

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



June 2008

Prepared by the Audubon Society of New Hampshire in consultation with the Lakes Region Planning Commission in consultation with the Bristol Planning Board. Support for the project was provided by the Samuel P. Pardoe Foundation and NH Department of Environmental Services, Regional Environmental Planning Program.

# Smart Growth Audit: Bristol, NH

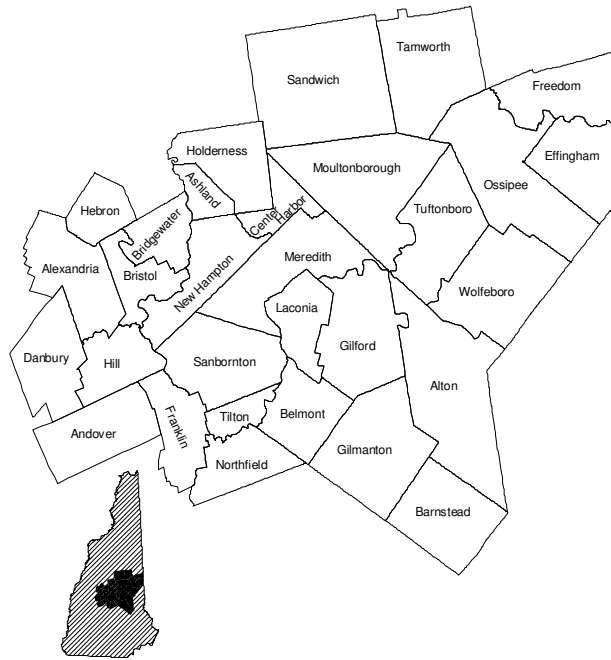


Downtown Bristol

June 2008

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## **I. The Need for Smart Growth**

Since 1999, New Hampshire has grown at a rate of more than 16,000 people each year<sup>1</sup>. 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. The term 'smart growth' is sometimes substituted for policies and techniques that prevent or counteract sprawl.

“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.”<sup>2</sup>

“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.”<sup>3</sup>

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”

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<sup>1</sup> NH Office of Energy and Planning webpage, <http://nh.gov/oep/programs/DataCenter/Population/PopulationEstimates.htm> (visited 6/15/06).

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

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



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.”<sup>4</sup>

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 central focus of a Smart Growth Audit is to provide a useful link between the Principles of Smart Growth and their application in municipal land use practice. This report is a first step for providing that link for the town of Bristol, NH. It is intended to be a guide as the town updates its regulations, ordinances, and master plan.

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<sup>4</sup> Smart Growth webpage, NH Department of Environmental Services, <http://www.des.state.nh.us/wmb/was/smartgrowth.htm> (visited May 14, 2007).

## II. What is Smart Growth?<sup>5</sup>

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. 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;
5. 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;
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.

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<sup>5</sup> 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](http://nh.gov/oep/programs/SmartGrowth/_docs/chester_report.pdf) pp.3, 4.

### **III. What is a Smart Growth Audit?**

A Smart Growth Audit is an assessment of where the community stands regarding the Smart Growth Principles. To accomplish this several steps must be taken:

- Recent changes in the municipality's population and development are compiled along with projections for these trends.
- 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 town-supported Smart Growth Principles.
- Suggestions are made regarding what steps the community might take to better implement the identified Smart Growth Principles.

This audit is based upon the most current documents available for Bristol, including the Master Plan, 2003; Zoning Ordinances, 2008; Subdivision Regulations, 2007; Site Plan Review Regulations, 2007 and conversations with the Planning Board. Bristol updates individual chapters of its master plan on an annual basis. The Planning Board felt that a consistency review of the master plan and relevant ordinances and regulations could be quite helpful in highlighting areas to address as each chapter comes up for review. Bristol is also beginning a Plan NH Charrette focusing on the downtown, making this audit a very timely project.



## IV. Smart Growth in Bristol

### A. Population and Development Trends

In the 1980s, the population of New Hampshire increased by 20%; then slowed to an 11% increase in the 1990s. The Lakes Region population grew at 17.6% in the 1980s and 15.8% in the 1990s. While Bristol's population increased more than 31% in the 1970s, during the 1980s Bristol's rate of growth (15.4%) was slightly lower than the region but then rose above the regional average in the 1990s (19.6%).<sup>6</sup> According to the NH Office of Energy and Planning (NH OEP), Bristol's 2006 estimated population was 3,131. NH OEP projects that the state population will grow at a rate of between 7% and 8% each decade through 2025. Bristol's population is projected to increase by approximately 7% during the next two decades, higher than the Grafton County projections of 6.4% and 5.7%. This level of growth will result in 460 additional residents in Bristol.<sup>7</sup>

NH OEP demographic projections are only available at the state and county levels therefore comparisons between communities cannot be made.<sup>8</sup> Statewide, the percent of the population over 64 years of age is projected to double between 2000 and 2025, while the actual number of people under 25 is predicted to remain fairly constant. In Grafton County the number of residents over 64 years of age is projected to increase more than two and a half times, while the number of people under 25 years old is expected to drop. The percentage of Grafton County residents over age 64 is projected to increase from 13.4% to 29.3% while the proportion of residents under age 25 is expected to drop from over 30% to less than 23% of the county's population by the year 2025.

### B. Housing Trends

In 2000, median home values in Bristol were among the lowest in the region, having dropped 9.2% during the 1990s. At the same time, Bristol had 2,073 housing units, a decrease of 7.9% from 1990, by far the largest decrease in the region. The percentage of these units that were seasonal in 2000 was 37.2%, higher than the Lakes Region and state averages of 29.8% and 10.3%. Although there was growth in seasonal housing during the 1980s, during the 1990s the number of seasonal housing units dropped by more than 300.<sup>9</sup> In Bristol, one finds slightly less manufactured housing (5.5% vs. 7.9%) and slightly more multi-family housing (13.2% vs. 10.5%) than the Lakes Region as a whole. Single family housing represents 77% of the housing stock, very similar to what is found throughout the region<sup>10</sup>.

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<sup>6</sup> *Lakes Region Demographic Profile*, Lakes Region Planning Commission, 2003.

<sup>7</sup> <http://nh.gov/oep/programs/DataCenter/Population/documents/pub05.xls>, visited Feb. 14, 2008.

<sup>8</sup> <http://nh.gov/oep/programs/DataCenter/Population/documents/populationforcountiesbyageandsex.xls>, visited Feb. 14, 2008.

<sup>9</sup> *Bristol Master Plan*, 2003. p. 4-7 and 4-8.

<sup>10</sup> *Lakes Region Demographic Profile*, Lakes Region Planning Commission, 2003.

Between 2000 and 2006, Bristol granted an average of 24 residential permits a year. During the same time period 11 commercial permits were granted.<sup>11</sup>

### C. Bristol's Smart Growth Principles

The Bristol Planning Board reviewed the eight Principles of Smart Growth outlined by the NH OEP that apply to New Hampshire communities. The Board agreed that all of the Principles apply to Bristol.

### D. Smart Growth and Bristol's Master Plan

This section outlines supporting master plan goals and objectives, land use regulations, and ordinance references for each Smart Growth Principle. This is followed by an analysis section that looks at 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 individual goal, objective, ordinance, or regulation references with one Principle; however, some repetition was necessary. Due to the interrelated nature of the Principles, there are some statements that play an important role in shaping the town's ability to implement multiple Principles. Some foster the Principle, a few run contrary to the Principle. For a complete list of the municipal statements and how they link to the Smart Growth Principles, please refer to the matrix that accompanies this report in Appendix A.

Key: Each statement is referenced using the following abbreviations (MP – Master Plan, ZO – Zoning Ordinance, SD – Subdivision, SP - Site Plan).

Statements in [brackets] were inserted by LRPC.

Statements found to run contrary to the Principle are listed at the end of each section.

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<sup>11</sup> *Development Activities in the Lakes Region: 2008 Annual Report*, Lakes Region Planning Commission.

## **Smart Growth Principle 1:**

### ***Maintain traditional compact settlement patterns***

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

#### **Summary:**

The Bristol Master Plan recognizes the need for compact development, and emphasizes the need to take advantage of the existing compact downtown area. A number of goals and objectives strongly suggest using the downtown/historic district as an asset to create a walkable environment, and efficiently using the available land. The Zoning Ordinance continues with these ideas, encouraging cluster residential development and the retention of open space.



**Downtown Bristol**

#### **Goals and Objectives:**

- Commercial areas should be concentrated as much as possible, and preferably located close to the traditional village center. (MP Vision 1.2)
- Zoning should allow for clustered residential development along with the preservation of open space. (MP Vision 1.2)
- The town needs to be more aware of the potential offered by its unique and historic downtown square. The effort to revitalize the downtown area should have the highest priority, since the positive effects of a successful revitalization effort will extend far beyond the downtown area. (MP Vision 1.4)
- Since compact, commercial development is essential to the survival of downtown, full utilization of the downtown area should have a higher priority than development outside the central business district. (MP III.III)
- Though limited land is available for future development in the downtown core, public and private improvements to the existing structures and amenities in the downtown will have a lasting impact on the community, and carry over to other areas in the community. (MP II.VI)
- New commercial development should be encouraged to locate downtown rather than being dispersed throughout the town. Such dispersed business development generally does not attract shoppers to the downtown area and does not permit the convenience of one-stop shopping that clustered pedestrian scale shopping allows. (MP III.IV)

### **Ordinances and Regulations:**

- The object of cluster residential development is to encourage flexibility in housing by permitting homes to be built on lots of reduced dimensions to allow for a more economic provision of street and utility network... (ZO IV, 4.7)
- This ordinance is enacted pursuant to RSA 674:16 and 674:21, and in order to: Prevent scattered or premature development of land as would involve danger or injury to health, safety, or prosperity by reason of the lack of water supply, drainage, transportation, schools, fire protection, or other public services, or necessitate the excessive expenditure of public funds for the supply of such services. (ZO XI, 1.1)
- [The Downtown Commercial] district includes the traditional commercial areas that are adjacent or close to residential neighborhoods, schools, and fire and police protection and serviced by town water and sewer (Class 1). (ZO III, 3.2 C)

### **Statements Contrary to Principle 1**

- A majority of 568 Bristol residents (57%) expressed a desire to encourage new residential building “distributed over less populated parts of town.” Only 31% expressed a desire to encourage development “distributed over more populated parts of town.” (1999 Community Opinion Survey, Q. 5) [See Table 1.]

### **Analysis:**

Bristol’s Master Plan has excellent vision statements pertaining to efficient use of land, resources, and infrastructure. The desire to revitalize the downtown area is a priority tantamount to efficiently and effectively using existing resources. This desire (albeit not a reality as of 2008) demonstrates agreement with and adherence to Smart Growth Principle 1. The town also encourages compact commercial development as an alternative to the existing areas of strip development along NH 3A north and NH 104 east of downtown. The conditions and restrictions in the Zoning Ordinance vary depending on the zone and the utilities servicing the site. This flexibility can encourage varying patterns of development density.

There is also a strong endorsement of cluster development in the Zoning Ordinance. Cluster development is permitted in the Rural District and Lake District, and allowed by special exception in the Village Residential District. The fact that cluster development is discussed fairly extensively suggests a great desire on the part of Bristol to consolidate development rather than consuming limited [or additional] open space.

Statements in town documents contrary to Smart Growth Principle 1 are at a minimum. It is worthwhile to note that in a town survey conducted in 1999, 57% of those residents surveyed expressed a desire to “encourage residential building distributed over less populated parts of town”, running contrary to the concept of compact development. That percentage dropped slightly in the 2007 version of the survey (55%). There was a decided shift in public sentiment regarding the desirability of residential building in or near the Village, up from 43% to 58%.

Table 1. Community Survey Results, 1999 and 2007									
Q6. Should new residential building be encouraged?									
		Yes	No	Und.			Yes	No	Und.
In or near the Village	1999	43%	48%	9%	Distributed over more-populated parts of town	1999	31%	59%	10%
	2007	58%	34%	9%		2007	31%	56%	13%
Near Newfound Lake	1999				Distributed over less-populated parts of town	1999	57%	24%	9%
	2007	19%	77%	5%		2007	55%	35%	10%
In strips along existing roads	1999	41%	48%	11%	Clustered in new villages or new neighborhoods	1999	48%	38%	14%
	2007	44%	46%	11%		2007	52%	36%	12%

### Recommendations:

The town of Bristol has many valuable statements pertaining to compact settlement patterns and cluster development. It seems as if problems have occurred when it comes to physically making improvements in the downtown area. Central Square improvements, while highly desirable, have continually failed to occur. According to the Planning Board, this is a result of differences of opinion by residents and a lack of funding. Greater public outreach in communicating the benefits of a revitalized downtown and compact development is an important step. This can be done through the upcoming PlanNH Charrette but should also be done through local business organizations and at public meetings.

While there is a cluster ordinance in place, no one has made use of it since its inception in 2000, according to the Planning Board Chairman. Perhaps an initiative to make cluster development more attractive to developers would be beneficial.

## **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.*

#### **Summary:**

Bristol refers to a “pedestrian scale” several times in its Master Plan, indicating a desire to eliminate endless expanses of pavement to create a more walkable community. Landscaping, buffer strips, and outdoor lighting are all discussed in the Site Plan Review Regulations. Various references to community life in the Zoning Ordinance and Subdivision Regulations also confirm Bristol’s support of Smart Growth Principle 2.



#### **Goals and Objectives:**

- To provide downtown pedestrian improvements in aesthetics and amenities, including landscaping, lighting, sidewalks and street furniture. (MP III.II.Objective 4)
- Streetscapes are public space, but they are part of everyone's shared experience and, consequently, their appearance and maintenance should be a common concern and a collective responsibility. (MP III.V.3.17)
- Steps should be taken to restore a pedestrian scale and beauty to Bristol's downtown area. These improvements would stimulate shopping and building occupancy, as well as improve the quality of life for local residents. (MP III.VII.3.23)
- The Bristol Downtown Improvement Plan proposes a significant number of recommendations that private business, organizations and local government must undertake to achieve a pedestrian scale and attractiveness to the central downtown area. A downtown is, after all, supposed to be a pedestrian area, and the more attractive it is to people on foot, the more successful it is likely to be. (MP III.VIII. Intro)
- To provide for an improved pedestrian scale shopping environment, it is recommended that the sidewalk on the west side of Central Square be widened by about five feet to provide additional space for street trees, pedestrian scale decorative lighting fixtures of an appropriate design and in harmony with the downtown, benches, and other amenities. (MP III.VIII.2)
- The lack of definition between vehicular traffic and pedestrian movement, with the relatively large open areas along portions of Pleasant, Lake and South Main Streets creates an interruption or gap in the streetscape scale of Bristol's downtown area. It is recommended that this gap be softened... by the introduction of curbed islands or green space with appropriate plantings. This effort will create a more comprehensive downtown unit that will (sic) help in reestablishing the pedestrian scale and provide (sic) a soft green texture along the downtown streets. (MP III.VIII.8)



- The town should encourage and assist with a street tree-planting program to provide shade in the summer, as well as to improve the town's visual appearance. Such a program should involve coordination between various interested groups and the town with regard to the selection of appropriate species, tree locations, etc. Tree planting would be appropriate in the downtown area. (MP III.VIII.13)
- New commercial development should be encouraged to locate downtown rather than being dispersed throughout the town. Such dispersed business development generally does not attract shoppers to the downtown area and does not permit the convenience of one-stop shopping that clustered pedestrian scale shopping allows. (MP III.IV)

### **Ordinances and Regulations:**

- It is the objective of this section to provide for the regulation and restriction of signs which are confusing, distracting, or impair visibility, and to protect scenic views and the character of residential and rural areas. (ZO IV, 4.11)
- Outdoor lighting shall be shielded so as not to shine onto abutting properties or onto public highways or streets, and it shall be restricted to that which is necessary for advertising and security of the development. (SP VIII.8.5C)
- Landscaped buffer strips shall be provided to assure that the development of the project conforms at its boundaries with the character of the adjoining land and its uses. These buffer areas shall be of sufficient width to provide privacy and noise protection, but in no case shall the width of such areas be less than the setbacks required by the ZO. (SP VIII.8.5H)
- Landscape treatment shall consist of natural, undisturbed vegetation or features, or ground cover, shrubs, or trees as appropriate. Where green areas are required by the Planning Board, wood chips or crushed stone may be prohibited. (SP VIII.8.5I)
- The Board may require areas of the plat to be set aside for parks and playgrounds to be dedicated or to be reserved for the common use of all property owners by a covenant in the deed. Whether or not required by the Board, these play or recreation areas shall be of reasonable size and character for neighborhood playgrounds or other recreational uses. (SD V.5.2C)



### Statements Contrary to Principle 2

- Downtown Bristol has a long history of traffic congestion and confusion, particularly at the Central Square intersection. The street pattern within the downtown area and the through-traffic highway intersections create problems that need to be addressed. (MP III.VI)

**Analysis:**

Bristol's aspirations to foster a human scale of development are prevalent throughout all town documents. Downtown improvements often coincide with the need to create a human-scale environment attractive to pedestrians. Tree-planting is seen in the Master Plan as a significant improvement to both aesthetic appearance and keeping the area pedestrian-friendly. Other initiatives mentioned in the Zoning Ordinance, Site Plan Review, and Subdivision Regulations include the shielding of outdoor lighting, use of landscaped buffer strips, and restriction of signs that could prove confusing or detrimental to scenic views. These all contribute to the town's perceived need for human scale public spaces.

