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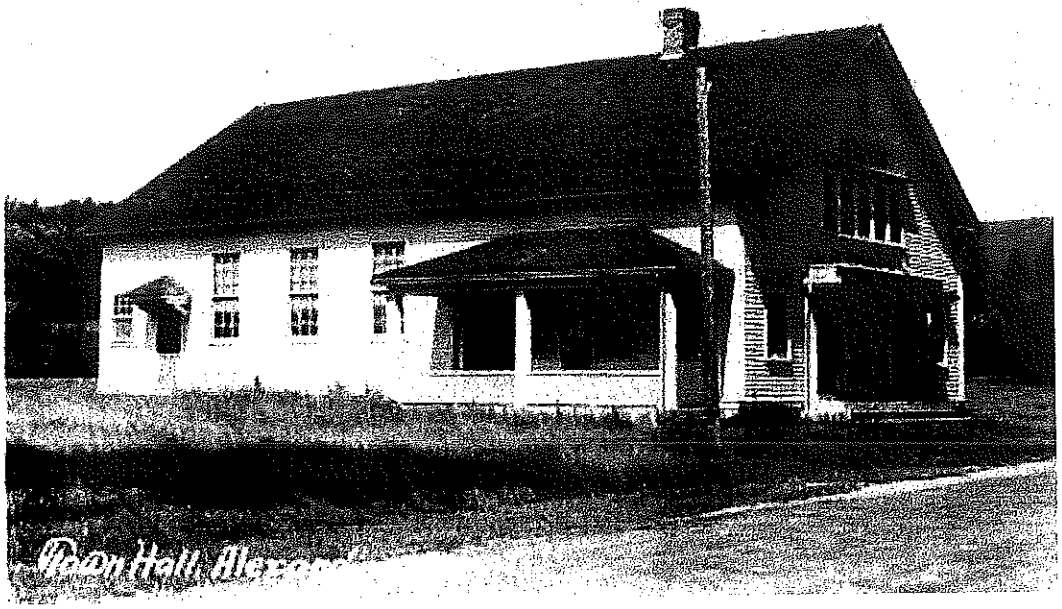
Town of

ALEXANDRIA

New Hampshire

COMMUNITY MASTER PLAN

October 2014



Alexandria Community Master Plan

October 2014

TOWN OF ALEXANDRIA
PLANNING BOARD

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This plan was developed by the town of Alexandria Planning Board.

PREFACE

The first Alexandria Master Plan was approved on June 17, 1987 in compliance with the 1986 Town Meeting vote. The Alexandria Master Plan Committee, a sub committee of the Planning Board, began to update the 1987 Master Plan in February of 2004.

The Lakes Region Planning Commission (LRPC) facilitated a community 'Vision Forum' on September 11, 2004 at the Alexandria Town Hall. The purpose of this meeting was to gather input for a community survey. The 1987 Master Plan Goals were reviewed and it was found that many are still pertinent. Based on this information and input from committee members, LRPC helped to develop and pretest a survey.

In February 2005, surveys were sent to all Alexandria taxpayers. After analyzing the responses, (approximately 69% response) LRPC presented the Town with the results of the Master Plan Community Survey in April 2005.

LRPC worked with the Master Plan Committee to formulate a Land Use Section over the next year. The Land Use Section was approved by the Planning Board in April of 2006.

Based on conclusions derived from the Vision Forum and the Town Survey results, a Vision Statement and Goals were developed, finalized, and approved by the Planning Board on January 17, 2007 and on April 16, 2014.

Moosewood Ecological LLC prepared the Alexandria Natural Resources Inventory for the Alexandria Conservation Commission in July 2013. The Alexandria Natural Resources Inventory can serve as a basis for developing innovative land use planning that can be adopted to help protect various resources, such as wetlands, wildlife habitats, and biological diversity. The Planning Board voted on March 19, 2014 to include the Alexandria Natural Resources Inventory as part of the Master Plan.

