of high value Open Space features is provided.
 - (5) At least 75% of the Open Space must be Conservation Open Space.
 - (6) A protecting agency must be designated for Open Space and Common Land.
 - (7) There is a Density Bonus of 10% for the provision of Open Space and Common Land > 60%.
 - (8) Connectivity is not addressed.
- D) **Do the future land use plan and zoning ordinance allow for compatible, small-scale neighborhood commercial uses (e.g., corner stores) adjacent to or within residential neighborhoods?**
- a) [MP p.126-7: Future Land Use Map] The FLU map describes Downtown, Lakeport, and the Weirs as "areas where mixed use is encouraged".

Smart Growth Assessment: Checklist Answers and Documentation

- b) [MP 3.1.a] Establish “neighborhood/village” zoning districts to encourage the development of mixed residential/commercial use, single family and multi-family housing, and amenities like parks, playgrounds, village greens/parks, sidewalks, and pedestrian ways.
 - c) [MP 3.3.h] Connect neighborhoods by developing and publicizing pedestrian, bicycle, and motor vehicle connections among residential neighborhoods, and between residential and commercial areas, to allow for safe and efficient movements throughout the City.
 - d) [MP 3.3.i] Develop and implement mixed-use zoning to provide connections between zones.
 - e) [ZO Article V: Uses] The Table of Uses indicates that “Neighborhood Store” is permitted in the SFR Districted and could be permitted with a special exception in all other residential districts.
 - f) [ZO Article V: Uses] The Table of Uses indicates that “Flea/Farmer’s Market” and “Eating and Drinking Place” are not permitted in any residential district.
- E) **Do all (or most) zoning districts require a minimum open space ratio (i.e., percentage of land area for each development that must be open space)?**
- a) [ZO] Open Space is only referenced under Cluster Housing; see Question 2C above.
 - b) [ZO] A minimum percentage of Green Space is required in most districts, see 2C.d above.

Smart Growth Assessment: Checklist Answers and Documentation

3) Mix of Uses

- A) **Where are commercial/industrial and residential uses located in relation to each other?**
a) [ZO Districts Map] (Description) The downtown area is compact; there are commercial areas surrounded by residential districts. There are pockets of industrial districts, reflecting pre-existing uses. To the north and south of downtown are larger industrial districts. A variety of districts extend along the south and east sides of Paugus Bay, yielding to Commercial Resort into the Weirs.
- B) **Can townspeople meet most daily shopping needs (groceries, hardware, etc.) in the community?**
a) [Planner] There are many service and professional businesses accessible, some hardware stores **but many residents need to drive to get much of their grocery shopping done.**
- C) **How does local zoning encourage business development in the downtown/village center?**
a) [ZO Article V: Uses] Within a half mile of the center of downtown there are half a dozen districts including industrial, commercial, and residential districts. Lakeport has a commercial core, surrounded by General Residential and then SFR. The Weirs is dominated by the Commercial Resort District.
(1) Most residential and commercial uses are permitted in the CR district.
- D) **Which option best describes the mix of housing types in your community?**
a) [Planner] There is a mix of housing, including affordable homes for purchase and multi-family rental housing.
- E) **How has your community planned for future housing needs, especially in and around your downtown?**
a) [MP p50] Based on the population projection for Laconia in 2020, and the current household size, it appears that Laconia will likely need at least 7,400 year-round housing units by 2020. This represents an increase of approximately 700 units over the next fifteen years, or an average increase of 47 units per year.
b) [Pattern] The 2000 Census reported 7,077 year-round units. The Estimated Total Housing Units for 2007 was 9,398.
c) [MP p 51] There are currently about 2,000 single-family housing units which have been approved, and could be constructed, as primary residences or vacation homes in the years to come.
d) [MP Objective 3] **The only discussion of housing needs is the type, Workforce and Community-focused housing.**
- F) **Do local regulations enable your community to meet diverse housing needs and ensure long-term affordability?**
a) [ZO Article V: Table of Uses] Six of Laconia's 15 Zoning Districts are Residential Districts and each permits or excludes a variety of uses.
b) [ZO Article V: Table of Uses] Residential uses are permitted in most of the commercial districts.
c) [ZO Article V: Table of Uses] Accessory apartments are permitted in three of the residential districts **but not permitted in the Residential General District.**
- G) **Does your community provide incentives to support affordable housing (density bonuses, fee waivers, higher density zones, fast tracking)?**
a) [MP 3.2.a] Work with regional and municipally based private, quasi-public, and public agencies to develop a regional Master Plan for development and construction of workforce housing.

Smart Growth Assessment:

Checklist Answers and Documentation

- b) [MP 3.2.b] Work with financial institutions, State and Federal agencies, and local non-profits to develop a revolving loan fund to provide down payments and security deposits for eligible recipients.
 - c) [MP 3.2.c] Continue to apply for Community Development Block grants, U.S. Housing and Urban Development (HUD) grants, and other grant based funding opportunities for the rehabilitation of existing buildings for workforce housing.
 - d) [MP 3.2.d] Continue to support the Laconia Housing Authority efforts to provide and manage workforce housing opportunities.
 - e) [ZO Article IV; Housing Redevelopment Overlay District]
 - (1) Lot consolidation is expedited.
 - (2) Density – up to 12 units/acre
 - (3) Front setbacks are reduced
 - (4) Green space requirements are reduced (25%)
 - f) [ZO Article VI; Dimensional Table] Several of the districts where residential uses are permitted allow for higher densities if utilities are available.
 - g) [ZO] No incentives related to the application and review processes.
- H) **If the community has a downtown, are residential uses allowed in the central business zoning district?**
- a) [ZO Article V: Uses, Table of Uses] Combined dwelling units/businesses, Multifamily dwelling, Single family, and Two-family dwelling are permitted uses in most of the commercial districts.
- I) **Do the provisions within at least some of the residential zoning districts allow for a wide range of housing types by right (versus requiring a conditional use permit or special exception)?**
- a) [ZO Article V: Uses, Table of Uses] A variety of housing types are permitted by right in the six residential districts, allowing for a range of housing options. Four types are permitted by right in the SFR, RG, and RA districts; two are permitted in the RR1, RR2, and RS districts, along with accessory apartments being permitted (enhancing affordability).
 - b) [ZO Article V: Uses, Table of Uses]
 - (1) Accessory apartments are not permitted in the RG district.
 - (2) Cluster Development requires a conditional use permit in all residential areas.
- J) **Does the zoning ordinance allow for “accessory apartments” within single-family residential (RS) zoning districts?**
- a) [ZO Article V: Uses, Table of Uses] Accessory apartments are permitted in the single family residential district, **although not in the General Residential district.**

Smart Growth Assessment: Checklist Answers and Documentation

4) Working Landscape

- A) **Where is most development in your community located?**
a) [Patterns] Primarily near the downtown, Lakeport, the Weirs, with some expansion around Paugus Bay.
- B) **What strategies does your master plan have for protecting farmland?**
a) [MP 1.4.d] Establish an Open Space Commission or other similar mechanism for managing municipally-owned open space, and to maintain and enforce conservation restrictions, deed restrictions, and other open-space protection easements.
b) [MP 1.4.e] Research and evaluate mechanisms that encourage and provide incentives for open space in the rural zones in order to establish scenic byways. Incorporate the promotion of these byways into the tourist attraction network.
c) MP Chapter 1 has several statements about the status of Ag and Forest lands in Laconia but the Objectives and Actions (above) focus on the “Community Character”. These are not specific to Ag and Forest land, addressing Open Space especially as it pertains to tourism.
- C) **Does your master plan map the location of farms and prime agricultural soils?**
a) Not in the 2007 Master Plan.
b) A map of Agricultural land is in the 1991 Master Plan.
c) There is a good deal of correspondence between the Ag uses on the LC and LULC circa 2001 and the Ag soils layer. More recent LULC data is not available.
d) [Planner] It is not referenced by the Planning Board or Planning staff.
- D) **Is there local support for farming and/or forestry through tax abatements, and/or a dedicated town fund to help purchase or protect prime working land?**
a) [Planner] No tax abatements or dedicated fund. While there are some agricultural soils, there are very few farms in Laconia.
b) [Planning Board] The Conservation Commission has funds to specifically target high value land for purchase or easement.
- E) **Does the zoning ordinance zone much of the fringe land as exclusively agricultural (i.e., a holding category) or with a substantial minimum lot size that discourages single-family tract housing and preserves large sites for viable farm use?**
a) [ZO Article VI; Dimensional Table] The largest lot requirement in Laconia is 2 acres.

Smart Growth Assessment:

Checklist Answers and Documentation

5) **Choice and Safety in Transportation**

- A) **Which of these options best describes the layout of local streets?**
- a) Interconnected in downtown, Lakeport, and some of the Weirs, **much less connectivity outside of these areas.**
- B) **How has your community planned for future streets?**
- a) [MP 4.1.d] Develop a comprehensive Roadway Capital Improvement Program to determine a baseline goal of City road conditions and to integrate road construction and improvements with development and impact fees.
 - b) [MP 4.1.j] With the assistance of Professional Engineering/Planning consultants, use the existing collection of site specific studies on file at the Department of Public Works and the Planning Department to accomplish a City-wide comprehensive study of traffic flows that would include a “functional assessment” of critical intersections. Use this plan to further design a comprehensive improvement plan to include location priorities and budget estimates to assist in future Capital Improvement considerations.
 - c) [MP 4.3.a] Ensure adequate on and off-site traffic circulation at commercial development sites.
 - d) [MP 4.3.b] Continue to improve the traffic flow through the Downtown Business District.
 - e) [MP 4.3.c] Develop a Transportation Plan for commercial corridors to better manage access points and to identify the most efficient use of the existing rights-of-way. Institute guidelines for location of site access and driveways to preserve capacity, increase safety, and improve traffic flow.
 - f) [MP 4.3.d] Incorporate development requirements to mitigate traffic impacts. Use Tax Increment Financing Districts (TIFs) and impact fees to finance street and utility improvement work.
 - g) [MP 4.4.d] Develop comprehensive guidelines for sidewalks, trails, and crosswalks in all construction that ensures neighborhood connectivity to schools, community centers, and open space.
 - h) [MP 4.4.e] Discourage through traffic in residential areas.
 - i) [MP Implementation] **As of Nov. 2008, none of the above items had been achieved.**
 - j) [Planner] **There is no street network plan.**
- C) **How does your community regulate the width of new streets?**
- a) [MP 4.4.f] Revise Zoning Ordinances and Regulations to allow a variety of parking designs and options to better address the varying types of development within the City.
 - b) [Sub 6.2.B.6] Minimum ROW is 50’.
 - c) [ZO Cluster Development (o.1.) Streets] Right of way width may be reduced to 40 feet. Pavement width may be reduced to 18 feet.
 - d) **No other language seen regarding regulation of road widths.**
- D) **What provisions has your community made for pedestrians and cyclists?**
- a) [MP 3.3.a] Revise the Zoning Ordinance to encourage the development of “front-porch” housing including such things as reduced front setback, parking and garages in rear of property, sidewalks, and traffic calming mechanisms.
 - b) [MP 3.3.h] Connect neighborhoods by developing and publicizing pedestrian, bicycle, and motor vehicle connections among residential neighborhoods, and between residential and commercial areas, to allow for safe and efficient movements throughout the City.
 - c) [MP 4.4.a] Invest in and support non-motorized transportation systems such as the Rails with Trails program, the Riverwalk, and sidewalks.
 - d) [MP 4.4.b] Collaborate with the Rails With Trails Program to incorporate their activities into a City-wide trails network.

Smart Growth Assessment: Checklist Answers and Documentation

- e) [MP 4.4.c] Develop comprehensive guidelines for sidewalks, trails, and crosswalks in all construction that ensures neighborhood connectivity to schools, community centers, and open space.
- f) [Sub Article 6.5 Sidewalks] ADA-compliant sidewalks are required on one side of the street in all new subdivisions.
- E) **Does your community offer public transportation?**
 - a) [MP p. 68-69] There is a limited bus service within Laconia, connecting the city with other parts of Belknap County and a long distance bus route.
 - b) [MP p. 68-69] There is no regular train service in Laconia.
 - c) [Planner] Working to get regular train running through the summer.
- F) **Do you require sidewalks and trails in new developments?**
 - a) [Sub Article 6.5 Sidewalks] ADA-compliant sidewalks are required on one side of the street in all new subdivisions.
 - b) [SPR Article 7.13 Sidewalks] ADA-compliant sidewalks are required on one side of the street in all new subdivisions.
 - c) **Trails are not required.**
 - d) [Planner] The Planning Department is finding that all new developments are coming in with “amenities packages” including sidewalks and trails.
- G) **Does your street design enable pedestrian traffic?**
 - a) [Planner] In many areas, yes.
- H) **Has your community designated or established safe routes for children to walk or bike to school?**
 - a) [Planner] There has been some exploration of the Safe Routes to Schools program and funds **but no proposals have been developed.** .
 - b) **[NH DOT] There was some correspondence with the city but it has not developed into any proposals.**
- I) **Do land use regulations include maximum parking ratios (i.e., a cap on the number of parking spaces that can be built in a particular development) in addition to minimum parking requirements?**
 - a) [ZO Article VIII] There is frequent reference to exemptions from parking requirements if within 1,000’ of a public parking garage.
 - b) **[ZO] There is no mention of maximum number of parking spaces.**
- J) **Is on-street parking allowed in places where it can be safely provided, such as in downtown areas and pedestrian retail districts?**
 - a) [ZO Article VIII] It is allowed. There is frequent reference to exemptions from parking requirements if within 1,000’ of a public parking garage.

Smart Growth Assessment: Checklist Answers and Documentation

6) Environmental Quality

- A) **What action is your community taking to protect natural areas?**
- a) [Planner] The Cluster Ordinance was recently revised to incorporate more elements of Conservation Subdivision.
 - b) [Planner] The Planning Board is working on a Steep Slopes Ordinance.
 - c) [ZO 235.17] Have a Wetlands Conservation and Water Quality Overlay District which includes heightened buffers along named streams and around vernal pools. This also identifies the standards required to grant a conditional use permit.
 - d) **Do not have a map of these areas readily available.**
 - e) [ZO 235.19] Have a Shoreland Protection District
 - f) [MP V] Developing a Natural Resources Inventory (NRI).
 - g) [MP V] Developing Stormwater Management Impact Fees.
- B) **Has your community identified its natural assets (rivers, mountains, wetlands, open space, agricultural lands, viewsheds, agricultural lands) and taken steps to restore or protect them?**
- a) NRI published in November, 2009.
 - b) [ZO 235.17] Identifies specific streams for added protection.
 - c) [MP, Chapter V] Names and identifies many of the specific natural resources in Laconia.
 - (1) [MP 5.1 & 5.2] Heavy emphasis on water and wetlands.
 - (2) **[MP 5.3] Far less specific language regarding other natural resources.**
- C) **Do land use regulations require developers to consider connecting open spaces and greenways to existing destinations and open space reservations?**
- a) **[ZO 235.40] The Cluster Development Ordinance encourages the connectivity of trails but does not address Open Space connectivity.**
 - b) **Greenways and Open Space are not addressed in other parts of the ZO.**
- D) **Do local land use regulations provide for “conservation subdivisions” or “cluster subdivisions” as a matter of right (versus requiring a conditional use permit or special exception)?**
- a) [ZO Table of Uses] Cluster Subdivision is permitted in the Downtown Redevelopment District* and **conditional in all other residential districts.**
 - b) **[Planner] * This appears to be an oversight as it is not likely that any lots in this district meet the physical requirements.**
- E) **Have the community’s development regulations been revamped recently to encourage or require best management practices (BMPs) for water quality? Does this include a water-quality or aquifer ordinance?**
- a) [ZO Article IV] There are several districts and overlay districts which specifically address water quality issues: Floodplain District, Shoreland Protection District, Wetlands Conservation and Water Quality Overlay District, and the Water Supply Protection Overlay District.
 - b) **[MP 5.1 & 5.2] The recommended actions indicate a need to take further steps to protect water quality in Laconia.**
- F) **Does the community have guidelines and incentives for designing development sites and buildings for energy efficiency?**
- a) [ZO 235.40] The Cluster Development Ordinance defines Energy Efficient Building Design as well as LEED Design Guidelines.
 - (1) A 15% density bonus may be granted for LEED guidelines are followed.
 - (2) **No other mention of energy efficiency is mentioned.**
 - b) **[ZO, SPR] No other guidelines addressing energy efficiency were found.**

Smart Growth Assessment: Checklist Answers and Documentation

7) ***Involve the Community***

- A) **Which of these options best describes the conditions of historic buildings in your community?**
 - a) [Planner] The Heritage Commission has begun the process of inventorying historic buildings.
- B) **Does your community have a set of clear design guidelines so streets, buildings, and public spaces work together to create a sense of place?**
 - a) [Planner] No, but Architectural Regulations are in the works.
 - b) [Planner] For downtown, yes.
 - c) [SPR 6.6] An Architectural Plan is required as part of the Site Plan Review package.
- C) **Does your community sponsor events to celebrate its cultural heritage, natural assets or community character?**
 - a) [Planner] Yes, Theatre in the Park, Economic events, Multicultural Day, Craft Shows, Boat and Car shows.
- D) **What action is your community taking to protect historic buildings and other features?**
 - a) [Planner] There is a Heritage Commission that has begun an inventory of historic structures.
- E) **To what extent was the public involved in developing your most recent the community plan?**
 - a) [MP Process] Numerous community forums were held over the five year development process.
- F) **Are citizens active in community planning, development, and resource protection?**
 - a) [MP 5.5.b] Collaborate with neighboring towns on planning and conservation concerns and issues by holding and participating in “issue meetings” workshops for the Regional community...
 - b) [Planning Board] There are numerous local groups including the Lakeport Historical Association, the Main Street Program, the Belknap Independent Business Alliance, the Belknap County Economic Development Council, and the Weirs Action Committee.
 - c) [Planner] No. It is rare to have citizens show up for planning discussions.

Smart Growth Assessment: Checklist Answers and Documentation

8) Manage Growth Locally (but work with neighbors)

- A) **Do elected and appointed board members and staff in nearby communities have opportunities to meet and network with each other on a regular basis?**
 - a) [Planning Board] Some residents are involved with regional organizations such as the Winnepesaukee Watershed Association, the Lakes Region Planning Commission, and the Laconia Municipal Airport.
- B) **Do the towns, cities, and counties in your area have any formal cooperative agreements on issues such as land use, transportation, housing, infrastructure, emergency services, other services, revenue sharing, or economic development?**
 - a) [Planner] In its role as the seat of Belknap County government, Laconia bears a large burden of expenses since it needs to provide services and infrastructure for many people who rely on county services. *The cost/benefit of such a role is sometimes a challenge.*

Notes

*The format of the Zoning Ordinance is inconsistent and difficult to read.
An index for the Site Plan and Subdivision Regulations would be useful.*

**Review of Land Use Planning Documents
for Laconia, New Hampshire
with respect to
Wildlife Habitat and Natural Resource Protection**



**Prepared by the
Audubon Society of New Hampshire
Conservation Department**

**in consultation with the
Laconia City Planner and Laconia Planning Board
Project funding provided by the Samuel P. Pardoe Foundation
December 2009**

Analysis by Topic

The intent of this review is to assess the current level of protection for wildlife habitat and natural resources provided by the City of Laconia's land use regulations and identify additional opportunities for regulatory protection. The review included the following:

- Master Plan adopted in 2007;
- Zoning Ordinance adopted in 1975 and revised in 1995;
- Site Plan Review Regulations as amended in 2009;
- Subdivision Regulations as amended in 2007;
- Planning Study for Weirs, Paugus Bay, Opechee Bay and Winnepesaukee River Watersheds prepared in 2000 (Watershed Planning Study);
- U.S. EPA Smart Growth Implementation Assistance Final Report completed in 2007 (Smart Growth report);
- Hazard Mitigation Plan adopted in 2005;
- Natural Resource Inventory prepared in 2009.

This chapter provides a comprehensive analysis of current provisions for protecting important natural resources and wildlife habitat in the City's land use planning documents. Some topics are interrelated and provide alternate strategies for protecting a given resource or addressing a particular problem, such as sprawl. Each section includes a brief description of the topic and how it affects human quality of life and wildlife survival, a brief summary of pertinent provisions in current documents and recommendations for revisions if stronger protections are desired by the City. Legal review of proposed revisions is always advisable.

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A. Agriculture and Productive Soils

Agriculture is an important component of New Hampshire's economy and environment, and makes vital contributions to the State's food supply. New Hampshire's glacial history has left the State with limited areas of productive soils suitable for agriculture. These soils are critical to the future of food production in New Hampshire. Prime agricultural soils and soils of statewide importance are included in the NH Natural Services Network, a GIS-based tool identifying lands that provide important ecological services that are difficult and expensive to replicate. Agricultural lands are important to native wildlife by providing breeding habitat for grassland birds, migration stopover habitat for waterfowl, and wintering habitat for wild turkeys.

Summary of Current Provisions and Information

Master Plan recognizes importance of agricultural lands in contributing to local food supply, community character, open space, and wildlife habitat and acknowledges on-going loss of agricultural land. Zoning Ordinance includes prime and important agricultural lands as high-value characteristics of land and provides for cluster development as tool to discourage consumption of agricultural land. Watershed Planning Study concludes that agriculture is not a significant source of non-point source pollution in the City's watersheds. Smart Growth report recommends preserving large, continuous areas of natural lands. Natural Resource Inventory includes section on Agriculture and Productive Soils.

Recommendations

Master Plan

- Consider adding a paragraph in the Master Plan Vision Statement that focuses on natural resources, including agriculture, such as: "Our City's open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations. Active agricultural lands contribute to the local economy, rural character, and quality of life."
- Consider adding an objective to Goal 1 (Community Character) that specifically addresses protection of natural resources and ecological services, such as "Protect Natural Resources – Laconia's natural resources support human welfare and economic activity, and provide important ecological services," with pertinent actions, such as
 - Maintain and protect agricultural lands and productive soils.
- Consider adding an action to Objective 1.1 (Community Character) that addresses natural resource data, including active agricultural lands, aquifers, managed forests, and wildlife connectivity zones.
- Consider adding actions to Objective 2.1 (Economic Development) such as
 - Provide incentives to local farmers to maintain agricultural activities as a viable means of self-employment.
 - Review local ordinances and regulations to ensure that opportunities exist for economically viable agriculture.
 - Encourage the continuation of working farms within the City.
- Consider revising Objective 5.3 to be more inclusive of important resources, such as "Protect and preserve natural and scenic resources – Laconia's natural and scenic resources, including lakes, forests, and agricultural lands, contribute to the City's economic vitality and quality of life, and deserve protection."
- Consider adding actions to Objective 5.3, such as

Analysis by Topic

- Protect agricultural lands and productive soils through easements and an agricultural overlay district.

Zoning Ordinance

- Consider adopting an overlay district with performance standards to protect agricultural soils. “Agricultural Incentive Zoning” (Chapter 1.7) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for an Agricultural Conservation District Ordinance and examples of agricultural zoning in New Hampshire municipalities.
- Consider making cluster subdivision a Permitted Use, with conventional, frontage-based subdivision allowable by Conditional Use Permit in the Rural Residential districts, outside an adopted urban growth boundary, or in an adopted conservation district.

Subdivision Regulations

- Consider including provision in Purpose & Intent (II), such as “Provide for the protection of agricultural lands and productive soils.”
- Consider including existing natural resources, including agricultural lands and productive soils among discussion topics for Pre-application Design Review (IV.4.2).
- Consider including agricultural lands and productive soils among key features of the site in purpose of Design Review (IV.4.2.2).
- Consider including agricultural lands and productive soils among features for which subdivider shall give due regard (V.5.1.1).
- Consider requiring Pre-application Design Review for all subdivision proposals in Rural Residential and Residential Rural Corridor districts.

Site Plan Review Regulations

- Consider adding provision to Purpose and Intent (Section II) of Site Plan Review Regulations, such as “Provide for the protection of agricultural lands and productive soils.”
- Consider requiring design review for site plan proposals in Rural Residential and Residential Rural Corridor districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including Prime Farmland, Farmland of State Importance, and active or recently active agricultural lands.
- Consider including protected agricultural lands in Natural Features section of Subdivision Plan and Site Plan checklists.

B. Energy Efficiency

Energy efficient design of neighborhoods and buildings has long-term economic benefits for residents and taxpayers as well as environmental benefits of resource conservation and reduced pollution. Energy efficiency benefits wildlife by decreasing the habitat loss and degradation associated with producing electricity and the global impacts of burning fossil fuels.

Summary of Current Provisions and Information

Master Plan Vision Statement includes leadership in conserving energy; recommends development of public transportation and outreach to highlight benefits of energy efficient buildings. Zoning Ordinance includes definitions of energy efficient building design and LEED design guidelines and provides a 15% density bonus for LEED design buildings in cluster developments. Subdivision Regulations require sidewalks. Subdivision and Site Plan Review regulations include outdoor lighting regulations that promote energy efficiency.