Further support of adhering to human scale development can be found in the acknowledgement of the town's traffic congestion in the Master Plan. There is also mention of an "interruption of the streetscape" in the downtown area, and the need to remedy that situation. This interruption probably refers to the large expanses of roadway that divide the walkability and accessibility of downtown businesses and residences. Possible remedies include a reconfigured traffic pattern which might include a roundabout, along with improved sidewalks, crosswalks, and green spaces to enhance the small-town feel and pedestrian-friendliness.

**Recommendations:**

Similar to Principle 1, there is much desire in the town to continue to improve the downtown area at a human scale. Desires, however, and what exists on the ground can be vastly different. Attempting to convince both town residents and state agencies that downtown improvements are tantamount to the prosperous future of Bristol should be a top priority. Residents should be informed of the necessity of downtown improvements, and funding should be sought without hesitation. Educating dissenters about the ramifications of sprawl development and loss of a pedestrian-scale village may foster greater stewardship for improvements. If funding and outreach obstacles can be overcome, Bristol has the potential to be a wonderful example of a compact, human-scale New Hampshire village.

### **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.*

#### **Summary:**

Bristol's town documents have limited references to incorporating a mix of uses. There is an expressed desire for mixed development downtown, as seen in the Master Plan. There is also recognition of existing conditions that are unfavorable to mixed-use and compact development patterns.

#### **Goals and Objectives:**

- The town should encourage efforts to create affordable housing by avoiding such exclusionary tactics as large-lot zoning. The town should also encourage the creation of residential units in existing buildings in and around the downtown area. Existing property tax credits for senior citizens should be maintained. (MP Vision 1.5)
- Though limited land is available for future development in the downtown core, public and private improvements to the existing structures and amenities in the downtown will have a lasting impact on the community, and carry over to other areas in the community. (MP Land Use II.15)
- Village Commercial District- "A mix of commercial, residential, and municipal uses exists, with the potential for additional in-fill development." (MP II.IV)

#### **Statements Contrary to Smart Growth Principle 3:**

- Over the course of time, land use in the downtown area has become more diverse. Land uses of a non-mercantile character, such as automobile service stations, residential and certain semi-public facilities tend to fragment the Central Business District, making compact pedestrian shopping somewhat difficult and significantly diluting the business district's overall strength. (MP III-IV Downtown Today)

#### **Analysis:**

There is very little reference to Smart Growth Principle 3 in Bristol's town documents. While Bristol's Master Plan mentions the benefits of a mixed-used downtown, a look at the Zoning Ordinance, Site Plan Review and Subdivision Regulations have few references to mixed use development. In the "Downtown Improvement Plan Recommendations" portion of the Master Plan, there is no mention of adding or improving residential opportunities in the downtown area. Businesses and pedestrian spaces are encouraged, but seemingly at the expense of mixed-use residential opportunities.

It is also significant to note that in the Master Plan is a section entitled "Downtown Today." The town points out that existing conditions have "diluted the business district's overall

strength.” This gives good reason to concentrate both commercial and residential development downtown and in a mixed-use fashion. However, residential development is referred to as a “conflicting use” in this section, in direct contrast to Smart Growth Principle 3. Conversations with the Planning Board indicate that some resistance to residential use in the downtown area is related to concerns over limited off-street vehicle parking for potential residents.

### **Recommendations:**

Bristol’s Master Plan envisions a downtown with mixed residential and commercial use. Successful integration of the two uses will encourage walkability, reduce sprawl, and can have economic benefits for the downtown businesses.<sup>12</sup> Adopting zoning ordinances and site plan regulations that specifically encourage apartments, businesses and off-street parking solutions in the downtown area could enhance the overall village environment (For examples, see: <http://www.nh.gov/oep/programs/SmartGrowth/learn/Interviews.htm>).

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<sup>12</sup> *Getting to Smart Growth II: 100 More Policies for Implementation*, Smart Growth Network. p. 2. (Undated).

## **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.*

#### **Summary:**

While Bristol's town documents do not emphasize at length the need to sustain farm and forest land, there are some concepts mentioned that adhere to Smart Growth Principle 4. Among these are efforts to create affordable housing and eliminate large-lot zoning, encouraging ordinances to be "friendly toward the agricultural and forest industries," and maintaining connectivity between protected areas.



#### **Goals and Objectives:**

- The town should encourage efforts to create affordable housing by avoiding such exclusionary tactics as large-lot zoning. The town should also encourage the creation of residential units in existing buildings in and around the downtown area. Existing property tax credits for senior citizens should be maintained. (MP Vision 1.2)
- Municipal authorities, business associations, private organizations and community leaders must work together to ensure the long-term health of the region's working landscape. Town ordinances should be friendly toward the agricultural and forest industries while encouraging the use of Best Management Practices. (MP Vision 1.7)
- Engage in land acquisition and easement projects, such as easements (sic) to protect wetlands and forested areas. To maintain connectivity between protected areas and minimize fragmentation, attempts should be made to purchase lands adjacent to existing protected lands. The Conservation Commission should consider overseeing such projects and research potential funding sources. (MP V.VI.1.1.2)

#### **Ordinances and Regulations:**

- ...and to encourage the preservation and recreational use of open space in harmony with the natural terrain, scenic qualities, and outstanding land features. The remaining land in the tract which is not built upon shall be reserved as a permanent protected open space. (ZO IV.4.7)

#### **Analysis:**

Bristol appears to support Principle 4 in their town planning and zoning documents. The Master Plan and Zoning Ordinance unequivocally support the sustenance of open space and natural resources through responsible planning efforts such as cluster development, land acquisitions, and easement projects. There is also encouragement for the use of open space

for recreation “in harmony with the natural terrain, scenic qualities, and outstanding land features.” No statements contrary to Principle 4 could be found in any town documents.

**Recommendations:**

While Bristol does have a Cluster Residential Development ordinance, the Planning Board noted that it has not been utilized by those developing land in town. To encourage the use of cluster development or conservation subdivisions the Planning Board could include incentives to developers, making it easier to implement one of these tools. Bristol should also consider adopting an Agricultural Incentive Ordinance to help reduce the likelihood of conflicts resulting from normal agricultural practices (model: [http://www.des.nh.gov/REPP/ilupth/Agricultural\\_Incentive\\_Zoning.doc](http://www.des.nh.gov/REPP/ilupth/Agricultural_Incentive_Zoning.doc)).



## **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.*

#### **Summary:**

Bristol appears to have a great desire for a walkable downtown area. There is mention of improving the downtown square not only for better circulation of vehicular traffic, but also for enhanced safety and enjoyment for pedestrians. The town fails, however, to mention transportation alternatives. While public transit might not be a realistic possibility, bicycles and other alternative forms of transport go unmentioned. All in all, there is clearly a perceived need for transportation improvements, particularly in the downtown area.



#### **Goals and Objectives:**

- One of the primary responsibilities of governments at all levels is to provide the infrastructure which helps to make the state, region and town a safe, pleasant and desirable place to live. The Master Plan seeks to assure that this infrastructure at the local level is continuously updated and upgraded to meet the current and future needs of the community. (MP Vision 1.3)
- Traffic (sic) control and/or a redesign of the traffic pattern should be considered, not solely for the benefit of the motorist, but for the aid and safety of the pedestrian. The main goal of providing traffic improvements is to achieve an efficient and convenient movement of vehicles in harmony with pedestrian traffic, while improving the aesthetic and environmental quality of downtown Bristol. (MP III.VI.3.21)
- The primary objectives of the Downtown Improvement Plan are: To provide for a more efficient use of the land; stimulate a viable economic climate; provide for an improved visual image; improve parking conditions and relieve existing pedestrian-vehicular conflicts. (MP III.II.1)
- The redesign of Central Square to a more pedestrian scale will help to create a greater identity for the town center and serve as a focal point of the community. (MP III.VIII.1)
- Property owners and employees of downtown businesses should not utilize prime on-street parking spaces, thus making parking more difficult for prospective shoppers. It is essential that employees, building owners and apartment tenants use off-street parking areas or parking spaces not generally used by Bristol shoppers. (MP III.VIII.6)

- Sidewalk and curbing improvements made along Pleasant Street in the section between Lake Street and Central Square should be continued all the way to Central Square. The curbs should be granite, and crosswalk areas should be clearly delineated. (MP III.VIII.9)

### **Ordinances and Regulations:**

- Walkways, including sidewalks if necessary, shall be provided by the applicant to connect the proposed activities with the parking which serves those activities, and with adjacent premises, if developed. (ZO IV, 4.5 F)
- The plan shall provide for the convenience and safety of vehicular and pedestrian traffic and for adequate location of driveways in relation to street traffic. Adequate parking per unit and minimum distance from lot lines shall be required. (ZO IV, 4.7 F)
- Sidewalks shall be provided for pedestrian traffic between the main entrances of business, housing, or industrial establishments and parking areas and streets. (SP VIII.8.5 D)

### **Analysis:**

Desire for a more pedestrian-friendly downtown area is present throughout town documents. This is certainly a positive sign, as Bristol acknowledges its current situation of both an awkward traffic pattern and underutilized pedestrian spaces downtown. Central Square is, appropriately, a high priority, as it is the main gathering place in town, as well as the intersection of the main transportation routes.

Discussions of aesthetic and safety improvements to pedestrian life often overshadow other aspects of Smart Growth Principle 5, such as universal accessibility and bicyclists. There is no mention of any initiatives regarding bicycle paths through town or bicycle parking downtown. In conclusion, Bristol's town documents offer a positive and innovative, if incomplete, vision for transportation improvements in the future.

The Planning Board noted that over the years several efforts have been started to upgrade the transportation configuration in downtown, each resulting in limited success. The fact that the two major intersecting streets in downtown are state highways does compound efforts to effect structural changes to the roads because alterations to the roads have to go through the state prioritization and funding process, a challenging task in this era of tight finances for NH Department of Transportation.



The town has constructed a Bike Path from Newfound Lake to the north end of town. To reach downtown a rider still needs to travel along the shoulder of NH Route 3A. The town has applied to NH DOT for funds to begin a Safe Routes to Schools effort, encouraging children to walk and bike to school. Necessary sidewalk improvements have already been identified.

**Recommendations:**

Based on town documents and conversations with the Planning Board, the town of Bristol has a clear vision for the downtown, which is very much in line with Smart Growth Principles. The challenge seems to be in implementing changes to attain the vision. A primary element in bringing about this change is communicating this vision and the necessary changes, along with their benefits, to residents, business owners, and decision-makers both inside and outside the community.

There are several avenues for communicating this vision of which the town could take advantage: consistent involvement on the regional Transportation Technical Advisory Committee (TAC), the Historic District Commission, and the upcoming Plan NH Charrette.

## **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.*

### **Summary:**

As a town, Bristol references environmental quality repeatedly in its documents. Every aspect of protecting environmental quality, from public awareness to conservation land, to natural buffers, can be found in the Master Plan, Zoning Ordinance, Site Plan Regulations and Subdivision Regulations. There is especially protective legislation regarding wetlands and floodplains. The Pemigewasset River corridor also has stringent protection due to local adoption of a Pemigewasset Overlay District.



### **Goals and Objectives:**

- At the local level, The Conservation Commission has an obvious role to play in increasing public awareness of the town's natural assets and helping to educate the public about such approaches as conservation easements. The Planning Board should review the existing overlay districts to be sure they provide adequate protection for the most sensitive areas. (MP Vision 1.6)
- Maintaining the health of natural systems is essential to the sustainability of natural resources and to the economic stability of the region. (MP Vision 1.8)
- Protected conservation land represents the second largest portion of undeveloped land (16%). Protected conservation land has some measure of permanent restriction on future development. (MP II.II)
- It must be recognized that vehicular traffic detracts from the environmental quality and beauty of the downtown area, competing with and disrupting the flow of pedestrian traffic, the real lifeblood of any business area. (MP III.VI)
- Provide educational opportunities (workshops, field trips) for proper conservation practices and utilization of lands protected by the town. (MP V.II.1.1.4)
- Limit the use of recreational vehicles in protected areas by providing designated trails to reduce potential impacts to wildlife habitats. (MP V.II.1.3.2)
- Land development around Newfound Lake should be minimized to protect the lake from non-point source pollution from run-off from impermeable surfaces. (MP V.III.2.1.5)

### **Ordinances and Regulations:**

- Applications for dock permits shall be reviewed by the Conservation Commission. In making its recommendations to the Wetlands Board and the Planning Board, the Conservation Commission shall consider the size and depth of the water area, the total frontage proposed for the common area, boat traffic already existing in the area, impact on neighboring property owners, protection of water quality, wildlife habitat and public safety. A buffer of natural vegetation shall be maintained between the beach and/or docking area and the parking area. The buffer may include facilities permitted within the shore front area. (ZO III, 3.2F B-5)
- Expansion and/or construction of unroofed impervious ground cover within the 50 foot setback area measured from the high water mark, not to exceed five percent (5%) or two hundred (200) square feet of the setback area, whichever is less. (ZO III, 3.2 F B-7)
- PEMIGEWASSET OVERLAY DISTRICT: This district provides protection for the environmentally sensitive corridor along the Pemigewasset River, and the restrictions contained herein apply in addition to those on permitted uses in the portions of the districts over which it lies. (ZO III, 3.2H)
- BUFFERS: Where existing, a natural woodland buffer shall be maintained within 150 feet of the reference line. The purpose of this buffer shall be to protect the quality of public waters by minimizing erosion, preventing siltation and turbidity, stabilizing (sic) soils, preventing excess nutrient and chemical pollution, maintaining natural water temperatures, maintaining a healthy tree canopy and understory, preserving fish and wildlife habitat, and respecting the overall condition of the protected shoreland. (ZO III, 3)
- New structures within the [Pemigewasset] Overlay District shall be designed and constructed to prevent the release of surface runoff across exposed mineral soils. (ZO III, 3.2H, 5.B)
- FLOOD AREA: No building for human occupancy shall be permitted to be built within any floodway and no building for human occupancy shall have its first floor level less than one (1) foot above any known flood elevation within a floodplain outside any floodway, as indicated on the Bristol Flood Insurance Map. (ZO IV, 4.6)
- WETLANDS CONSERVATION OVERLAY DISTRICT: To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
  3. To protect rare, unique, and unusual natural species, both flora and fauna.
  4. To protect wildlife habitats and maintain ecological balances.
  5. To protect existing and potential water supplies and aquifers (water-bearing strata) and aquifer recharge area.
  6. To prevent the expenditure of municipal funds for the purposes of providing and/or maintaining essential services and utilities which might be required as a result of misuse or abuse of wetlands. (ZO IV. 9.2 Article IX)

- No development activity for either site plan or subdivision construction (sic) shall encroach within fifty (50) feet of a wetland unless a Special Use Permit specifically allowing that use is granted by the board. (ZO IV, 9.8 B)
- All efforts shall be made by the site developer to maintain the fifty foot buffer between the construction activity and the Wetlands Conservation Overlay District boundary in its existing undisturbed natural vegetative state. (amended 3/13/07). (ZO IV, 9.8 B)
- Land area not used for individual lots, construction of buildings, roads or on site sewer or water systems shall be permanently maintained as open space or common land for the purposes of recreation, conservation, park, public easement, or agriculture. (ZO IV, 4.7 C) [Cluster Residential Development]
- Pollution Control Provisions shall be made to prevent ground and surface water contamination due to on-site storage or use of petroleum products and hazardous substances in compliance with NH RSA 146-C, 147-A, 153, 430, and such other Federal, State and Local statutes, ordinances and regulations as are or may be applicable. (SP VIII, 8.5 G)
- Erosion and Sedimentation Plan shall contain the following:
  - 1) make provisions to accommodate the increased run-off caused by changed soils and surface conditions during and after development;
  - 2) identify, and relatively locate, proposed erosion and sediment control measures and structures during and after development;
  - 3) include drawings, details and specifications for proposed flood hazard prevention measures and structures and for proposed storm water retention basins;
  - 4) ensure that stripping of vegetation, regrading or other development will be done in such a way that will minimize soil erosion.