The Alexandria Master Plan is a document meant to be reviewed and updated. Work on the Transportation Section of the Master Plan is in process. The town and Planning Board look forward to continued citizen involvement in the planning process.

PLANNING BOARD MEMBERS

Date: 10-15-14

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*Community Opinion Survey is available at Town Hall for viewing

HISTORICAL OVERVIEW OF ALEXANDRIA

Alexandria, New Hampshire is located at the foothills of the White Mountains on the west side of Newfound Lake. Alexandria borders the towns of Danbury, Hill, Hebron, Bridgewater, and Bristol, New Hampshire.

A land grant of this area by King James I of England in 1606 was awarded to John Mason. Continual controversy surrounded the land grant until finally in 1740, when the boundaries were established to be within a circular sector of roughly a 60 mile radius from the mouth of the Merrimack River. This circular section is known as "The Masonian Patent Line." John Tufton Mason, John Mason's heir, quit claimed his land in Massachusetts and sold the remainder to a group called the Masonian Proprietors in 1749.

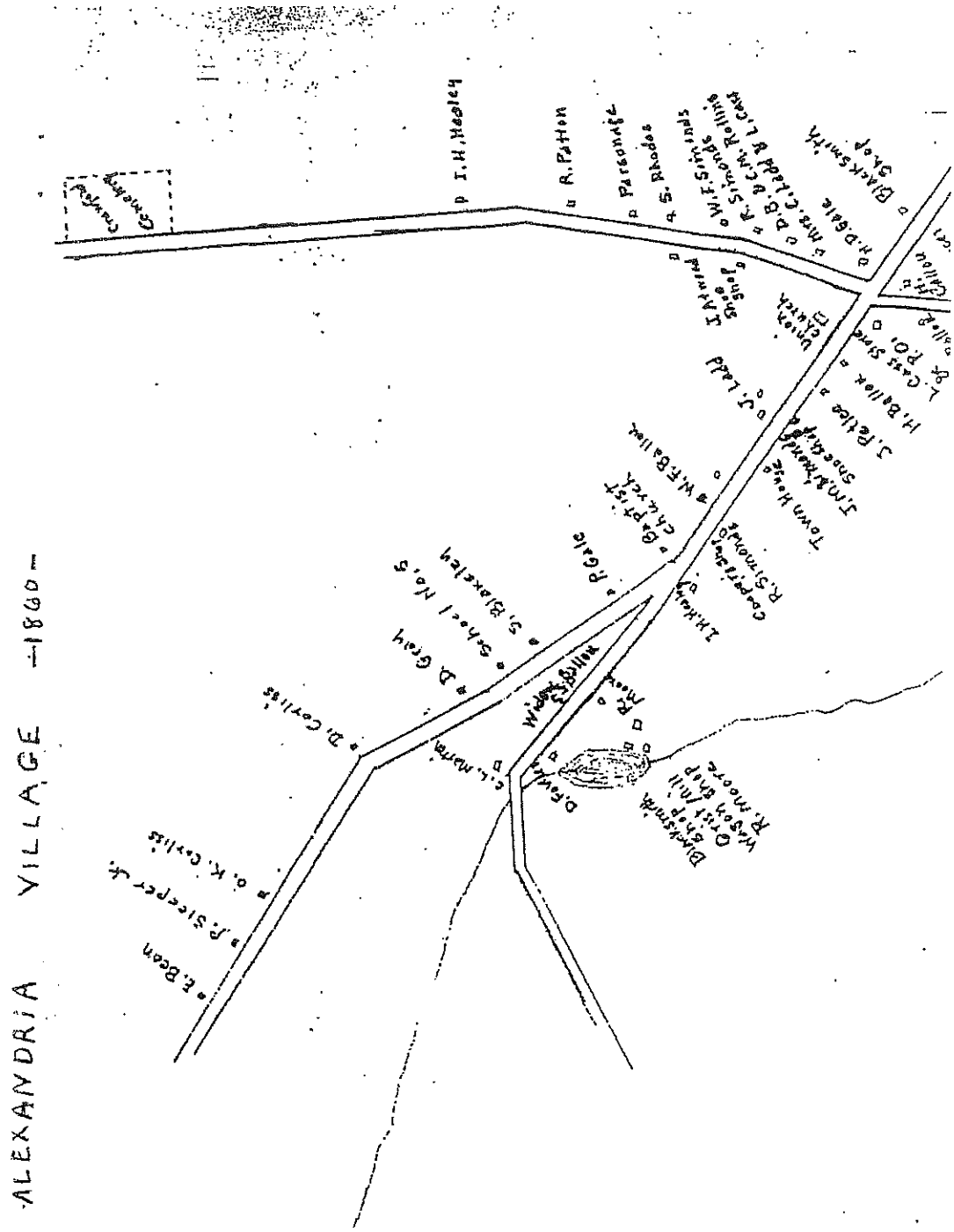
The Masonian Proprietors had their land surveyed and subdivided into towns, one of which is Alexandria. They were land speculators who sold their towns to other groups of speculators. They surveyed towns into lots, which they divided up among themselves by lottery. They made their profit by selling those lots.