Recommendations

Master Plan

- Consider adding an action to Objective 1.6 (Community Character), such as
 - Encourage landscaping designs that reduce heating and cooling costs.
- Consider adding an objective to Goal 3 (Housing) of increasing the energy efficiency of the City's housing stock and providing appropriate actions, such as
 - Develop and implement incentives for maximizing the energy efficiency of new housing and increasing the energy efficiency of existing housing stock.
- Consider revising Action 3.3.d (Housing) to include energy efficiency, such as "Develop and implement incentives for the rehabilitation, increased energy efficiency, and maintenance of existing housing units in developed commercial areas."
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as "Design and implement a transportation network that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services."
- Consider adding actions to Objective 7.9 (Community Facilities and Services), such as
 - Increase the energy efficiency of municipal buildings and vehicles.
 - Revise the building code to include provisions for energy efficiency.

Zoning Ordinance

- Consider including an item that specifically addresses promotion of energy efficiency in the Purpose and Intent of the Zoning Ordinance, such as
 - Promote efficient use of energy by and within the City.
- Consider including LEED in definitions.
- Consider providing incentives for all LEED buildings.
- Consider adopting an article that specifically addresses energy efficient development (The "Energy Efficient Development" chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses energy efficient development.)

- Consider making cluster subdivision a Permitted Use, with conventional, frontage-based subdivision allowable by Conditional Use Permit in the Rural Residential districts, outside an adopted urban growth boundary, or in an adopted conservation district.
- Consider adopting *maximum* setback and driveway length in the Rural Residential districts.

Subdivision Regulations

- Consider including provision for encouraging energy efficiency in Purpose & Intent (II).
- Consider adopting design standards for energy efficiency. The “Energy Efficient Development” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides a list of fundamental concepts to address energy efficiency in design standards of subdivision and site plan review regulations.
- Consider including provisions in the Design Standards and Required Improvements for Landscaping (7.11) that
 - discourage use of plants that require significant inputs of water and nutrients and
 - encourage landscaping designs that reduce heating and cooling costs.The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for site plan review regulations pertaining to landscaping.

Site Plan Review Regulations

- Consider including provision for encouraging energy efficiency in Purpose & Intent (II).
- Consider adopting design standards for energy efficiency. The “Energy Efficient Development” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides a list of fundamental concepts to address energy efficiency in design standards of subdivision and site plan review regulations.

Application Checklists

- Consider including an Energy Efficiency Plan in the Subdivision Plan and Site Plan checklists, including such items as street and building orientations, efficiency of outdoor lighting, shade tree locations, provisions for pedestrians and bicyclists, and for Site Plans, proposed building performance standards (e.g., Energy Star, LEED, 2030 Challenge) or energy efficient building design features.

C. Floodplains

Floodplains are low-lying lands where water spreads out after overflowing the banks of streams and rivers during periods of snowmelt or heavy precipitation. In addition to providing critical storage areas for floodwaters, they provide the surface over which a river's meanders can shift over time. Floodplain development results in damage to private property and public investments such as roads and utilities, risks to public health and safety, and increased flooding downstream. Floodplains provide important habitat for furbearing mammals, a number of amphibians, several species of turtles, and numerous breeding and migrating birds.

Summary of Current Provisions and Information

Master Plan cites City's Flood Plain District. Hazard Mitigation Plan indicates that floodplains within the City are narrow and limited. Zoning Ordinance includes a Floodplain District. Subdivision and Site Plan Review regulations include special requirements for designated Special Flood Hazard Areas; Site Plan Review Regulations authorize the Planning Board to prohibit development in flood plains. Natural Resources Inventory includes section on Riparian Zones and Floodplains.

Recommendations

Hazard Mitigation Plan

- Consider including a map of flood prone areas in the City's Hazard Mitigation Plan.

Zoning Ordinance

- Consider excluding steep slopes, FEMA flood plains, and soils subject to frequent or occasional flooding from buildable area calculations (Section VI.235-32.D). (Steep Slopes and Ridgelines; Floodplains; Green Infrastructure)
- Consider revising Floodplain District (235-18) and Cluster (235-40) regulations to require certification that new construction and substantial improvements do not reduce the flood-storage capacity of the floodplain.

Subdivision and Site Plan Review Regulations

- Consider adding a provision in Lots (6.1) that eliminates flood hazard areas from lot coverage calculations.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including hydrologic features, soils subject to frequent or occasional flooding, soils subject to frequent or occasional ponding, soils classified as poorly or very poorly drained, and the FEMA Floodplain Boundary.

D. Forests and Forestry

Forests provide the natural vegetation for most of New Hampshire's landscape. They play important roles in providing clean air and water, and opportunities for recreation; moderating climate; protecting watersheds; and contributing to aesthetic values and rural character. Urban forests, including trees in riparian buffers, parks, yards, parking lot islands, and streetscapes, reduce heat absorption by pavement, filter particulates from the air, reduce stormwater runoff, and provide wildlife habitat. Forestry is a significant component of New Hampshire's economy, providing fuel, fiber, and solid wood products to state, regional, national, and international markets. Forests provide essential habitat for the majority of New Hampshire's wildlife species. Harvesting patterns contribute to the diversity of forest age classes, species compositions, and structures on the New Hampshire landscape, providing diverse habitats for native wildlife.

Summary of Summary of Current Provisions and Information

Master Plan recognizes increasing development pressures on the City's forest lands and their important contributions to water and air quality, recreation, tourism, wildlife habitat, community character, local timber production, and as a local energy source; recommends an inventory of existing open space to identify appropriate areas for conservation restrictions or acquisition, and establishing a mechanism for managing municipally-owned open space. Zoning Ordinance includes forestry in definition of Agriculture; defines Active, Sustainable Timber Management; permits agriculture and open space in Residential Rural District; permits logging operations in wetlands and water body buffers with certain restrictions; permits active, sustainable timber management in open space of cluster subdivision. Subdivision and Site Plan checklists include Significant Tree Stands. Watershed Planning Study discusses potential for timber harvesting to create non-point source pollution. Smart Growth report recommends preserving large, continuous areas of natural lands. Natural Resource Inventory includes section on Forests and Forestry.

Recommendations

Master Plan

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, including wildlife habitat, such as: "Our City's open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations. Local forests contribute to air quality, water quality, climate moderation, economic activity, aesthetic values, opportunities for recreation, and biodiversity."
- Consider adding an objective to Goal 1 (Community Character) that specifically addresses protection of natural resources and ecological services, such as "Protect Natural Resources – Laconia's natural resources support human welfare and economic activity, and provide important ecological services," with pertinent actions, such as
 - Maintain and protect large blocks of contiguous forest to provide timber and fuel sources, watershed protection, climate moderation, air quality protection, wildlife habitat, recreation sites, and education opportunities.
 - Maintain and protect urban forests to provide climate moderation, air quality protection, and wildlife habitat.
- Consider adding an action to Objective 1.1 (Community Character) that addresses natural resource data, including active agricultural lands, aquifers, managed forests, and wildlife connectivity zones.

Analysis by Topic

- Consider adding actions to Objective 2.9 (Economic Development) and Objective 5.3 (Natural Resources), such as
 - Provide incentives to local forest landowners to maintain forest management as an economically viable activity.
 - Review local ordinances and regulations to ensure that opportunities exist for economically viable forestry.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as “Design and implement a transportation system that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services.”

Zoning Ordinance

- Consider making cluster subdivision a Permitted Use in the Rural Residential districts, with conventional, frontage-based subdivision allowable by Conditional Use Permit.
- Consider adopting a maximum front yard depth for the Rural Residential districts to reduce fire risks at urban-wildland interface and minimize forest fragmentation.

Subdivision and Site Plan Review Regulations

None.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including
 - Contiguous forest area exceeding 50 acres pre- and post-development
 - Size class and species composition of current forest cover.
- Consider including access to post-development forest lands and forest area maintained as open space in Plat Requirements of Subdivision Plan.

E. Green Infrastructure

Green Infrastructure consists of the network of undeveloped lands and waters that support human life and economic activity as well as native wildlife. Green infrastructure provides the essential services, including solar energy conversion, nutrient cycling, air and water purification, and climate moderation, that enable ecosystems to function and support life. Green infrastructure also enhances human quality of life, contributes to property values, and provides wildlife habitat.

Summary of Current Provisions and Information

Master Plan recognizes the values of open space and encourages establishment of green spaces and pocket parks. Zoning ordinance requires vegetated buffers for wetlands and waterbodies; requires green space in dimensional standards; provides for cluster subdivisions; includes landscaping standards. Subdivision Regulations authorize Planning Board to require open space. Site Plan Review Regulations require Landscaping Plan. Subdivision and Site Plan checklists include Significant Tree Stands, Street Trees, and Green Space Calculations. Watershed Planning Study includes green space recommendations. Smart Growth report recommends preserving large, continuous areas of natural lands and incorporating open space, parks, and green places into stormwater management plans. Natural Resources Inventory includes sections on Forested Lands, Conservation Land, and Unfragmented Lands.

Recommendations

Master Plan

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, such as: “Our City’s open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations. Local forests contribute to air quality, water quality, climate moderation, economic activity, aesthetic values, opportunities for recreation, and biodiversity.”
- Consider including discussion of green infrastructure in Chapters 1 (Community Character) and/or 5 (Natural Resources).
- Consider adding an objective to Goal 1 (Community Character) that specifically addresses protection of natural resources and ecological services, such as “Protect Natural Resources – Laconia’s natural resources support human welfare and economic activity, and provide important ecological services,” with pertinent actions, such as
 - Maintain and protect large blocks of contiguous forest to provide timber and fuel sources, watershed protection, climate moderation, air quality protection, wildlife habitat, recreation sites, and education opportunities.
 - Maintain and protect urban forests to provide climate moderation, air quality protection, and wildlife habitat.
- Consider adding actions to Objective 1.3 (Community Character), such as
 - Develop and adopt a green infrastructure plan for the City.
 - Identify and map critical green infrastructure within the City.
 - Review and revise local policies and regulations to support protection of critical green infrastructure.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as “Design and implement that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services.”

Analysis by Topic

- Consider including maintaining a network of green infrastructure as an objective to Goal 1 (Community Character), Goal 5 (Natural Resources), and/or Goal 7 (Community Facilities and Services).
- Consider adding actions to Objective 5.4 (Natural Resources), such as
 - Review and revise the City's Open Space Plan to ensure adequate protection of essential ecological services.
 - Ensure that development will not adversely impact important natural resources and ecological services.

Zoning Ordinance

- Consider adding green infrastructure to purpose language for zoning ordinance, such as
 - Protect a functioning network of green infrastructure within the City to maintain essential ecological services.
- Consider adopting overlay districts or other policies to protect components of green infrastructure as discussed elsewhere in this document.
- Consider excluding steep slopes, FEMA flood plains, and soils subject to frequent or occasional flooding from buildable area calculations (Section VI.235-32.D). (Steep Slopes and Ridgelines; Floodplains; Green Infrastructure)
- Consider adopting maximum impervious lot coverage for each zoning district. (Green Infrastructure; Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)

Subdivision and Site Plan Review Regulations

None.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including existing vegetation.
- Consider adding landscaping detail and natural vegetation features to be retained to Plat Requirements for Subdivision Plan.

F. Groundwater

Groundwater includes water stored in stratified drift (i.e., sand and gravel) aquifers and in bedrock (i.e., deep or artesian) aquifers, and is the most common source of drinking water in New Hampshire. Potable groundwater is a critical resource for New Hampshire communities. High-yield aquifers are included in the NH Natural Services Network as Water Supply Lands. Groundwater is important to wildlife as the source of springs and seeps which provide water in upland areas and feed surface waters and wetlands.

Summary of Current Provisions and Information

Master Plan notes existence of aquifers within the City. Zoning Ordinance purpose includes assuring proper use of natural resources and prohibits earth excavations that would substantially damage a known aquifer. Site Plan Review Regulations Purpose and Intent includes guarding against inadequate protection of groundwater quality. Subdivision and Site Plan Review application checklists include Groundwater Analysis. Smart Growth report recommends protection of groundwater recharge areas. Natural Resources Inventory includes section on Stratified Drift Aquifers.

Recommendations

Master Plan

- Consider adding an action to Objective 1.1 that addresses natural resource data, including active agricultural lands, aquifers, managed forests, and wildlife connectivity zones.
- Consider adding actions to Objective 5.4 (Natural Resources), such as
 - Adopt an aquifer protection ordinance to ensure adequate recharge and prevent contamination of important aquifers.
 - Develop/maintain/implement a wellhead protection plan.
 - Work with adjacent municipalities to protect shared aquifers.

Zoning Ordinance

- Consider adopting an aquifer overlay district. The NH Department of Environmental Services has published a Model Groundwater Protection Ordinance (www.des.nh.gov/DWSPP/pdf/ModelOrdinance.pdf). The “Protection of Groundwater and Surface Water for Drinking Water Supply” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides information about existing groundwater protection ordinances in New Hampshire.

Subdivision Regulations

- Consider including provision for protecting stratified drift aquifers in Purpose & Intent (II).
- Consider including existing natural resources, including stratified drift aquifers, among discussion topics for Pre-application Design Review (IV.4.2).
- Consider including stratified drift aquifers among key features of the site in purpose of Design Review (IV.4.2.2).
- Consider including stratified drift aquifers among features for which subdivider shall give due regard (V.5.1.1).
- Consider encouraging minimization of roads on lands overlaying mapped aquifers in Minimum Design Standards for Streets (Section VI.6.2.B).

Analysis by Topic

- Consider including discussion of aquifer recharge and preventing groundwater pollution in requirements for Stormwater and Drainage Improvements (Section VI.6.3).

Site Plan Review Regulations

- Consider including provision for protecting stratified drift aquifers in Purpose and Intent (Section II).
- Consider including location of stratified drift aquifers in Existing Conditions (Section VI.6.4).
- Consider including measures to prevent groundwater contamination in Design Standards and Required Improvements (Section VII) for lands overlaying mapped aquifers.
- Consider including discussion of aquifer recharge and preventing groundwater pollution in requirements for Stormwater and Drainage Improvements (6.3).
- Consider including minimization of impervious surface in General Requirements for Off-Street Parking and Loading (7.8). (Groundwater; Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including favorable gravel well analysis and stratified drift aquifers.

G. Growth Management and Sprawl

Growth management includes a variety of techniques and strategies intended to encourage orderly growth and development in areas appropriate for development, protect important natural resources, and discourage sprawl. Growth management helps to prevent deterioration of human quality of life and property values and loss and degradation of wildlife habitat that result from uncontrolled growth. Sprawl refers to dispersed, automobile-dependent development that segregates residential, commercial, industrial, and business uses. Sprawl contributes to air pollution and inefficient use of time and resources, which have negative impacts on human health, economic well-being, and quality of life. The inefficient use of land associated with sprawl results in excessive loss and degradation of wildlife habitat.

Summary of Current Provisions and Information

Master Plan acknowledges challenge of allowing future development without exacerbating sprawl, and recommends encouragement of mixed-use buildings in commercial centers, in-fill development in heavily developed areas, and cluster development in rural zones. Zoning Ordinance provides for cluster subdivision. Watershed Planning Study includes build-out analyses and carrying capacity standards. Smart Growth report provides recommendations for growth management strategies.

Recommendations

Master Plan

- Consider adding actions to Objective 1.6 (Community Character) such as
 - Explore the desirability of adopting growth management practices such as urban growth boundaries, village districts, or natural resource overlay districts.
 - Review and revise zoning ordinances to ensure that they do not inadvertently encourage sprawl.
 - Adopt growth management strategies to protect natural resources, maintain rural character, and prevent scattered development and sprawl.
 - Encourage development in designated areas (i.e., within Village District or Urban Growth Boundary) to prevent scattered development and sprawl.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as “Design and implement that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services.”

Zoning Ordinance

- Consider making cluster subdivision a Permitted Use in the Rural Residential districts, with conventional, frontage-based subdivision allowable by Conditional Use Permit.
- Consider adopting an urban growth boundary and/or village districts and providing incentives for locating development in these areas. “Urban Growth Boundary and Urban Service District” (Chapter 1.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides information on approaches to implementing urban growth boundaries.

Subdivision and Site Plan Review Regulations

- See Zoning Ordinance, above.

Analysis by Topic

Application Checklists

None.

H. Impervious Surfaces

Impervious surfaces include buildings, exposed rock, concrete, and other materials through which water cannot move. Impervious surfaces increase run-off of precipitation, potentially leading to erosion, sedimentation, flooding, and reduced groundwater supplies. Impervious surfaces also contribute to heat island effects and reduce air quality.

Summary of Current Provisions and Information

Master Plan recommends reducing impermeable surfaces in new developments and considering incentives for pervious parking, sidewalks, and walkways. Smart Growth report recommends minimizing impervious cover. Watershed Planning Study includes recommendations pertaining to impervious surfaces.

Recommendations

Master Plan

- Consider adding actions to Objective 1.6 (Community Character) such as
 - Encourage use of pervious pavement where appropriate.
 - Establish limits on impervious lot coverage.
 - Review and revise local policies and regulations to minimize stormwater runoff and erosion potential.
 - Encourage (or require) the practice of low impact development (LID).
 - Adopt an ordinance to address stormwater management.
 - Develop and adopt a stormwater management manual.
 - Adopt land use policies that manage cumulative impacts of land use within a watershed.
 - Adopt watershed-based zoning.
- Consider adding an action to Objective 5.1 (Natural Resources) to
 - Review and revise local policies and regulations to minimize impervious surfaces.

Zoning Ordinance

- Consider adopting maximum impervious lot coverage for each zoning district.
- Consider encouraging the use of permeable pavement in Design Requirements for Offstreet Parking and Loading (VIII.235-48. A).
- Consider adopting an ordinance to address impervious surfaces. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses impervious surfaces.

Subdivision Regulations

- Consider including minimization of impervious surface in General Requirements for the Subdivision of Land (V.5.1).
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in

Innovative Land Use Planning Techniques: A Handbook for Sustainable Development provides additional references. (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)

Site Plan Review Regulations

- Consider including total impervious surface and percent of project area, and impervious area and percent for each lot on proposed site plan (Section VI.6.5).
- Consider including surface material of parking lots and loading areas in proposed improvements to be shown on proposed site plan (Section VI.6.5 b).
- Consider including minimization of impervious surface in Off-Street Parking and Loading General Requirements (Section VII.7.8).

Application Checklists

- Consider including total impervious surface calculations in Subdivision Plan and Site Plan checklists.

I. Landscaping and Natural Vegetation

Landscaping refers to visible, human-modified features of a plot of land, including vegetation, water features, shape of terrain, fences and other material objects. Landscaping contributes to the aesthetics of neighborhoods and communities, enhances property values, improves urban air quality, and can reduce heating and cooling costs. Natural vegetation includes the native trees, shrubs, wildflowers, grasses, ferns, and mosses that grow on a land parcel before it is cleared for development. Maintaining as much natural vegetation on a development site as practical prevents erosion, mediates microclimate, contributes to human quality of life and property values, and saves the time, cost, and risks of installing new plantings. Landscaping creates backyard habitat that benefits wildlife. Natural vegetation provides higher wildlife habitat value than new plantings.

Summary of Current Provisions and Information

Master Plan addresses aesthetic benefits of landscaping and recognizes benefits of vegetated shoreline buffers in reducing pollution and runoff. Zoning Ordinance includes Wetlands Conservation and Water Quality Overlay District, which requires vegetated buffers for wetlands and waterbodies; requires landscaping for cul-de-sacs and building envelopes in cluster developments; provides landscaping and street tree planting requirements. Site Plan Review Regulations require submission of landscaping plan. Smart Growth report recommends use of streetscape landscaping to reduce stormwater runoff.

Recommendations

Master Plan

- Consider addressing adding actions to Objective 1.6 (Community Character) such as
 - Review and revise local policies and regulations to minimize destruction of natural vegetation during construction activities.
 - Review and revise local policies and regulations to encourage the use of native species in landscaping.
 - Review and revise local policies and regulations to discourage the use of plants that require significant inputs of water and nutrients in landscaping.
 - Encourage landscaping designs that reduce heating and cooling costs.

Zoning Ordinance

- Consider including a provision that landscaping plans minimize the need for significant inputs of water and nutrients in the Standards for Approval of Landscaping plans (VII.E.2). *Integrated Landscaping: Following Nature's Lead* provides information about sustainable landscaping systems for developments in the Northeast.

Subdivision Regulations

- Consider adopting landscaping standards and guidelines for subdivisions. The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for subdivision regulations pertaining to landscaping.

Site Plan Review Regulations

- Consider including provisions in the Design Standards and Required Improvements for Landscaping (Section VII.7.11) that
 - discourage use of plants that require significant inputs of water and nutrients and

Analysis by Topic

- encourage landscaping designs that reduce heating and cooling costs.
- The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for site plan review regulations pertaining to landscaping.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including existing vegetation.
- Consider including natural vegetation features to be retained in Subdivision Plan checklist.

J. Light Pollution

Light pollution includes any adverse effects of artificial light, including sky glow, glare, light trespass, decreased night visibility and energy waste. Controlling light pollution conserves energy and resources, saves money, and prevents public health and safety hazards and nuisances. Controlling light pollution can avoid negative impacts of artificial light on wildlife, particularly on migratory birds.

Summary of Current Provisions and Information

Zoning Ordinance addresses light pollution in cluster ordinance. Subdivision and Site Plan Review regulations include standards for outdoor lighting.

Recommendations

Master Plan

- Consider adding actions to Objectives 1.6 (Community Character) and 7.9 (Community Facilities and Services) such as
 - Review and revise local policies and regulations to prevent light trespass.
 - Review and revise local policies and regulations to encourage dark sky preservation.

Zoning Ordinance

- Consider extending light pollution provisions of cluster ordinance to apply throughout the City.

Subdivision and Site Plan Review Regulations

None.

Application Checklists

None.

K. Natural Hazards

Natural hazards are dangers to people and property associated with natural phenomena such as geological and ecological processes and weather. New Hampshire's most common natural hazard is flooding. Forest fires are infrequent in the State, and are usually controlled before spreading very far. Landslides are most likely in mountainous areas, but can occur locally anywhere slopes exist.

Land use practices can mitigate or exacerbate the risks of natural hazards. Development that reduces infiltration and storage of precipitation can exacerbate downstream flooding. Scattered residential development in extensive forests both increases the risk of forest fires and makes fighting them more difficult and dangerous. On steep slopes, increased water in soils from precipitation or leach fields, soil vibration from construction or traffic, undercutting at the foot of slope, and increased weight from new buildings above all can trigger slope failure.

Climate change may alter the frequency of these hazards if precipitation events become more sporadic and intense. Natural hazards can threaten human health and safety, damage public and private property, and degrade or destroy wildlife habitat.

Summary of Current Provisions and Information

Master Plan notes City's Flood Plain District. Hazard Mitigation Plan indicates that floodplains within the City are narrow and limited, ranks forest fire risk relatively low, notes hillsides provide a natural updraft that hampers fire-fighting efforts. Zoning Ordinance includes a Floodplain District. Subdivision and Site Plan Review regulations include special requirements for designated Special Flood Hazard Areas; Site Plan Review Regulations authorize the Planning Board to prohibit development in flood plains.

Recommendations

Master Plan

- Consider adding an action to Objective 5.4 (Natural Resources) such as
 - Maintain a functional network of green infrastructure.
 - Adopt regulations to minimize the extent of terrain alteration associated with development in order to maintain natural hydrologic patterns, maintain rural character, and protect property and public safety.

Hazard Mitigation Plan

- Consider including slope failure as a potential hazard.
- Consider including a map of natural hazards in the Hazard Mitigation Plan, identifying areas prone to flooding as well as formally recognized floodplains, areas vulnerable to wildfire, and areas of steep slopes.
- Consider adding a long-term objective of revising local policies and regulations to minimize structure vulnerability to forest fires.

Zoning Ordinance

- Consider revising cluster regulations (235-40) to require certification that new construction and substantial improvements do not reduce the flood-storage capacity of floodplains. (Floodplains; Natural Hazards)
- Consider revising the definition of steep slope from 25% to 15%.

Analysis by Topic

- Consider adopting a Steep Slopes Overlay District.
- Consider adopting maximum setback and driveway length in the Rural Residential districts to reduce fire risks at urban wildland interface.
- Consider excluding steep slopes, FEMA flood plains, and soils subject to frequent or occasional flooding from buildable area calculations (Section VI.235-32.D).

Subdivision and Site Plan Review Regulations

None.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including areas of slopes >15%, soils subject to frequent or occasional flooding, lands below the 1% frequency (100-year flood) elevation, and excessively drained soils.
- Consider including areas of slopes >15%, cut and fill volumes, slope stabilization measures (if appropriate), and a fire protection plan in Subdivision Plan and Site Plan checklists.

L. Natural Services Network

The New Hampshire Natural Services Network (NSN) is a GIS-based tool identifying lands that provide important ecological services that are difficult and expensive to replicate. Loss of these services affects human health, safety, quality of life, and economic opportunity. Created by a collaborative of planning and natural resource professionals, this tool can be adapted for use at multiple scales and refined to incorporate additional data. Base maps for this network consist of four components: water supply lands, flood storage areas, productive soils, and important wildlife habitat.