Temporary seeding and/or mulching may be required by the Board to protect exposed critical areas during development. Whenever practical, natural vegetation shall be retained, protected and supplemented. (SP VIII. 8.5 K)
- Provisions shall be made to prevent erosion and sedimentation caused by change topography and soil and surface conditions during and after construction. During construction, sediment in the run-off water shall be trapped by the use of sediment basins or other acceptable methods until the disturbed areas is stabilized. Diversion, sediment retention basins, and other such devices shall be constructed prior to any on-site grading or disturbance of existing surface materials. (SP VIII, 8.5 L)
- The land indicated on the plan shall be of such characer (sic) that it can be used for development purposes without danger or injury to health, safety, or the prosperity of the Town by reason of fires, flooding, water pollution, inadequate streets or walkways, accelerated erosion or other dangers, perils or hazards. (SP VIII, 8.5 M)
- For site plans that involve land designated as "Special Flood Hazard Areas" (SFHA) by the National Flood Insurance Program (NFIP): The Planning Board shall review the proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is



required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334. (SP VIII, 8.5 O.1)

- The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment. (SD V, 5.1 B)
- NOTE: Steep land (fifteen (15) degrees natural slope or greater over the majority of lots), areas with high water table (within two (2) feet of the surface), flood plains with less than three (3) feet of natural soil over impermeable material (percolation rate slower than thirty (30) minutes per inch) are problems of such nature to endanger health, life or property. Such areas shall not be platted unless a design solution acceptable to the Board can be presented. (SD V, 5.1 C)
- Proposed subdivision which create one or more lots within the 250-foot shoreland Protection zone defined in the Comprehensive Shoreland Protection Act (RSA 483-B) and are not served by municipal sewers must be approved by the New Hampshire Department of Environmental Services (NHDES) prior to submission for approval by the Board. (SD V, 5.1 D)
- The Planning Board shall review the proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334 (SD V, 5.3 A.1)
- The Planning Board shall require that all proposals for development greater than 50 lots or 5 acres, whichever is the lesser, include Base Flood Elevation (BFE) data within such proposals (I.e. floodplain boundary and 100-year flood elevation). (SD V, 5.3 A.2)
- The Planning Board shall require the applicant to submit sufficient evidence (construction drawings, grading and land treatment plans) so as to allow a Determination that: a) all such proposals are consistent with the need to minimize flood damage; b) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage; and c) adequate drainage is provided so as to reduce exposure to flood hazards. (SD V, 5.3 A.3)
- Pursuant to RSA 674:36, it shall be the responsibility for the developer, if the Board deems it necessary, to provide an accurately documented environmental and economic impact statement. Such statement may require adherence to the Master Plan documentation on drainage, erosion, forest productivity, land use, ground and surface water quality, traffic safety, public services, and any other factors that could impact the short and long-term well-being of the people of Bristol. (SD V, 5.5 A)
- Wells or springs used as a source of water supply shall be located, constructed and protected so as to preclude their pollution by surface drainage or by seepage from sink drains, cesspools or septic tank effluent. (SD V, 5.11 D.2)



### **Analysis:**

Bristol has incorporated many varied environmental initiatives to protect its natural resources. The town's Master Plan and Ordinances/Regulations address soil and water quality through erosion and impervious surface controls and buffers. The Ordinances/Site Plan Regulations appear to lack restrictions regarding development on Steep Slopes; such restrictions can be effective tools in reducing erosion. In addition to the Wetlands and Pemigewasset Overlay Districts, Bristol does have a Cluster Residential Ordinance, all of which are intended to protect resources and encourage stewardship. The Planning Board indicated that the Cluster Ordinance has not been utilized often; however, there are several modifications that the Board may wish to consider to encourage such development.

### **Recommendations:**

While Bristol has a number of proactive ordinances and regulations safeguarding natural resources, there are several steps that the town can take to further protect local resources. The development of a steep slopes ordinance would reduce erosion and runoff, thereby maintaining the on-site water quality, preserving property values, and limiting damage to roads. Additional information about a steep slopes ordinance and a model ordinance can be found at [http://www.lakesrpc.org/services\\_repp.asp](http://www.lakesrpc.org/services_repp.asp).

To encourage the preservation of open space, the Planning Board could revise their Cluster Residential Development Ordinance (ZO 4.7) to include incentives such as a density bonus and/or an expedited review process. Including additional educational information specifying what the owner/developer can do under Cluster Development, why it is being encouraged by the town, and what the benefit to the owner/developer is may also be helpful. The Planning Board could also replace the Cluster Residential Development Ordinance with a Conservation Subdivision Ordinance, which protects specific resources ([http://www.lakesrpc.org/services\\_repp.asp](http://www.lakesrpc.org/services_repp.asp)).

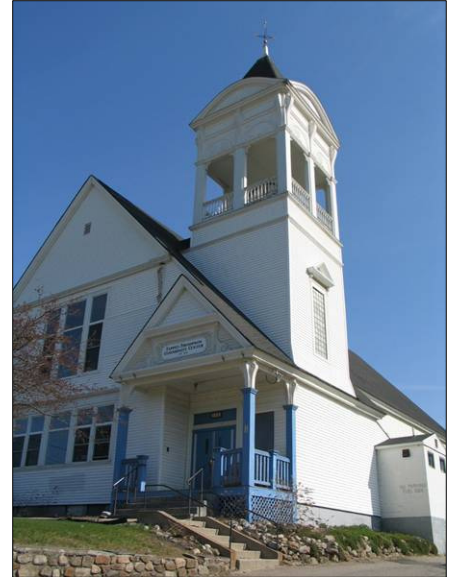
## **Smart Growth Principle 7:**

### ***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.*

#### **Summary:**

Bristol appears to have a desire to involve the community in many aspects of town decision-making, including historic preservation, investment in the downtown core, and addressing clean water and clean air issues. The vast majority of statements in town documents refer to the historic district, both its identification and preservation. The high priority placed on this initiative proves Bristol's willingness to cooperate and collaborate with the local community in order to succeed in preserving and restoring the town's historic character.



#### **Goals and Objectives:**

- The first step in preserving historic assets is to identify those natural features, structures and areas of historic significance. The Historical Society can play a role by enhancing the public's awareness and appreciation of historic assets. (MP Vision 1.2)
- While a good deal of federal and state legislation addresses such concerns as clean water and clean air, local awareness and concern play an important role in implementing this vision. The town should work closely with groups which are devoted to the preservation of forests, rivers, etc. to assure that vital natural systems are preserved. (MP Vision 1.3)
- Ongoing public and private investment in the downtown core is critical to maintaining and enhancing Bristol's economic vitality. Small or large, these public and private investments build a community's economic strength and contribute to the economic vitality of the region and state. (MP Vision 1.4)
- Municipal authorities, business associations, private organizations, and community leaders must work together to ensure the long-term health of the region's working landscape. (MP Vision 1.7)
- A Historic District Commission should be established to oversee the historic district, now included in the National Register. Its function would be to provide some guidance to individual property owners and the town with regard to the appropriateness of proposed building renovations, signage, street lighting, etc. (MP III.VIII.3)
- Under the direction of the Historic District Commission, storefronts and buildings in the downtown area should be restored or enhanced in their appearance in keeping with their original architectural character. (MP III.VIII.4)

- In more recent years, several signs have been installed which are inconsistent with the Old New England Village character. Compatible, easy-to-read signs should be a goal. (MP III.VIII.5)

### **Ordinances and Regulations:**

- This Historic District Ordinance reaffirms the goals of the 2003 Bristol Master Plan by working to preserve Bristol's historic structures and historic character. Specifically, the purpose of the HDO is to recognize, preserve, enhance and perpetuate buildings, structures and sites within the Town having historic, architectural, cultural or design significance, in accordance with RSA 674:45. (Historic District Ordinance 1)
- It is hereby declared a public interest that the historic value of Bristol will be safeguarded by:
  - A) preserving the heritage of the Town by providing for the protection of buildings, structures, and sites representing elements of its history
  - B) enhancing the visual character of the Town by encouraging and regulating the compatibility of new construction and alterations to existing buildings, structures and sites within the Historic District to reflect the Town's distinctive architectural identity, unique character and prevailing scale;
  - C) fostering public appreciation of and civic pride in the beauty of the Town and the accomplishments of its past;
  - D) strengthening the economy of the Town by protecting and enhancing the attractiveness of the community to residents, tourists and visitors;
  - E) stabilizing and improving property values within the Town; and
  - F) promoting the use of Historic Districts for the education, pleasure and welfare of the citizens of Bristol. (Historic District Ordinance 1)

### **Analysis:**

Bristol is very concerned with establishing and maintaining a historic district. This, by nature, involves interaction with the community which supports Smart Growth Principle 7. Sense of place is another Smart Growth concept that Bristol seems to embrace. By striving for “public appreciation of and civic pride in the beauty of the Town,” it is clear that Bristol wants to emphasize its heritage so that all members of the community can enjoy and remember it.

Although there is support for restoring and preserving historic structures in the town documents, little reference was made about how new development will “retain and enhance” the town’s sense of place. While it is valuable to preserve historic structures, this would be augmented by new development striving to keep in character with the town’s history. Building styles, compactness of development, and type of buildings permitted will affect, positively or negatively, Bristol’s sense of place for years to come.

### **Recommendations:**

There are two parts to this principle; the first part addresses community involvement while the second part acknowledges the need for retaining a sense of place and traditions. Through the Historic District Commission, much of the second part is being addressed. Fostering

greater community involvement will assist Bristol attain their Master Plan vision. Three topics that the town will continue to address in the future are sprawling development, downtown improvements, and transportation. Ensuring that the vision of the Master Plan gets implemented requires understanding and acceptance by the community and developers, as well as business owners in downtown. Because many of its primary roads are state roads, the relationship between town representatives, the Road Agent, and NH DOT needs to be fostered.

## **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.*

#### **Summary:**

There are limited references to Smart Growth Principle 8 in Bristol's town documents. All of the references are, however, in compliance with the principle. There is acknowledgement that natural resources cross town boundaries, and that cooperation with neighboring towns is necessary to ensure the preservation of those resources.

#### **Goals and Objectives:**

- Support the recommendations of the Pemigewasset River Corridor Management Plan, published in late 2001 by the Pemigewasset River Local Advisory Committee (PRLAC). The PRLAC is made up of residents from eleven towns in the Pemigewasset corridor, including Bristol. (MP V.III.3.1.4)
- Natural resources cross town boundaries, thus programs initiated by adjacent towns aid Bristol as well. (MP V.I. Introduction)
- The region's natural resources are more than just a beautiful backdrop for communities. The air, forests, lakes, rivers, streams, meadows, agricultural lands and marshes are the life support system for human settlement and for the plants and wildlife that inhabit the Newfound Area. Maintaining the health of natural systems is essential to the sustainability of natural resources and to the economic stability of the region. (MP Vision 1.8)

#### **Analysis:**

There is evidence that Bristol supports a regional approach to protecting natural resources, as can be seen in their endorsement of PRLAC. This desire for environmental protection, particularly beyond town boundaries, shows foresight for management of regional natural resources in support of Principle 8.

#### **Recommendations:**

To improve regional collaboration, regard should be given to neighboring communities when development is proposed near town boundaries through the Development of Regional Impact notification process. It is important to ensure that a forum through which adjacent communities can express support or concern is fostered. Likewise, managing growth locally applies to a wide array of issues that may impact the greater region. In addition to natural resources, a town that plans for future transportation, housing, employment, and service needs will be in a better position to match the eventual implementation with their vision.



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



Profile Falls

June 2008

Prepared by New Hampshire Audubon Commission in  
consultation with the Bristol Planning Board.  
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### **Purpose of Review**

The intent of this audit is to assess the current level of protection for wildlife habitat and natural resources provided by Bristol's land use regulations and identify additional opportunities for regulatory protection.

### **Process of Review**

New Hampshire Audubon staff compiled a template document to guide review of municipal land use planning documents with respect to protection for wildlife habitat and other natural resources. The template addresses 26 topics that New Hampshire towns might consider addressing in their Master Plan and land use regulations in order to protect their community's natural resources and rural character. Some topics are interrelated and provide alternate strategies for protecting a given resource or addressing a particular problem, such as sprawl.

This document itemizes the provisions in Bristol's Master Plan, Zoning Ordinance, and Site Plan Review and Subdivision regulations that pertain to each topic, and assesses need for additional language in these documents if stronger protection is desired by the Town. Planning Board members may refer to accompanying documents that provide sample master plan goals and objectives, zoning ordinance purposes, and application checklist items, as well as chapters of Innovative Land Use Techniques in preparation by New Hampshire's regional planning commissions and the Department of Environmental Services for ideas in considering revisions of land use planning documents. Legal review of proposed revisions is always advisable.

## **Summary of Findings**

The current master plan for the Town Bristol , New Hampshire, was adopted in 2003; the current zoning ordinance was adopted in 1985 and amended in 1987, 1989, 1990, 1991, 1992, 1993, 1994, 1996, 1997, 1998, 2001, 2002, 2003, 2004, 2005, 2006, and 2007; the site plan review and subdivision regulations were adopted in 1977 and amended in 1980, 1984, 1989, twice in 1991, 1997, 2001, 2002, three times in 2003, 2004, 2005, 2006, and 2007; the current application checklists were adopted in 2002. The following paragraphs summarize the findings of our review. Detailed findings are presented in the following section of this report. The document “Addressing Wildlife Habitat and Natural Resource Protection in Municipal Land Use Documents: Ideas for New Hampshire Municipalities” provides helpful information for addressing audit findings.

### **Agriculture**

Addressed adequately in goals and objectives of Master Plan. Consider specific reference in purpose of Zoning Ordinance, adding protection of opportunities to practice agriculture in description of Rural District, adoption of an agricultural conservation district or some form of protection for important agricultural soils, performance standards for agricultural district, and inclusion of agricultural lands in application requirements and checklists.

### **Energy Efficiency**

Not clearly addressed in Master Plan. The Planning Board may wish to consider this topic for further attention in Bristol’s planning documents.

### **Erosion Control**

Addressed adequately in goals and objectives of Master Plan. Consider extending specifications for erosion and siltation control in Pemigewasset Overlay District to entire town and including Site Plan Regulations standards regarding erosion and sedimentation in Subdivision Regulations standards.

### **Floodplains**

Addressed adequately in Master Plan, Zoning Ordinance, and Site Plan Review requirements and Application Checklist. Consider addressing in Subdivision requirements and Application Checklist.