Alexandria was granted by the Masonians in 1753 to Joseph Butterfield, Jr., and his partners who subdivided it into three sections. At that time, the town included most of what is now Danbury and some of what is now Hill. It did not include the land in the western portion of town, which was annexed from the town of Orange in 1820. The Masonian Proprietors did not live up to their commitment to settle on the land, build roads, churches and schools even though they were given an extension in 1767 because of the delays caused by the French and Indian Wars. Therefore, at the meeting of the Proprietors held on July 7, 1773 the town was granted again by the Masonian Proprietors. They passed a grant to Jonas Minot, Jonathan Bagley, Matthew Bailey, William Thornton and others of the town of Alexandria. These Proprietors fulfilled the terms of the Grant and started the settlement of the town of Alexandria. In 1782, Alexandria was incorporated.

I. Population

The first European settler of Alexandria was Daniel Young, who had a deeded parcel given to him by William Bailey. Three years later John Moor Corliss settled in Alexandria. By 1785 the population had risen to approximately 300 people, where it remained until around 1812. In 1840, the population peaked at approximately 1,280. During the next decades, the population in Alexandria began to decrease due to the westward emigration. The gradual decrease in population continued into the 1930's until approximately 400 people remained. During the century of decreasing population, land became more readily available to those that remained. This resulted in purchase and clearing of land, and an increase in the number and size of farms in Alexandria.

Figure 1: Historical Map of the Alexandria Village 1860



In the 1900s most people earned their living from farms, trades, apple orchards, and logging. However, during the post WWII years, much of the farmland lay dormant and was reclaimed by woodlands. In the ensuing years to present, most of the early farmland has been subdivided and sold. There are still a number of home businesses, apple orchards, and logging enterprises, but the majority of residents work outside Alexandria. The population as of July 2013 was approximately 1,500 year-round residents.

II. Schools

In 1875, Alexandria had 14 one-room schoolhouses scattered throughout town. When the Newfound Area School District was founded in 1965, the numerous one-room schools were disbanded. The middle and high school students attend the Newfound Regional High School in Bristol.

III. Haynes Library

Dr. Timothy Haynes, a native of Alexandria, bequeathed 1000 dollars for the creation of a library. The money was given with the provision that the town had to match the contribution. At the 1884 Town Meeting it was so voted, and the library was named Haynes Library. The current building was built and opened on December 22, 1894. The Haynes Library continues to be a private trust.

IV. Churches

According to the late Eva Phillips, the first church in Alexandria was organized in 1823 and subsequently disbanded in 1941. Currently, the United Methodist Church is the only church in town.