- **Water supply lands** include highly transmissive aquifers identified by the US Geological Survey and favorable gravel well sites identified by NH DES.
- **Flood storage areas** include 100-year floodplains identified by FEMA and lacustrine (associated with lakes), riverine (associated with rivers), and palustrine (other non-tidal) wetlands identified by the USFWS National Wetlands Inventory.
- **Productive soils** include prime farmland and farmland of statewide importance identified by the Natural Resource Conservation Service.
- **Important wildlife habitat** includes habitat of statewide priority and habitat of eco-regional priority identified by the NH Fish & Game Department Wildlife Action Plan.

Summary of Current Provisions and Information

Master Plan notes existence of aquifers within the City. Zoning Ordinance purpose includes assuring proper use of natural resources and prohibits earth excavations that would substantially damage a known aquifer. Site Plan Review Regulations Purpose and Intent includes guarding against inadequate protection of groundwater quality. Subdivision and Site Plan Review application checklists include Groundwater Analysis. Smart Growth report recommends protection of groundwater recharge areas. Natural Resources Inventory includes sections on Stratified Drift Aquifers, Rivers and Large Waterbodies, Riparian Zones and Floodplains, Wetlands and Hydric Soils, Farmland Soils, and Wildlife Action Plan.

Recommendations

Master Plan

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, such as: “Our City’s open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations.
- Consider including discussion of the Natural Services Network in Chapter 5 (Natural Resources).
- Consider adding actions to Objective 5.4 (Natural Resources) such as
 - Adopt regulations and policies to protect the City’s natural services network.
 - Review and revise the City’s Open Space Plan to ensure adequate protection of essential ecological services.
 - Ensure that development will not adversely impact important natural resources and ecological services.

Zoning Ordinance

- Consider adopting overlay districts to protect aquifers and productive soils as discussed elsewhere in this document.

Analysis by Topic

- Consider making cluster subdivision a Permitted Use, with conventional, frontage-based subdivision allowable by Conditional Use Permit. in areas identified as high quality wildlife habitat by the NH Wildlife Action Plan, if not throughout the Rural Residential districts.

Subdivision and Site Plan Review Regulations

- See Agriculture and Productive Soils; Floodplains; Groundwater; Shorelands, Surface Waters, and Wetlands; and Wildlife Habitat.

M. Shorelands, Surface Waters, and Wetlands

Shorelands, surface waters, and wetlands comprise the visible parts of the land's hydrological network. These resources govern the quality and availability of water for human and livestock consumption, recreational activities, industrial uses, and wildlife habitat. Shorelands, also called riparian areas, are frequently used as travel corridors for wildlife moving across the landscape.

Summary of Current Provisions and Information

Master Plan recognizes lakes and waterfront resources as among the City's strengths; acknowledges challenges of balancing shorefront development with high water quality and aesthetics; recommends strengthening provisions of Shoreland Protection Overlay District, updating 1976 Sewerage Plan for Prioritization to protect waterfront districts and areas with extensive wetlands. Zoning Ordinance includes Floodplain District, Shoreland Protection District, and Wetlands Conservation and Water Quality Overlay District. Smart Growth report provides strategies for protecting water quality. Watershed Planning Study provides recommendations for protecting and improving surface water quality. Natural Resources Inventory includes sections on Rivers and Large Waterbodies, Subwatersheds, Riparian Zones and Floodplains, and Wetlands and Hydric Soils.

Recommendations

Master Plan

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, including wildlife habitat, such as: "Our City's open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations."
- Consider adding actions to Objective 1.6 (Community Character), such as
 - Review and revise local policies and regulations to minimize stormwater runoff and erosion potential.
 - Encourage (or require) the practice of low impact development (LID).
 - Adopt an ordinance to address stormwater management.
 - Develop and adopt a stormwater management manual.
 - Encourage use of pervious pavement where appropriate.
 - Establish limits on impervious lot coverage.
- Consider adding actions to Objective 5.1 (Natural Resources), such as
 - Review and revise local policies and regulations to minimize impervious surfaces.
 - Collaborate in regional efforts to protect the Winnepesaukee watershed.
 - Consider adopting a steep slopes ordinance to reduce risks of erosion and siltation.
- Consider adding an action to Objective 5.4 (Natural Resources), such as
 - Maintain a functional network of green infrastructure.
- Consider adding an action to Objective 5.4 (Natural Resources) such as
 - Adopt regulations to minimize the extent of terrain alteration associated with development in order to maintain natural hydrologic patterns, maintain rural character, and protect property and public safety.

Zoning Ordinance

- Consider revising provisions of Shoreland Protection District to limit impervious surfaces to a maximum of 10 or 20 percent of any lot. Article IV.235-19. F (2)(d) currently requires that total green space be no less than 70% of a lot, which allows for impervious surface on up to

30% of a lot. Studies have shown water quality impacts at impervious coverage of approximately 10%. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for further information.

- Consider adopting watershed-based zoning to help mitigate stormwater runoff problems and protect water quality. (See the U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website, which provides guidelines for watershed-based zoning (cfpub.epa.gov/npdes/stormwater/menuofbmps). (Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Consider adopting an ordinance to address impervious surfaces. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses impervious surfaces. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Consider including a provision that landscaping plans minimize the need for significant inputs of water and nutrients in the Standards for Approval of Landscaping plans (VII.E.2). *Integrated Landscaping: Following Nature’s Lead* provides information about sustainable landscaping systems for developments in the Northeast. (Landscaping and Natural Vegetation; Shorelands, Surface Waters, and Wetlands; Watersheds)
- Consider revising provisions of Shoreland Protection District to require submittal of a stormwater management plan for all earth moving or excavation activities on lots exceeding one acre. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for details.
- Consider revising provisions of Shoreland Protection District to require a Conditional Use Permit for water-dependent uses and structures, including boathouses, beaches, docks, piers, breakwaters, moorings, and marinas.
- Consider including
 - use of fertilizers, except lime or wood ash, on lawns;
 - sand and gravel excavations;
 - processing of excavated materials;
 - underground tanks;
 - structures;
 - impervious surfaces;
 - activities resulting in soil compaction, such as parking vehicles or heavy equipment in prohibited uses within the WC District (Article IV. G).

Subdivision Regulations

- Consider including wetland and shoreland buffers in Definitions of Specific Terms (Section III.A.3).

Site Plan Review Regulations

- Consider adding wetland and shoreland buffers to Existing Conditions section of Application Contents Required for Site Plan Submission (Section VI.6.4).
- Consider including wetland and shoreland buffers in Definitions of Specific Terms (Section IV.3).

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including
 - Hydrologic features
 - Soils classified as poorly or very poorly drained
 - Soils subject to frequent or occasional ponding
 - Soils classified as hydric.
- Consider adding Shoreland Protection Zone boundary and Vegetated buffers detail to Subdivision Plan and Site Plan checklists.

N. Steep Slopes and Ridgelines

Steep slopes are often defined as grades equal to or exceeding 15%, i.e., areas where the elevation increases 15 feet in 100 feet of horizontal distance. Slopes with such high gradients are vulnerable to failure, when the pull of gravity on slope materials exceeds the forces of friction and cohesion that hold them in place. Protecting steep slopes prevents damage to public and private property resulting from slope failure; environmental damage such as erosion, sedimentation, and drainage problems; excessive cuts and fills; and unsightly slope scars. Ridgelines form the boundary between watersheds, and land uses in these sensitive areas can have negative impacts for great distances downstream. Ridgeline development is also visible over large areas and affects community aesthetics and rural character. Many ridgelines have shallow soils that support mast-bearing trees, such as oaks, hickories, and beech, which provide important food sources for wildlife. Ridgeline protection benefits wildlife by protecting these food sources and important travel routes for large mammals. Protection of steep slopes benefits wildlife by preventing habitat degradation of uplands, wetlands, and surface waters.

Summary of Current Provisions and Information

Master Plan cites occurrence of steep slopes within the City's land area, particularly associated with shorelines of water bodies, and recommends adoption of hillside development regulations. Zoning Ordinance defines steep slopes as lands with grade equaling or exceeding 25%, excludes steep slopes from buildable area calculations, and recommends steep slopes as areas to consider for preservation in cluster subdivisions. Subdivision Regulations Minimum Design Standards include grade limitations for streets and driveways. Site Plan Review Regulations require adequate measures to prevent soil erosion and other adverse environmental impact during construction and authorize Planning Board to prohibit development on steep slopes without adequate protections for safety and general welfare. Watershed Planning Study points out that development on slopes of 15-25% can cause significant problems. Natural Resource Inventory includes section on Steep Slopes and Ridgelines.

Recommendations

Master Plan

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, including wildlife habitat, such as: "Our City's open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations."
- Consider adding an action to Objective 5.1 (Natural Resources), such as
 - Consider adopting a steep slopes ordinance to reduce risks of erosion and siltation.

Hazard Mitigation Plan

- Consider addressing slope failure as a potential hazard.

Zoning Ordinance

- Consider adopting a steep slopes ordinance or overlay district. [See Lakes Region Planning Commission. 2005. *Regulating Development on Steep Slopes, Hillsides, and Ridgelines* and "Steep Slope and Ridgeline Protection" (Chapter 2.2) in *Innovative Land Use Planning Techniques*].
- Consider excluding steep slopes from buildable area calculations (Section VI.235-32.D).
- Consider revising the definitions of steep slope from 25% to 15% (Section II).

Subdivision Regulations

- Consider applying grade restrictions to entire length of private driveways (Section VI.6.2.B.9).
- Consider requiring Pre-application Design Review for all subdivision proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies. (Agriculture and Productive Soils; Forests and Forestry; Shorelands, Surface Waters, and Wetlands; Steep Slopes and Ridgelines; Wildlife Habitat; Watersheds)

Site Plan Review Regulations

- Consider adopting grade restrictions for driveway access (7.2), off-street parking and loading facilities (7.8), and sidewalks (7.13.h).
- Consider requiring pre-application design review for site plan proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies. (Agriculture and Productive Soils; Forests and Forestry; Shorelands, Surface Waters, and Wetlands; Steep Slopes and Ridgelines; Wildlife Habitat; Watersheds)

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including mapped ridgelines and slopes in excess of 15%.
- Consider including cut and fill volumes and slope stabilization measures (if appropriate) in the Subdivision and Site Plan checklists.

O. Stormwater Management and Erosion Control

Stormwater runoff refers to precipitation that cannot soak into the ground and subsequently ponds or flows over the earth's surface. Management of this runoff is important for preventing soil erosion, water pollution, and flooding, and for ensuring adequate recharge of groundwater. Erosion control prevents damage to private property and public investments such as roadways, conserves the productivity of upland soils, and prevents degradation of wetlands and surface waters. Stormwater management and erosion control benefit wildlife by preventing degradation of upland and aquatic habitats.

Summary of Current Provisions and Information

Master Plan includes recommendations for strengthening stormwater and erosion control regulations. Zoning Ordinance includes Shoreland Protection District and Wetlands Conservation and Water Quality Overlay District. Subdivision and Site Plan Review regulations include stormwater management and drainage regulations. Watershed Planning Study includes extensive recommendations for stormwater management.

Recommendations

Master Plan

- Consider adding actions to Objective 1.3 (Community Character), such as
 - Identify and map critical green infrastructure within the City.
 - Develop and adopt a green infrastructure plan for the City.
- Consider adding actions to Objective 1.6 (Community Character) such as
 - Encourage (or require) the practice of low impact development (LID).
 - Adopt an ordinance to address stormwater management.
 - Develop and adopt a stormwater management manual.
 - Encourage use of pervious pavement where appropriate.
 - Establish limits on impervious lot coverage.
- Consider adding an action to Objective 5.1 (Natural Resources) such as
 - Consider adopting a steep slopes ordinance to reduce risks of erosion and siltation.
- Consider adding actions to Objective 5.3 (Natural Resources), such as
 - Review and revise local policies and regulations to minimize stormwater runoff and erosion potential.
 - Maintain and protect urban forests to provide climate moderation, air quality protection, stormwater management, and wildlife habitat.
 - Maintain a functional network of green infrastructure.

Zoning Ordinance

- Consider adopting a steep slopes ordinance or overlay district. [See Lakes Region Planning Commission. 2005. *Regulating Development on Steep Slopes, Hillsides, and Ridgelines* and “Steep Slope and Ridgeline Protection” (Chapter 2.2) in *Innovative Land Use Planning Techniques*].
- Consider adopting a stormwater ordinance. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses stormwater management and information about pertinent existing ordinances in New

Hampshire. The U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website (cfpub.epa.gov/npdes/stormwater/menuofbmps) also provides guidance for developing an ordinance to control post-construction runoff.

- Consider adopting Watershed-Based Zoning to help mitigate stormwater runoff problems and protect water quality. (See US EPA NPDES website referenced above)
- Consider revising the definition of steep slope from 25% to 15% (Article II).
- Consider revising Floodplain District (235-18) regulations to require certification that new construction and substantial improvements do not reduce the flood-storage capacity of the floodplain.
- Consider revising provisions of Shoreland Protection District (235-19) to :
 - limit impervious surfaces to a maximum of 10 or 20 percent of any lot. [Article IV.235-19. F (2)(d) currently requires that total green space be no less than 70% of a lot, which allows for impervious surface on up to 30% of a lot. Studies have shown water quality impacts at impervious coverage of approximately 10%. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for further information.]
 - require submittal of a stormwater management plan for all earth moving or excavation activities on lots exceeding one acre. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for details.
- Consider adopting maximum impervious lot coverage for each zoning district.
- Consider encouraging the use of permeable pavement in Design Requirements for Offstreet Parking and Loading (VIII.235-48. A).

Subdivision Regulations

- Consider allowing permeable pavement for driveways and sidewalks, with Board approval.
- Consider applying grade restrictions to entire length of private driveways (Section VI.6.2.B.9).
- Consider including minimization of impervious surface in General Requirements for the Subdivision of Land (5.1).
- Consider increasing design standards for stormwater systems (6.3).
- Consider increasing storm frequency criteria for stormwater management plans (6.3.1).
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides additional references.

Site Plan Review Regulations

- Consider allowing permeable pavement for driveways, sidewalks, and off-street parking and loading facilities with Board approval.

- Consider including total impervious surface and percent of project area, and impervious area and percent for each lot on proposed site plan (6.5).
- Consider including surface material of parking lots and loading areas in proposed improvements to be shown on proposed site plan (Section VI.6.5 b).
- Consider adopting design standards for stormwater systems (7.5).
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides additional references.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including existing drainage patterns on and adjacent to site.
- Consider including
 - Culvert crossings
 - Drainage, existing and proposed
 - Drainage culvert trench detail
 - Drainage structures
 - Erosion and sedimentation control devices
 - Landscaping detail
 - Stormwater basin detail
 - Swales detail
 - Underdrain detail
 - Application of Low Impact Development practices
 - Design calculations for detention/retention facilities
 - Design calculations for drainage improvements
 - Drainage calculations, pre- and post-construction in the Subdivision and Site Plan checklists.

P. Terrain Alteration

Terrain alteration refers to earth-moving operations, including cut and fill, that reshape the topography of the land. State law requires a permit from the Department of Environmental Services for activities that disturb more than 100,000 square feet of terrain (50,000 square feet within protected shorelands), but municipalities may adopt more stringent regulations. Terrain alteration can result in soil erosion and increased stormwater runoff, leading to water pollution and damage to public and private property damage. Terrain alteration results in direct and indirect loss of wildlife habitat.

Summary of Current Provisions and Information

Master Plan recommends natural-based design regulations to minimize terrain alteration. Zoning Ordinance requires minimum disturbance of terrain and natural vegetation in Shoreland Protection District and cluster developments. Site Plan Review Regulations require construction methods that minimize disturbance of environment.

Recommendations

Master Plan

- Consider adding an action to Objective 5.4 (Natural Resources) such as
 - Adopt regulations to minimize the extent of terrain alteration associated with development in order to maintain natural hydrologic patterns, maintain rural character, and protect property and public safety.

Zoning Ordinance

- Consider making cluster subdivision a Permitted Use in the Rural Residential districts, with conventional, frontage-based subdivision allowable by Conditional Use Permit.

Subdivision and Site Plan Review Regulations

- Consider adopting limitations on cut and fill volumes associated with development proposals.

Application Checklists

- Consider including cut and fill volumes in the Subdivision and Site Plan checklists.

Q. Urban Growth Boundary/Village District

An urban growth boundary is a mapped line that separates land where infrastructure, such as public water and sewer, can support dense development from land designated for lower density development. This planning tool provides economic benefits by concentrating services and infrastructure needs and helps to prevent sprawl. Urban growth boundaries benefit wildlife by concentrating development on the landscape, resulting in larger contiguous areas of undeveloped land.

A village district is a defined zoning area that accommodates mixed development, including the residential, commercial, and office uses that evolved in traditional New England villages. Village districts can be designed to encompass or expand existing village centers or to enable the development of new villages at desired locations, such as at crossroads or other nodes of activity. This planning tool provides economic benefits by concentrating services and infrastructure needs and helps to prevent sprawl. Village districts benefit wildlife by concentrating development on the landscape, resulting in larger contiguous areas of undeveloped land.

Summary of Current Provisions and Information

Master Plan recognizes three distinct community centers and recommends establishing neighborhood/village zoning districts and encouraging infill development in existing urban zones. Zoning Ordinance includes Housing Redevelopment Overlay District.

Recommendations

Master Plan

- Consider adding actions to Objective 1.6 (Community Character) such as
 - Encourage development in designated areas (i.e., within Village District or Urban Growth Boundary) to prevent scattered development and sprawl.
 - Explore the desirability of adopting growth management practices, such as an urban growth boundary, village districts, or natural resource overlay district.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as “Design and implement a transportation system that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services.”

Zoning Ordinance

- Consider adopting an urban growth boundary and/or Village District to encompass the Downtown, Lakeport, and Weirs community centers. “Urban Growth Boundary and Urban Service District” (Chapter 1.8) and “Village Plan Alternative” (Chapter 1.5) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provide model language for zoning ordinance articles that create an urban growth boundary and village district and information about pertinent existing ordinances in New Hampshire.
- Consider prohibiting municipal water sewer extensions beyond the existing system or any adopted urban growth boundary or village district.

Subdivision and Site Plan Review Regulations

None.

Application Checklists

- Consider adopting Pre-application Checklist, including location with respect to any adopted Urban Growth Boundary or Village District, for Preliminary Conceptual Consultation Phase.
- Consider including location with respect to any adopted Urban Growth Boundary or Village District in the Subdivision and Site Plan checklists.

R. Watersheds

A watershed is the area of land that drains into a particular water body. The cumulative effects of land uses within a watershed can lead to problems with water quality and flooding, and their associated negative impacts on humans and wildlife. Stream health deteriorates when impervious surfaces cover more than 10% of the watershed area; streams may become incapable of supporting beneficial uses when impervious coverage exceeds 25%.¹

Summary of Current Provisions and Information

Master Plan discusses City in context of its watershed and sub-watersheds, recognizes that urban, suburban, agricultural, and recreational uses within Laconia have potential to significantly affect water quality, and recommends establishment of Paugus Bay Watershed Overlay District. Zoning Ordinance includes Shoreland Protection District and Wetlands Conservation and Water Quality Overlay District. Subdivision Regulations require watershed analysis for stormwater and drainage improvements. Watershed Planning Study provides extensive data on the City's sub-watersheds and recommendations for watershed protection. Smart Growth report includes watershed-level recommendations for water quality protection. Natural Resource Inventory includes section on Subwatersheds.

Recommendations

Master Plan

- Consider adding actions to Objective 1.6 (Community Character) such as
 - Adopt land use policies that manage cumulative impacts of land use within a watershed.
 - Adopt watershed-based zoning.
 - Review and revise local policies and regulations to minimize stormwater runoff and erosion potential.
 - Encourage (or require) the practice of low impact development (LID).
 - Adopt an ordinance to address stormwater management.
 - Develop and adopt a stormwater management manual.
 - Encourage use of pervious pavement where appropriate.
 - Establish limits on impervious lot coverage.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as “Design and implement a transportation network that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services.”
- Consider adding actions to Objective 5.1 (Natural Resources) to
 - Collaborate in regional efforts to protect the Winnepesaukee watershed.
 - Review and revise local policies and regulations to minimize impervious surfaces.
- Consider adding an action to Objective 5.4 (Natural Resources), such as
 - Adopt regulations to minimize the extent of terrain alteration associated with development in order to maintain natural hydrologic patterns, maintain rural character, and protect property and public safety.

Zoning Ordinance

- Consider adopting watershed-based zoning. The U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website provides guidelines for watershed-based zoning. (cfpub.epa.gov/npdes/stormwater/menuofbmps)
- Consider making cluster subdivision a Permitted Use in the Rural Residential districts, with conventional, frontage-based subdivision allowable by Conditional Use Permit.
- Consider adopting a steep slopes ordinance or overlay district. [See Lakes Region Planning Commission. 2005. *Regulating Development on Steep Slopes, Hillsides, and Ridgelines* and “Steep Slope and Ridgeline Protection” (Chapter 2.2) in *Innovative Land Use Planning Techniques*].
- Consider adopting a stormwater ordinance. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses stormwater management and information about pertinent existing ordinances in New Hampshire. The U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website (cfpub.epa.gov/npdes/stormwater/menuofbmps) also provides guidance for developing an ordinance to control post-construction runoff.
- Consider including protection of important wildlife habitat and connectivity zones in Article I. 235-2.B, such as
 - Protect important wildlife habitat and connectivity zones within the City.
- Consider revising provisions of Shoreland Protection District (235-19) to limit impervious surfaces to a maximum of 10 or 20 percent of any lot. Article IV.235-19. F (2)(d) currently requires that total green space be no less than 70% of a lot, which allows for impervious surface on up to 30% of a lot. Studies have shown water quality impacts at impervious coverage of approximately 10%. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for further information.
- Consider adopting maximum impervious lot coverage for each zoning district.
- Consider adopting an ordinance to address impervious surfaces. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses impervious surfaces.
- Consider including a provision that landscaping plans minimize the need for significant inputs of water and nutrients in the Standards for Approval of Landscaping plans (VII.E.2). *Integrated Landscaping: Following Nature’s Lead* provides information about sustainable landscaping systems for developments in the Northeast.
- Consider encouraging the use of permeable pavement in Design Requirements for Offstreet Parking and Loading (VIII.235-48. A).

Subdivision Regulations

- Consider requiring Pre-application Design Review for all subdivision proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies.

Analysis by Topic

- Consider including minimization of impervious surface in General Requirements for the Subdivision of Land (5.1).
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides additional references.
- Consider allowing permeable pavement for driveways and sidewalks, with Board approval.
- Review “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* and adopt new regulations and standards as appropriate.
- Consider increasing design standards for stormwater systems (6.3).
- Consider adopting a stormwater management manual.

Site Plan Review Regulations

- Consider allowing permeable pavement for driveways, sidewalks, and off-street parking and loading facilities with Board approval.
- Consider including minimization of impervious surface in General Requirements for Off-Street Parking and Loading (7.8).
- Consider adopting design standards for stormwater systems (7.5).
- Consider adopting a stormwater management manual.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including location within HUC10 watershed.

¹ Schueler, T. 2000. Basic Concepts of Watershed Planning. Pp. 145-161 in T. Schueler and H. Holland, eds., *The Practice of Watershed Protection*. Center for Watershed Protection, Ellicott City, MD.

S. Wildlife Habitat

Wildlife habitat includes the resources that native species need to survive: food, water, and shelter, including safe places to produce young, and safe travel routes between areas of critical resources. High quality wildlife habitat identified in the NH Fish & Game Department's Wildlife Action Plan is included in the NH Natural Services Network. The NH Wildlife Connectivity Model identifies potential travel corridors between large areas of protected land. Wildlife habitat contributes to human amenities such as clean water, clean air, recreation opportunities, aesthetic values, and rural character.

Summary of Current Provisions and Information

Master Plan recommends improving land development process to maximize functional open space; providing incentives for open space protection, and developing open space/conservation criteria that include important habitat corridors. Zoning Ordinance includes Shoreland Protection District, Wetlands Conservation and Water Quality Overlay District, with protection for vernal pools. Watershed Planning Study recommends increasing protected open space. Smart Growth report recommends protecting large areas of natural land. Natural Resource Inventory includes sections on Riparian Zones and Floodplains, Permanent Wildlife Openings, Forested Lands, Rare Species and Exemplary Natural Communities, Wildlife Action Plan, Conservation Land, Unfragmented Lands, and Habitat Area Summary Table.

Recommendations

Master Plan:

- Consider adding paragraph in Master Plan Vision Statement that focuses on natural resources, including wildlife habitat, such as: "Our City's open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations."
- Consider adding a section on Wildlife Habitat in the Community Character chapter, drawing on information from the New Hampshire Wildlife Action Plan.
- Consider adding an action to Objective 1.1 (Community Character) that addresses natural resource data, including areas of important wildlife habitat and connectivity zones.
- Consider adding an objective and actions to Goal 1 (Community Character) that specifically addresses protection of ecological services and natural resources, including wildlife habitat.
- Consider revising Goal 4 (Transportation) to include minimizing adverse impacts on natural resources and ecological services, such as "Design and implement.....enhances quality of life, and minimizes adverse impacts on natural resources and ecological services."
- Consider adding an action to Objective 4.2 (Transportation) that addresses maintaining connectivity for wildlife, such as
 - Identify important wildlife crossing areas and include provisions for wildlife passage in bridge and culvert design where appropriate.
- Consider expanding the Vegetation and Terrestrial Wildlife Habitat section of Chapter 5 (Natural Resources) to include habitat from the New Hampshire Wildlife Action Plan and describe the habitat needs of threatened and endangered wildlife.
- Consider adding an action to Objective 5.3 (Natural Resources), such as
 - Protect important wildlife habitat and maintain landscape connectivity.