### **Forestry**

Addressed adequately in Master Plan and purpose of Zoning Ordinance. Consider adding protection of opportunities to practice forestry in description of Rural District, adoption of Mountain and Forest Conservation District, inclusion in application requirements and checklists.

### **Forests**

See Forestry above.

### **Green Infrastructure**

Addressed by implication in Master Plan and purpose of Zoning Ordinance. Consider more explicit direction in Master Plan and subsequent reference in other planning documents.

### **Groundwater**

Addressed adequately in Master Plan, Zoning Ordinance, Standards of Site Plan Review Regulations. Consider addressing in General Requirements of Subdivision Regulations and application checklists.

### **Growth Management**

Addressed by implication in Master Plan. Consider addressing more specifically in Master Plan and adopting specific growth management techniques.

### **Impervious Surfaces**

Addressed by implication in Master Plan and Purpose of Zoning Ordinance. Consider addressing in Subdivision Regulations and Application Checklist.

### **Landscaping**

Addressed adequately in Master Plan, Zoning Ordinance, and Site Plan Review Regulations. Consider rewording General Guidelines of Subdivision Regulations to encourage protection of existing natural vegetation, rather than trees specifically.

### **Light Pollution**

Addressed by implication in Master Plan. Consider addressing specifically in Master Plan, Zoning Ordinance, and Subdivision Regulations and checklist. Consider wording in Site Plan Review Regulations that addresses dark sky preservation as well as light trespass.

### **Natural Hazards**

Addressed adequately in Master Plan and Purpose of Zoning Ordinance. Consider addressing forest fire risk through setback limitations and fire protection plans in Rural District.

### **Natural Services Network**

Consider adding language in Master Plan to encourage consideration of Natural Services Network in identifying priorities for open space and in siting development. Consider adoption of overlay district(s) to protect Natural Services Network components.

### **Natural Vegetation**

Addressed adequately in Master Plan, Zoning Ordinance, and Site Plan Review Regulations. Consider rewording General Guidelines of Subdivision Regulations to encourage protection of existing natural vegetation, rather than trees specifically.

### **Ridgelines**

Addressed by implication in Master Plan and Purpose of Zoning Ordinance. Consider more specific language in Master Plan and adopting a ridgeline protection ordinance with pertinent provisions in Subdivision and Site Plan Review regulations.

### **Shorelands, Surface Waters, and Wetlands**

Addressed specifically in Master Plan, Zoning Ordinance, Site Plan Review and Subdivision Regulations and checklists. Consider including vernal pools in Wetlands Conservation Overlay District. Consider adding wetlands to regulations regarding watercourses, ponds, or standing water.

### **Sprawl**

Addressed by implication in Master Plan and Purpose of Zoning Ordinance. Consider adopting innovative zoning techniques to prevent sprawl.

### **Steep Slopes**

Addressed specifically in Master Plan, Rural District of Zoning Ordinance, and Subdivision Regulations with constraint against building on slopes of or exceeding 25% (15 degrees). Slopes of or exceeding 15% are considered potentially unstable from engineering perspective, depending on soil and bedrock characteristics. Consider requiring engineering studies of slope stability and slope stabilization plans for projects involving construction on slopes exceeding 15%.

### **Stormwater Runoff**

Addressed in Master Plan, Zoning Ordinance, Site Plan Review and Subdivision regulations. However, the Subdivision Regulations provision that “Natural watercourses shall be cleaned and increased in size, where necessary, to take care of storm runoff” is in violation of State law and should be deleted. Consider adopting a stormwater management ordinance that requires a stormwater management plan and includes impact fees for off-site stormwater management facilities where necessary.

### **Terrain Alteration**

Addressed adequately in Master Plan, Zoning Ordinance, and Subdivision and Site Plan regulations. Consider including cut and fill volumes and pre- and post-development topography in application checklists.

### **Urban Growth Boundary**

Addressed by implication in Master Plan and Purpose of Zoning Ordinance. Consider adopting an urban (or village) growth boundary and associated regulations.

### **Village District**

Addressed by implication in Master Plan and Purpose of Zoning Ordinance. Consider adopting some version of growth boundary or expanded mixed-use village district.

**Watersheds**

Addressed adequately in Master Plan, Zoning Ordinance, and Site Plan Review and Subdivision regulations.

**Wildlife Habitat**

Addressed specifically in Master Plan. Consider including important wildlife habitat in Purpose of Zoning Ordinance. General Guidelines of Subdivision Regulations, Purpose of Site Plan Regulations, and application checklists.



## Detailed Findings

### Agriculture

Agriculture is an important component of New Hampshire's economy and environment, and makes vital contributions to the State's food supply. 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.

#### *Master Plan*

Addressed in Vision (Chapter I):

- Safeguard the rural quality of the Town of Bristol.
- Conserve and showcase our natural assets.
- Maintain the economic viability of Bristol's agricultural lands and forests.

Addressed in Land Use (Chapter II), which recognizes Agricultural Lands of Significance as a development constraint and recommends consideration in development proposals and conservation land acquisitions.

#### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

“to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”

“to promote the health, safety, prosperity, convenience and general welfare of all residents.”

“to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed by implication in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

#### *Subdivision Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land

use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

*Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

*Application Checklists*

Not addressed.

## 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.

### *Master Plan*

Addressed tangentially in Vision (Chapter I):

- “Build to create lasting value and beauty.”
- “Maintain and improve community assets supporting public safety, recreation, transportation, and the general welfare.”
- “Anticipate and address the housing needs of all community residents.”

These principals provide an opportunity to specifically address energy efficiency with respect to building codes, municipal facilities, and affordable housing.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Regulations*

Not addressed.

### *Application Checklists*

Not addressed.

## **Erosion Control**

Erosion control prevents damage to private property and public investments such as roadways, conserves the productivity of upland soils, and prevents the degradation of wetlands and surface waters. Erosion control benefits wildlife by preventing degradation of upland and aquatic habitats.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Maintain the health of the natural systems that support life in Bristol.”
- “Conserve and showcase our natural assets.”

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol’s water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands..

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol’s Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol’s rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town’s rivers.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “ to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “ to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the Pemigewasset Overlay District, which provides for protection of the environmentally sensitive corridor along the Pemigewasset River and includes specifications for erosion and siltation control.

### *Subdivision Regulations*

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “Provisions shall be made to prevent erosion and sedimentation caused by changed topography and soil and surface conditions during and after construction” and by standards for Erosion and Sedimentation plans.

### *Application Checklists*

Check List for Site Plan Review includes Soil type(s) and boundaries, Drainage calculations, and Erosion or sediment control plans. Check List for Subdivision Review includes Soil types and Drainage plan.

## **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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Maintain the health of the natural systems that support life in Bristol.”

Addressed in Land Use (Chapter II), which recognizes Floodplains as development constraints and refers to development guidelines provided in Floodplain Ordinance.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in General Provisions (Flood Area) which restrict construction of buildings for human occupancy within floodways and floodplains.

Addressed in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

Addressed specifically in the Floodplain Zoning Ordinance, which provides for the protection of lands subject to a one-percent or greater possibility of flooding in any given year.

Addressed specifically in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.

#### *Subdivision Regulations*

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property. Addressed in General Requirements, which include special requirements for Flood Hazard Areas.

Addressed in General Requirements, which require prior approval by NHDES for proposed subdivisions involving lots within the 250-foot Shoreland Protection Zone before submission to Planning Board.

#### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application Checklists*

Check List for Site Plan Review includes Location of Flood Zone, Soil type(s) and boundaries, Drainage calculations, and Erosion or sediment control plans. Check List for Subdivision Review includes Soil types.



## **Forestry**

Forestry is a significant component of New Hampshire's economy, providing fuel, fiber, and solid wood products to state, regional, national, and international markets. 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.

### *Master Plan*

Addressed specifically in Vision (Chapter I):

- “Maintain the economic viability of Bristol’s agricultural lands and forests.”

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources.

#### VII. Forest Resources.

Goal 1. Protect and enhance Bristol’s forest resources for multiple uses while encouraging responsible logging, minimizing soil erosion, and protecting wildlife habitats, recreational uses, and air quality.

Objective 1.1. Preserve Bristol’s forest resources.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed by implication in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

### *Subdivision Regulations*

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

### *Site Plan Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”

- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

*Application checklists*

Not addressed.

## **Forests**

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. Forests provide essential habitat for the majority of New Hampshire's wildlife species.

### *Master Plan*

Addressed in Vision (Chapter I):

- "Safeguard the rural quality of the Town of Bristol."
- "Conserve and showcase our natural assets."
- "Maintain the economic viability of Bristol's agricultural lands and forests."
- "Maintain the health of the natural systems that support life in Bristol."

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources.

#### VII. Forest Resources.

Goal 1. Protect and enhance Bristol's forest resources for multiple uses while encouraging responsible logging, minimizing soil erosion, and protecting wildlife habitats, recreational uses, and air quality.

Objective VII.1.1. Preserve Bristol's forest resources.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- "to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol."
- "to promote the health, safety, prosperity, convenience and general welfare of all residents."
- "to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds."

Addressed by implication in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

### *Subdivision Regulations*

Addressed in General Guidelines: "The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment."

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land

use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application Checklists*

Check List for Subdivision Review includes Wooded areas.

## **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. At a local scale, the presence of green infrastructure enhances human quality of life, contributes to property values, and provides wildlife habitat.

### *Master Plan*

Addressed in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the economic viability of Bristol’s agricultural lands and forests.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources.

#### II. Wildlife Resources.

Goal 1. Protect and enhance wildlife resources.

Objective 1.1 Preserve native species, both endangered and common, for the purpose of maintaining ecological balance and stabilization of the environment.

Objective 1.3. Protect wildlife habitats.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

#### VII. Forest Resources.

Goal 1. Protect and enhance Bristol’s forest resources for multiple uses while encouraging responsible logging, minimizing soil erosion, and protecting wildlife habitats, recreational uses, and air quality.

Objective VII.1.1. Preserve Bristol’s forest resources.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed by implication in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

Addressed in the intent of the Wetlands Conservation Overlay District:

1. To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.
2. To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
3. To protect rare, unique, and unusual natural species, both flora and fauna.
4. To protect wildlife habitats and maintain ecological balances.
5. To protect existing and potential water supplies and aquifers and aquifer recharge area.

Addressed in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

Addressed in the Pemigewasset Overlay District, which provides for protection of the environmentally sensitive corridor along the Pemigewasset River.

#### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

Addressed in General Requirements, which require prior approval by NHDES for proposed subdivisions involving lots within the 250-foot Shoreland Protection Zone before submission to Planning Board.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application Checklists*

Check List for Site Plan Review includes Location of Flood Zone, Impervious areas as % of total lot area, and landscape buffer area (where required). Subdivision Review includes Water Courses, Ponds/Standing water, Rock Outcroppings, and Wooded areas.

## **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. Groundwater is important to wildlife as the source of springs and seeps which provide water in upland areas and feed surface waters and wetlands.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Conserve and showcase our natural assets.”
- Maintain the health of the natural systems that support life in Bristol.”

Addressed in Land Use (Chapter II), which recognizes Aquifers as development constraints and recommends consideration in development proposals and conservation land acquisitions.

Addressed in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources.

IX. Waste Management.

Goal 1. Monitor Bristol’s waste.

Objective 1.1. Provide effective management of Bristol’s waste.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “ to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “ to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.



- To protect existing and potential water supplies and aquifers and aquifer recharge area.

#### *Subdivision Regulations*

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “Pollution Control Provisions shall be made to prevent ground and surface water contamination...”

#### *Application Checklists*

Check List for Site Plan Review includes Soil type(s) and boundaries and Impervious areas as % of total lot area. Check List for Subdivision Review includes Soil types, Drainage Plan, and Other conditions on tract including Water Courses and Ponds/Standing water.

## **Growth Management**

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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- Safeguard the rural quality of the Town of Bristol.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed by implication in the definitions of different districts in the Zoning Ordinance.

### *Subdivision Regulations*

Not addressed.

### *Site Plan Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Not applicable.

## **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 which are detrimental to both humans and wildlife. Impervious surfaces also contribute to heat island effects and reduce air quality.

### *Master Plan*

Addressed in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed by implication in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol’s water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands..

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol’s Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol’s rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town’s rivers.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “ to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “ to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision regulations*

Not addressed.

### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Check List for Site Plan Review includes Impervious areas as % of total lot area.

## **Landscaping**

Landscaping refers to 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. Landscaping benefits wildlife by providing backyard habitat.

### *Master Plan*

Addressed tangentially in Vision (Chapter I):

- “Build to create enduring value and beauty.”
- “Maintain the health of the natural systems that support life in Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “ to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “ to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Addressed in General Guidelines: “ The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “Landscape treatment shall consist of natural , undisturbed vegetation or features, or ground cover, shrubs, or trees as appropriate.”

### *Application checklists*

Check List for Site Plan Review includes Landscape buffer area (where required).

## **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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “Outdoor lighting shall be shielded so as not to shine onto abutting properties or onto public highways or streets, and it shall be restricted to that which is necessary for advertising and security of the development.”

### *Application checklists*

Check List for Site Plan Review includes Exterior Lighting.

## **Natural Hazards**

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 occur. 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.

Increased weight above a steep slope (from new buildings), increased water within the soils of a steep slope (from precipitation or leach fields), vibration of soils on a steep slope (from construction or traffic), and undercutting at the foot of a steep slope all can trigger slope failure. Climate change may alter the frequency of all 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.

### ***Master Plan***

Addressed by implication in Vision (Chapter I):

- “Maintain the health of the natural systems that support life in Bristol.”

Addressed partially in Land Use (Chapter II), which recognizes Floodplains as development constraints and refers to development guidelines provided in Floodplain Ordinance.

### ***Zoning Ordinance***

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in General Provisions (Flood Area) which restrict construction of buildings for human occupancy within floodways and floodplains.

Addressed specifically in the Floodplain Zoning Ordinance, which provides for the protection of lands subject to a one-percent or greater possibility of flooding in any given year.

Addressed in the intent of the Wetlands Conservation Overlay District:



- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.

Addressed specifically in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

#### *Subdivision Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

#### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application checklists*

Check List for Site Plan Review includes Location of Flood Zone.

## Natural Services Network

The New Hampshire Natural Services Network 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 lands, 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 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 eco-regional priority identified by the NH Fish & Game Department Wildlife Action Plan.

### *Master Plan*

Addressed in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the economic viability of Bristol’s agricultural lands and forests.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol’s water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands.

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol’s Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol’s rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town’s rivers.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.
- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
- To protect rare, unique, and unusual natural species, both flora and fauna.
- To protect wildlife habitats and maintain ecological balances.
- To protect existing and potential water supplies and aquifers and aquifer recharge area.

Addressed in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

Addressed in the Pemigewasset Overlay District, which provides for protection of the environmentally sensitive corridor along the Pemigewasset River.

### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

Addressed in General Requirements, which require prior approval by NHDES for proposed subdivisions involving lots within the 250-foot Shoreland Protection Zone before submission to Planning Board.

Addressed in General Requirements, which include special requirements for Flood Hazard Areas.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Review Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application checklists*

Check List for Site Plan Review includes Location of Flood Zone and Soil type(s) and boundaries. Check List for Subdivision Review includes Soil types, and Other conditions on tract including Water Courses, Ponds/Standing water, Rock Outcroppings, and Wooded areas.

## **Natural Vegetation**

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. Natural vegetation provides higher wildlife habitat value than new plantings.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

### *Site Plan Review Regulations*

Addressed in Standards: “Landscape treatment shall consist of natural, undisturbed vegetation or features, or ground cover, shrubs, or trees as appropriate.”

### *Application checklists*

Check List for Site Plan Review includes Landscape buffer area (where required). Check List for Subdivision Review includes Other conditions on tract Wooded areas.

## **Ridgelines**

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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Review Regulations*

Not addressed.

### *Application checklists*

Check List for Subdivision Review includes Topography at two foot intervals.

## **Shorelands, Surface Waters, and Wetlands**

Shorelands, surface waters, and wetlands comprise the visible part 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.