Figure 2: Historical Map of Alexandria 1892

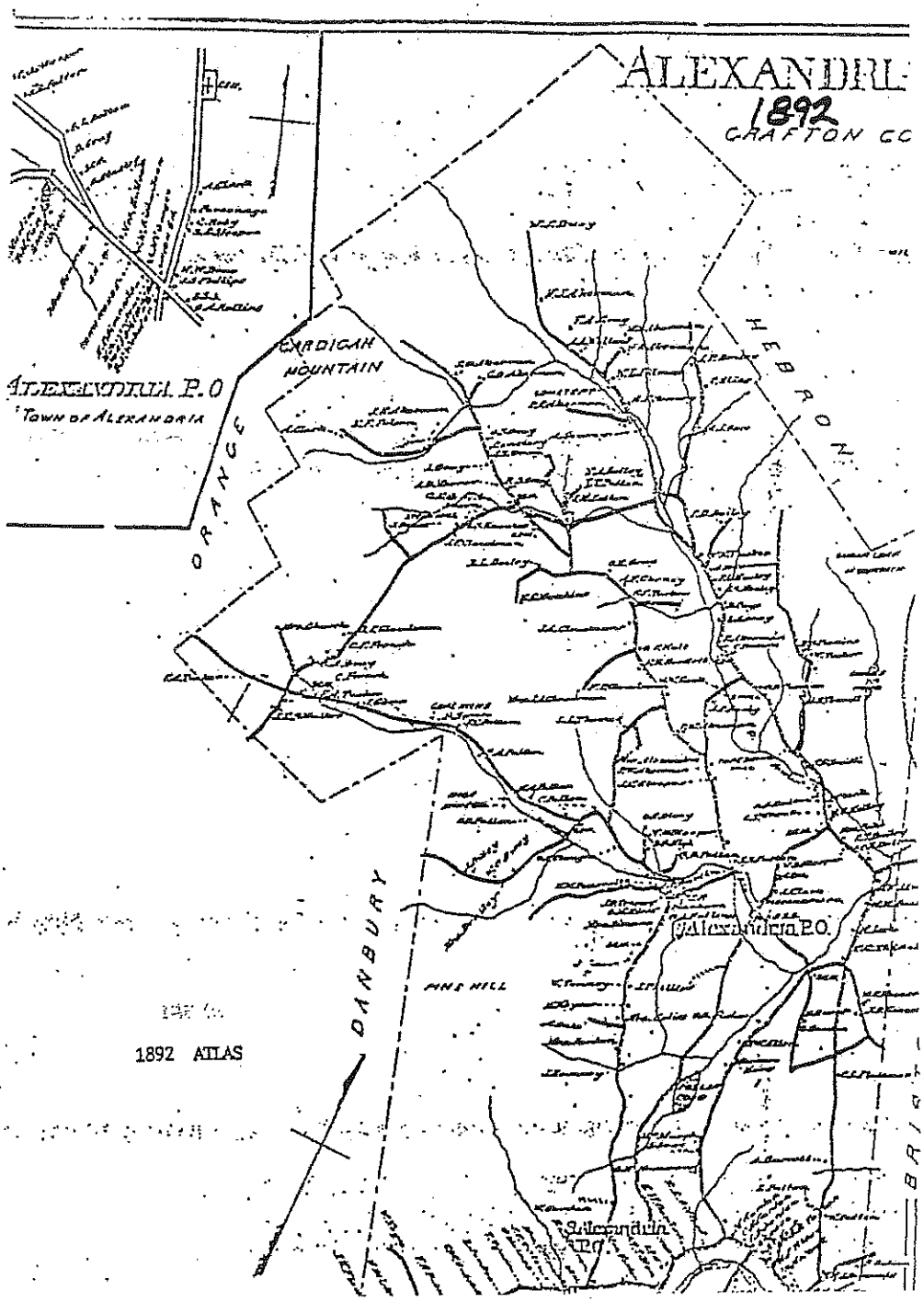
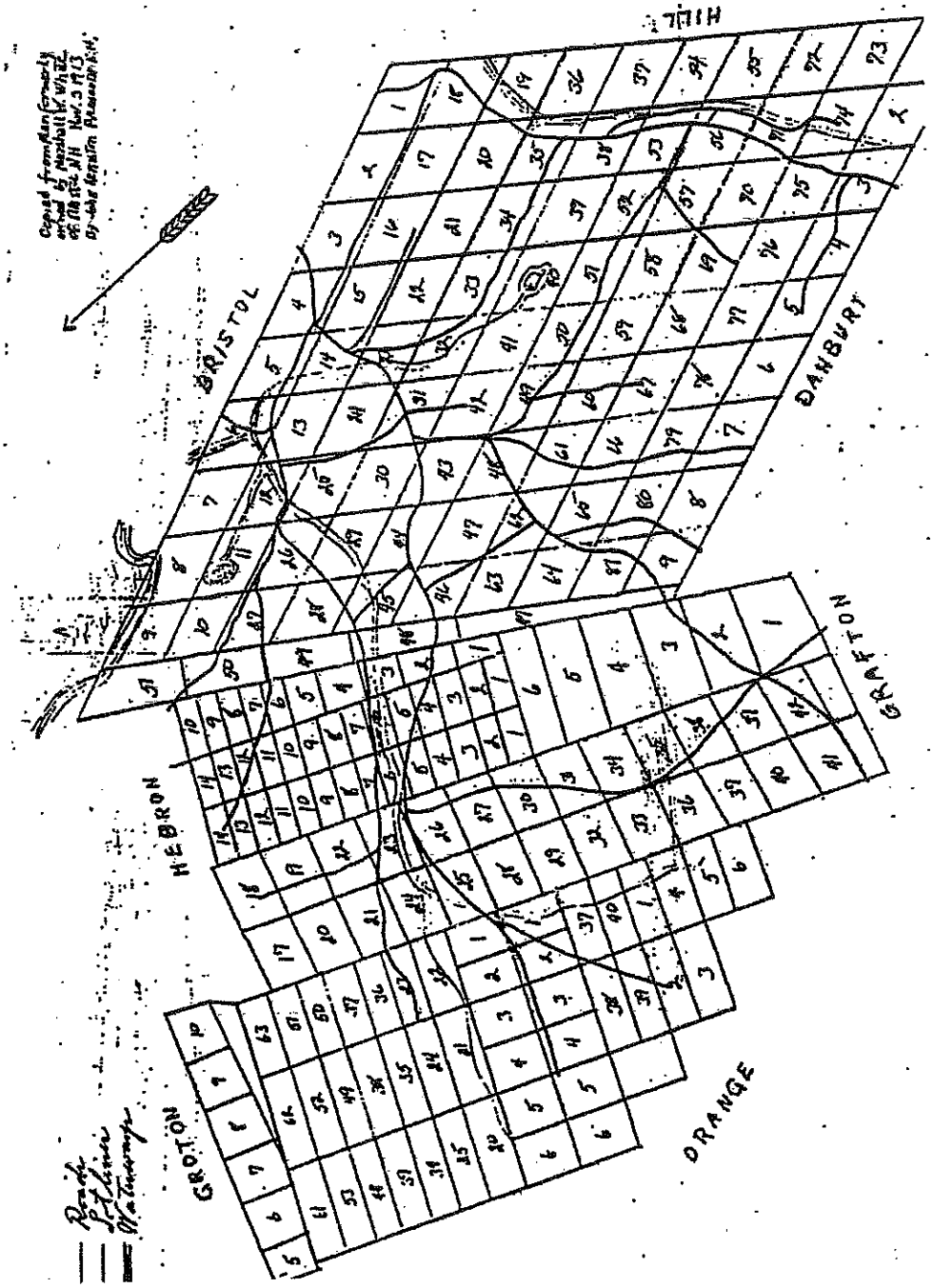