- Maintain and protect large blocks of contiguous forest to provide timber and fuel sources, watershed protection, climate moderation, air quality protection, wildlife habitat, recreation sites, and education opportunities.
- Maintain and protect urban forests to provide climate moderation, air quality protection, stormwater management, and wildlife habitat.
- Maintain a functional network of green infrastructure.

Zoning Ordinance

- Consider including protection of important wildlife habitat and connectivity zones in purposes and objectives of Zoning Ordinance (Article I.B).
- Consider making cluster subdivision a Permitted Use in the Rural Residential districts, with conventional, frontage-based subdivision allowable by Conditional Use Permit.
- Consider adopting a *maximum* front yard depth for the Rural Residential districts to reduce habitat fragmentation.

Subdivision and Site Plan Review Regulations

- Consider requiring Pre-application Design Review for all subdivision proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies.
- Consider including existing natural resources, including important habitat and wildlife connectivity zones among discussion topics for Pre-application Design Review (4.2).
- Consider requiring identification and protection of special habitats such as deer wintering areas and important mast stands in subdivision layouts.
- Consider including special habitats such as deer wintering areas and important mast stands among features for which subdivider shall give due regard (5.1.1). [See Voluntary Practices document in Section 8 for further information on deer wintering areas, important mast stands, and vernal pools.]
- Consider requiring sloped (Cape Cod) curbing where curbing is required in Rural Residential districts to prevent entrapment in roadways of amphibians, reptiles, and small mammals.

Application Checklists

- Consider adopting a pre-application checklist for Pre-application Design Review, including
 - Existing habitat types (per NHFG Wildlife Action Plan)
 - Deer wintering areas
 - Vernal pools
 - Wetlands
 - Surface waters
 - Headwater streams
 - Mast stands
 - Location relative to high quality habitat for state and ecological region
 - Location relative to identified wildlife connectivity zones.
- Consider including habitat areas to be protected and connectivity zones to be maintained in the Subdivision and Site Plan checklists.

Spatial Analysis of Laconia's Important Natural Resources with respect to Current Zoning

Introduction

Maps provide useful tools for understanding the distribution of important natural resources on the landscape and how current zoning supports or hinders their protection. Several tools have been developed recently to help municipalities assess the spatial distribution of natural resources within their boundaries. The New Hampshire Natural Services Network (NSN) is a GIS-based tool created by a collaborative of planning and natural resource professionals. The NSN identifies lands throughout the State that provide important ecological services on which human life and economic opportunity depend, and which are difficult and expensive to replicate.

Natural Services Network base maps (Figure 1) include four components:

- **Water supply lands** include highly transmissive aquifers identified by the US Geological Survey and favorable gravel well sites identified by the NH Department of Environmental Services.
- **Flood storage lands** include 100-year floodplains identified by FEMA and lacustrine (associated with lakes), riverine (associated with rivers), and palustrine (other non-tidal) wetlands identified by the USFWS National Wetlands Inventory.
- **Productive soils** include prime farmland and farmland of statewide importance identified by the Natural Resource Conservation Service.
- **Important wildlife habitat** includes habitat of statewide priority and habitat of ecoregional priority identified by the NH Fish & Game Department Wildlife Action Plan.

The NH Wildlife Connectivity Model was developed in 2008 by NH Audubon and NH Fish & Game biologists. The model includes set of raster data layers consisting of cost surfaces for 16 native wildlife species. Each cost surface was created by assigning a “cost” value for each species to each 30 meter square of land. The cost value reflects the ease or difficulty of moving across it for the species in question, and is based on land cover, distance to road (weighted for traffic volume), distance to riparian area, and slope. The 16 cost surfaces can be used individually or in combination to identify wildlife connectivity zones by determining least cost routes between selected polygons. The mean cost surface (Figure 2), which averages cost values for the 16 species, is the most useful for general planning purposes.

Laconia currently has 15 zoning districts (Figure 3, Table 1). The Rural Residential District is the largest with approximately 5130 acres (rounded to the nearest 5 acres), located primarily in the northern part of the City between Winnisquam Lake and Paugus Bay, with smaller blocks east of Paugus Bay and in the southeast corner adjacent to Belmont and Gilford. The Residential Single Family and Commercial Resort districts follow, with approximately 3040 and 1185 acres, respectively. The former occurs in scattered blocks throughout the City; the latter follows Route 3 along the eastern shore of Paugus Bay and north to the Meredith line. Business Central, Business Central/Industrial, Commercial, Downtown Riverfront, Professional, Residential Apartment, and Residential General, and Residential Single Family districts comprise the downtown area; Lakeport includes Commercial, Residential General, and Professional

districts; and the Weirs is within the Commercial Resort district. An Airport Industrial district abuts most of the boundary with Gilford between Route 3 and Lake Winnepesaukee.

Table 1. Laconia Zoning Districts

Zoning District	Area (acres)
Airport Industrial	201
Business Central	12
Business Central/Industrial	14
Commercial	395
Commercial Resort	1184
Downtown Riverfront	153
Industrial	144
Industrial Park	174
Professional	81
Residential Apartment	193
Residential General	608
Residential Single Family	3041
Rural Residential 1	5129
Rural Residential 2	876
Shorefront Residential	491

Data Sources

Data layer

Laconia_Zone
NH Natural Services Network
NH Wildlife Connectivity Model
Mean cost surface

Source

Lakes Regional Planning Commission
GRANIT
NH Fish & Game Department

Methods

Using ArcView software, we overlaid Laconia's zoning districts on each component of the New Hampshire Natural Services Network and calculated resource areas within each zoning district. We used the mean cost surface from the Wildlife Connectivity Model to evaluate connectivity zones at the regional and local scales. For the regional assessment, we used the protected polygons associated with the Belknap Mountains (Alton/Gilford/Gilmanton), Castle in the Clouds (Moultonborough), Hersey Mountain (New Hampton/Sanbornton), and Red Hill (Moultonborough) as endpoints for the analysis. For the local assessment, we used polygons associated with Bond Park, Governor's State Park, Hamel State Forest, Huston-Morgan State Forest, Opechee Bay State Forest, Paugus Bay State Forest, Prescott State Forest, Puleo Farm Conservation Easement, and Swain State Forest as endpoints. Appendix A lists the various parcels associated with each of the endpoint polygons used in these analyses.

Results and Discussion

Water Supply Lands

Laconia encompasses 122 acres of water supply lands, distributed among the City's 15 zoning districts as shown in Table 2 and Figure 4. This acreage is a subset of the overburden aquifers identified in the Natural Resource Inventory (Map #5), and represents the most valuable groundwater resources from a statewide perspective. The City's high quality aquifers are very limited in number and extent, and include three small areas that straddle the eastern boundaries with Belmont and Gilmanton. None of this acreage, nor the additional area identified in the Natural Resources Inventory, is currently protected by conservation ownership or easement.

Laconia's largest high quality aquifer is overlain by Industrial, Industrial Park, and Rural Residential districts; the next largest by Commercial, Commercial Resort, and Industrial districts. The third area is primarily in Gilmanton.

An aquifer protection overlay district would help to safeguard the future of this important resource. Although the City anticipates continued dependence on surface waters for municipal water supply, access to a pristine groundwater supply could be an important asset to some commercial and industrial interests.

Table 2. Distribution of Water Supply Lands (acres) across Laconia's Zoning Districts

Zoning District	Area
Airport Industrial	0
Business Central	0
Business Central/Industrial	0
Commercial	27.6
Commercial Resort	9.7
Downtown Riverfront	0
Industrial	13.6
Industrial Park	46.8
Professional	0
Residential Apartment	0
Residential General	0
Residential Single Family	0
Rural Residential 1	22.5
Rural Residential 2	0
Shorefront Residential	0
Total	122.1
Total in Conservation	0

Flood Storage Areas

Laconia encompasses nearly 730 acres of flood storage area in addition to the 3936 acres of lakes and ponds, distributed among the City's 15 zoning districts as shown in Table 3 and Figure 5. Besides the pond and lake basins, the City's largest flood storage areas include wetlands associated with the drainage flowing into

Pickerel Cove, a sizeable wetland east of White Oaks Road, the eastern tributary of Pickerel Pond, and a headwaters wetland that drains both north into Pickerel Pond and southwest into Winnisquam Lake, all of which are in the Rural Residential District. These areas provide good opportunities for land conservation efforts, as less than 6% of the total flood storage acreage (excluding lakes) is protected by conservation ownership or easement. Portions of the more densely developed districts fall within flood storage areas. Detailed hazard mitigation planning can help to minimize future flood damage in these areas.

Table 3. Distribution of Flood Storage Areas (acres) across Laconia's Zoning Districts (excluding lake basins and river channels)

Zoning District	Area
Airport Industrial	24.1
Business Central	0
Business Central/Industrial	3.3
Commercial	28.8
Commercial Resort	27.7
Downtown Riverfront	60.7
Industrial	18.1
Industrial Park	0.1
Professional	0.1
Residential Apartment	3.7
Residential General	25.6
Residential Single Family	133.2
Rural Residential 1	348.2
Rural Residential 2	37.1
Shorefront Residential	16.5
Total	727.2
Total in Conservation	41.2

Productive Soils

Laconia encompasses 780 acres of productive soils, distributed among the City's 15 zoning districts as shown in Table 4 and Figure 6. These soils occur in scattered areas on the uplands east and west of Paugus Bay. Approximately 11.2% of this acreage is currently protected by conservation ownership or easement. Nearly 90% of Laconia's productive soil area occurs in the Rural Residential 1, Residential Single Family, and Rural Residential 2 districts.

An agricultural overlay district combined with additional fee or easement acquisitions would help to safeguard the future of this important resource. Although agriculture may not be a major economic activity in Laconia at the present time, productive soils, once developed, are lost forever, and the City should strongly consider preserving the option of local food production for future generations.

Table 4. Distribution of Productive Soils (acres) across Laconia's Zoning Districts

Zoning District	Area
Airport Industrial	0
Business Central	0
Business Central/Industrial	0
Commercial	1.8
Commercial Resort	7.1
Downtown Riverfront	0
Industrial	13.6
Industrial Park	9.6
Professional	0
Residential Apartment	14.4
Residential General	0.1
Residential Single Family	244.0
Rural Residential 1	275.6
Rural Residential 2	177.7
Shorefront Residential	33.7
Total	779.7
Total in Conservation	87.2

Important Wildlife Habitat

Laconia encompasses 3742 acres of important wildlife habitat (in addition to the open waters of Lake Winnepesaukee, Opechee and Paugus bays, and Winnisquam Lake), distributed among the City's 15 zoning districts as shown in Table 5 and Figure 7. Most of this acreage is associated with the shores of the major bodies listed above; the headwaters wetland between the Pickerel Pond and Winnisquam Lake watersheds is also included. The Natural Resources Inventory (Map #2) identifies clusters of vernal pools in the northwest corner of the City, between Opechee Bay and Winnisquam Lake, and associated with the headwaters wetland discussed above. The Natural Resources Inventory (Map #2) also identifies scattered areas of dense softwoods, which may provide important wintering habitat for white-tailed deer in the rural areas of the City. Sizeable areas of dense softwoods occur in the northwest corner, east of Pickerel Pond, and in association with the headwaters wetland.

Approximately 9% of Laconia's important wildlife habitat is currently protected by conservation ownership or easement; much of the shoreline area is already impacted by development to a greater or lesser extent. Strengthening and expanding the Shoreline Protection Overlay District and additional land conservation efforts along the lakeshores would benefit wildlife as well as water quality. Additional land conservation within the City's larger blocks of unfragmented land (Natural Resources Inventory, Map #4), particularly those with wetlands and waterbodies, would provide long-term protection for a diverse assemblage of wildlife species.

No regional-scale wildlife connectivity zones occur in Laconia (Figure 8). Local-scale connectivity zones lace through the Residential Single Family and the two Rural Residential districts (Figure 9). Use of cluster

subdivisions in these areas could maintain connectivity between already protected lands. Some portions of identified connectivity zones overlap with key habitat features, such as shorelines, vernal pools, and dense softwoods, and may be considered for fee or easement acquisition.

Table 5. Distribution of Important Wildlife Habitat (acres) across Laconia's Zoning Districts

Zoning District	Area
Airport Industrial	0
Business Central	0.1
Business Central/Industrial	0.8
Commercial	69.5
Commercial Resort	498.2
Downtown Riverfront	28.5
Industrial	17.1
Industrial Park	13.9
Professional	1.5
Residential Apartment	21.0
Residential General	95.2
Residential Single Family	1323.5
Rural Residential 1	1245.1
Rural Residential 2	58.5
Shorefront Residential	369.2
Total	3742.1
Total in Conservation	372.9

Considerations

Laconia has invested considerable effort in planning for the Downtown, Lakeport, and Weirs Beach areas. Rural parts of the City have received less consideration. This report focuses attention on Laconia's natural resources, many of which occur in rural districts.

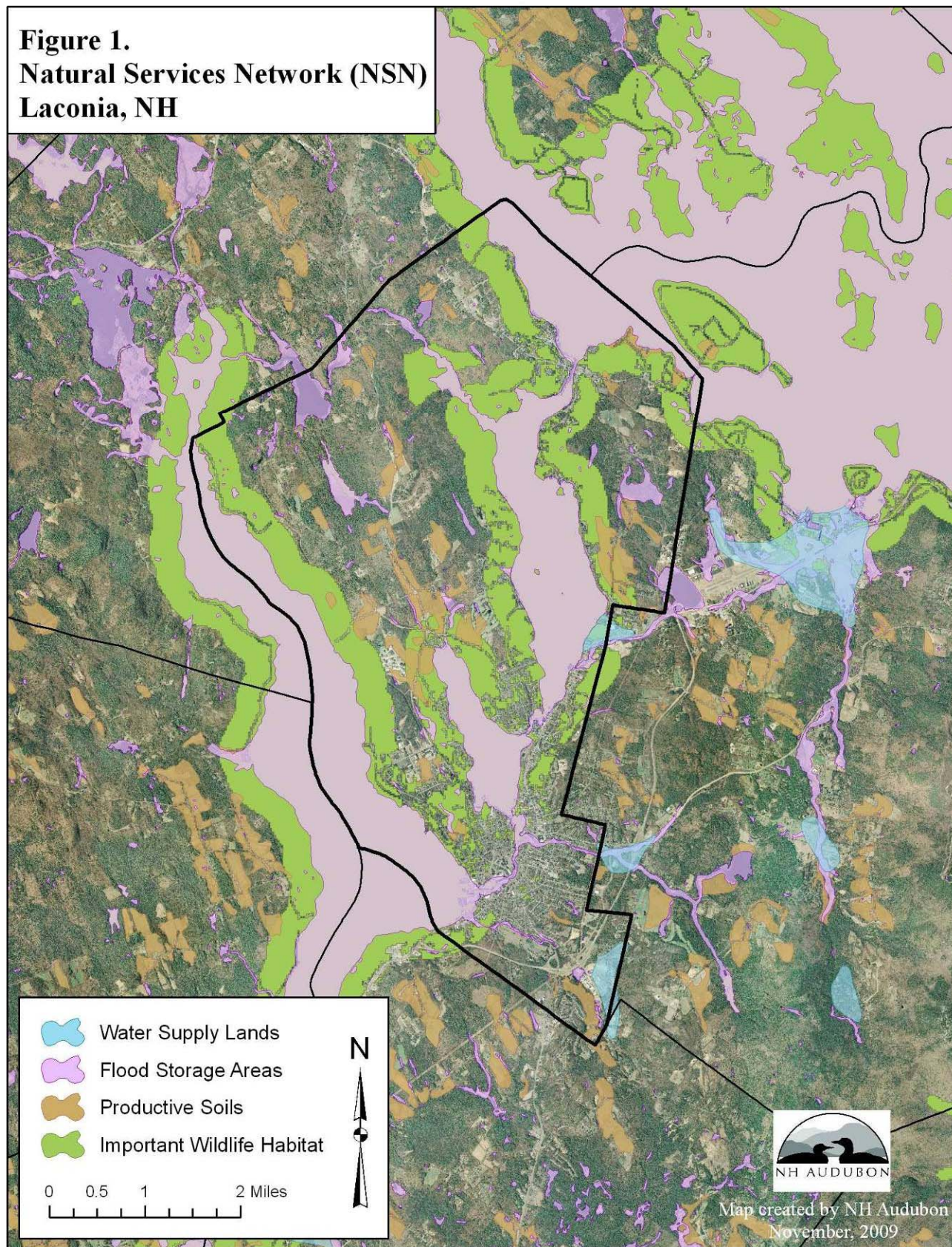
The interactions between Laconia's zoning districts and important natural resources are complex (Figure 10). Implementing strategies such as an urban growth boundary, resource overlay districts, and land protection by fee and easement could strengthen the City's protection of resource values for future generations.

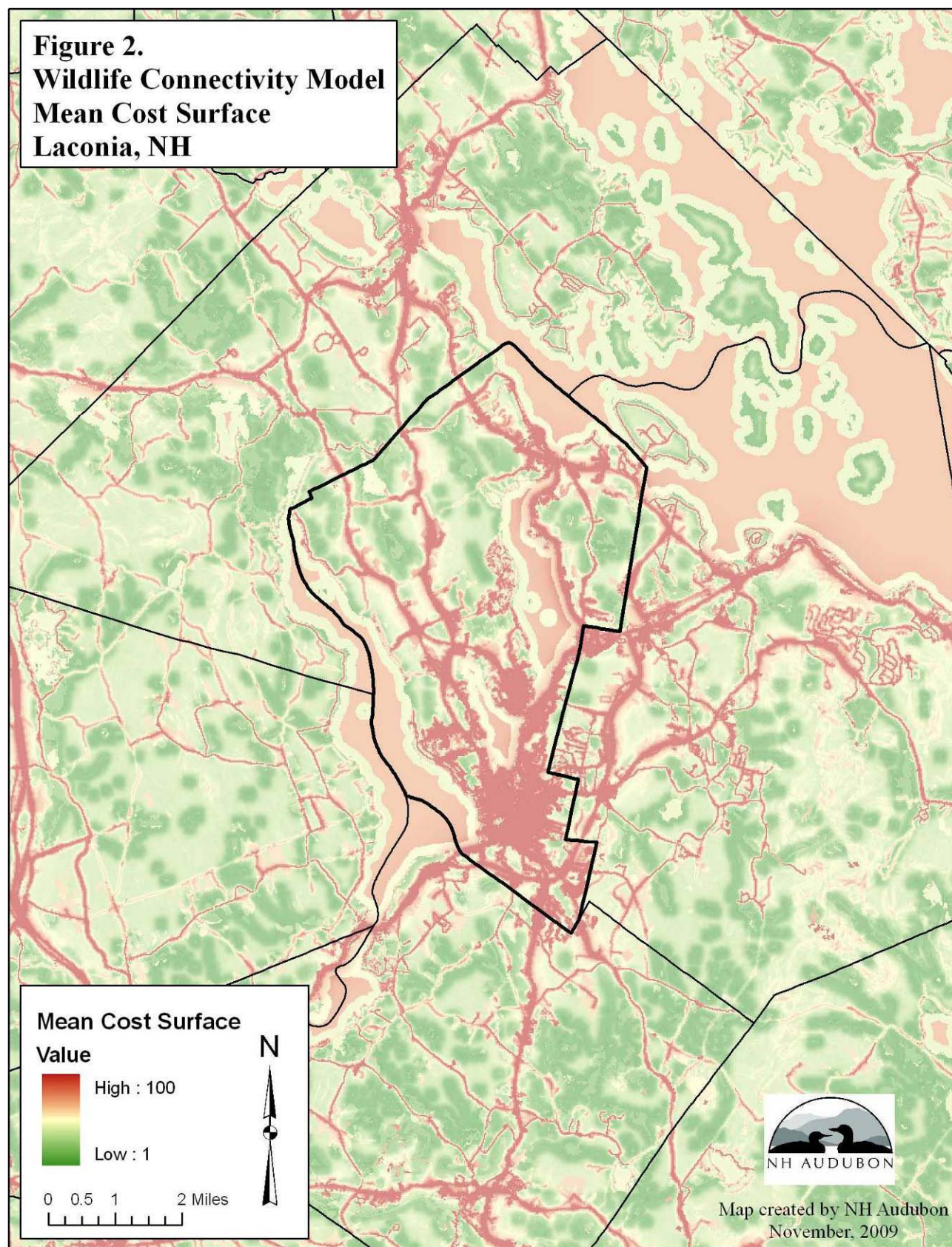
Adoption of an urban growth boundary could help to protect the City's remaining rural areas. Alternative approaches include designating a conservation overlay district or adopting cluster subdivision by right throughout the rural residential districts, with conventional subdivision a conditional use. An overlay district could effectively protect aquifers, and could provide near-term protection for productive soils. Areas of productive soils have strong potential for conservation easements, since few non-agricultural land uses are compatible with protecting their resource value. Currently-protected lands are concentrated in the large blocks of unfragmented, roadless areas north of the Downtown. Expanding protection to contiguous parcels, through either fee or easement acquisition, would protect multiple resources and increase the value

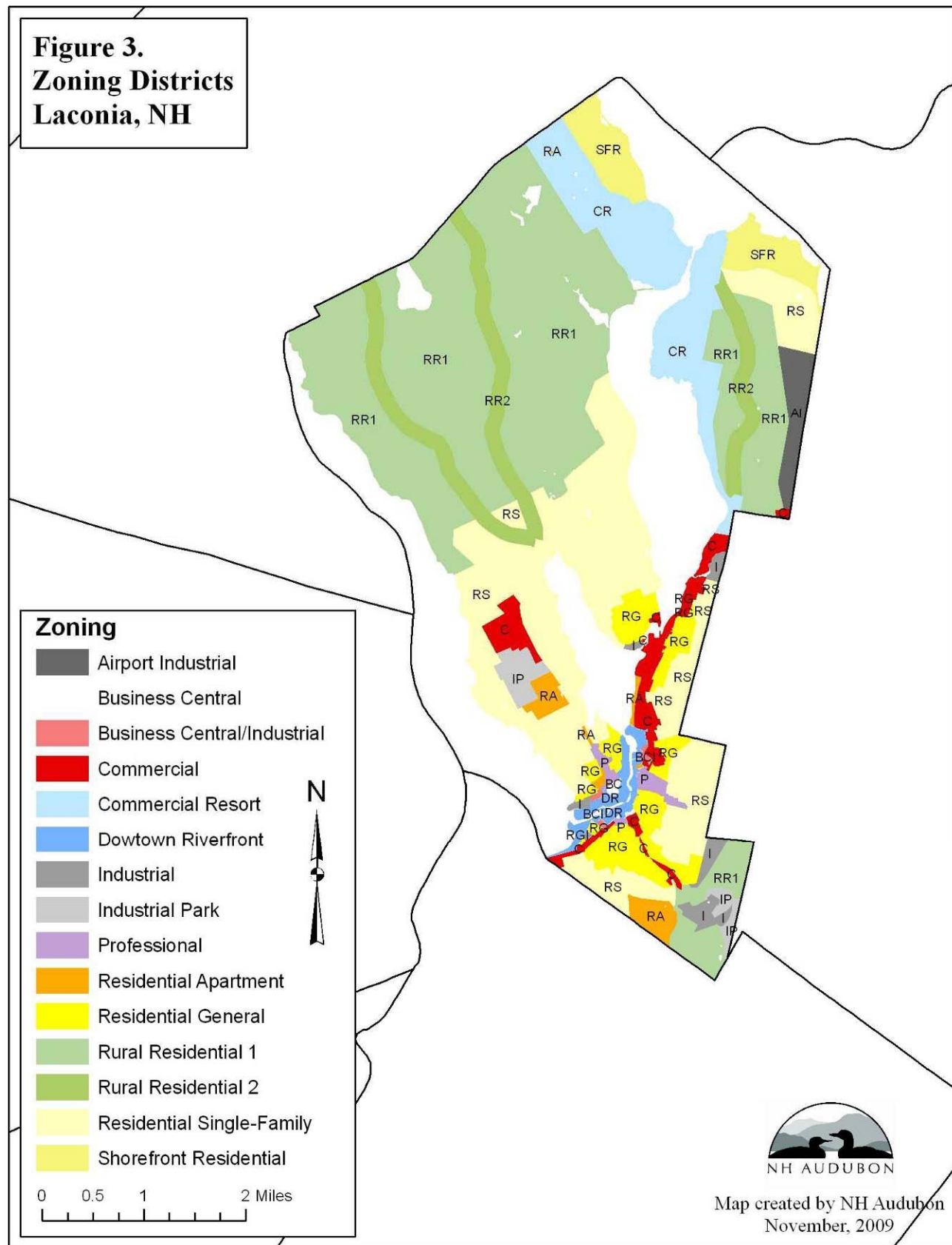
of the already-protected lands. Extending protection northward towards Pickerel Pond, to encompass the headwaters wetland, would be a particularly high priority.