### *Master Plan*

Addressed in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed in Land Use (Chapter II), which recognizes Wetlands as development constraint and recommends consideration in development proposals and conservation land acquisitions.

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol's water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands..

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol's Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol's rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town's rivers.

#### IV. Wetlands

Goal 1. Protect Bristol's wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

#### IX. Waste Management.

Goal 1. Monitor Bristol's waste.

Objective 1.1. Provide effective management of Bristol's waste.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”

- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.
- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
- To protect existing and potential water supplies and aquifers and aquifer recharge area.

Addressed specifically in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

Addressed in the Pemigewasset Overlay District, which provides for protection of the environmentally sensitive corridor along the Pemigewasset River.

#### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

Addressed in General Requirements, which require prior approval by NHDES for proposed subdivisions involving lots within the 250-foot Shoreland Protection Zone before submission to Planning Board.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.



### *Site Plan Review Regulations*

Addressed by implication in Purpose of Subdivision Regulations

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “Pollution Control Provisions shall be made to prevent ground and surface water contamination...”

### *Application checklists*

Check List for Site Plan Review includes Location of Flood Zone, Erosion or sediment control plans, and Additional requirement option for Environmental impact. Check List for Subdivision Review includes Topography at two foot intervals, Drainage Plan, and Other conditions on tract including Water Courses and Ponds/Standing water.

## **Sprawl**

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 has 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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the economic viability of Bristol’s agricultural lands and forests.”
- “Maintain the health of the natural systems that support life in Bristol.”
- “Build to create enduring value and beauty.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Not applicable.

## **Steep Slopes**

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. Protecting steep slopes prevents environmental damage such as erosion, sedimentation, and drainage problems; excessive cuts and fills, and unsightly slope scars. Protection of steep slopes benefits wildlife by preventing habitat degradation of uplands, wetlands, and surface waters.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed in Land Use (Chapter II), which recognizes Steep Slopes as development constraint and recommends against construction on slopes of or exceeding 25%.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

### *Subdivision Regulations*

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Check List for Site Plan Review includes Location of Soil type(s) and boundaries. Check List for Subdivision Review includes Soil types and Topography at two foot intervals.

## **Stormwater Runoff**

Stormwater runoff refers to precipitation that cannot soak into the ground and subsequently ponds or flows over the earth's surface. Runoff can cause land erosion, water pollution, and flooding, damaging public and private property and degrading water quality and wildlife habitat.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol's water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands.

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol's Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol's rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town's rivers.

#### IV. Wetlands

Goal 1. Protect Bristol's wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.
- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
- To protect existing and potential water supplies and aquifers and aquifer recharge area.

Addressed in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

#### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application checklists*

Check List for Site Plan Review includes Location of Flood Zone, Soil type(s) and boundaries, Impervious areas as % of total lot area, Drainage calculations and Erosion or sediment control plans. Check List for Subdivision Review includes Soil types, Topography at two foot intervals, Drainage Plan, and Other conditions on tract including Water Courses and Ponds/Standing water.

## **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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

### *Site Plan Regulations*

Addressed by implication in Purpose:

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

Addressed in Standards: “The development shall conform, as much as possible, to the natural topography of the site.”

*Application checklists*

Check List for Subdivision Review includes Topography at two foot intervals.



## Urban Growth Boundary

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.

### *Master Plan*

Addressed tangentially in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the economic viability of Bristol’s agricultural lands and forests.”
- “Maintain the health of the natural systems that support life in Bristol.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Not addressed.

## **Village District**

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.

### *Master Plan*

Addressed tangentially in Vision (Chapter I):

- “Enhance Bristol’s economic vitality through ongoing reinvestment in the downtown core.”

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

### *Subdivision Regulations*

Not addressed.

### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

### *Application checklists*

Check List for Site Plan Review includes Zoning District. Check List for Subdivision Review includes Zoning District.

## **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.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed specifically in Goals and Objectives of Chapter V: Conservation and Preservation of Natural Resources:

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol’s water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands..

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol’s Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol’s rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town’s rivers.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “ to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”
- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “ to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the Rural District, which includes low to medium density rural living and open space, and provides for the protection of environmentally sensitive areas such as wetlands, floodplains, poor soils, and steep slopes.

Addressed in the intent of the Wetlands Conservation Overlay District:

- To prevent the development of the structures and land uses on naturally occurring wetlands which will contribute to pollution of surface and ground water by sewage, sediment, and/or noxious substances.
- To prevent the destruction of, or significant changes to, natural wetlands which provide flood protection.
- To protect existing and potential water supplies and aquifers and aquifer recharge area.

Addressed specifically in the Wetlands Conservation Overlay District, which provides for controlling and guiding the use of land areas which are subject to standing water, flooding, or high water tables for extended periods of time.

Addressed in the Pemigewasset Overlay District, which provides for protection of the environmentally sensitive corridor along the Pemigewasset River.

#### *Subdivision Regulations*

Addressed in General Requirements, which prohibit scattered or premature subdivision of land that would involve danger or injury to health, safety, or prosperity by reason of flood hazard, poor soil conditions, excessive slope or other hazardous conditions.

Designate steep land (fifteen or more degrees natural slope over the majority of lots), areas with high water table (within two feet of the surface), flood plains, areas with less than three feet of natural soil over impermeable material (percolation rate slower than thirty minutes per inch) as problems of such nature to endanger health, life, or property.

Addressed in General Requirements, which require prior approval by NHDES for proposed subdivisions involving lots within the 250-foot Shoreland Protection Zone before submission to Planning Board.

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Review Regulations*

Addressed by implication in Purpose

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

*Application checklists*

Check List for Site Plan Review includes Location of Flood Zone, Impervious areas as % of total lot area, and Additional requirement option for Environmental impact. Check List for Subdivision Review includes Drainage Plan, and Other conditions on tract including Water Courses and Ponds/Standing water.

## **Wildlife Habitat**

Wildlife habitat includes the resources that native species need to survive: food, water, shelter, including safe places to produce young. Wildlife habitat contributes to human amenities such as clean water, clean air, recreation opportunities, aesthetic values, and rural character.

### *Master Plan*

Addressed by implication in Vision (Chapter I):

- “Safeguard the rural quality of the Town of Bristol.”
- “Conserve and showcase our natural assets.”
- “Maintain the health of the natural systems that support life in Bristol.”

Addressed specifically and by implication in Goals and Objectives of Chapter V:

Conservation and Preservation of Natural Resources:

#### II. Wildlife Resources.

Goal 1. Protect and enhance wildlife resources.

Objective 1.1 Preserve native species, both endangered and common, for the purpose of maintaining ecological balance and stabilization of the environment.

Objective 1.3. Protect wildlife habitats.

#### III. Water Resources.

Goal 1. Maintain a high level of water quality for all of Bristol’s water resources to ensure a clean drinking water supply, continued economic benefits from tourism, valuable recreational opportunities, maintenance of fish and wildlife habitats, and effective irrigation of the lands..

Objective 1.1 Protect water quality and water resources.

Objective 1.2. Ensure an adequate clean water supply.

Goal 2. Protect Bristol’s Newfound Lake.

Objective 2.1. Bring together resources to ensure sound quality control of the lake.

Goal 3. Protect Bristol’s rivers.

Objective 3.1. Coordinate policies to ensure clean water for each of the town’s rivers.

#### IV. Wetlands

Goal 1. Protect Bristol’s wetlands.

Objective 1.1. Monitor wetlands to curtail wetland violations.

#### VII. Forest Resources.

Goal 1. Protect and enhance Bristol’s forest resources for multiple uses while encouraging responsible logging, minimizing soil erosion, and protecting wildlife habitats, recreational uses, and air quality.

### *Zoning Ordinance*

Addressed by implication in purposes of Zoning Ordinance:

- “to take into account the impacts of land uses and promote uses of resources, and the rural qualities of Bristol.”

- “to promote the health, safety, prosperity, convenience and general welfare of all residents.”
- “to minimize the impact of potentially incompatible uses with particular consideration given to the character of the area as well as an effort to conserve the value of buildings, to promote good civic design and the wise and efficient expenditures of public funds.”

Addressed in the intent of the Wetlands Conservation Overlay District:

- To protect rare, unique, and unusual natural species, both flora and fauna.
- To protect wildlife habitats and maintain ecological balances.

#### *Subdivision Regulations*

Addressed in General Guidelines: “The subdivider shall give due regard to the preservation and protection of existing features: trees, scenic points, brooks, streams, water bodies, other natural areas and historic landmarks in order to preserve the natural environment.”

Addressed in General Requirements, which provide for Planning Board to require an environmental impact statement that addresses drainage, erosion, forest productivity, land use, ground and surface water quality, and any other factors that could impact the short and long-term well-being of the people of Bristol.

#### *Site Plan Regulations*

Addressed by implication in Purpose:

- “to provide for balanced, responsible and attractive growth by encouraging appropriate land use, providing for harmonious and aesthetically pleasing development, protecting public health and safety...”
- “to insure adherence to sound site utilization principles, including:
  - providing open and green spaces of adequate proportions
  - and otherwise employing innovative land use controls consistent with the Master Plan.”

#### *Application checklists*

Not addressed.

## Summary of Recommendations

### *Master Plan*

While there are many opportunities to be more specific about particular issues, the existing language does a good job of covering natural resources and wildlife habitat. Areas that would especially benefit from special consideration include energy efficiency, growth management, green infrastructure, light pollution, ridgelines, and stormwater management.

### *Zoning Ordinance*

- The basic Zoning Ordinance is more than 20 years old and has been amended 17 times. Provisions in some of the overlay districts could be extended to additional areas of the town.
- Appendix C. Consider including overlay districts in District Use Table.
- Consider including protection of vernal pools in Wetlands Conservation Overlay District.
- Consider increasing wetland buffer to at least 100 feet to adequately address water quality issues.
- Consider changing Pemigewasset Overlay District to a River Protection Overlay District and including Newfound and Fowler rivers. Then remove Newfound and Fowler from Lake District.
- Consider extending erosion control provisions of Pemigewasset Overlay District to the entire town.
- Consider providing text definition of Lake District boundary, revising to provide protection for natural vegetation buffer where such still exists, and increasing minimum setbacks for any new construction.
- Consider adopting an urban (or village!) growth boundary, potentially including the Village Commercial, Village Residential, Downtown Commercial, Corridor Commercial, and Industrial Districts.
- Consider adopting ordinances to address ridgeline protection, stormwater management, protection of agricultural soils, dark sky preservation
- Consider adding language in purpose of Zoning Ordinance to include protection of opportunities to practice economically viable agriculture and forestry.
- Consider adopting Mountain and Forest Conservation District.

### *Subdivision and Site Plan Review Regulations*

- Subdivision purpose language specifically addresses historic preservation, economic growth, and promotion of services to and for all citizens of Bristol. Consider including reference to conserving natural resources, maintaining ecological services, protecting environmental assets.
- In Subdivision General Guidelines, consider replacing very specific “trees” with more inclusive “natural vegetation” in list of existing features to be protected. Consider adding stone walls and other cultural features.



- Curbing requirements appear to be at the discretion of the Planning Board. If curbing is to be installed in the Rural District, Wetland Conservation Overlay District, or Pemigewasset (River Protection) Overlay District, consider requiring sloped curbing to enhance wildlife mobility.
- Subdivision Regulations provision that “Natural watercourses shall be cleaned and increased in size, where necessary, to take care of storm runoff” violates State law and should be deleted.
- Consider requiring pre-application conference in some zones and/or overlay districts.
- In a number of locations the regulations invoke watercourses, ponds, or standing water. Consider adding wetlands to this list.
- Consider adding wetlands, aquifers, important agricultural soils, and high ranking wildlife habitat to list of features included in preliminary and final layout requirements, construction drawings.
- Consider requiring stormwater management plans and adding stormwater management facilities to list of off-site public facilities for which impact fees are required.

#### *Application checklists*

Some towns have a single checklist for both Subdivision and Site Plan Review applications. If the town desires to maintain separate ones, it would be worthwhile to review them carefully to see where consistency is and isn't appropriate. Numerous opportunities exist for adding checklist items to enhance protection of natural resources and important wildlife habitat during the development process. Review Regulations Checklist Template for ideas. Consider adopting pre-application checklist to facilitate protection of these resources.

**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 The Jordan Institute  
for the  
New Hampshire Fish & Game Department  
December 2007**

# **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

FSSWT (New Hampshire Forest Sustainability Standards Work Team) 1997. Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire. New Hampshire Division of Forests & Lands, DRED and Society for the Protection of New Hampshire Forests, Concord.

Gustafson, K.A. 2004. New Hampshire White-tailed Deer Assessment 2004. New Hampshire Fish & Game Department, Concord.

Halls, L.K., ed. 1984. White-tailed Deer: Ecology and Management. Stackpole Books, Harrisburg, PA.

Lavigne, G.R. 1999. White-tailed Deer Assessment and Strategic Plan 1997. Maine Department of Inland Fisheries and Wildlife, Augusta.

Reay, R.S., D.W. Blodgett, B.S. Burns, S.J. Weber, and T. Frey. 1990. Management Guide for Deer-Wintering Areas in Vermont. Vermont Department of Forests, Parks, & Recreation and Department of Fish & Wildlife, Montpelier, VT.

Tierson, W.C., G.F. Mattfeld, R.W. Sage, Jr., and D.F. Behrend. 1985. Seasonal movements and home ranges of white-tailed deer in the Adirondacks. *Journal of Wildlife Management* 49(3): 760-769.

U.S. Dept. of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of the Census. 2003. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation – New Hampshire. U.S. Government Printing Office, Washington, DC.

## **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**

Alexander, R.G., E.W. Boyer, R.A. Smith, G.E. Schwarz, and R.B. Moore. 2007. The role of headwater streams in downstream water quality. *Journal of the American Water Resources Association* 43: 41-59.

Bjorn, R.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pp. 83-138 in W.R. Meehan, ed. *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitat*. American Fisheries Society, Bethesda, MD.

Lowe, W.H., and D.T. Bolger. 2002. Local and landscape-scale predictors of salamander abundance in New Hampshire headwater streams. *Conservation Biology* 16:183-193.

Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire: Best Management Practices for the Handling of Agricultural Compost, Fertilizer, and Manure. New Hampshire Dept. of Agriculture, Markets, and Food, Concord, NH. 41pp.

Meyer, J.L., L.A. Kaplan, D. Newbold, C.J. Woltemade, J.B. Zedler, R. Beilfuss, Q. Carpenter, R. Semlitsch, M.C. Watzin, and P.H. Zedler. 2007a. *Where Rivers are Born: The Scientific Imperative for Defending Small Streams and Wetlands*. American Rivers and Sierra Club, Washington, D.C.

Meyer, J.L., D.L. Strayer, J.B. Wallace, S.L. Eggert, G.S. Helfman, and N.E. Leonard. 2007b.

The contribution of headwater streams to biodiversity in river networks. *Journal of the American Water Resources Association* 43: 86-103.

New Hampshire Forest Sustainability Standards Work Team. 1997. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. New Hampshire Division of Forests & Lands, DRED; and the Society for the Protection of New Hampshire Forests.

Waters, T.F. 1995. *Sediment in streams: sources, biological effects and control*. American Fisheries Society. Bethesda, MD.

## **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.

## References

Burns, R.M. and B.H. Honkala. 1990. *Silvics of North America, Volume 2, Hardwoods*. USDA Forest Service Agriculture Handbook 654, Washington, D.C.

Elowe, K. 1987. Factors affecting black bear reproductive success and cub survival in Massachusetts. Ph. D. Thesis, Univ. Massachusetts, Amherst. 71pp.

Gavin, D.G., and D.R. Peart. 1993. Effects of beech bark disease on the growth of American beech (*Fagus grandifolia*). *Canadian Journal of Forest Research* 23, 1566-1575) in E.F. Latty. 2004. Stand-level patterns and Ecosystem Consequences of Beech Bark Disease. Pages 36-42 in *Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium*, USDA Forest Service, Northeast Forest Experiment Station, Gen. Tech. Rep. NE-331.