Figure 3: Historical Map of Alexandria 1913



VISION STATEMENT

The citizens of Alexandria have a keen interest in preserving the quiet and rural character of the Town with an appreciation of nature, wildlife, and the conservation of natural resources. Citizens also encourage the use of land use policies and planning tools that would further protect open space and the rural character of the Town. There is great concern about the increase in population and how this will impact the Town. Citizens and newcomers alike want to manage growth appropriately, keeping the rate of development in proportion to the Town's ability to provide services. We must make a commitment to a future that includes development that is healthy and well-balanced.

There is a strong desire to protect the abundant natural resources. Citizens endorse the type of activities that protect the natural resources year round. Citizens are interested in an increase in local job opportunities consistent with the preservation of the rural character of the Town. Citizens recommend increased local governmental communication, an increase in energy environmental education and awareness, as well as the continued improvement of roads and municipal services. On-going communication from governmental bodies is the foremost concern to citizens.

The Master Plan goals are:

1. To preserve and protect the predominantly rural character of the Town.
2. To design, plan, and maintain a road system balanced for cost effectiveness.
3. To maintain and preserve historic sites, buildings, and stone walls.
4. To broaden the Town's tax base by encouraging appropriate industry that is consistent with the preservation of the rural character of the Town.
5. To respect the relationship of individual rights to community interests.
6. To explore energy alternatives and impact on town clean up.

The following goals and recommendations enhance Alexandria's ability to manage growth while balancing the existing rural character.

I. Demographics

Goal: To assimilate new population within the community while continuing to preserve the rural way of life:

Recommendations:

- Welcome to the community orientation sheet.
- Encourage agricultural enterprises.
- Support yearly Old Home Day.
- Encourage residents to participate in Old Home Day and Town Boards.

II. Land Use

Goal: To locate, identify and label wetlands, flood plains, protected lands, roads, and placement for future subdivisions.

Recommendations:

- Map details of existing land use in Alexandria.
- Inventory all roads (completed....see appendix 20.
- Establish maintenance and repair plans for all roads.
- Establish ordinances and regulations designed to preserve and protect the rural character of Alexandria.
- Endorse "green" approach to subdivision regulations.

III. Conservation

Goal: To protect the environment such as, wetlands, stone fences (land boundaries) water (both surface and groundwater) lakes, streams and wildlife as well as particular locations of unusual trees and flora/fauna.

Recommendations:

- Expand a recycling program.
- Encourage land donations, conservation easements and land trusts.
- The Alexandria Bog be established as a prime wetland.
- Develop and implement environmental education within the community.
- Develop and implement a sustainable energy policy.

IV. Economics

Goal: To encourage and invite light commercial businesses into Alexandria and increase the number of local job opportunities.

Recommendations:

- Participate in development of business groups in the area.
- Support local businesses through the selectmen's office.
- Prepare a pamphlet that will detail existing businesses without endorsement.
- Encourage expanded agricultural enterprises.
- Support expanded broadband for business use.

V. Recreation

Goal: To increase and expand the types of recreation available.

Recommendations:

- Assemble existing recreational groups to attend yearly advisory meetings.
- Develop trails for non-motorized and motorized use.
- Increase in activities and events.
- Develop a Town Center recreational field.

VI. Government

Goal: To increase communication between citizens and governmental offices and to expand existing municipal facilities.

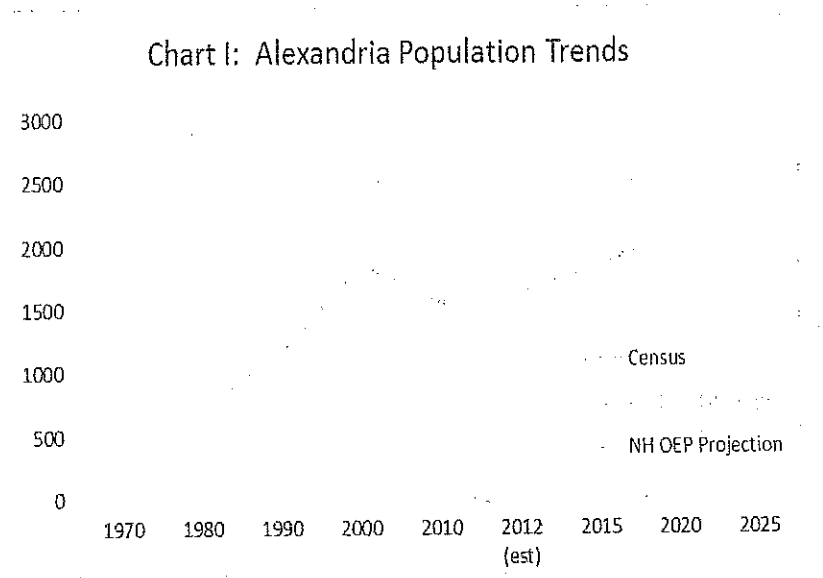
Recommendations;