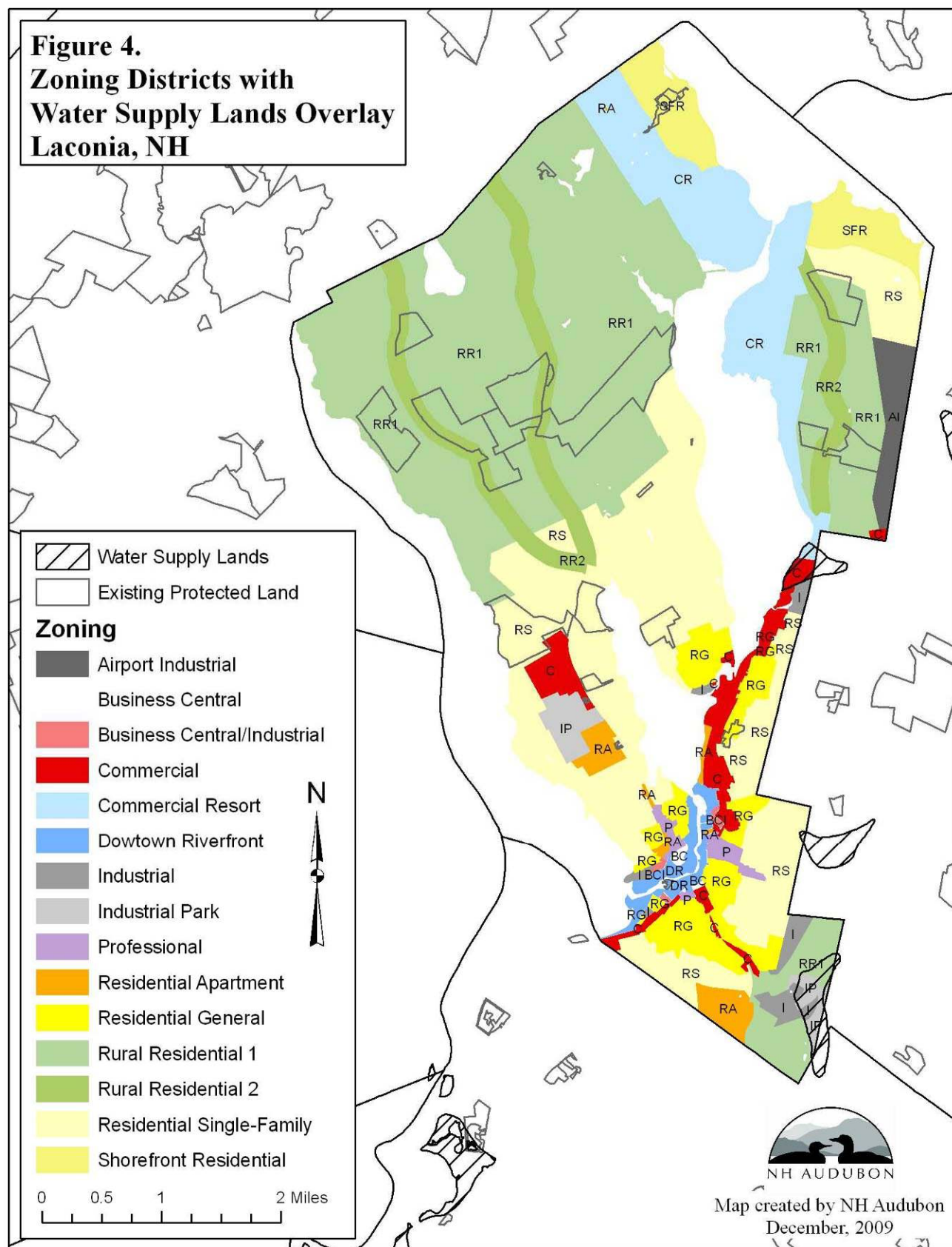
Laconia is unique in New Hampshire with its relatively small land area, high proportion of developed land, and extensive waterfront. While water bodies and historical development patterns present some interesting challenges, the City has important opportunities to protect its natural resources during the twenty-first century.

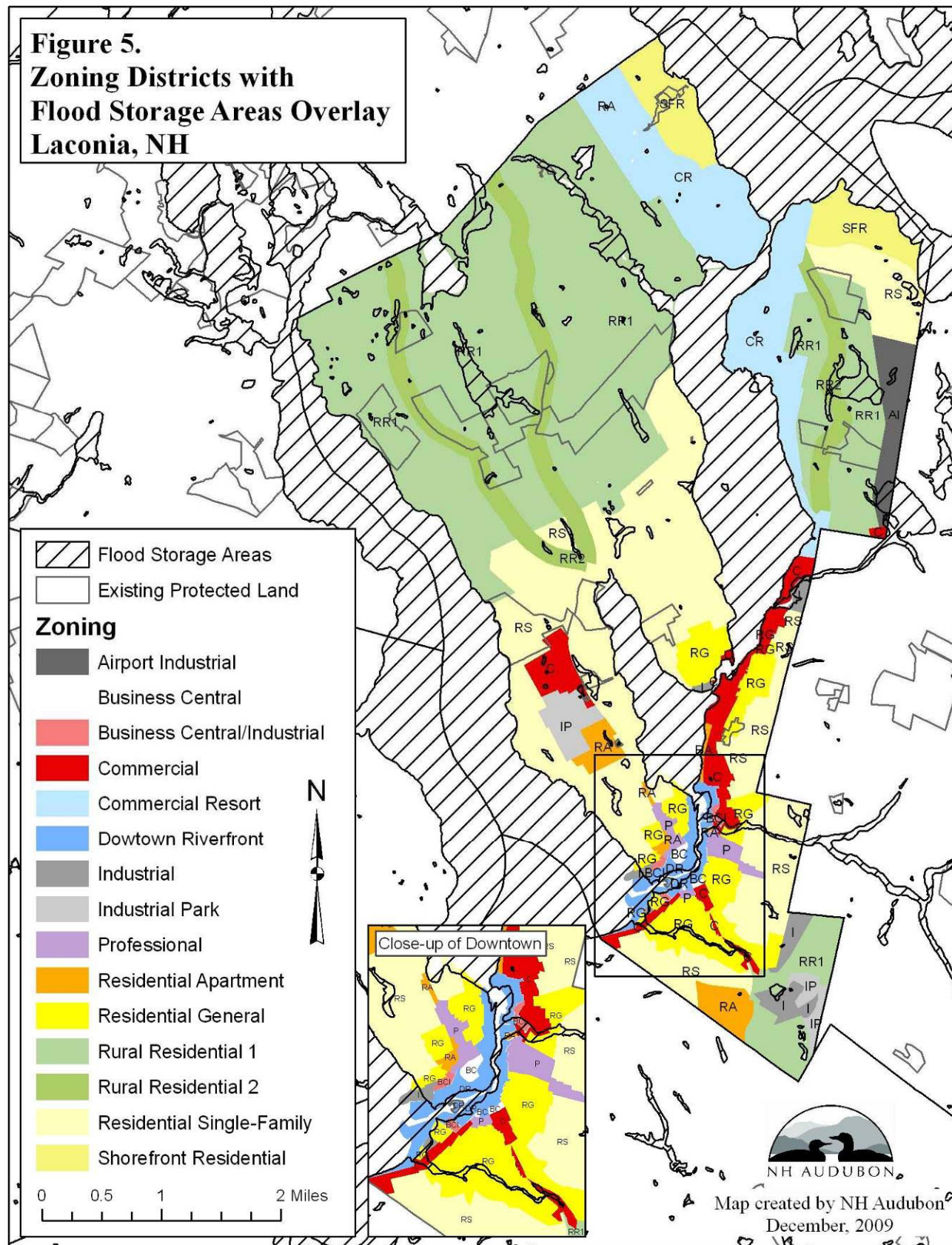
Figure 1.
Natural Services Network (NSN)
Laconia, NH

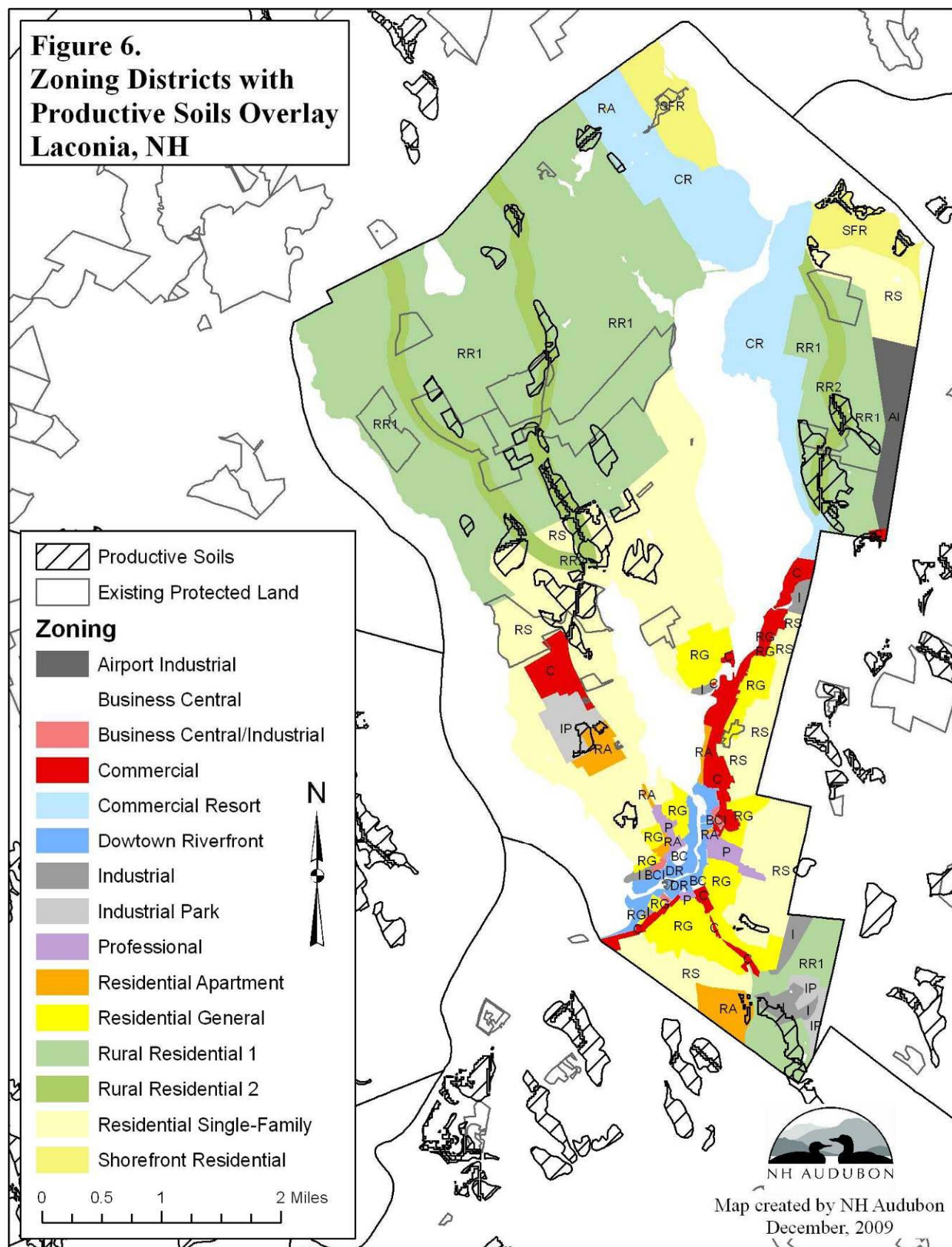


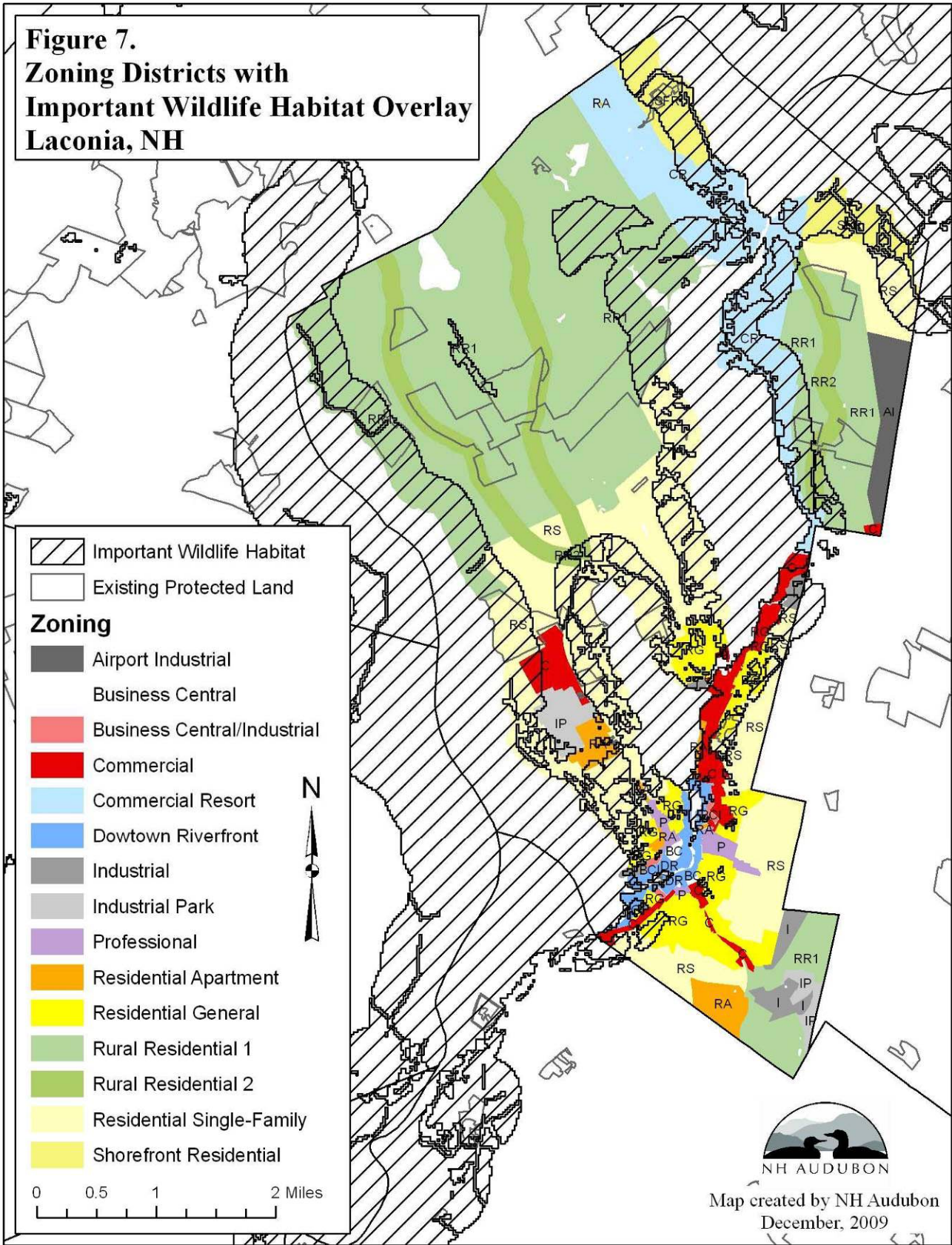


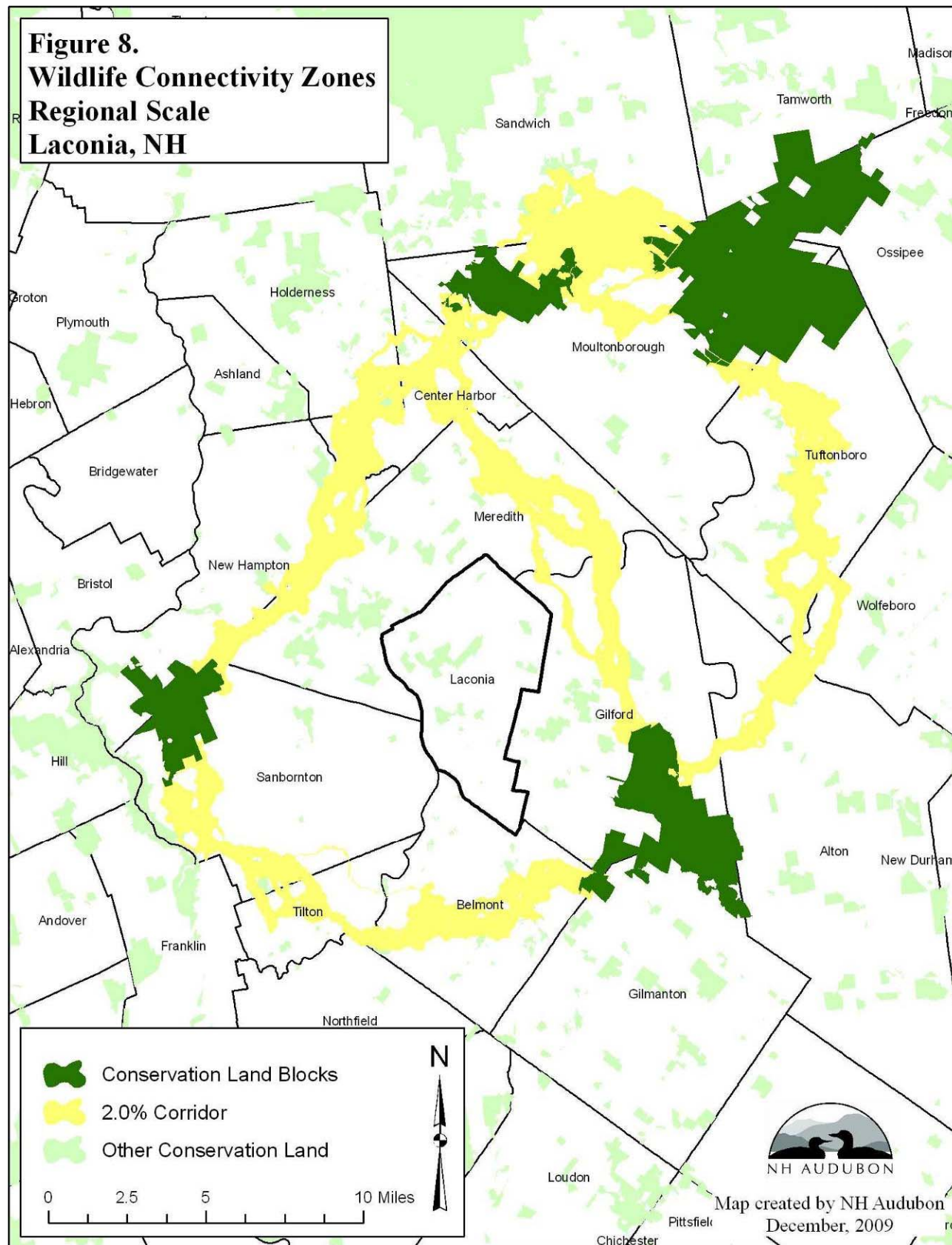


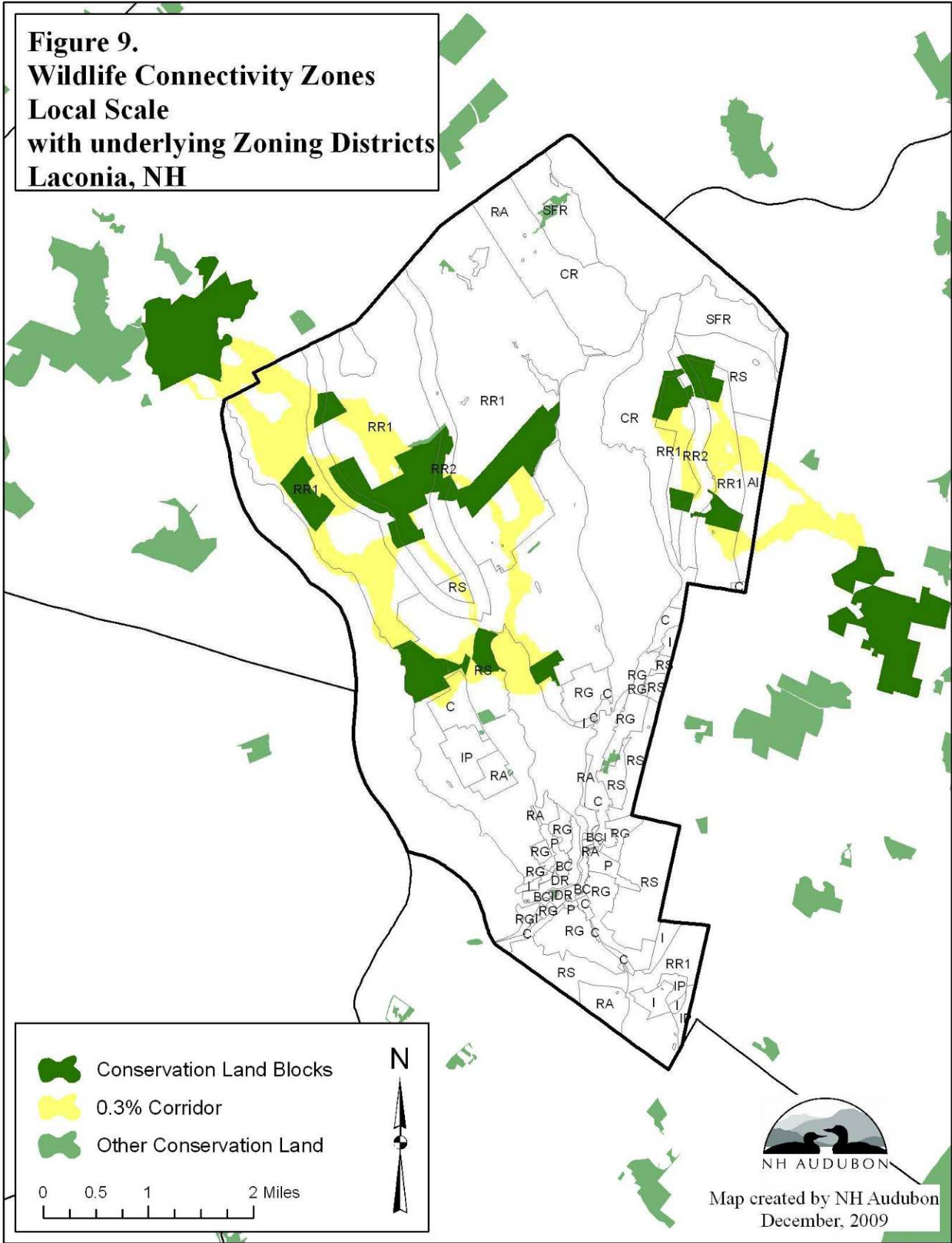


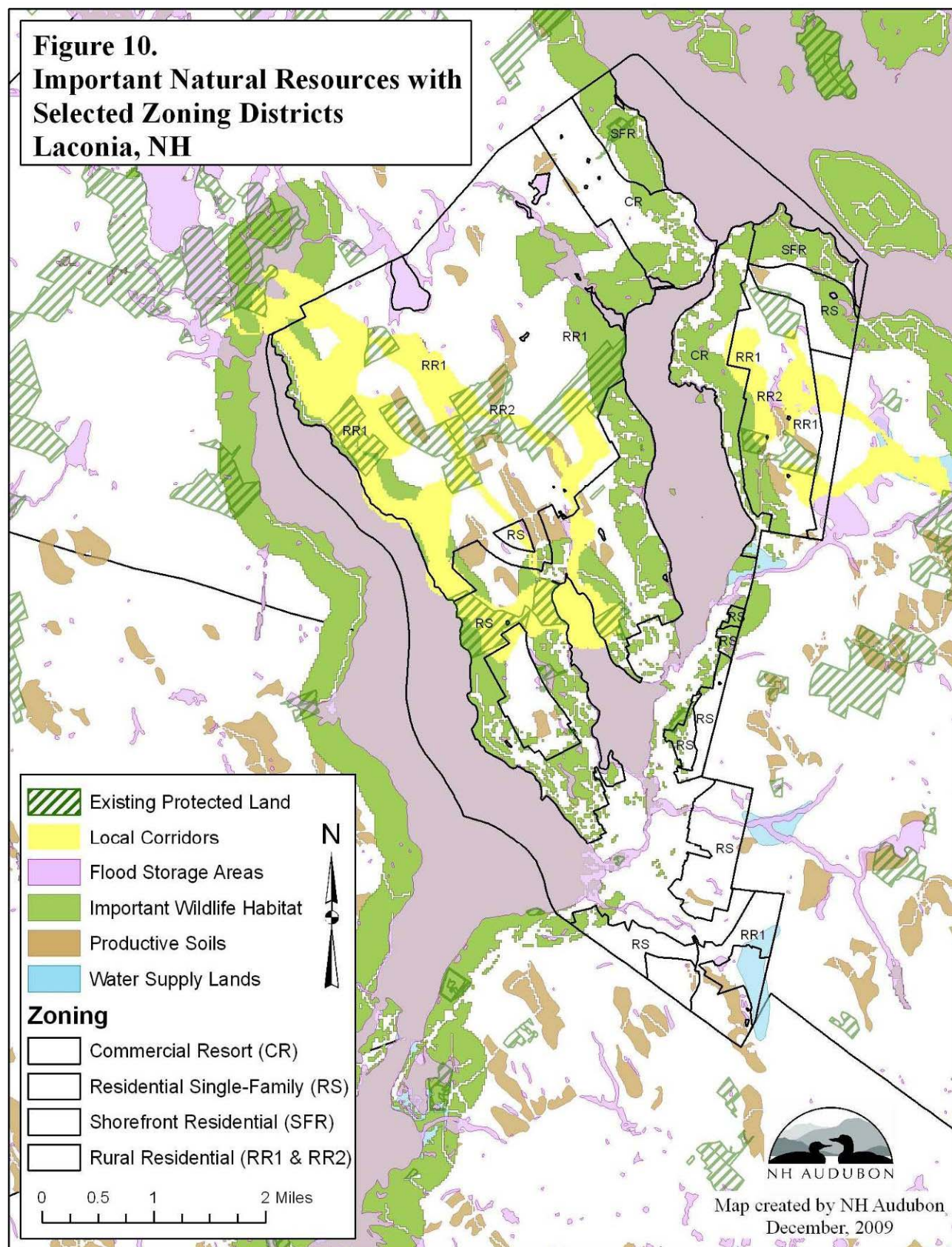












Appendix A. Parcels included in endpoint polygons for connectivity analysis

Analysis Polygon	Parcels in Polygon	Number of parcels
GRANIT parcels		
Belknap Mountain State Forest	Andrew Sanborn Farm Conservation Land	1
	Belknap County Recreation Area	2
	Belknap Mountain State Forest	1
	Etta & Leon Tilton Memorial Forest	1
	Frank L. Allen Forest	1
	Hidden Valley CE	1
	Mitchell 2006 Trust, Charles Z.	1
	Mitchell Homestead	1
	Mitchell, C&N CE	1
	Peverly Lot	1
	Piper Mountain Conservation Area	1
	Piper/Whiteface	1
	Powell Associates Lot	1
	Westergren CE	1
Bond Park	Bond Park	1
Castle in the Clouds	AB Thompson Trust	1
	AB Thompson Trust – The Kennetts	2
	Burrows Farm Easement	2
	Castle in the Clouds	4
	Halfway Brook Easement	3
	Ossipee Mountains Tract	2
	Retsof/Chocorua Forestlands	1
	Severance Farm	1
	Thompson #2 Chocorua Forestlands	1
	Thompson #3 Sangler Brook Inc.	1
	Town of Moultonborough land	2
Governors State Park	Governors State Park	1
Hamel State Forest	Hamel State Forest	1
Hersey Mountain	Beale (Lower)	1
	Beale (Upper)	1
	Beale Lot	1
	DeJeager	1
	Gallup	1
	George Duncan State Forest	1