Hammond, F.M. 2002. *Stratton Mountain Black Bear Study: The Effects of Resort and Residential Development on Black Bears in Vermont Final Report*. Vermont Agency of Natural Resources Department of Fish and Wildlife

- Houston, D.R. 2004. Beech Bark Disease: 1934 to 2004: What's new since Ehrlich? Keynote Address. Pages 2-13 in Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium, USDA Forest Service, Northeast Forest Experiment Station, Gen. Tech. Rep. NE-331.
- Houston, D.R., E.J. Parker, and D. Lonsdale. 1979. Beech bark disease: patterns of spread and development of the initiating agent *Cryptococcus fagisuga*. Canadian Journal of Forest Research 9, 336-344. in E.F. Latty. 2004. Stand-level patterns and Ecosystem Consequences of Beech Bark Disease. Pages 36-42 in Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium, USDA Forest Service, Northeast Forest Experiment Station, Gen. Tech. Rep. NE-331.
- Jakubas, W.J., C.R. McLaughlin, P.G. Jensen, and S.A. McNulty. 2004. Alternate year beechnut production and its influence on bear and marten populations. Pages 79-87 in Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium, USDA Forest Service, Northeast Forest Experiment Station, Gen. Tech. Rep. NE-331.
- Kolensosky, G.B., and S.M. Strathearn. 1987. Black bear. Pages 442-455 in M. Novak, J.A. Baker, M.E. Obbard, and B. Mollock, eds. Wild furbearer management and conservation in North America. Ont. Minist. Nat. Resour., Toronto, Can.
- Martin, A.C., H.S. Zim and A.L. Nelson. 1961. American wildlife and plants: a guide to wildlife food habits. Dover Publications., New York.
- Miller, T.O. 1975. Factors influencing black bear habitat selection of Cheat Mountain, West Virginia. M.S. Thesis. West Virginia University, Morgantown. 61pp.
- NutritionData. 2005. [www.nutritiondata.com/facts-001](http://www.nutritiondata.com/facts-001), 14 October 2005
- Pelton, M.R. 1980. Final report to Office of Surface Mining regarding potential impacts on black bears of mining on the Shavers Fork Basin, Monongahela National Forest, West Virginia. University of Tennessee, Knoxville. 36pp.
- \_\_\_\_\_. 2003. Black bear (*Ursus americanus*). Pages 547-555 in G.A. Feldhamer, B.C. Thompson, and J.A. Chapman, eds. Wild mammals of North America. John Hopkins University Press, Baltimore and London. 1368 pp.
- Schlarbaum, S.E., F. Hebard, P.C. Spaine, and J.C. Kamalay. 1997. Three American tragedies: chestnut blight, butternut canker, and Dutch elm disease. Pp. 45-54 in Britton, K.O., Ed. Proceedings of Exotic Pests of Eastern Forests, April 8-10 1997, Nashville, TN. Tennessee Exotic Pest Plant Council.
- Silver, H. 1957. A History of New Hampshire Game and Furbearers. NH Fish & Game Dept., Survey Report No. 6. Concord, NH. 466pp.
- Storer, A.J., J.N. Rosemeier, B.L. Beachy, and D.J. Flaspohler. Potential effects of beech bark disease and decline in beech abundance on birds and small mammals. Pages 72-78

in Beech Bark Disease: Proceedings of the Beech Bark Disease Symposium, USDA Forest Service, Northeast Forest Experiment Station, Gen. Tech. Rep. NE-331.

Timmins, A.A. 2004. New Hampshire Black Bear Assessment. New Hampshire Fish and Game Dept., Concord. 92pp.

## **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.

## References

- Anderson, L.T. 2000. *Planning the Built Environment*. Planners Press, American Planning Association, Chicago.
- Aylor, D.E. 1972. Noise reduction by vegetation and ground. *Journal of the Acoustic Society of America* 51(1): 197-205.
- Maine Forest Service. 2000. What do trees have to do with it? A Forestry Guide for Communities. Maine Forest Service, Department of Conservation, Augusta, ME.
- McPherson. E.G. 1994. Cooling Urban Heat islands with sustainable landscapes. Pp.151-171 in R.H. Platt, R.A. Rowntree, and P.C. Muick, *The Ecological City, Preserving and Restoring Urban Biodiversity*. University of Massachusetts Press, Amherst, MA.
- Moffat, A.S., M. Schiler, and the Staff of Green Living. 1994. *Energy-efficient and Environmental Landscaping*. Appropriate Solutions Press, South Newfane, VT.
- Nelson, W.R., Jr. 1975. Trees in the landscape; a look beyond the obvious. *Journal of Arboriculture* 1: 121-128.
- Nowak, D.J. 1994. Air pollution removal by Chicago's urban forest. Pp. 63-81 in E.G. McPherson, D.J. Nowak, and R.A. Rowntree, eds. *Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project*. General Technical Report NE-186, USDA Forest Service, Northeastern Forest Experiment Station , Radnor, PA.

Robinette, G.O. 1972. *Plants/People/and Environmental Quality*. USDI National Park Service, Washington, DC.

Simons, K., ed. 1996. Minnesota Supplement to the Guide for Plant Appraisal with Regional Tree Appraisal Factors. Minnesota Society of Arboriculture.

Smith, D. 1999. The case for greener cities. *American Forests* Autumn 1999:35 – 37.

## **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, reduce 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 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.

## **Technical References:**

Chase, V., L. Deming, and F. Latawiec. 1995. *Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities*. Audubon Society of New Hampshire, Concord, NH. 80pp.

DeGraaf, R.M., and D.D. Rudis. 1986. *New England Wildlife: Habitat, Natural History, and Distribution*. USDA Forest Service Gen. Tech. Rep. NE-108.

Foss, C.R. 1989. *Wetlands as Crucial Habitat for New Hampshire's Wildlife*. Audubon Society of New Hampshire, Concord. 3pp.

Montgomery, G.L. 1996. *Riparian Areas: Reservoirs of Diversity*. Natural Resource Conservation Service, Working Paper N. 13. Lincoln NB.

Porter, B.W. 1981. The wetland edge as a community and its value to wildlife. Pp. 15-25 *in* B. Richardson, ed. *Selected Proceedings on the Midwest Conference on Wetland Values and Management*. Freshwater Society, Nevarre, MN.

Stauffer, D.F., and L.B. Best. 1980. Habitat selection by birds of riparian communities: evaluating effects of habitat alterations. *Journal of Wildlife Management* 44:1-15.

Vannote, R.I., G.W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing. 1980. The river continuum concept. *Canadian Journal of Fisheries and Aquatic Sciences* 37:130-137.

## **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).

### **References**

- Berven, K.A. and T.A. Grudzien. 1990. Dispersal in the wood frog (*Rana sylvatica*): Implications for genetic population structure. *Evolution* 44: 2047-2056.
- Burton, T.M. and G. E. Likens. 1975. Energy flow and nutrient cycling in salamander populations in the Hubbard Brook Experimental Forest, New Hampshire. *Ecology* 56:1068-1080.
- Calhoun, A.J.K. and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.
- Calhoun, A.J.K. and P. deMaynadier. 2004. Forestry habitat management guidelines for vernal pool wildlife. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.
- Colburn, E. A. Vernal pools: natural history and conservation. The MacDonald & Woodward Publishing Co., Blacksburg, VA. 426pp.
- Crossland, M.R. 1998. The effect of tadpole size on predation success and tadpole survival. *Journal of Herpetology* 32:443-446.
- deMaynadier, P.G. and M.L. Hunter, Jr. 1995. The relationship between forest management and amphibian ecology: A review of the North American literature. *Environmental Reviews* 3: 230-261.
- deMaynadier, P.G. and M.L. Hunter, Jr. 1999. Forest canopy closure and juvenile emigration by pool-breeding amphibians in Maine. *Journal of Wildlife Management* 63:441-450.
- DiMauro, D. and M.L. Hunter, Jr. 2002. Reproduction of amphibians in natural and anthropogenic temporary pools in managed forests. *Forest Science* 48:397-406.
- Duellman, W.E. and L. Trueb. 1986. *Biology of amphibians*. McGraw-Hill, New York.
- Faccio, S.D. 2003. Postbreeding emigration and habitat use by Jefferson and spotted salamanders in Vermont. *Journal of Herpetology* 37(3): 479-489.
- FSSWT (New Hampshire Forest Sustainability Standards Work Team) 1997. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. New Hampshire Division of Forests & Lands, DRED and Society for the Protection of New Hampshire Forests, Concord.
- Gibbs, J.P. 1993. Importance of small wetlands for the persistence of local populations of wetland-associated animals. *Wetlands* 13:25-31.

- Gibbs, J.P. 1998. Amphibian movements in response to forest edges, roads, and streambeds in southern New England. *Journal of Wildlife Management* 62:584-589.
- DiMauro, D. and M.L. Hunter, Jr. 2002. Reproduction of amphibians in natural and anthropogenic temporary pools in managed forests. *Forest Science* 48:397-406.
- Henrikson, B.I. 1990. Predation on amphibian eggs and tadpoles by common predators in acidified lakes. *Holarctic Ecology* 13:201-206.
- Kats, L.B., J.W. Petranka, and A. Sih. 1988. Anti-predator defenses and the persistence of amphibian larvae with fishes. *Ecology* 69:1865-1870.
- Lehtinen, R.M., S.M. Galatowitsch, and J.R. Tester. 1999. Consequences of habitat loss and fragmentation for wetland amphibian assemblages. *Wetlands* 19:1-12.
- Petranka, J.W. 1998. Predation by tadpoles of *Rana sylvatica* on embryos of *Ambystoma maculatum*: Implications of ecological role reversals by *Rana* (predator) and *Ambystoma* (prey). *Herpetologica* 54: 1-12.
- Semlitsch, R.D. 1981. Terrestrial activity and summer home range of the mole salamander, *Ambystoma talpoideum*. *Canadian Journal of Zoology* 59: 315-322.
- Wyman, R.L. 1998. Experimental assessment of salamanders as predators of detrital food webs: Effects on invertebrates, decomposition and the carbon cycle. *Biodiversity and Conservation* 7:641-650.

## **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.

### **References**

DeGraaf, R.M. and D. D. Rudis. 1987. New England Wildlife: Habitat, Natural History, and Distribution. USDA Forest Service, Northeastern Forest Experiment Station, General Technical Report NE-108.

Nelson, B.B., and K. Titus. 1988. "Silvicultural practices and raptor habitat associations in the Northeast." Pages 171-179 in Pendleton, B.G., M.N. LeFranc, Jr., M.B. Moss, eds. Proceedings of the northeast raptor management symposium and workshop; 1988, May 16-18, Syracuse, N.Y. Scientific and Technical Series No. 13, Institute for Wildlife Research, National Wildlife Federation, Washington, DC.

Simpson, M.B., Jr. 1972. The saw-whet owl population of North Carolina's southern Great Balsam Mountains. *Chat* 36: 39-47.

Speiser, R., and T. Bosakowski. 1987. Nest site selection in northern goshawks in northern New Jersey and southeastern New York. *Condor* 89:387-394.

Thomas, J.W., R. Anderson, C. Maser, E. Bull. 1979. Snags. In Thomas, J.W., ed. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Handbook 553, U.S. Dept. of Agriculture, Washington, D.C. 512pp.

## **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.

## **References**

Elowe, K.D. 1984. Home Range, Movements, and Habitat Preferences of Black Bear (*Ursus americanus*) in Western Massachusetts. M.S. Thesis. University of Massachusetts, Amherst.

Mitsch, W.J., and J.G. Gosselink. 1986. Wetlands. Van Nostrand Reinhold Co., NY.



**Checklist Items**  
**for Subdivision and Site Plan Review Applications**  
**Pertinent to Protection of Natural Resources and Wildlife Habitat**

**Prepared by**  
**New Hampshire Audubon and The Jordan Institute**  
  
**for the**  
**New Hampshire Fish & Game Department**  
  
**December 2007**

## **Checklists for Subdivision and Site Plan Review Regulations**

### **Introduction**

Many municipalities use checklists to facilitate review of Subdivision and Site Plan Review applications. In some, but not all communities the checklist must be completed and submitted with the application. The checklists itemize information that is required for an application.

Checklists typically are organized into a number of sections, one of which addresses current characteristics and conditions of the proposed development site. Information in this section could inform pre-application discussions regarding a site's natural resource and habitat values and how best to protect them in the development design. Information in other sections, such as grading plans, subdivision plats, street and road plans, and utility plans, would become available when the application was complete.

This document provides a list of potential topics pertaining to natural resources and wildlife habitat that could be added to Site Plan Review and Subdivision pre-application and application checklists to ensure their consideration in development plans.

## **Checklist Items for Subdivision and Site Plan Review Applications Pertinent to Protection of Natural Resources and Wildlife Habitat**

### **Agriculture**

#### **Pre-application checklist**

- Active or recently active agricultural lands

Soils categorized as Prime farmland, Farmland of statewide importance, or Farmland of local importance

#### **Application checklist**

- Protected agricultural lands

### **Energy Efficiency**

#### **Application checklist**

- Note regarding proposed building performance standards (e.g., Energy Star, LEED, 2030 Challenge)
- Road layout
- Building orientation

### **Erosion Control**

#### **Application checklist**

- 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
- Design calculations for stormwater detention/retention facilities
- Design calculations for drainage improvements
- Drainage calculations, pre- and post-construction

### **Floodplains**

#### **Pre-application checklist**

- Soils subject to frequent or occasional flooding
- Lands below the 1% flood frequency (100-year flood) elevation

### **Forestry**

#### **Pre-application checklist**

- Contiguous forest area exceeding 50 acres pre- and post-development
- Access to post-development forest

## Forests

### Pre-application checklist

- Size class and species composition of current forest cover
- Contiguous forest area

## Green Infrastructure

### Pre-application checklist

- Existing vegetation
- Existing hydrologic features

### Application checklist

- Natural vegetation features to be retained
- Landscaping detail
- Swales detail
- Open space to be maintained
- Wetland buffers to be maintained

## Groundwater

### Pre-application checklist

- Favorable gravel well analysis

## Impervious Surfaces

### Application checklist

- Curbing detail
- Driveway detail
- Sidewalk detail
- Road layout
- Pavement widths

## Landscaping

### Pre-application checklist

- Existing vegetation

### Application checklist

- Natural vegetation features to be retained
- Landscaping detail
- Swales detail

## Light Pollution

### Application checklist

- Outdoor lighting fixtures and locations

## Natural Hazards

### Pre-application checklist

- Soils subject to frequent or occasional flooding
- Lands below the 1% flood frequency (100-year flood) elevation
- Excessively drained soils

Application checklist

- Driveway length
- Fire protection plan

Natural Services Network

Pre-application checklist

- Location with respect to Natural Services Network
- Underlying components of the Natural Services Network

Natural Vegetation

Pre-application checklist

- Existing vegetation

Application checklist

- Natural vegetation features to be retained

Ridgelines

Pre-application checklist

- Mapped ridgelines

Shorelands and Surface Waters

Pre-application checklist

- Hydrologic features

Application checklist

- Vegetated buffers detail

Steep Slopes

Pre-application checklist

- Slopes in excess of 15(20)(25)(30) %

Stormwater

Pre-application checklist

- Existing drainage patterns on and adjacent to site

Application checklist

- Culvert crossings
- Drainage culvert trench detail
- Drainage structures
- Erosion and sedimentation control devices
- 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

#### Terrain Alteration

##### Pre-application checklist

- Existing topography (two foot contour interval)

##### Application checklist

- Post-construction topography
- Cut and fill volumes

#### Urban Growth Boundary

##### Pre-application checklist

- Location with respect to Urban Growth Boundary

#### Watersheds

##### Pre-application checklist

- Location within HUC 12 watershed

#### Wetlands

##### Pre-application checklist

- Soils classified as poorly or very poorly drained
- Soils subject to frequent or occasional ponding
- Soils classified as hydric

##### Application checklist

- Vegetated buffers detail

#### Wildlife Habitat

##### Pre-application checklist

- Existing habitat types (per NHFG Wildlife Action Plan)
- Deer wintering areas
- Vernal pools
- Wetlands
- Surface waters
- Headwater streams
- Mast stands
- Location relative to Highest Ranking Habitat by Ecological Condition for State and Biological Regions
- Location relative to NHFG Conservation Focus Areas

##### Application checklist

- Habitat areas to be protected

**Addressing Wildlife Habitat and Natural Resource Protection**  
**In Municipal Land Use Documents:**  
**Ideas for New Hampshire Municipalities**

**Prepared by**  
**New Hampshire Audubon and The Jordan Institute**  
**for the**  
**New Hampshire Fish & Game Department**

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## **Municipal Land Use Documents**

Land use regulations provide New Hampshire municipalities with a number of tools for natural resource and wildlife habitat protection. New Hampshire land use law designates the Master Plan as the basis for all municipal land use regulations. The Master Plan must identify important resources and issues and articulate policies to address them. Towns may then enact ordinances, regulations, and codes to implement the policies. We have identified 25 topics that New Hampshire towns might consider addressing in their land use documents in order to protect their community's natural resources and rural character. Some topics are interrelated and provide alternate strategies for protecting a given resource or addressing a particular problem, such as sprawl.