- Continue to distribute newsletters to Alexandria residents on a regular basis.
- Educate the elected officials and volunteers about Alexandria's Master Plan goals and recommendations.
- Expand recycling program.
- Increased citizen participation in local affairs.

LAND USE

I. Recent Development Trends

Alexandria's population more than tripled between 1960 and 1990, growing from a total of 370 residents to 1,190. According to the U.S. Census, the rate of growth in Alexandria between 1980 and 1990 (68.6%) exceeded growth rates in all other Lakes Region communities in Grafton County, Grafton County as a whole (17.5%) and New Hampshire (20.5%). More recently, between 1990 and 2000, the rate of growth in Alexandria (11.7%) was comparable to the state's rate of growth (11.4%). The 2012 Census estimate for Alexandria was 1606 residents, which ranked 157th among New Hampshire's incorporated cities and towns. According to the U.S. Census Bureau, in 2010 there were 37.6 persons per square mile of land area. NH OEP population projections indicate an average population increase of 14.7 percent per decade between 2000 and 2020.



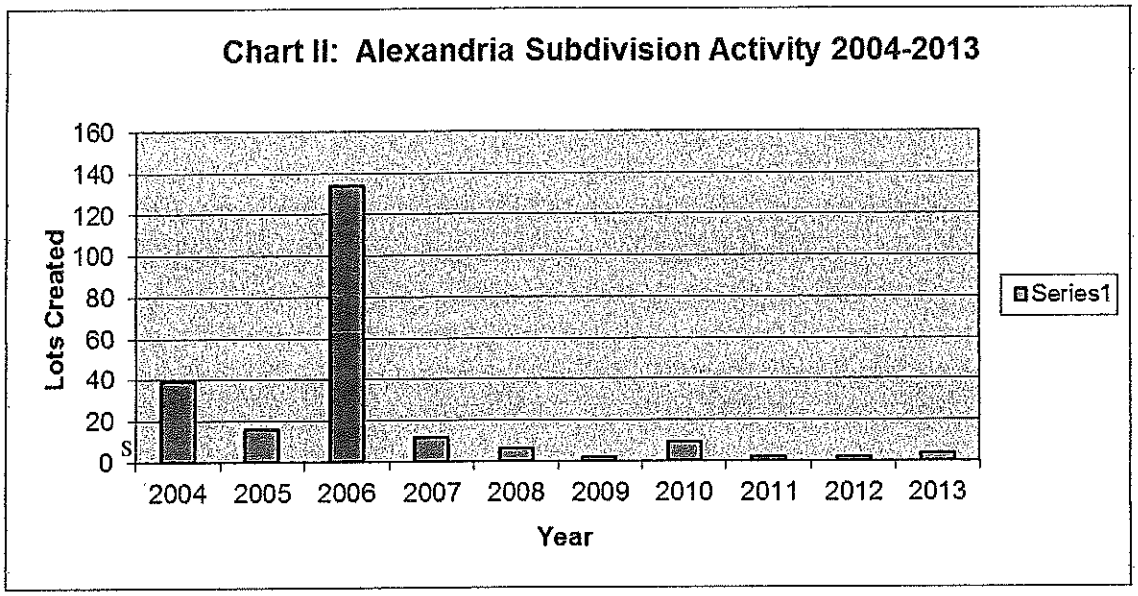
Significant new residential development has taken place in Alexandria. As indicated in Table I, a total of 559 housing units were built between 1980 and 2009, which represents 58.8 percent of the total housing stock (951 units).