Appendix A. continued

<u>Analysis Polygon</u>	<u>Parcels in Polygon</u>	<u>Number of parcels</u>
Hersey Mountain	Henry	1
	Knox Mountain Tree Farm	1
	Mike Burke Memorial Forest	1
	Ness	1
	Stitzinger	1
Opechee Bay State Forest	Opechee Bay State Forest	1
Swain State Forest	Swain State Forest	1
Red Hill	Bierer Easement	1
	Cotton Farm I	1
	Dane (Red Hill)	1
	Foster #3	2
	Foster Easement, Garland Pond Extension	1
	Foster, Foster & Foster	2
	Garland Pond	2
	Harvard Point	1
	Koenig Forest Conservation Area	4
	Mayer Family Trust	1
	Raymond Conley Conservation Area	1
	Red Hill – Linglebach	1
	Sheridan Woods Conservation Area	1
	Unsworth Preserve	1
	Wiggin – Red Hill Conservation Area	1
State Forest	Huston-Morgan State Forest	1
	Paugus Bay State Forest	1
	Prescott State Forest	2
	Puleo Farm Conservation Easement	1
Laconia parcel data		
Harrington Easement	Harrington Easement	2
Howe Easement	Howe Easement	10
Prescott Conservancy	Prescott Conservancy	2

Summary of Recommendations

This section of the report consolidates recommendations from both the Smart Growth Assessment and the Wildlife Habitat and Natural Resource review. The first group of recommendations pertains to potential revisions of land use planning documents, and is organized by document. The second group of recommendations pertains to actions and policies that could be undertaken by City government, including the City Council, Planning Board, Conservation Commission, Heritage Commission, and Department of Public Works. Before implementing any of the following recommendations, it is critically important to refer back to the previous sections, which provide detailed information and justifications. (References to pertinent smart growth principles and natural resource topics are provided at the end of each recommendation.)

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Subdivision and Site Plan Review Checklist	17
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Document Revisions

Master Plan

Master Plan Vision Statement

- Consider adding statement that focuses on natural resources, such as: “Our City’s open spaces protect important natural resources, provide essential ecological services, and provide habitat for native wildlife populations. Local forests contribute to air quality, water quality, climate moderation, economic activity, aesthetic values, opportunities for recreation, and biodiversity. Active agricultural lands contribute to the local economy, rural character, and quality of life.” (Agriculture and Productive Soils; Forests and Forestry; Green Infrastructure; Natural Services Network; Shorelands, Surface Waters, and Wetlands; Steep Slopes and Ridgelines; Wildlife Habitat)

Community Character

- Consider including a discussion of green infrastructure in the Land Use section of the chapter. (Green Infrastructure)
- Consider adding a section on Wildlife Habitat in the Land Use section of the chapter, drawing on information from the New Hampshire Wildlife Action Plan. (Wildlife Habitat)
- Consider adding an objective that specifically addresses protection of natural resources and ecological services to Goal 1, such as “Protect Natural Resources – Laconia’s natural resources support human welfare and economic activity, and provide important ecological services” with pertinent actions, such as
 - Maintain and protect agricultural lands and productive soils. (Agriculture and Productive Soils)
 - Maintain and protect large blocks of contiguous forest to provide timber and fuel sources, watershed protection, climate moderation, air quality protection, wildlife habitat, recreation sites, and education opportunities. (Forests and Forestry; Wildlife Habitat)
 - Maintain and protect urban forests to provide climate moderation, air quality protection, aesthetic values, and wildlife habitat. (Forests and Forestry, Green Infrastructure; Wildlife Habitat)
 - Maintain a network of green infrastructure throughout the City. (Green Infrastructure; Wildlife Habitat)
- Consider including an action under Objective 1.1 that addresses natural resource data, including active agricultural lands, aquifers, managed forests, and wildlife connectivity zones. (Agriculture and Productive Soils; Forests and Forestry; Groundwater; Wildlife Habitat)
- Consider adding actions to Objective 1.3 such as:
 - Identify and map critical green infrastructure within the City. (Green Infrastructure; Stormwater Management and Erosion Control)
 - Develop and adopt a green infrastructure plan for the City. (Green Infrastructure; Stormwater Management and Erosion Control)
- Consider including actions under Objective 1.6 such as:
 - Explore the desirability of adopting growth management practices such as urban growth boundaries, village districts, or natural resource overlay districts. (Growth Management and Sprawl; Urban Growth Boundary/Village District)

Summary of Recommendations

- Review and revise zoning ordinances to ensure that they do not inadvertently encourage sprawl. (Growth Management and Sprawl)
- Adopt growth management strategies to protect natural resources, maintain rural character, and prevent scattered development and sprawl. (Growth Management and Sprawl)
- Encourage development in designated areas (i.e., within Village District or Urban Growth Boundary) to prevent scattered development and sprawl. (Growth Management and Sprawl; Urban Growth Boundary/Village District)
- Review and revise local policies and regulations to minimize destruction of natural vegetation during construction activities. (Landscaping and Natural Vegetation)
- Review and revise local policies and regulations to encourage the use of native species in landscaping. (Landscaping and Natural Vegetation)
- Review and revise local policies and regulations to discourage the use of plants that require significant inputs of water and nutrients in landscaping. (Landscaping and Natural Vegetation)
- Encourage landscaping designs that reduce heating and cooling costs. (Energy Efficiency; Landscaping and Natural Vegetation)
- Review and revise local policies and regulations to prevent light trespass and encourage dark sky preservation. (Light Pollution)
- Review and revise local policies and regulations to minimize stormwater runoff and erosion potential. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Encourage (or require) the practice of low impact development (LID) (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Adopt an ordinance to address stormwater management (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Develop and adopt a stormwater management manual. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Adopt land use policies that manage cumulative impacts of land use within a watershed. (Impervious Surfaces; Watersheds)
- Adopt watershed-based zoning. (Impervious Surfaces; Watersheds)
- Encourage use of pervious pavement where appropriate. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Establish limits on impervious lot coverage. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Review and revise local policies and regulations to support protection of critical green infrastructure. (Green Infrastructure)

Economic Development

- Consider including actions to Objective 2.1 such as
 - Review local ordinances and regulations to ensure that opportunities exist for economically viable agriculture. (Agriculture and Productive Soils)

Summary of Recommendations

- Provide incentives to local farmers to maintain agricultural activities as a viable means of self-employment. (Agriculture and Productive Soils)
- Encourage the continuation of working farms within the City. (Agriculture and Productive Soils)
- Review local ordinances and regulations to ensure that opportunities exist for economically viable forestry. (Forests and Forestry)
- Provide incentives to local forest landowners to maintain forest management as an economically viable activity. (Forests and Forestry)

Housing

- Consider adding an objective under Goal 3 of increasing the energy efficiency of the City's housing stock and providing appropriate actions, such as
 - Develop and implement incentives for maximizing the energy efficiency of new housing and increasing the energy efficiency of existing housing stock. (Energy Efficiency)
 - Consider revising Action 3.3.d to include energy efficiency, such as "Develop and implement incentives for the rehabilitation, increased energy efficiency, and maintenance of existing housing units in developed commercial areas." (Energy Efficiency)

Transportation

- Consider revising Goal 4 to include minimizing adverse impacts on natural resources and ecological services, such as "Design and implement a transportation system that serves the comprehensive mobility needs of residents and businesses, enhances quality of life, and minimizes adverse impacts on natural resources and ecological services." (Energy Efficiency; Forests and Forestry; Green Infrastructure; Growth Management and Sprawl; Urban Growth Boundary/Village Districts; Watersheds; Wildlife Habitat)
- Consider adding an action to Objective 4.2 that addresses maintaining connectivity for wildlife, such as "Identify important wildlife crossing areas and include provisions for wildlife passage in bridge and culvert design where appropriate." (Wildlife Habitat)
- Consider developing a road network plan. (Principle 1)

Natural Resources

- Consider including discussions of green infrastructure and the Natural Services Network in the Natural Resources chapter. (Green Infrastructure; Natural Services Network)
- Consider expanding the Vegetation and Terrestrial Wildlife Habitat section of the Natural Resources Chapter to include habitat information from the New Hampshire Wildlife Action Plan and describe the habitat needs of threatened and endangered wildlife. (Shorelands, Surface Waters, and Wetlands; Wildlife Habitat)
- Consider adding actions under Objective 5.1, such as
 - Review and revise local policies and regulations to minimize impervious surfaces. (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
 - Collaborate in regional efforts to protect the Winnepesaukee watershed. (Shorelands, Surface Waters, and Wetlands; Watersheds)
 - Consider adopting a steep slopes ordinance to reduce risks of erosion and siltation. (Steep Slopes and Ridgelines; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control)

Summary of Recommendations

- Consider revising Objective 5.3 to be more inclusive of important resources, such as “Protect and preserve natural and scenic resources – Laconia’s natural and scenic resources, including lakes, forests, and agricultural lands, contribute to the City’s economic vitality and quality of life, and deserve protection.” (Agriculture and Productive Soils; Forests and Forestry; Shorelands, Surface Waters, and Wetlands)
- Consider adding actions to Objective 5.3, such as
 - Protect agricultural lands and productive soils through easements and an agricultural overlay district. (Agriculture and Productive Soils)
 - Maintain and protect large blocks of contiguous forest to provide timber and fuel sources, watershed protection, climate moderation, air quality protection, wildlife habitat, recreation sites, and education opportunities. (Forests and Forestry; Green Infrastructure; Watersheds; Wildlife Habitat)
 - Maintain and protect urban forests to provide climate moderation, air quality protection, stormwater management, and wildlife habitat. (Green Infrastructure; Stormwater Management and Erosion Control; Wildlife Habitat)
- Consider adding actions to Objective 5.4, such as
 - Adopt regulations and policies to protect the City’s natural services network. (Natural Services Network)
 - Review and revise the City’s Open Space Plan to ensure adequate protection of essential ecological services. (Green Infrastructure; Natural Services Network)
 - Ensure that development will not adversely impact important natural resources and ecological services. (Green Infrastructure; Natural Services Network)
 - Adopt regulations to minimize the extent of terrain alteration associated with development in order to maintain natural hydrologic patterns, maintain rural character, and protect property and public safety. (Natural Hazards; Shorelands, Surface Waters, and Wetlands; Terrain Alteration; Watersheds)
 - Maintain a functional network of green infrastructure. (Green Infrastructure; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Wildlife Habitat)
 - Adopt an aquifer protection ordinance to ensure adequate recharge and prevent contamination of important aquifers. (Groundwater)
 - Develop/maintain/implement a wellhead protection plan. (Groundwater)
 - Work with adjacent municipalities to protect shared aquifers. (Groundwater)
 - Protect important wildlife habitat and maintain landscape connectivity. (Wildlife Habitat)

Community Facilities and Services

- Consider adding actions to Objective 7.9, such as
 - Increase the energy efficiency of municipal buildings and vehicles. (Energy Efficiency)
 - Revise the building code to include provisions for energy efficiency. (Energy Efficiency)
 - Review and revise local policies and regulations to support protection of critical green infrastructure. (Green Infrastructure)
 - Consider including an objective of maintaining a network of green infrastructure throughout the City. (Green Infrastructure)

Hazard Mitigation Plan

- Consider including slope failure as a potential hazard. (Natural Hazards; Steep Slopes and Ridgelines)
- Consider including a map of natural hazards in the Hazard Mitigation Plan, identifying areas prone to flooding as well as formally recognized floodplains, areas vulnerable to wildfire, and areas of steep slopes. (Natural Hazards; Steep Slopes and Ridgelines; Floodplains)
- Consider adding a long-term objective of revising local policies and regulations to minimize structure vulnerability to forest fires. (Natural Hazards)

Zoning Ordinance

Article I (General Provisions, 235-2 Authority and Purpose)

- Consider including an item that specifically addresses promotion of energy efficiency in Article I. 235-2.B, such as
 - Promote efficient use of energy by and within the City. (Energy Efficiency)
- Consider including an item that specifically addresses green infrastructure in Article I. 235-2.B, such as
 - Protect a functioning network of green infrastructure within the City to maintain essential ecological services. (Green Infrastructure)
- Consider including protection of important wildlife habitat and connectivity zones in Article I. 235-2.B, such as
 - Protect important wildlife habitat and connectivity zones within the City. (Wildlife Habitat)

Article II (Definitions and Word Usage)

- Consider including LEED in Definitions. (Energy Efficiency)
- Consider revising the definition of steep slope from 25% to 15%. (Steep Slopes and Ridgelines; Stormwater Management and Erosion Control)

Article III (Districts; Zoning Map)

- Consider adopting an urban growth boundary and/or Village District to encompass the Downtown, Lakeport, and Weirs community centers and providing incentives for locating development in these areas. “Urban Growth Boundary and Urban Service District” (Chapter 1.8) and “Village Plan Alternative” (Chapter 1.5) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provide model language for zoning ordinance articles that create an urban growth boundary and village district and information about pertinent existing ordinances in New Hampshire. (Growth Management and Sprawl; Urban Growth Boundary/Village District)
- Alternatively, consider adopting a Conservation District to maintain and protect rural areas.
- Consider adopting watershed-based zoning to help mitigate stormwater runoff problems and protect water quality. (See the U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website, which provides guidelines for watershed-based zoning (cfpub.epa.gov/npdes/stormwater/menuofbmps). (Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Consider developing an Urban Service District. (Principle 1; Principle 6)
- Consider replicating the successes in the Downtown Riverfront District in other parts of the city. (Principle 7)

Article IV (Overlay Districts)

- Consider adopting an overlay district with performance standards to protect agricultural soils. “Agricultural Incentive Zoning” (Chapter 1.7) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for an Agricultural Conservation District Ordinance and examples of agricultural zoning in New Hampshire municipalities. (Agriculture and Productive Soils)
- Consider adopting an aquifer overlay district. The NH Department of Environmental Services has published a Model Groundwater Protection Ordinance

Summary of Recommendations

(www.des.nh.gov/DWSPP/pdf/ModelOrdinance.pdf). The “Protection of Groundwater and Surface Water for Drinking Water Supply” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides information about existing groundwater protection ordinances in New Hampshire. (Groundwater)

- Consider adopting a Steep Slopes Overlay District. [See Lakes Region Planning Commission. 2005. *Regulating Development on Steep Slopes, Hillsides, and Ridgelines* and “Steep Slope and Ridgeline Protection” (Chapter 2.2) in *Innovative Land Use Planning Techniques*]. (Steep Slopes and Ridgelines; Stormwater Management and Erosion Control; Watersheds)
- Consider including
 - use of fertilizers, except lime or wood ash, on lawns;
 - sand and gravel excavations;
 - processing of excavated materials;
 - underground tanks;
 - structures;
 - impervious surfaces;
 - activities resulting in soil compaction, such as parking vehicles or heavy equipment in prohibited uses within the WC District (Article IV. G). (Shorelands, Surface Waters, and Wetlands).
- Consider revising Floodplain District (235-18) regulations to require certification that new construction and substantial improvements do not reduce the flood-storage capacity of the floodplain. (Floodplains; Stormwater Management and Erosion Control)
- Consider revising provisions of Shoreland Protection District (235-19) to
 - limit impervious surfaces to a maximum of 10 or 20 percent of any lot. Article IV.235-19. F (2)(d) currently requires that total green space be no less than 70% of a lot, which allows for impervious surface on up to 30% of a lot. Studies have shown water quality impacts at impervious coverage of approximately 10%. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for further information. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
 - require submittal of a stormwater management plan for all earth moving or excavation activities on lots exceeding one acre. See “Shoreland Protection: The Importance of Riparian Buffers” (Chapter 2.6) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* for details. (Stormwater Management and Erosion Control; Shorelands, Surface Waters, and Wetlands)
 - require a Conditional Use Permit for water-dependent uses and structures, including boathouses, beaches, docks, piers, breakwaters, moorings, and marinas. (Shorelands, Surface Waters, and Wetlands)

Article V (Uses)

- Consider making cluster subdivision a Permitted Use, with conventional, frontage-based subdivision allowable by Conditional Use Permit in the Rural Residential districts, outside an adopted urban growth boundary, or in an adopted conservation district. (Principle 1; Principle 6; Energy Efficiency; Forests and Forestry; Growth Management and Sprawl; Watersheds; Wildlife Habitat)
- Encourage the development of Farmer’s Markets in the Downtown and Village areas. (Principle 4)

Summary of Recommendations

Article VI (Dimensional Standards)

- Consider adopting *maximum* setback and driveway length in the Rural Residential districts to reduce fire risks at urban-wildland interface and minimize forest fragmentation. (Energy Efficiency; Forests and Forestry; Impervious Surfaces; Wildlife Habitat)
- Consider excluding steep slopes, FEMA flood plains, and soils subject to frequent or occasional flooding from buildable area calculations (Section VI.235-32.D). (Steep Slopes and Ridgelines; Floodplains; Green Infrastructure)
- Consider adopting a *maximum* front yard depth for the Rural Residential districts. (Forests and Forestry; Landscaping and Natural Vegetation; Wildlife Habitat)
- Consider adopting maximum impervious lot coverage for each zoning district. (Green Infrastructure; Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)

Article VII (Supplementary Provisions)

- Consider adopting an ordinance to address impervious surfaces. “Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses impervious surfaces. (Impervious Surfaces; Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Consider including a provision that landscaping plans minimize the need for significant inputs of water and nutrients in the Standards for Approval of Landscaping plans (VII.E.2). *Integrated Landscaping: Following Nature’s Lead* provides information about sustainable landscaping systems for developments in the Northeast. (Landscaping and Natural Vegetation; Shorelands, Surface Waters, and Wetlands; Watersheds)
- Consider adopting a stormwater ordinance. [“Permanent (Post-construction) Stormwater Management” (Chapter 2.1) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses stormwater management and information about pertinent existing ordinances in New Hampshire. The U.S. Environmental Protection Agency National Pollution Discharge Elimination System (NPDES) website (cfpub.epa.gov/npdes/stormwater/menuofbmps) also provides guidance for developing an ordinance to control post-construction runoff. (Shorelands, Surface Waters, and Wetlands; Stormwater Management and Erosion Control; Watersheds)
- Consider extending light pollution provisions of cluster ordinance to apply throughout the City. (Light Pollution)
- Consider providing incentives for all LEED buildings. (Energy Efficiency)
- Consider adopting an article that specifically addresses energy efficient development. [“Energy Efficient Development” (Chapter 3.5) of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses energy efficient development.] (Energy Efficiency)
- Consider revising cluster regulations (235-40) to require certification that new construction and substantial improvements do not reduce the flood-storage capacity of floodplains. (Floodplains; Natural Hazards)

Summary of Recommendations

Article VIII (Off-street Parking and Loading Requirements; Driveways and Access)

- Consider encouraging the use of permeable pavement in Design Requirements for Offstreet Parking and Loading (VIII.235-48. A). (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider maximum parking ratios to limit the amount of pavement associated with developments; both from an environmental as well as a traffic flow perspective. (Principle 5)
- Consider a reduction in street-front surface parking and better management of on-street parking. (Principle 5)

Subdivision Regulations

II. Purpose and Intent

- Consider including provision for protecting agricultural lands and productive soils, such as “Provide for the protection of agricultural lands and productive soils.” (Agriculture and Productive Soils)
- Consider including provision for encouraging energy efficiency, such as “Encourage the efficient use of energy.” (Energy Efficiency)
- Consider including provision for protecting stratified drift aquifers, such as “Provide for the protection of groundwater.” (Groundwater)

III. Definitions

- Consider including wetland and shoreland buffers in Definitions of Specific Terms (Section III.A.3).