This document provides information to help towns consider the benefits and begin to draft policies regarding each of the 25 topics. Information on each topic includes a brief description, a discussion of potential treatment in a Master Plan, where to find a sample zoning ordinance and, in some cases, sample subdivision and site plan review regulations, and where appropriate, sample application checklist items. These documents are intended to provide municipal Planning Boards with ideas for possible revisions of land use planning documents. Legal review of proposed revisions is always advisable.

## **Agriculture**

Agriculture is an important component of New Hampshire's economy and environment, and makes vital contributions to the State's food supply. 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.

### **Master Plan**

In order to enact ordinances and regulations designed to promote agriculture, a municipality must address this topic in the Master Plan with a description of agriculture's role in the community and inclusion of pertinent goal or objective statements. Economic Development, Land Use, and Natural Resources chapters of a Master Plan all provide opportunities to discuss the role of agriculture in the community. Sample Master Plan goals/objectives pertaining to agriculture include:

- Promote the protection of remaining agricultural lands within the Town.
- 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 Town.

### **Zoning Ordinance**

In order to enact regulations designed to promote agriculture, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include maintaining rural character may provide justification for regulations pertaining to agriculture. The "Agricultural Incentive Zoning" chapter of *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. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

The "Agricultural Incentive Zoning" chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model performance standards for agricultural zones.

Sample application checklist items pertaining to agriculture include:

#### **Pre-application checklist**

- Active or recently active agricultural lands
- Soils categorized as Prime farmland, Farmland of statewide importance, or Farmland of local importance

#### **Application checklist**

- Protected agricultural lands

## 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.

### Master Plan

In order to enact ordinances and regulations designed to promote energy efficiency, a municipality must address this topic in the Master Plan and include goal or objective statements. Community Facilities, Economic Development and Land Use chapters of a Master Plan provide opportunities to discuss a community's desire to encourage energy efficiency. Sample Master Plan goals/objectives pertaining to energy efficiency include:

- Review and revise local ordinances, regulations, and codes to promote energy efficient design of neighborhoods and buildings.
- Improve the energy efficiency of schools and municipal buildings.
- Encourage landscaping designs that reduce heating and cooling costs.
- Assess currently available bicycle and pedestrian opportunities within the Town, including access to local facilities and businesses as well as recreational opportunities.
- Develop and implement a bicycle and pedestrian plan for the Town.

### Zoning Ordinance

In order to enact regulations designed to promote energy efficiency, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, protecting property values, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to energy efficiency. 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. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

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.

Sample application checklist items pertaining to energy efficiency include:

#### Application checklist

- Proposed building performance standards (e.g., Energy Star, LEED, 2030 Challenge)
- Road layout
- Building orientation

**Building Codes**

The “Energy Efficient Development” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model construction standards for building codes that address energy efficiency.

## **Erosion Control**

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. Erosion control benefits wildlife by preventing degradation of upland and aquatic habitats.

### **Master Plan**

In order to enact ordinances and regulations designed to promote erosion control, a municipality must address this topic in the Master Plan and include goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of erosion control to the community. Sample Master Plan goals/objectives pertaining to erosion control include:

- Review and revise local policies and regulations to minimize erosion during construction activities.
- Review and revise local policies and regulations to ensure that future development will minimize erosion potential.
- Review and revise local ordinances to ensure that all subdivision and site plan proposals minimize erosion potential.

### **Zoning Ordinance**

In order to enact regulations designed to promote erosion control, a municipality should include language in the zoning ordinance that authorizes the adoption of stormwater regulations during construction based on NH RSA 674:16 (Grant of Power), RSA 674:17 (Purposes of Zoning Ordinance), and RSA 674:21 (Innovative Land Use Controls, Environmental Characteristics).

### **Subdivision and Site Plan Review Regulations**

The “Erosion and Sediment Control During Construction” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model subdivision and site plan regulations to address erosion control, including design standards and construction practices.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

Sample application checklist items pertaining to erosion control include:

#### Application checklist

- 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
- Design calculations for detention/retention facilities

- Design calculations for drainage improvements
- Drainage calculations, pre- and post-construction

## **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. Development in floodplains may result 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.

### **Master Plan**

In order to enact ordinances and regulations designed to protect floodplains, a municipality must address this topic in the Master Plan, with a discussion of floodplain locations and extent and inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of protecting floodplains in the community. Sample Master Plan goals/objectives pertaining to floodplains include:

- Identify local priorities for open space protection that include floodplains.
- Adopt a floodplain overlay district.
- Create a comprehensive map of floodplains within the Town, including floodplains of low order streams.

### **Zoning Ordinance**

In order to enact regulations designed to protect floodplains, a municipality should include provisions for floodplain protection in the zoning ordinance. The Lyme, NH zoning ordinance includes a Flood Prone Area Conservation District (Article 3.27.5), which provides one model for addressing this issue ([www.lymenh.gov/Public\\_Documents/LymeNH\\_Regs/regs/ZoneOrd.doc](http://www.lymenh.gov/Public_Documents/LymeNH_Regs/regs/ZoneOrd.doc)). The Concord, NH zoning ordinance includes a Flood Hazard Overlay District (chapter 28, Article 28-3-2), which provides another approach (<http://www.municode.com/RESOURCES/gateway.asp?PID=10210&SID=29>).

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to floodplains include:

#### **Pre-application checklist**

- Soils subject to frequent or occasional flooding
- Lands below the 1% flood frequency (100-year flood) elevation

#### **Application checklist**

- Stormwater management plan

## **Forestry**

Forestry is a significant component of New Hampshire's economy, providing fuel, fiber, and solid wood products to state, regional, national, and international markets. 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.

### **Master Plan**

In order to enact ordinances and regulations designed to promote forestry, a municipality must address this topic in the Master Plan with a description of forestry's role in the community and inclusion of pertinent goal or objective statements. Economic Development, Land Use, and Natural Resources chapters of a Master Plan all provide opportunities to discuss the role of forestry in the community. Sample Master Plan goals/objectives pertaining to forestry include:

- Identify local priorities for open space protection that include large blocks of contiguous forest land.
- Acquire and manage town forests to provide forest products and recreational opportunities.
- Promote the protection of remaining large blocks of contiguous forest land within the Town.
- 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.

### **Zoning Ordinance**

In order to enact regulations designed to promote forestry, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. New Hampshire law includes forestry in the definition of agriculture (NH RSA 21:34-a).

Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for regulations pertaining to forestry. The Lyme, NH zoning ordinance includes a Mountain and Forest Conservation District, which could provide a model for other municipalities to adapt.

([www.lymenh.gov/Public\\_Documents/LymeNH\\_Regs/regs/ZoneOrd.doc](http://www.lymenh.gov/Public_Documents/LymeNH_Regs/regs/ZoneOrd.doc))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to forestry include:

Pre-application checklist

- Contiguous forest area exceeding 50 acres pre- and post-development

Application checklist

- Access to post-development forest lands



## **Forests**

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. Forests provide essential habitat for the majority of New Hampshire's wildlife species.

### **Master Plan**

In order to enact ordinances and regulations designed to protect forests, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a master plan provide opportunities to discuss the importance of forests to the community. Sample master plan goals/objectives pertaining to forests include:

- 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.

### **Zoning Ordinance**

In order to enact regulations pertaining to forests, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for regulations pertaining to forests. The Lyme, NH zoning ordinance includes a Mountain and Forest Conservation District, which could provide a model for other municipalities to adapt.

([www.lymenh.gov/Public\\_Documents/LymeNH\\_Regs/regs/ZoneOrd.doc](http://www.lymenh.gov/Public_Documents/LymeNH_Regs/regs/ZoneOrd.doc))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to forests include:

Pre-application checklist

- Size class and species composition of current forest cover
- Contiguous forest area

Application checklist

- Forest area maintained as open space

## **Greenfield Development**

Greenfield development refers to conversion of agricultural or forest land to developed uses. Such development contributes to sprawl and loss of rural character, and results in loss, fragmentation, and degradation of wildlife habitat. Regulation of greenfield development can minimize its impacts on important natural resource values.

### **Master Plan**

In order to enact ordinances and regulations designed to regulate greenfield development, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Economic Development, Land Use, and Natural Resources chapters of a Master Plan all provide opportunities to discuss policies regarding greenfield development in the community. Sample Master Plan goals/objectives pertaining to greenfield development include:

- Create and adopt performance standards for greenfield development.
- Develop and adopt standards for open space protection in greenfield developments.
- Develop and implement policies to protect important natural resources in greenfield developments.

### **Zoning Ordinance**

In order to enact regulations pertaining to greenfield development, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for regulations pertaining to greenfield development. Towns may elect to require cluster or conservation subdivisions in rural zoning districts or outside their urban growth boundary, with conventional, frontage-based subdivisions allowed by special exception. (See the Concord, NH Zoning Ordinance for an example.)

### **Subdivision and Site Plan Review Regulations**

Most of the sample application checklist items in this document are relevant to greenfield development.

## **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. At a local scale, the presence of green infrastructure enhances human quality of life, contributes to property values, and provides wildlife habitat.

### **Master Plan**

In order to enact ordinances and regulations designed to protect green infrastructure, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements.

Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of green infrastructure to the community. The New Hampshire Natural Services Network can help inform a green infrastructure plan (see Natural Services Network in this document). Sample Master Plan goals/objectives pertaining to green infrastructure include:

- Develop and adopt a green infrastructure plan for the Town.
- Identify and map critical green infrastructure within the Town.
- Review and revise local policies and regulations to support protection of critical green infrastructure.

### **Zoning Ordinance**

In order to enact regulations pertaining to green infrastructure, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for regulations pertaining to green infrastructure.

Sample ordinance purposes pertaining to green infrastructure include:

- Maintain the Town's green infrastructure for future generations;
- Protect and maintain a green infrastructure network within the Town;
- Protect green infrastructure within the Town to maintain essential ecological services.

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to green infrastructure include:

#### **Pre-application checklist**

- Existing vegetation
- Existing hydrologic features
- Location with respect to Natural Services Network
- Underlying components of Natural Services Network
- Location with respect to town green infrastructure plan

#### **Application checklist**

- Natural vegetation features to be retained
- Landscaping detail

- Swales detail
- Open space to be retained

## 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. Groundwater is important to wildlife as the source of springs and seeps which provide water in upland areas and feed surface waters and wetlands.

### Master Plan

In order to enact ordinances and regulations designed to protect groundwater, a municipality must address this topic in the Master Plan with a description of the community's groundwater resources and inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of groundwater to the community. Sample Master Plan goals/objectives pertaining to groundwater include:

- Develop/maintain/implement a wellhead protection plan.
- Adopt an aquifer protection ordinance to ensure adequate recharge and prevent contamination of important aquifers.
- Review and revise the Town's aquifer protection regulations based on the State's most recent stratified drift aquifer maps.
- Develop a groundwater quality map for the town.
- Work with adjacent towns to protect shared aquifers.

### Zoning Ordinance

In order to enact regulations designed to protect groundwater, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to groundwater. The NH Department of Environmental Services has published a Model Groundwater Protection Ordinance ([www.des.nh.gov/DWSPP/pdf/ModelOrdinance.pdf](http://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. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to groundwater include:

- Pre-application checklist
  - Favorable gravel well analysis

## **Growth Management**

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.

### **Master Plan**

In order to enact ordinances and regulations designed to implement growth management, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Economic Development, Land Use, and Natural Resources chapters of a Master Plan provide opportunities to discuss growth management. Sample Master Plan goals/objectives pertaining to growth management include:

- Explore the desirability of adopting growth management practices such as urban growth boundaries, village districts, or natural resource overlay districts.
- 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.

### **Zoning Ordinance**

In order to enact regulations pertaining to growth management, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. The “Growth Management,” “Urban Growth Boundary and Urban Service District,” “Village Plan Alternative,” “Feature-based Density,” “Lot Size Averaging – One Size Does Not Fit All,” chapters of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provide model language for zoning ordinance articles that address growth management and information about existing growth management ordinances in New Hampshire. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Pertinent application checklist items will depend on the particular growth management strategies adopted. Refer to the Greenfield Development, Green Infrastructure, Sprawl, Urban Growth Boundary, and Village District sections of this document and the *Innovative Land Use Planning Techniques* chapters listed above for ideas. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

## 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 which are detrimental to both humans and wildlife. Impervious surfaces also contribute to heat island effects and reduce air quality.

### Master Plan

In order to enact ordinances and regulations designed to minimize impervious surfaces, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Economic Development, Land Use, and Transportation chapters of a Master Plan provide opportunities to discuss policies regarding impervious surfaces in the community. Sample Master Plan goals/objectives pertaining to impervious surfaces include:

- Encourage appropriate road sizes within subdivisions that minimize paving while ensuring adequate and safe access for emergency response vehicles.
- Review and revise local policies and regulations to minimize impervious surfaces.

### Zoning Ordinance

In order to enact regulations pertaining to impervious surfaces, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to impervious surfaces. The “Permanent (Post-construction) Stormwater Management” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses impervious surfaces in the context of stormwater management and includes information about existing stormwater management ordinances in New Hampshire.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to impervious surfaces include:

#### Application checklist

- Curbing detail
- Driveway detail
- Sidewalk detail
- Road layout
- Pavement widths

## Landscaping

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. Landscaping benefits wildlife by providing backyard habitat.

### Master Plan

In order to enact ordinances and regulations pertaining to landscaping, a municipality must address this topic in the Master Plan with goal or objective statements. Economic Development, Land Use, and Natural Resources chapters of a Master Plan all provide opportunities to discuss the importance of landscaping in the community. Sample Master Plan goals/objectives pertaining to landscaping include:

- 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

In order to enact regulations pertaining to landscaping, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include maintaining rural character and protecting property values may provide justification for regulations pertaining to landscaping. The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses landscaping and information about existing landscaping ordinances in New Hampshire. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for subdivision and site plan review regulations pertaining to landscaping. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

Sample application checklist items pertaining to landscaping include:

Pre-application checklist

- Existing vegetation

Application checklist

- Natural vegetation features to be retained
- Landscaping detail
- Swales detail



## **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.

### **Master Plan**

In order to enact ordinances and regulations designed to prevent light pollution, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Community Facilities, Economic Development, Housing, Land Use, Natural Resources, and Transportation chapters of a Master Plan all provide opportunities to discuss desired policies toward light pollution in the community. Sample Master Plan goals/objectives pertaining to light pollution and dark sky preservation include:

- 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**

In order to enact regulations designed to control light pollution, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include maintaining rural character, protecting property values, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to lighting. The New England Light Pollution Advisory Group (NELPAG) provides model language for an outdoor lighting ordinance to address light pollution, based on successful ordinances in Kennebunkport, ME and Tucson, AZ. ([www.cfa.harvard.edu/nelpag/ordbylaw.html](http://www.cfa.harvard.edu/nelpag/ordbylaw.html))

### **Subdivision and Site Plan Review Regulations**

The International Dark Sky Association provides simple guidelines that could serve as design standards in subdivision and site plan regulations.