IV. Application Procedures

- Consider requiring Pre-application Design Review for all subdivision proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies. (Agriculture and Productive Soils; Forests and Forestry; Shorelands, Surface Waters, and Wetlands; Steep Slopes and Ridgelines; Wildlife Habitat; Watersheds)
- Consider including existing natural resources, including agricultural lands and productive soils, stratified drift aquifers, and wildlife connectivity zones among discussion topics for Pre-application Design Review (4.2). (Agricultural Lands and Productive Soils; Groundwater; Wildlife Habitat)
- Consider including agricultural lands and productive soils and stratified drift aquifers among key features of the site in purpose of Design Review (4.2.2). (Agricultural Lands and Productive Soils; Groundwater)
- Maintain communication and involvement with neighboring communities on development proposals. (Principle 8)
- When a development of regional impact is proposed; the Planning Board should notify surrounding communities. (Principle 8)

V. General Requirements for the Subdivision of Land

- Consider putting in requirements for road connectivity. (Principle 1)
- The Planning Board should reference Agricultural Soils maps when considering applications for development and identify areas where agriculture and silviculture (forestry) are being practiced. (Principle 4)
- Consider encouraging more variation in street widths, where appropriate; this can reduce traffic speeds, making it safer for pedestrians. (Principle 5)
- Consider adopting several elements of the Pedestrian Oriented Development and Landscaping section of the ILU Handbook into the Subdivision Regulations, especially those related to pedestrian flow, parking lots, and vegetative buffers. (Principle 5)
- Consider including agricultural lands and productive soils, stratified drift aquifers, and special habitats such as deer wintering areas and important mast stands among features for which

Summary of Recommendations

subdivider shall give due regard (5.1.1). (Agriculture and Productive Soils; Groundwater; Wildlife Habitat)

- Consider including minimization of impervious surface in General Requirements for the Subdivision of Land (5.1). (Impervious Surface; Stormwater Management and Erosion Control; Watersheds)
- Consider adopting limitations on cut and fill volumes associated with development proposals in General Requirements for the Subdivision of Land (5.1). (Terrain Alteration)

VI. Design Standards

- Consider encouraging minimization of roads on lands overlaying mapped aquifers in Minimum Design Standards for Streets (Section VI.6.2.B). (Groundwater)
- Consider including discussion of aquifer recharge and preventing groundwater pollution in requirements for Stormwater and Drainage Improvements (Section VI.6.3). (Groundwater)
- Consider adopting landscaping standards and guidelines for subdivisions. The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for subdivision regulations pertaining to landscaping. (Landscaping and Natural Vegetation)
- Consider applying grade restrictions to entire length of private driveways (Section VI.6.2.B.9). (Steep Slopes and Ridgelines; Stormwater Management and Erosion Control)
- Consider increasing design standards for stormwater systems (6.3). (Stormwater Management and Erosion Control; Watersheds)
- Consider adopting design standards for energy efficiency. The “Energy Efficient Development” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides a list of fundamental concepts to address energy efficiency in design standards of subdivision and site plan review regulations. (Energy Efficiency)
- Consider adding a provision in Lots (6.1) that eliminates flood hazard areas from lot coverage calculations. (Floodplains; Green Infrastructure; Natural Hazards)
- Consider allowing permeable pavement for driveways and sidewalks, with Board approval. (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides additional references. (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider requiring sloped (Cape Cod) curbing where curbing is required in Rural Residential districts. (Wildlife Habitat)

Site Plan Regulations

II. Purpose and Intent

- Consider adding provision for the protection of important natural resources, including agricultural lands and productive soils, such as “Provide for the protection of agricultural lands and productive soils.” (Agriculture and Productive Soils)
- Consider including provision for encouraging energy efficiency, such as “Encourage the efficient use of energy.” (Energy Efficiency)
- Consider including provision for protecting stratified drift aquifers, such as “Provide for the protection of groundwater.” (Groundwater)

IV. Definitions

- Consider including wetland and shoreland buffers in Definitions of Specific Terms (Section IV.3). (Shorelands, Surface Waters, and Wetlands)

V. Application and Review Process

- The Planning Board should reference Agricultural Soils maps when considering applications for development and identify areas where agriculture and silviculture (forestry) are being practiced. (Principle 4)
- Maintain communication and involvement with neighboring communities on development proposals. (Principle 8)
- When a development of regional impact is proposed; the Planning Board should notify surrounding communities. (Principle 8)
- Consider requiring pre-application design review for site plan proposals in Rural Residential, Residential Rural Corridor, and Shoreland Protection districts. Such pre-application conferences provide an opportunity to identify any important resources on the parcel and discuss strategies for their protection prior to investments in survey and engineering studies. (Agriculture and Productive Soils; Forests and Forestry; Shorelands, Surface Waters, and Wetlands; Steep Slopes and Ridgelines; Wildlife Habitat; Watersheds)

VI. Application Contents Required for Site Plan Submission

- Consider adding a provision in Lots (6.1) that eliminates flood hazard areas from lot coverage calculations. (Floodplains; Green Infrastructure; Natural Hazards)
- Consider including location of stratified drift aquifers in Existing Conditions (6.4). (Groundwater)
- Consider including discussion of aquifer recharge and preventing groundwater pollution in requirements for Stormwater and Drainage Improvements (6.3). (Groundwater)
- Consider including total impervious surface and percent of project area, and impervious area and percent for each lot on proposed site plan (6.5). (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider including surface material of parking lots and loading areas in proposed improvements to be shown on proposed site plan (Section VI.6.5 b). (Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider adding wetland and shoreland buffers to Existing Conditions section of Application Contents Required for Site Plan Submission (6.4). (Shorelands, Surface Waters, and Wetlands)

Summary of Recommendations

- Consider including special habitats such as deer wintering areas and important mast stands in existing natural features shown on proposed site plan (6.4.m). (Wildlife Habitat)

VII. Design Standards and Required Improvements

- Consider working with the Police and Fire Departments to incorporate elements of the CPTED (Crime Prevention Through Environmental Design) into the planning process. (Principle 1)
- Consider providing incentives to link green spaces; this would further enhance the Green Space requirement. Incentives typically take the form of a tax incentive, a density bonus, or an expedited permit process. (Principle 2)
- There should be ample bicycle parking available to encourage the use of bicycles for recreation and everyday usage. (Principle 2)
- Consider implementing traffic calming measures such as trees and narrow roads; these can be used to give a sense of pedestrian safety along streets. (Principle 2)
- Consider adopting elements of the Pedestrian Oriented Development section in the Innovative Land Use Planning Techniques' handbook; it has guidelines related to building location, scale, and façade that the Planning Board might incorporate into its Site Plan Regulations. (Principle 2)
- Consider adopting several elements of the Pedestrian Oriented Development and Landscaping section of the ILU Handbook into the Site Plan Regulations, especially those related to pedestrian flow, parking lots, and vegetative buffers. (Principle 5)
- It is recommended that city planners review and implement elements of the Stormwater Management Section of the ILU Handbook. (Principle 6)
- Consider including measures to prevent groundwater contamination in Stormwater and Other Drainage (7.5) for lands overlying mapped aquifers. (Groundwater; Stormwater Management and Erosion Control)
- Consider including minimization of impervious surface in General Requirements for Off-Street Parking and Loading (7.8). (Groundwater; Impervious Surfaces; Stormwater Management and Erosion Control; Watersheds)
- Consider including provisions in the Design Standards and Required Improvements for Landscaping (7.11) that
 - discourage use of plants that require significant inputs of water and nutrients and
 - encourage landscaping designs that reduce heating and cooling costs.The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for site plan review regulations pertaining to landscaping. (Energy Efficiency; Landscaping and Natural Vegetation)
- Consider adopting grade restrictions for driveway access (7.2), off-street parking and loading facilities (7.8), and sidewalks (7.13.h). (Steep Slopes and Ridgelines; Stormwater Management and Erosion Control; Watersheds)
- Consider adopting design standards for stormwater systems (7.5). (Stormwater Management and Erosion Control)
- Consider adopting design standards for energy efficiency. The “Energy Efficient Development” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable*

Summary of Recommendations

Development provides a list of fundamental concepts to address energy efficiency in design standards of subdivision and site plan review regulations. (Energy Efficiency)

- Consider allowing permeable pavement for driveways, sidewalks, and off-street parking and loading facilities with Board approval. (Groundwater; Stormwater Management and Erosion Control; Watersheds)
- Consider adopting a stormwater management manual. The NH Department of Environmental Services published *Innovative Stormwater Treatment Technologies Best Management Practices Manual* in 2002 and a three-volume *New Hampshire Stormwater Management Manual* in 2008. The City of Nashua adopted a two-part Alternative Stormwater Management Methods in 2003. “Erosion and Sediment Control During Construction” (Chapter 2.8) in *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides additional references. (Stormwater Management and Erosion Control)
- Consider adopting limitations on cut and fill volumes associated with development proposals. (Terrain Alteration)
- Consider requiring sloped (Cape Cod) curbing where curbing is required in Rural Residential districts. (Wildlife Habitat)

Pre-application Design Review Checklist

- Prime Farmland and Farmland of State Importance
- Active or recently active agricultural lands
- Hydrologic features
- Soils subject to frequent or occasional flooding
- Soils subject to frequent or occasional ponding
- Soils classified as poorly or very poorly drained
- Soils classified as hydric
- Existing drainage patterns on and adjacent to site
- Location within HUC10 watershed
- FEMA Floodplain Boundary
- Excessively drained soils
- Existing vegetation
- Contiguous forest area exceeding 50 acres
- Size class and species composition of current forest cover
- Favorable gravel well analysis
- Stratified drift aquifers
- Mapped ridgelines
- Slopes >15%
- Location with respect to any adopted Urban Growth Boundary or Village District
- Existing habitat types (per NHFG Wildlife Action Plan)
- Deer wintering areas
- Vernal pools
- Wetlands
- Surface waters
- Headwater streams
- Mast stands
- Location relative to high quality habitat for state and ecologic region
- Location relative to identified wildlife connectivity zones

Subdivision and Site Plan Review Checklist

- Habitat areas to be protected and connectivity zones to be maintained
- Location with respect to any adopted Urban Growth Boundary or Village District in the Subdivision and Site Plan checklists.
- Cut and fill volumes
- Slope stabilization measures (if appropriate)
- Culvert crossings
- Drainage, existing and proposed
- Drainage culvert trench detail
- Drainage structures
- Erosion and sedimentation control devices
- Landscaping detail
- Stormwater basin detail
- Swales detail
- Underdrain detail
- Application of Low Impact Development practices
- Design calculations for detention/retention facilities
- Design calculations for drainage improvements
- Drainage calculations, pre- and post-construction
- Shoreland Protection Zone boundary
- Vegetated buffers detail
- Slopes >15%
- Fire protection plan
- Natural vegetation features to be retained
- Total impervious surface calculations
- Access to post-development forest lands
- Forest area maintained as open space
- Protected agricultural lands
- Energy Efficiency Plan, including such items as
 - street and building orientations
 - efficiency of outdoor lighting
 - shade tree locations
 - provisions for pedestrians and bicyclists
 - Proposed building performance standards (e.g., Energy Star, LEED, 2030 Challenge) or energy efficient building design features [for Site Plans]

Actions and Policies

- Consider limiting the expansion of sewer lines in the northern portion of Laconia. (Principles 1& 6)
- Consider providing adequate funding for a planned sidewalk maintenance and expansion program. (Principle 2)
- As the Zoning Ordinance is updated, the board should maintain the policy of allowing mixed uses in the downtown, Lakeport, and Weirs areas. (Principle 3)
- Consider taking steps to encourage infill redevelopment in the Lakeport, and Weirs areas. (Principle 3)
- Consider making an unbiased assessment periodically as to whether residents in downtown, Lakeport, and the Weirs can meet their daily shopping needs within the neighborhood. If the assessment reveals gaps in the availability of services, steps should be taken to bring this into balance. (Principle 3)
- When the results of the 2010 Census are available, the Planning Board should carefully explore what it reveals about Laconia's population and their existing and projected needs; then compare this with the existing housing stock. There does appear to be a disconnect between the number and types of residential units that the city's residents need and what is being approved and developed. (Principle 3)
- Consider documenting the guidelines upon which the granting of variations in street widths are made. (Principle 5)
- Consider promoting more walking and biking to school by students through the Safe Routes to Schools program. (Principle 5)
- Consider Transit Oriented Development and Access Management strategies, several of which are outlined in the Innovative Land Use Planning Techniques (ILU Handbook). These include the development of a Corridor Management Plan and identifying a site for a commuter Park and Ride. (Principle 5)
- Encourage the Heritage Commission to continue with its work of cataloguing historic buildings. (Principle 7)
- Consider making a concerted effort to utilize and promote public spaces such as parks and playgrounds. (Principle 7)
- Consider holding public meetings and listening sessions in the voting ward buildings to enhance input and involvement from neighborhoods. (Principle 7)
- Maintain communication and involvement with neighboring communities on environmental issues. (Principle 8)
- City officials, such as the Planning Department and Conservation Commission should consider coordinating their land preservation and planning efforts with adjacent communities to ensure that such efforts are done effectively. (Principle 8)
- Continue to collaborate with surrounding towns on projects such as road construction and infrastructure needs. (Principle 8)
- Encourage use of conservation easements to protect agricultural lands. (Agriculture and Productive Soils)
- Encourage protection of shorelands, wetland complexes, and large blocks of unfragmented lands through fee or easement acquisition. (Forests and Forestry; Green Infrastructure; Shorelands, Surface Waters, and Wetlands; Watersheds; Wildlife Habitat)

**Balancing Development and Rural Character:
Voluntary Practices to Protect Important Wildlife Habitat Features
During Development and Other Land Use Changes**

Prepared by

**New Hampshire Audubon
and
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**for the
New Hampshire Fish & Game Department
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Voluntary Practices to Protect Important Wildlife Habitat Features

Introduction

Voluntary practices provide opportunities for communities to encourage protection of habitat and other natural resources during development in the absence of regulations. Voluntary practices are particularly useful tools for protecting habitat features that are scattered on the landscape, such as deer wintering areas or vernal pools. Such features benefit from flexible approaches to protection that can be designed through discussions between planners and developers, rather than by “one-size-fits-all” regulations. Voluntary practices also can be incorporated into incentive approaches, such as density bonuses, to protect natural resources in communities with minimal land use regulations.

Successful application of voluntary practices depends on pre-application conferences between planners and developers. These meetings provide an opportunity for developers to share ideas about prospective use of a land parcel before investing in surveys and engineering studies, and for municipal planners to share concerns about natural resources associated with the parcel that are important to the community. The parties can then develop consensus on an approach to development that protects the important resources, and the points of agreement become special conditions of the subdivision or site plan permit.

This document includes voluntary practices designed to protect the following habitats:

- Deer wintering areas
- Important mast stands
- Headwater streams
- Natural vegetation
- Raptor nest trees
- Shorelands and riparian areas
- Vernal pools

For each topic, we provide a brief issue statement, objectives for the voluntary practices, a justification and benefits section, a list of implementation strategies, and technical references.

We welcome comments and suggestions from municipalities on the usefulness of these practices, ways in which they might be improved, and additional topics for which voluntary practices might be helpful.

Deer Wintering Areas

Issue: Human activity in deer wintering areas can have negative impacts on both people and deer.

Objectives

- Avoid destruction of deer wintering habitat.
- Minimize disturbance of wintering deer from human activity and domestic dogs.
- Minimize negative interactions between deer and people, including
 - Wildlife/vehicle collisions
 - Human exposure to wildlife-borne diseases
 - Property damage from foraging deer.

Justification/Benefits

The white-tailed deer is both ecologically and economically important in New Hampshire. Deer hunting has a significant economic impact in the state, with estimated annual expenditures of \$47,344,000 associated with big game hunting in New Hampshire, based on data from 2001 (U.S. Dept. of the Interior and U.S. Dept. of Commerce 1993). Deer are also popular subjects for wildlife observation and photography. Such “non-consumptive use” of wildlife (not specifically deer) in New Hampshire generated an estimated \$325,658,000 in 2001, more than half of which was spent by non-residents.

Local deer densities in New Hampshire range from less than 6 per sq. mi. in the White Mountains to 16-19 per sq. mi. in the southern part of the state, and average about 10 per square mile statewide (Gustafson 2004).

New Hampshire is near the northern limit of the white-tailed deer’s range, which extends to the north shore of the Saint Lawrence River in Quebec (Halls 1984). In northern areas with severe winters, deer maintain distinctly different ranges during the winter and during the milder part of the year.

Nutritional stress during severe winters may result in more than 30% mortality of adults, as well as high mortality of fawns born the following spring (Lavigne 1999).

Studies in the northeast indicate that deer begin to move from summer/fall range to wintering areas when snow depths reach approximately 15 inches (Tierson et al. 1985). They commonly move 4-5 miles between summer and winter ranges, and may move more than 25 miles (Lavigne 1999).

Roads do not pose barriers to deer movement, as they do with many other species of wildlife. Deer commonly cross highways and other busy roads. In fact, collisions with vehicles on New Hampshire highways have killed more than 1000 deer annually since 1989 (Gustafson 2004). Based on recent population estimates of approximately 82,000 deer statewide, about 12% of the deer herd is lost to road mortality each year. With increasing numbers of vehicles, there is increasing mortality due to collisions. Deer killed by cars has increased from 662 in 1987

(accounting for 80% of all deer mortality) to 1292 in 2003 (91 % of total mortality (Gustafsen 2004). From 1995 to 2003, there were seven years in which collisions accounted for 93% or more of deer mortality, and three years in which vehicle collisions caused 96% of all deer mortality.

Deer wintering areas occur in softwood stands of various types, often in riparian areas. In northern New Hampshire, deer wintering areas are typically located in low elevation stands of red spruce, balsam fir, and northern white cedar. These areas may cover areas of more than 1000 acres and support hundreds of deer. In the southern part of the state, wintering areas are typically scattered patches of hemlock as small as a half acre. Such small wintering areas accommodate 20 or 30 deer during bouts of severe weather and 15 inches or more of snow, but deer in southern New Hampshire do not typically spend long periods of time in these “yards.” In mild winters, deer may not “yard up” at all in southern New Hampshire (Gustafson, pers. commun.).

Deer wintering areas consist of core areas with dense coniferous trees that reduce snow accumulation and provide shelter from wind, adjacent to mixed hardwood and coniferous trees that provide an accessible food supply. Softwood canopy height of at least 35 feet and average canopy cover of 65-70% are required to provide functional shelter (Reay et al.1990).

Deer are hosts of the black-legged tick (or “deer tick”), which is a vector in the transmission of Lyme disease. Black-legged ticks occur throughout most of southern and central New Hampshire. Many factors influence the occurrence of black-legged ticks and incidence of Lyme disease among humans, but in general, areas of high deer densities are more likely to exhibit greater black-legged tick abundance and higher Lyme disease incidence rates in humans (Gustafsen 2004).

Deer and human populations have increased since the early 1980's, especially in the southern part of the state, resulting in greater potential for human-deer conflicts. Calls to Wildlife Services for assistance with deer damage rose sharply from 1988 through 1993, but have remained fairly consistent since then. From 1993 to 2002, requests that were agriculturally related accounted for about half of all calls, varying from 39-62% for that time period (Gustafsen 2004).

Implementation Strategies

- Identify deer wintering areas on site map, including core shelter area, surrounding hardwood buffer extending at least 200 feet from perimeter of core, and corridors connecting wintering areas to surrounding habitats.
- Avoid any clearing or other construction activity within identified deer wintering areas.
- Locate houses to discourage winter intrusion of humans and domestic dogs into identified wintering areas.

- Locate roads to avoid fragmenting of deer use areas, and plan for low traveling speeds to minimize the potential for vehicle-deer collisions.
- Install fences around residential properties adjacent to buffer habitat to discourage intrusions of humans and dogs.
 - Avoid landscaping techniques that attract deer into the interior of the neighborhood.
 - Discourage intentional feeding of deer, and encourage fencing of gardens to reduce attraction of deer to residential properties.

References

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Floodplain Forests

Issue: Clearing floodplain forests increases bank erosion and downstream flood damage and destroys important wildlife habitat.

Objectives:

- Protect floodplain forest vegetation to mitigate flood damage and maintain biodiversity.
- Minimize recreational activity in floodplain forests to prevent soil compaction and wildlife disturbance.

Justification/Benefits

A floodplain is a valley floor where water spreads out after overtopping the banks of a stream (Gordon et al. 1992, Riley 1998).

Annual shallow river flooding is common in the northern United States during spring snowmelt (Daniels and Daniels 2003).

The timing, duration, and depth of flooding are important influences on floodplain vegetation (Mitsch and Gosselink 1986, McKevlin et al. 1997).

In New Hampshire, floodplain forests occur primarily along third and higher order rivers (Sperduto 2005).

Floodplain plants are specially adapted to tolerate inundation for part of the year (Mitsch and Gosselink 1986, Verry et al. 2000).

Small elevation changes within a floodplain result in large changes in the depth and duration of flooding, and in the resulting plant communities (Mitsch and Gosselink 1986).

Long histories of stream meanders, erosion, and deposition create variable topography within floodplains, resulting in complex vegetation patterns. Floodplain systems often include sloughs, oxbows, shrub swamps, wet meadows, and vernal pools, as well as floodplain forests.

Two major types of floodplain forests occur in northern New Hampshire and the White Mountains. These forests develop along rivers with floods of high intensity and short duration that result from mountain runoff. One type consists primarily of sugar maple, red oak, ironwood, white ash, black cherry, and white pine; the other of balsam fir, red maple, white pine, and speckled alder (Sperduto 2005).

Silver maple floodplain forests occur along the Connecticut and Merrimack rivers and the lower reaches of their major tributaries. White ash, American elm, hackberry, and Eastern cottonwood also may grow in these forests (Sperduto 2005).

Red maple dominates the floodplain forests along smaller rivers in central and southern New Hampshire. These forests also may include black ash, black cherry, and ironwood (Sperduto 2005).

During floods, floodplain forests slow water movement, capture sediment and nutrients, and shelter aquatic organisms from strong currents (Gordon et al. 1992).

Floodplain forests provide buffers between developed areas and waterways (Daniels and Daniels 2003).

Floodplain forests facilitate the recharge of aquifers during periods of inundation (Verry et al. 2000, Gordon et al. 1992).

Floodplain forests facilitate the transfer of nutrients from aquatic to terrestrial ecosystems by capturing organic matter and sediments from floodwaters during periods of inundation (Gordon et al. 1992).

Floodplain forests provide a natural filtering system for stormwater runoff (Daniels and Daniels 2003).

New Hampshire's floodplain forests provide important habitat for native wildlife, including wood turtle, northern leopard frog, American woodcock, northern oriole, blue-gray gnatcatcher, yellow-throated vireo, otter, eastern red bat, and silver-haired bat (NHFG 2005).

Implementation Strategies

- Avoid or minimize clearing and other construction activity within floodplain forests.
- Locate houses to discourage intrusion of pets into floodplain forests.
- Design recreational facilities to minimize impacts on floodplain forests.

References

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Headwater Streams

Issue: Alteration of headwater streams can degrade important aquatic habitat and affect flow regimes and water quality downstream in the watershed.

Objective

- Avoid destruction and degradation of headwater streams and adjacent riparian habitats from development and other human activities.

Justification & Benefits

Streams are categorized based on their size and relationship to the rest of the stream network. Ephemeral streams flow only during snowmelt or heavy rains; intermittent streams flow for several, but not all months of the year; and perennial streams flow year-round. First-order perennial streams are the smallest distinct channels, and originate from springs and seeps, where groundwater comes to the surface. Second-order streams are formed when two first-order streams join. Third-order streams are formed from two second-order streams, and so on up to fifth-order streams, which are large rivers.

A river's headwaters include the small streams and wetlands in the higher elevations of a watershed. Headwater streams are typically only a few feet wide and a few inches to a few feet deep. They include ephemeral, intermittent, and first- and second-order perennial streams. Headwaters also include small wetlands that are hydrologically connected to stream channels by groundwater.

Headwater streams are numerous and widespread, comprising at least 80% of the stream network in the United States (Meyer et al. 2007a).

Several comprehensive watershed surveys suggest that USGS maps show less than 20% of the actual stream network in humid regions of the country, such as the northeast (Meyer et al. 2007a).

Headwater streams and wetlands are critically important to the health and functions of the rivers they feed, and their destruction or degradation can severely impair downstream reaches. Headwaters play key roles in maintaining water quality and quantity, stream and river channel integrity, and aquatic biodiversity (Lowe and Likens 2005).

Because they are small, headwater streams are highly vulnerable to impacts from terrain alteration and other human activities.

The winding channels, streambed rocks and gravel, debris dams of logs and leaf litter, and streamside vegetation of headwater streams slow surface runoff and enable water to seep into and recharge underlying groundwater.

In the northeastern U.S., first-order streams contribute approximately 70% of the mean annual water volume in second order streams and approximately 55% of that in fourth and higher order rivers (Alexander et al. 2007).

Terrain alteration and impervious surfaces that increase the rate of flow in headwater streams can increase erosion and sedimentation along downstream reaches.

A study in northern New Hampshire documented declines of spring salamander populations in streams degraded by sedimentation (Lowe and Bolger 2002).

Heavy sediment loads retard the growth of submerged aquatic plants, clog fish and larval amphibian gills, smother fish eggs, disrupt fish behavior, and eliminate habitat for fish eggs and fry (Bjornn and Reiser 1991, Waters 1995).

Streams receive nutrients in the form of leaf litter and other debris, which supports a variety of aquatic invertebrates. Many invertebrates, their eggs and larvae are prey for small fish, salamanders, and mammals such as the water shrew.

Headwater streams remove or transform nutrients more effectively than larger streams through physical, chemical, and biological processes.

Recent research on a sampling of watersheds across North America suggests that half the nitrate removal within a river basin occurs in headwater streams (Meyers et al. 2007).

A study of eight northeastern watersheds suggests that wetlands associated with first order streams are responsible for 90% of wetland phosphorus removal (Meyers et al. 2007a).

A mathematical model based on field data from 14 headwater streams across North America suggests that 64% of inorganic nitrogen entering a small stream is retained or transformed within 1,000 yards (Meyers et al. 2007a).

Some headwater streams process organic material eight times more efficiently than fourth-order reaches downstream (Meyers et al. 2007a).

Processed organic matter forms the basis of food web for the entire river. Nutrients in the form of dissolved organic carbon, particles of fungus and leaf litter, dead plants, insects, fish and other animals, all flow downstream to support populations of other species. In Alaska, a study of fishless headwater streams concluded that enough insects and other invertebrates drifted downstream to support half of the fish population of downstream river reaches (Meyers et al. 2007a).

Headwater streams include a broad array of habitats, from cold, fast-moving brooks with alternating pools and riffles to shallow, muddy seeps, outflows of beaver ponds, and cool, clear springs. Elevation, slope, substrate, channel shape, water chemistry, and surrounding uplands all influence the aquatic life of headwater streams. Studies of three unmapped headwater streams in North Carolina documented more than 290 species of bacteria, fungi, plants, snails,

insects, crayfish, fish, and amphibians, some of which were unique to these environments (Meyer et al. 2007b).

Some fish species, including brook trout, use headwater streams for reproduction, seasonal feeding areas, and refuge during flood conditions.

Headwater wetlands also support important biological diversity. Studies have documented 274 at-risk plant and animal species in isolated wetlands, more than one-third of which are restricted to these habitats (Meyer et al. 2007).

Implementation strategies

- Conduct field survey of parcel to identify headwater streams and wetlands, including springs and seeps.
- Avoid disturbance to headwater streams and wetlands.
- Avoid terrain alteration and impervious surfaces that will increase flow rates in headwater streams.
- Avoid or minimize road crossings of headwater streams.
- Avoid construction activity within 100 ft. of ephemeral, intermittent, first and second order streams, and headwater wetlands.

References

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Mast stands

Issue: Development may destroy or eliminate wildlife access to stands of nut-producing trees, especially oak, beech, and hickory, which provide high value food sources important to winter survival of some wildlife species, especially black bears.

Objectives

- Ensure access to adequate fall food supply for mast-dependent wildlife.
- Minimize negative interactions between mast-dependent wildlife and people, including
 - Wildlife/vehicle collisions
 - Human exposure to wildlife-borne diseases
 - Property damage from deer and bears.

Justification/Benefits

Wild nuts, known as hard mast, are especially important food sources for native wildlife. New Hampshire's wild nut crops become available during the time of year when wildlife are preparing for winter by storing food or increasing their fat reserves.

American beech and red, white, and black oaks are the most widespread and abundant mast-producing tree species in New Hampshire. Scarlet, chestnut, and swamp white oaks; bitternut, mockernut, pignut, and shagbark hickories; beaked and American hazelnuts; and butternut also occur in New Hampshire, but are less abundant and have limited distribution in the state.

The American chestnut, formerly one of the most important mast-bearing trees in eastern North America, has nearly disappeared since accidental introduction of an Asian virus from Asia in the early 1900's. The resulting blight essentially eliminated the chestnut from New Hampshire's forests by about 1920 (Silver 1957). This loss increases the importance of the remaining mast-producing species.

Another New Hampshire mast-bearing tree, the butternut, is falling victim throughout its range in eastern North America to a rapidly spreading fungus disease (Schlarbaum et al. 1997).

American beech is also being severely impacted by a disease (an insect and fungus complex), which was introduced to Nova Scotia in the mid-1800's (Houston 2004) and reached New Hampshire by 1949 (Gavin and Peart 1993). Studies have shown that diseased beech forests have reduced foliage and mast compared to healthy stands (Storer et al. 2004).

Single ounces of acorns, beechnuts, hazelnuts, and hickory nuts contain 109, 163, 177, and 186 calories, respectively (compared to 15 calories in one ounce of apple) (Nutrition Data 2005).

Production of heavy wild nut crops is typically cyclical. Intervals between heavy crops are typically 2-8 years for American beech, 1-3 years for shagbark hickory, 4-10 years for white oak, 2-5 years for red oak, 2-3 years for black oak, and 4-5 years for chestnut oak (Burns and Honkala 1990). Maintaining a diversity of nut-bearing species within a local area increases the likelihood of at least one good mast crop in a given year.

New Hampshire's native nut-bearing trees typically begin to produce large numbers of nuts at 40-60 years of age (Burns and Honkala 1990).

A typical white oak tree growing in a forest probably produces about 10,000 acorns in a good year (Rogers 1990).

Wildlife species that rely heavily on nuts (hard mast) include black bear; white-tailed deer; red, gray, and northern and southern flying squirrels, eastern chipmunk, white-footed mouse, fisher, pine marten, wood duck, ruffed grouse, wild turkey, and blue jay (Martin et al. 1961).

Black bears are especially dependent on beech nuts in order to accumulate fat reserves for winter, and may concentrate on finding beech nuts above other foods during the fall. Bears may travel up to 100 linear miles outside of their normal range during the fall in order to take advantage of localized sources of nuts, as well as berries, other fruits, and agricultural crops (Miller 1975, Elowe 1987, Kolenosky and Strathearn 1987, Pelton 2003 in Timmins 2004).

Food abundance influences the age at which bears first reproduce, the size and frequency of litters, seasonal movements, and mortality rates (Pelton 1980).

Research in Maine indicates that nearly four times as many female black bears may reproduce in years of high beechnut production as do so in years of poor production (Jakubas et al. 2004).

When female bears lack sufficient fat reserves, fertilized eggs may not implant, fetuses may be absorbed, or cubs may die at birth from malnutrition (Timmins 2004).

Bears are more likely to damage field corn and raid dumpsters, bird feeders, and beehives in years of poor acorn and beechnut crops (Timmins 2004).

Bears prefer birdseed to most available natural foods (Hammond 2002).

Bears that overcome their natural wariness of humans to approach backyard bird feeders are at increased risk of being killed as nuisance bears or by collisions with vehicles (Hammond 2002).

Adult black bears followed by radio telemetry in the vicinity of the Stratton Mountain Ski Resort in Vermont stayed an average of 200-400 m from year-round houses, with avoidance distances varying by sex and season (Hammond 2002).

Implementation Strategies

- Consult with New Hampshire Fish & Game Department biologists to identify locations of
 - black bear habitat blocks
 - important mast standsin your area of interest.

Within or adjacent to black bear habitat blocks

- Avoid construction of houses within 300 m of important mast stands.
- Avoid construction of paved roads within 200 m of important mast stands.
- Maintain travel opportunities between important mast stands and large blocks of protected or undeveloped habitat.

In other areas

- Avoid locating house lots within important mast stands.
- Avoid locating roads between important mast stands and large blocks of protected or undeveloped habitat.

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Natural Vegetation

Issue: Some development approaches remove excessive natural vegetation from the site and replace it with generic landscaping after road and building construction have been completed.

Objectives

- Minimize loss of natural vegetation resulting from construction activities.
- Capture asset value of existing vegetation by retaining special vegetative features of the site (e.g., large diameter shade trees, clumps of native flowering shrubs, patches of native vegetation).

Justification/Benefits

Most of New Hampshire's natural vegetation consists of forests, which currently cover about 84% of the state's area. Retaining natural vegetation on developed sites reduces air pollution, soil erosion, stormwater runoff, heating and cooling costs, and glare and reflection from street traffic. Natural vegetation also provides privacy and visual screening, absorbs sound, and contributes to the aesthetic quality and uniqueness of a property, neighborhood, and community.

Generic landscaping materials often are poorly adapted for site conditions, require water and fertilizer, have a high mortality rate, and require numerous growing seasons to mature enough to provide full benefits. Natural vegetation maintains rural character by enabling new developments to blend into the New Hampshire landscape.

An acre of trees uses about 2.6 tons of carbon dioxide each year (American Forestry Association).

Large (diameter >30 inches) trees in Chicago removed approximately 70 times more pollution from the air in 1991 than small (diameter < 3 inches) trees (Nowak 1994).

The surfaces of leaves and twigs trap particulate pollution that contributes to asthma and other respiratory problems. One study found that a street with no trees had 4-100 times more dust particles in the air than a nearby street with trees (Nelson 1975).

Thirty-seven medium-sized trees on approximately 6 acres can slow stormwater runoff by 37% during heavy rain (Maine Forest Service 2000).

Pavement and roofs retain 5-30% of the rainfall from a 5- to 10-year storm; an average lawn (2-7% slope) retains 75-82%, and a forested area retains 80-95% (Anderson 2000).

Red and sugar maple, basswood, and northern red oak trees in full foliage block more than 80% of the sun's visible radiation (Moffat et al. 1994).

Air pressure from winter winds affects the air in a building by pushing out air that is already warmed and pushing in cold air that has to be heated. A building's heat loss due to wind is

proportional to wind speed squared - as wind speed doubles, heat loss quadruples (Moffat et al. 1994).

A study in central Pennsylvania found that wind speeds 2 meters above the ground were 60% lower in winter and 67% lower in summer in a residential neighborhood with 67% tree cover compared to a neighborhood with no trees (Heisler 1990).

A typical mature deciduous tree evaporates 100 gallons of water per day during sunny summer weather, using about 660,000 BTUs of energy and cooling the air as effectively as five average (10,000 BTU) air conditioners (Moffat et al. 1994).

Approximately 3-8% of current electric demand for cooling is used to compensate for urban heat islands. A city's resulting demand for electricity increases by 1.5-2% for each temperature increase of one degree Fahrenheit (Akbari et al. 1990 in McPherson 1994).

Computer simulations suggest that increasing vegetation is a more cost-effective strategy for mitigating heat island effects than reducing fuel use with energy-efficient vehicles and appliances (Akbari et al. 1988 in McPherson 1994).

Vegetation scatters transmitted sound (Aylor 1972); wind moving through foliage and birds singing from trees and shrubs can mask offensive noise (Robinette 1972).

Mature vegetation can add 6-15% to the value of developed land and 20-30% to that of undeveloped land (Minnesota Society of Arboriculture 1996).

Twenty years of extensive research suggests that 15% tree cover in urban districts, 25% in urban residential and light commercial districts, and 50% in suburban residential districts are appropriate landscaping goals (Smith 1999).

Tree replacement (including purchase, delivery, and planting) costs \$214-\$455 for a one-inch diameter sapling and \$1360-\$2890 for a 5-inch diameter tree, depending on delivery distance (information from a central New Hampshire nursery).

Implementation Strategies

- On large lots, minimize the disturbed footprint of the development.
- Identify existing trees and vegetation patches to retain for landscaping.
- Design site plan to incorporate existing trees and vegetation patches into permanent site landscaping. Large shade trees, such as oaks and maples, and native flowering shrubs, such as dogwoods and shadberries, make attractive choices for retention in lawn areas.
- Avoid locating driveways, high pedestrian-use areas, and excavation and fill sites within the root protection zones of trees and vegetation patches designated for retention.
- Protect designated trees and vegetation patches during construction activities.

Definitions

Root Protection Zone: the area extending from a tree's trunk to the dripline of its longest branches.

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Shorelands and Riparian Areas

Issue: Development near wetlands and surface waters may result in removal of natural vegetation along banks and shorelines. Naturally vegetated streambanks and shorelines protect water quality and provide important wildlife habitat. Removal of riparian vegetation can result in serious damage to water quality and overall health of aquatic habitats within a watershed.

Objectives

- Maintain functional riparian and shoreland buffers to protect water quality.
- Maintain functional riparian habitat.

Justification/Benefits:

Riparian areas are upland habitats adjacent to wetlands and water bodies.

Soils in riparian areas are highly productive. Runoff from surrounding uplands and occasional flooding concentrate nutrients, sediments, and organic debris in riparian areas and high water tables provide abundant moisture to support plant growth.

Riparian areas support lush, diverse vegetation. Many plant species growing in riparian areas are adapted to tolerate flooding.

Natural vegetation in riparian areas slows surface runoff during storm events and snowmelt, enabling water to infiltrate the soil and sediments, nutrients, and debris to settle out before reaching the wetland or water body.

During flood events, riparian vegetation stabilizes stream banks and shorelines and traps debris and sediments, thus reducing erosion and sedimentation which can degrade water quality.

Riparian vegetation physically slows floodwaters and uses large volumes of water and nutrients that would otherwise enter wetlands and water bodies.

Loss of riparian vegetation along small intermittent streams can mobilize large amounts of sediment and cause significant water level fluctuations in wetlands and waterbodies downstream (Chase et al. 1995).

Riparian habitats typically support higher biological diversity than adjacent upland and aquatic habitats (Porter 1981).

Natural vegetation along streams and rivers helps maintain suitable conditions for aquatic wildlife by shading the water, minimizing sedimentation and nutrient input, and providing large woody debris which is essential to many aquatic species.

Loss of shade increases water temperatures and temperature fluctuations, reducing dissolved oxygen available to aquatic animals and can increase stress from toxic compounds.

Some aquatic animals, such as brook trout, require clear, cool, well-oxygenated water.

Heavy sediment loads in water inhibit the growth of algae and other aquatic plants that form the basis of the food web in these ecosystems, reduces visibility for aquatic animals, and clog gills of fish and larval amphibians.

Riparian vegetation is an important source of organic debris in aquatic habitats. This debris provides nutrients, shelter, and substrates for attachment of eggs and non-mobile invertebrates.

Reduced riparian buffers are associated with decreased in aquatic biodiversity in streams (Vannote et al. 1980).

The lush vegetation of riparian areas provides an important wildlife food source in the spring. Snow melts earlier in valleys than surrounding uplands, and large mammals seek the green vegetation of riparian areas after emerging from hibernation (bears) or leaving their wintering areas (deer and moose).

Insects and feed on lush riparian vegetation and flying species with aquatic larvae provide important food sources for breeding and migrating birds. Riparian forests tend to support higher bird density and species richness than adjacent upland forests of similar vegetative structure and composition (Stauffer and Best 1980).

Riparian vegetation provides nest sites for waterfowl, which nest in tree cavities (wood duck, common goldeneye, common and hooded mergansers) or on the ground (American black duck, mallard, ring-necked duck,) up to several hundred meters away from the water (DeGraaf and Rudis 1986).

At least 15 of New Hampshire's breeding bird species require both wetlands or water bodies for foraging and nearby upland areas for nesting (DeGraaf and Rudis 1986).

Riparian areas provide relatively safe corridors for wildlife to travel through developed areas between important habitats.

Turtles spend much of their lives in aquatic habitats but nest in upland habitats, and may travel long distances to find suitable nest sites in loose dry soil.

Wood, spotted, and Blanding's turtles travel overland for many miles during spring and summer to forage and find mates as well as to nest, and depend on dense vegetation to protect them from predators.

Star-nosed moles, water shrews, northern ribbon snakes spend their lives in riparian areas.

Implementation Strategies

- Identify and map wetlands and water bodies, including streams and wetlands not shown on USGS topographic maps, and associated buffers on or adjacent to the property.
- Delineate boundaries of buffer areas on all lots with permanent markers (e.g., metal markers attached to trees).
- Avoid removal of natural vegetation within designated buffers.
- Avoid road crossings of streams and wetlands.
- Avoid construction of roads or houses within 100 ft. of wetlands and water bodies.
- Maintain connectivity among wetland and water bodies.

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Vernal Pools

Issue: Development can destroy the temporary wetlands and adjacent upland areas that populations of vernal pool-breeding amphibians require for survival.

Objectives

- Maintain adequate upland and wetland habitat to support populations of vernal pool-breeding amphibians.
- Minimize degradation of pools and surrounding habitats by development and human activity.

Justification/Benefits

Vernal pools are small, seasonally flooded wetlands that are isolated from permanent waterbodies. Because they are isolated and typically shallow, most pools dry up during summer months, and thus do not support fish populations.

Some amphibians and invertebrates are specifically adapted to breed in temporary, fishless ponds. In New Hampshire, these species include Wood Frogs, Marbled, Blue-spotted, Jefferson, and Spotted salamanders, and fairy shrimp. Wood frog egg masses lack toxic compounds characteristic of the eggs of amphibians that breed in permanent water that have fish (Henrikson 1990, Crossland 1998 *in* Calhoun and deMaynadier 2004), and the larvae of wood frogs and pool-breeding salamanders have insufficient defensive adaptations to survive fish predation (Kats et al. 1988 *in* Calhoun and deMaynadier 2004).

Additional species of amphibians and invertebrates use vernal pools for feeding, breeding, or safe resting areas but do not require them. These include clam shrimp, fingernail clams, caddisflies, four-toed salamanders, eastern newts, spring peepers, American toads, grey treefrogs, and green frogs.

Vernal pools provide important foraging habitat for many animal species, including Spotted and Blanding's turtles. Vernal pools are critically important to these turtles in the early spring, when they emerge from hibernation with low energy reserves. Vernal pools, with concentrated invertebrate and amphibian eggs and larvae, provide rich food sources and relative safety from predators.

The total weight of amphibians breeding in a vernal pool in Massachusetts was greater than the total weight of breeding birds and small mammals in 50 acres of surrounding forest (Windmiller 1990).

Among the vernal pool amphibians, spotted and blue-spotted salamanders and wood frogs are relatively common and widespread, while others are rare. Marbled Salamanders are endangered in New Hampshire; Blanding's and Spotted turtles and Jefferson's salamanders are species of conservation concern.

Although vernal pool specialists sometimes breed in permanent waters that support fish populations, their breeding success is extremely limited in such sites, resulting in low

recruitment of juveniles and thus, low long-term survival (Petranka 1998 in Calhoun and deMaynadier 2004).

Individuals typically return to breed in the same vernal pool they grew up in (Duellman and Trueb 1986, Berven and Grudzin 1990, Sinsch 1990).

Vernal pool amphibians typically remain in a pool for about two weeks to breed and spend the rest of the year in the surrounding landscape, leaving their eggs in the pool to develop and hatch.

Researchers have found that salamanders travel at least 500 ft (152 m) from their breeding pools, and juvenile wood frogs disperse as far as $\frac{3}{4}$ mile (1200 m) from the pools in which they hatch (Calhoun and deMaynadier 2004).

More than 700 species of multi-cellular animals, including 22 vertebrates, have been reported from vernal pools in the glaciated Northeast. (Colburn 2004).

The diversity of species in a particular pool depends on many factors, including size, depth, hydrology, water chemistry, and surrounding upland habitat. Pools in close proximity often support very different species of wildlife (especially invertebrates), so each pool contributes significantly to the biodiversity of the surrounding landscape (Colburn 2004).

Vernal pools produce a substantial amount of invertebrate and vertebrate prey for other wildlife in the forest ecosystem, and are important linkages, or “stepping stones” for wildlife traveling among wetlands.

Adult vernal pool amphibians play an important role in the ecology of the surrounding forest up to 0.25 mi from a breeding pool, consuming insects on the forest floor and providing prey for other wildlife species (Semlitsch et al. 1996, Skelly et al. 1999, Wilbur 1980, Pough 1983, Ernst and Barbour 1989).

Vernal pool amphibians may play an important role in forest nutrient cycling by regulating soil invertebrates that break down organic materials (Burton and Likens 1975, Wyman 1998 in Calhoun and deMaynadier 2004).

Frogs and salamanders are vulnerable to drying out, due to their thin skin, and therefore require upland habitats that are damp and relatively cool. They survive best in areas with deep, uncompacted leaf litter, downed woody debris, and patches of canopy shade (deMaynadier and Hunter 1995, DiMaura and Hunter 2002 *in* Calhoun and deMaynadier 2004).

Wood frog numbers declined by 40% and spotted salamander numbers by 53% within four years after construction began at a development that affected approximately 25% of the forested upland within 1000 ft. of a breeding pool in Massachusetts (Windmiller *in* Calhoun and Klemens 2002).

Vernal pools are commonly destroyed or degraded simply because they are not recognized as important habitats.

Alteration of the uplands surrounding a vernal pool can seriously degrade its habitat value.

Existing federal and state wetlands regulations do not adequately protect vernal pools, primarily because of their small size and isolation from permanent waterbodies.

Implementation Strategies

- Identify shallow, isolated wetlands that could be seasonal pools on National Wetland Inventory (NWI) Maps and on aerial photos. Conduct field surveys to verify whether identified wetlands are seasonal pools. Document locations of vernal pools on the site plan.
- Avoid any disturbance to a pool basin and associated vegetation.
- Avoid actions that will degrade the water quality in a vernal pool.
- Avoid actions that will cause a loss of tree canopy, compaction of soil and leaf litter, creation of deep ruts, erosion, sedimentation, or alteration of vegetation and coarse woody debris within 100 feet of a pool.
- Avoid permanent construction and minimize vegetation removal and terrain alteration within 400 feet of a pool.
- Minimize roads, developments, and other fragmenting features between pools, and between pools and other wetlands.

Definitions

Mole salamander: Any salamander of the genus *Ambystoma*, all of which spend most of their time in underground burrows.

Vernal pool: A seasonal water body that is deepest in spring or fall, lacks a permanent surface water connection with other wetlands or water bodies, and lacks an established fish population (Calhoun and Klemens 2002).

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Woodland Raptor Nests

Issue: Suitable trees for raptor nests are limited in number and elimination of nest trees can lead to population declines.

Objectives

- Avoid disturbance of nesting raptors
- Avoid removal of or damage to active and potential nest trees
- Minimize disturbance to areas surrounding known and potential nest trees
- Avoid removal or degradation of critical nesting, foraging, and wintering habitat

Justification/Benefits

Raptors, or birds of prey, capture other vertebrate animals for food. Prey for various raptor species may include birds, mammals, reptiles, amphibians, fish, and large insects.

Hawks and owls are important predators in New Hampshire's forests, helping to regulate populations of prey species, particularly rodents.

Eleven species of forest-dwelling raptors breed in New Hampshire, including seven species of hawks and four species of owls.

Raptors need large home ranges compared to other forest birds in order to find enough food to survive and raise young. Saw-whet owls, New Hampshire's smallest raptors, have home ranges of about 350 acres (Simpson 1972). Larger species of hawks and owls may use areas ranging from 0.3 sq mi to more than 2 square miles (DeGraaf and Rudis 1987).

Forest-dwelling hawks build large stick nests supported by strong branches. Such nests are typically placed against the trunk of a white pine on a whorl of branches or in a three-pronged fork of a large deciduous tree.

Large trees are necessary to support hawk nests. Northern Goshawk nest trees typically have diameters of at least 12" (Speiser and Bosakowski 1987) and those of Red-shouldered Hawks, at least 17" (Nelson and Titus 1988).

Unlike songbird nests, which seldom survive a New England winter, the large stick nests of hawks persist for multiple years and may be used by the same pair or by a succession of species over the course of many breeding seasons.

Owls do not build their own nests, but use tree cavities and old nests of hawks or great blue herons.

Saw-whet Owls and Eastern Screech-Owls nest in cavities of trees at least 12" in diameter; Barred Owl cavity nests are in trees with diameters of at least 20" (Thomas et al. 1979).

Many of New Hampshire's forest raptors are relatively tolerant of human activity, and may nest within sight of houses if there is adequate habitat for hunting nearby.

Implementation Strategies

- Inspect large trees for the presence of cavities and large stick nests.
- Maintain undeveloped open space for approximately 165 ft (50 m) around trees with large stick nests.
- Retain large cavity trees when clearing for development.

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Wetlands

Issue: Development sometimes results in degradation of wetland habitat through alteration of adjacent uplands, dredging or filling of the wetland itself, or increased human activity.

Objectives

- Avoid loss and degradation of wetland habitats.
- Maintain ecological functions of wetlands.

Justification/Benefits

Wetlands occur in sites where the water table is at or near the surface of the ground. They may be transitional areas between open water and upland ecosystems, or they may be isolated from open water habitats. Wetlands occur in freshwater, saltwater, and estuarine environments.

All wetlands share three characteristics:

- very poorly drained (hydric) soils;
- flooding during all or part of the year; and
- presence of plants that are adapted to survive in flooded or saturated soils.

In New Hampshire, common wetland types include floodplain forests, swamps, marshes, peatlands, seasonal pools (see separate topic), seeps, and springs (see definitions below).

Wetlands and their associated riparian areas are ecologically important, supporting a high diversity of plant and animal life.

Wetlands play important roles in protecting water quality, storing floodwaters, and replenishing groundwater.

Wetlands protect and improve water quality by acting as filters that trap or transform excess nutrients, heavy metals, and other harmful pollutants.

Wetlands act as sponges during storm events or snow melt, absorbing large volumes of water and releasing water gradually into groundwater and downstream flow.

Research suggests that wetland draining and levee construction reduced the storage capacity of Mississippi River floodplains from the equivalent of 60 days worth of river discharge before European settlement to about 12 days of discharge in the late twentieth century, resulting in more frequent and more severe floods (Mitsch and Gosselink 1986).

Coastal wetlands are extremely important for reducing damage from hurricanes and other severe storms. Salt marshes and estuaries absorb much of the energy of storm surges and buffer coastal uplands from the full force of the water.

Wetlands increase the volume of water able to replenish groundwater by holding precipitation and runoff for long periods of time.

Nearly one third of New Hampshire's wildlife species depend on wetlands for all or part of their life cycle.

Aquatic species of invertebrates, fish, amphibians, reptiles, birds, and mammals inhabit permanent wetlands. Terrestrial animals often forage on the abundant food sources in wetlands, including plants, insects, and other prey.

Wetlands provide "stepping stones" across the landscape for small animals that require water and dense cover while seeking food, mates, or nest sites, or when dispersing.

Riverine wetlands that extend along watercourses provide travel corridors for many wildlife species, including wide-ranging animals such as moose, deer, black bear, and bobcat.

Seeps provide important water sources and foraging areas for black bears in spring and early summer (Elowe 1984), and for early spring migrants such as robins and woodcocks.

Seeps and springs provide cool water to nearby streams during hot summer months when water temperature and dissolved oxygen may limit survival of some fish and other aquatic species.

Implementation Strategies

- Avoid dredging and filling of wetlands.
- Use cluster subdivision design to minimize impacts on wetlands.
- Avoid fragmenting wetland clusters with roads and buildings.
- Avoid use of heavy equipment within 50 ft. of a spring or seep.
- Avoid constructing roads or buildings downstream of seeps where they would intercept water flow.
- Maximize undeveloped open space adjacent to wetlands.
- Minimize disturbance of uplands that drain directly into wetland basins.
- Minimize human activities near wetlands that negatively impact water quality, wildlife populations, or wildlife habitat.
- See also implementation strategies for Shorelands and Riparian Areas.
- Maintain safe access for wildlife between wetlands and areas of undeveloped upland habitat.

Definitions

Floodplain forest: forest on low terraces along river banks that are inundated by overflow during periods of high water. Silver maple dominates floodplain forests along New Hampshire's major rivers; floodplain forests along smaller rivers are more diverse, with red maple, black ash, black cherry, and ironwood as major components and hackberry, American elm, eastern cottonwood, boxelder, sycamore, swamp white oak, and river birch sometimes present.

Marsh: wetland dominated by herbaceous (non-woody) vegetation such as cat-tails, grasses, sedges, and rushes.

Peatland: wetland where dead vegetation accumulates in a thick mat because highly acidic conditions inhibit decomposition. Sphagnum moss is characteristic of peatlands; typical vegetation also includes leatherleaf, labrador tea, bog rosemary, pitcher plant, sundew, wild cranberries, and several species of orchids.

Seep: small area where groundwater comes to the surface, saturating the soil for much or all of the growing season. Sensitive fern, skunk cabbage, and jewelweed often grow in seeps.

Spring: location where water flows out of the ground, originating a stream or feeding an existing water body.

Swamp: wetland dominated by woody vegetation. Shrub swamps and red maple swamps are common in New Hampshire.

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