([www.darksky.org/programs/simple-guidelines-for-lighting-ordinances.php](http://www.darksky.org/programs/simple-guidelines-for-lighting-ordinances.php))

Sample application checklist items pertaining to light pollution include:

Application checklist

- Outdoor lighting fixtures and locations

## **Natural Hazards**

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.

Increased weight (from new buildings) above a steep slope, increased water within the soils of a steep slope (from precipitation or leach fields), vibration of soils on a steep slope (from construction or traffic), and undercutting at the foot of a steep slope all can trigger slope failure. Climate change may alter the frequency of all 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.

### **Master Plan**

In order to enact ordinances and regulations designed to address natural hazards, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements and a discussion of the types and locations of natural hazards within the Town. The Land Use chapter of a Master Plan provides an opportunity to discuss natural hazards in the community. Sample Master Plan goals/objectives pertaining to natural hazards include:

- Create a map of natural hazards in the Town.
- Review and revise local policies and regulations to minimize development in areas vulnerable to natural hazards.
- Review and revise local policies and regulations to minimize structure vulnerability to forest fires.
- Review and revise local policies to ensure that development does not increase risks from natural hazards.

### **Zoning Ordinance**

In order to enact regulations pertaining to natural hazards, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations.

Purposes of a Zoning Ordinance that include protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to natural hazards. Many New Hampshire towns use a Floodplain Development Ordinance or a Flood Hazard Overlay District (e.g., [www.lymenh.gov/Public\\_Documents/LymeNH\\_Regs/regs/ZoneOrd.doc](http://www.lymenh.gov/Public_Documents/LymeNH_Regs/regs/ZoneOrd.doc); [www.ci.concord.nh.us/codeadmin/ZoningInfo](http://www.ci.concord.nh.us/codeadmin/ZoningInfo)) to address flood hazards.

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to natural hazards include:

Pre-application checklist

- Soils subject to frequent or occasional flooding
- Lands below the 1% flood frequency (100-year flood) elevation
- Excessively drained soils
- Slopes exceeding 15%

Application checklist

- Driveway length
- Fire protection plan
- Post-construction topography
- Cut and fill volumes
- Slope stabilization measures if appropriate

## Natural Services Network

The New Hampshire Natural Services Network 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 lands, 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 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 eco-regional priority identified by the NH Fish & Game Department Wildlife Action Plan.

### Master Plan

In order to enact ordinances and regulations designed to address natural hazards, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements and a discussion of the composition and extent of natural services network lands within the Town. The Land Use and Natural Resources chapters of a master plan provide opportunities to discuss the importance of a natural services network to the community. Sample master plan goals/objectives pertaining to natural services networks include:

- Maintain a natural services network map for the Town.
- Adopt regulations and policies to protect the Town's natural services network.
- Review and revise the Town'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

In order to enact regulations pertaining to the Natural Services Network, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to the Natural Services Network. Towns might use conservation overlay districts to address individual components of the natural services network or the network as a whole.

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to the Natural Services Network include:

Pre-application checklist

- Location with respect to Natural Services Network
- Underlying components of the Natural Services Network

Application checklist

- Provisions for protecting/maintaining key ecological services

## Natural Vegetation

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. Natural vegetation provides higher wildlife habitat value than new plantings.

### Master Plan

In order to enact ordinances and regulations pertaining to natural vegetation, a municipality must address this topic in the Master Plan with goal or objective statements. The Land Use, Housing, Community Facilities, and Economic Development chapters of a Master Plan all provide opportunities to discuss the importance of natural vegetation in the community. Sample Master Plan goals/objectives pertaining to natural vegetation include:

- 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 protection of natural vegetation during construction activities.

### Zoning Ordinance

In order to enact regulations pertaining to natural vegetation, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to natural vegetation. The “Landscaping” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses landscaping and information about existing landscaping ordinances in New Hampshire. This model ordinance includes a Special Provision that calls for minimizing site disturbance and retaining existing vegetation whenever possible. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to include:

Pre-application checklist

- Existing vegetation

Application checklist

- Natural vegetation features to be retained

## **Ridgelines**

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.

### **Master Plan**

In order to enact ordinances and regulations designed to protect ridgelines, a municipality must address this topic in the Master Plan with a discussion of the locations and extent of ridgelines in the community and inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of protecting ridgelines in the community. Sample Master Plan goals/objectives pertaining to ridgelines include:

- Identify local priorities for open space protection that include undisturbed ridgelines.
- Protect downstream areas from excessive flooding and degraded water quality by restricting ridgeline development.
- Protect scenic resources by restricting ridgeline development.

### **Zoning Ordinance**

In order to enact regulations designed to promote energy efficiency, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to

The “Steep Slope and Ridgeline Protection” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides a model ordinance for ridgeline protection and information about existing ridgeline protection ordinances in New Hampshire. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to ridgelines include:

- Pre-application checklist
  - Mapped ridgelines

## 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.

### Master Plan

In order to enact ordinances and regulations designed to protect shorelands, surface waters, and wetlands, a municipality must address this topic in the Master Plan with a discussion of the locations of these resources in the community and inclusion of pertinent goal or objective statements. As these features are also protected by state and federal laws, towns may elect to provide more stringent protections. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of protecting shorelands, surface waters, and wetlands in the community. Sample Master Plan goals/objectives pertaining directly to shorelands, surface waters, and wetlands include:

- Protect the Town's water resources.
- Protect the Town's natural resources, including water, agricultural, forest, wildlife, and geologic resources.

See also the Erosion, Steep Slopes, and Stormwater Runoff sections of this document.

### Zoning Ordinance

In order to enact regulations pertaining to landscaping, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to

The "Shoreland Protection" chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that addresses shorelands, surface waters, and wetlands and information about existing shoreland protection ordinances in New Hampshire.

[www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth)

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to shorelands, surface waters and wetlands include:

Pre-application checklist

- Hydrologic features

Application checklist

- Vegetated buffers detail
- Stormwater management plan



## **Sprawl**

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.

### **Master Plan**

In order to enact ordinances and regulations designed to prevent sprawl, a municipality must address this topic in the Master Plan with goal or objective statements. Economic Development and Land Use chapters of a Master Plan provide opportunities to discuss the importance of limiting sprawl in the community. Sample Master Plan goals/objectives pertaining to sprawl include:

- Review and revise zoning ordinances to ensure that they do not inadvertently encourage sprawl.
- Adopt innovative land use techniques to avoid sprawl.

### **Zoning Ordinance**

In order to enact regulations to prevent sprawl, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to sprawl. The “Growth Management,” “Urban Growth Boundary and Urban Service District,” “Village Plan Alternative,” “Feature-based Density,” “Lot Size Averaging – One Size Does Not Fit All,” chapters of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provide model language for zoning ordinance articles that address sprawl and information about pertinent existing ordinances in New Hampshire.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Pertinent application checklist items will depend on the particular growth management strategies adopted. Refer to the Greenfield Development, Green Infrastructure, Sprawl, Urban Growth Boundary, and Village District sections of this document and the *Innovative Land Use Planning Techniques* chapters listed above for ideas.

## Steep Slopes

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. Protection of steep slopes benefits wildlife by preventing habitat degradation of uplands, wetlands, and surface waters.

### Master Plan

In order to enact ordinances and regulations designed to protect steep slopes, a municipality must address this topic in the Master Plan with a discussion of the location and extent of steep slopes in the community and inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of protecting steep slopes in the community.

Sample Master Plan goals/objectives pertaining to steep slopes include:

- Review and revise local policies and regulations to ensure protection of steep slopes.
- Protect water quality by regulating development on steep slopes.

### Zoning Ordinance

In order to enact regulations designed to protect steep slopes, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to steep slopes.

The “Steep Slope and Ridgeline Protection” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides a model ordinance for steep slope protection and information about existing steep slope ordinances in New Hampshire.

[www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth)

### Subdivision and Site Plan Review Regulations

Sample application checklist items pertaining to steep slopes include:

Pre-application checklist

- Slopes in excess of 15%

## **Stormwater Runoff**

Stormwater runoff refers to precipitation that cannot soak into the ground and subsequently ponds or flows over the earth's surface. Runoff can cause land erosion, water pollution, and flooding, damaging public and private property and degrading water quality and wildlife habitat.

### **Master Plan**

In order to enact ordinances and regulations designed to control stormwater runoff, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of stormwater management to the community. Sample Master Plan goals/objectives pertaining to stormwater management include:

- Review and revise local policies and regulations to minimize stormwater runoff from developed lands.
- Review and revise local policies and regulations to ensure that future development will minimize stormwater runoff.
- Review and revise local ordinances to ensure that all subdivision and site plan proposals minimize stormwater runoff.

### **Zoning Ordinance**

In order to enact regulations pertaining to landscaping, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to stormwater management. The "Permanent (Post-construction) Stormwater Management" chapter of *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. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to stormwater include:

#### **Pre-application checklist**

- Existing drainage patterns on and adjacent to site

#### **Application checklist**

- Culvert crossings
- Application of Low Impact Development practices
- Drainage structures
- Erosion and sedimentation control devices
- Stormwater basin detail
- Swales detail
- Underdrain detail
- Design calculations for detention/retention facilities
- Design calculations for drainage improvements

- Drainage calculations, pre- and post-construction

## **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.

### **Master Plan**

In order to enact ordinances and regulations designed to limit terrain alteration, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the desired policies regarding terrain alteration to the community.

Sample Master Plan goals/objectives pertaining to terrain alteration include:

- Encourage development that is sensitive to the natural environment.
- 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**

In order to enact regulations pertaining to terrain alteration, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations.

Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, and preventing damage to the environment or adverse environmental impacts

may provide justification for regulations pertaining to terrain alteration.

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to terrain alteration include:

Pre-application checklist

- Existing topography (two foot contour interval)

Application checklist

- Post-construction topography
- Cut and fill volumes

## **Urban Growth Boundary**

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.

### **Master Plan**

In order to adopt an urban growth boundary, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Economic Development and Land Use chapters of a Master Plan provide opportunities to discuss the role of an urban growth boundary in the community. Sample Master Plan goals/objectives pertaining to urban growth boundaries include:

- Adopt an urban growth boundary to concentrate development and prevent sprawl.

### **Zoning Ordinance**

In order to enact regulations pertaining to urban growth boundaries, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for adopting an urban growth boundary. The “Urban Growth Boundary and Urban Service District” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that creates an urban growth boundary and information about pertinent existing ordinances in New Hampshire. ([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to urban growth boundaries include:

Pre-application checklist

- Location with respect to Urban Growth Boundary

## **Village District**

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.

### **Master Plan**

In order to create a village district, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Economic Development and Land Use chapters of a Master Plan provide opportunities to discuss the role of one or more village districts in the community. Sample Master Plan goals/objectives pertaining to village districts include:

- Create a (or several) village district(s) to concentrate development and prevent sprawl.

### **Zoning Ordinance**

In order to enact regulations pertaining to a village district, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations.

Purposes of a Zoning Ordinance that include conserving natural resources and maintaining rural character may provide justification for adopting one or more village districts. The “Urban Growth Boundary and Urban Service District” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a zoning ordinance article that creates an urban growth boundary and information about pertinent existing ordinances in New Hampshire. Information in this chapter could be adapted to create a “village growth boundary” in smaller communities. The “Village Plan Alternative Subdivision” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for a Village Plan Alternative Subdivision zoning ordinance and information about considerations for its application in New Hampshire. This chapter addresses creation of new village centers.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

Sample application checklist items pertaining to village districts include:

Pre-application checklist

- Location with respect to Village District

## **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.

### **Master Plan**

In order to adopt policies pertaining to watersheds, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the relationships of watersheds to the community. Sample Master Plan goals/objectives pertaining to watersheds include:

- Review and revise zoning ordinances to consider the position of land within its watershed.
- Adopt land use policies that manage cumulative impacts of land use within a watershed.

### **Zoning Ordinance**

In order to enact regulations pertaining to landscaping, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations. Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, protecting property values, promoting public health and safety, and preventing damage to the environment or adverse environmental impacts may provide justification for regulations pertaining to watersheds.

Watershed associations exist in many parts of New Hampshire and provide opportunities for towns to work together in protecting watersheds. The “Shoreland Protection” and “Permanent (Post-construction) Stormwater Management” chapters of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for zoning ordinance articles that help to protect watersheds and information about pertinent existing ordinances in New Hampshire.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### **Subdivision and Site Plan Review Regulations**

The “Erosion and Sediment Control During Construction” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model subdivision and site plan regulations to address erosion control, including design standards and construction practices.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

Sample application checklist items pertaining to watersheds include:

- Pre-application checklist
  - Location within HUC 12 watershed



## Wildlife Habitat

Wildlife habitat includes the resources that native species need to survive: food, water, shelter, including safe places to produce young. Wildlife habitat contributes to human amenities such as clean water, clean air, recreation opportunities, aesthetic values, and rural character.

### Master Plan

In order to enact ordinances and regulations designed to protect wildlife habitat, a municipality must address this topic in the Master Plan with inclusion of pertinent goal or objective statements. Land Use and Natural Resources chapters of a Master Plan provide opportunities to discuss the importance of wildlife habitat to the community. Sample Master Plan goals/objectives pertaining to wildlife habitat include:

- Promote development that protects important wildlife habitat and travel corridors.
- Identify local priorities for open space protection that include core areas of important wildlife habitat.

### Zoning Ordinance

In order to enact regulations pertaining to wildlife habitat, a municipality should include language in the zoning ordinance that authorizes the adoption of such regulations.

Purposes of a Zoning Ordinance that include conserving natural resources, maintaining rural character, and preventing adverse environmental impacts may provide justification for regulations pertaining to wildlife habitat. The “Growth Management,” “Feature-based Density,” “Lot Size Averaging – One Size Does Not Fit All,” and “Shoreland Protection” chapters of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for zoning ordinance articles that provide opportunities to protect wildlife habitat during development and information about pertinent existing ordinances in New Hampshire.

([www.des.nh.gov/REPP/index.asp?go=ilupth](http://www.des.nh.gov/REPP/index.asp?go=ilupth))

### Subdivision and Site Plan Review Regulations

The “Wildlife Habitat Management” chapter of *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development* provides model language for subdivision and site plan review regulations pertaining to wildlife habitat and a comprehensive application checklist.

Sample application checklist items pertaining to wildlife habitat include:

#### Pre-application checklist

- 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
- Application checklist
- Habitat areas to be protected

<b>Habitat/Natural Resource Topic</b>	<b>Smart Growth Principle</b>
Agriculture	5. Working landscape
Energy Efficiency	1. Compact settlement patterns 4. Transportation choices and safety
Erosion Control	6. Environmental quality
Floodplains	6. Environmental quality
Forestry	5. Working landscape
Forests	5. Working landscape 6. Environmental quality
Greenfield Development	1. Compact settlement patterns 5. Working landscape 6. Environmental quality
Green Infrastructure	5. Working landscape 6. Environmental quality
Groundwater	6. Environmental quality 8. Work with neighboring towns
Growth Management	1. Compact settlement patterns 2. Human scale of development
Impervious Surfaces	6. Environmental quality
Landscaping	6. Environmental quality
Light Pollution	6. Environmental quality
Natural Hazards	6. Environmental quality 8. Work with neighboring towns
Natural Services Network	5. Working landscape 6. Environmental quality 8. Work with neighboring towns
Natural Vegetation	6. Environmental quality
Ridgelines	6. Environmental quality 8. Work with neighboring towns
Shorelands, Surface Waters, and Wetlands	6. Environmental quality
Sprawl	1. Compact settlement patterns 2. Human scale of development 4. Transportation choices and safety
Steep Slopes	6. Environmental quality
Stormwater Runoff	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

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