Table I: Alexandria Housing Stock

Year Built	Number of Units	Percent of Total
1939 or earlier	151	16
1940 - 1959	81	9
1960 - 1969	56	6
1970-1979	104	11
1980-1989	249	26
1990-1999	136	14
2000-2009	174	18
Total	**951**	**100**

Another measure of impacts of growth and the potential for future development is subdivision activity. The NH Office of Energy and Planning *Handbook of Subdivision Review* recommends that the Planning Board "use a map to record pertinent information for all subdivision applications as they are submitted". This mapped information can provide a

community with a visual understanding of land use patterns which can assist in planning efforts. Subdivision activity that took place in Alexandria between 2004 and 2013 was summarized based on planning board records. The results indicate that a total of 226 lots were created between 2004 and 2013, and an additional two lots were created through May 2014. The majority of the lots (189 or 84%) were created in 2004 to 2006. Areas where multiple subdivision approvals were granted include Shem Valley, King, and Fowler River Roads. King Road subdivision activity accounted for four approvals which created a total of 117 new lots; representing the area with the greatest number of approvals and most lots created. During the same timeframe three approvals were granted on Shem Valley Road, which led to the creation of 9 new lots, the area with the second highest total number of lots created.



II. Challenges of Growth

Growth is challenging for communities large and small alike. In small communities growth can be more challenging, because the costs of providing municipal services are shared by fewer residents. Although cherished community resources attract new residents, the associated new development may threaten the very attributes that attracted newcomers to move to the community. Growth occurs incrementally, and the impacts of incremental growth over time are difficult to assess and manage fully because they are dependent on a series of development decisions. Care should be taken to monitor the negative impacts of growth such as loss of conservation land, increased tax burden, environmental degradation, and other issues directly associated with community land use policies.

Generally, New Hampshire and the nation are experiencing an aging population. The implications of this include an increasing need for medical services, senior centers, access to public transportation, and long-term care facilities. At the same time Alexandria has experienced increased demand for youth services. As school and youth services enrollments continue to rise, additional tax dollars are needed to fund these programs. Other municipal service demands related to growth are described below.

For the welfare of the community and the safety of the traveling public, the town needs a detailed bridge and road maintenance schedule to be developed and implemented. The town also needs to identify and prioritize existing and potential traffic and water problems. Improperly installed roadway access points have created erosion and water flow issues.

New growth has also resulted in increased use of municipal services, such as the town clerk, tax collector, and administrative assistants, as well as an increased need for documentation of safety services and schools. Increased residential development has also put pressure on the volunteer fire department to identify water sources for fire fighting hydrant maps.

Currently, 13 percent of the Tappley Thompson Community Center youth program is comprised of Alexandria youth. The Center is a shared municipal program in Bristol that serves an increasing number of Alexandria youth. In addition, the Alexandria Village School offers a free after school program.

Due to town growth, the town needs a waste disposal facility with more capacity.

III. Alexandria Land Use and Land Cover

Alexandria is comprised of 25,866.66 acres of land and 135.3 water acres. Land use and land cover are integral components of planning. Land use describes the types of human activity that exist such as residential, commercial, and industrial uses. Land cover refers to the vegetative or non-vegetative characteristics of the land. Land use and land cover were observed and classified by the Lakes Region Planning Commission using 2003 aerial photography. A preliminary land use map was developed and provided to the Planning Board for review and verification. The result of this process is the Town of Alexandria Land Use and Land Cover Map, 2003 on page 12. Table II classifies the amount of land use and land cover in the community. Forested land (80%) represents the largest land cover type; residential (4%) represents the single greatest land use.

Figure 4: Land Use of Alexandria

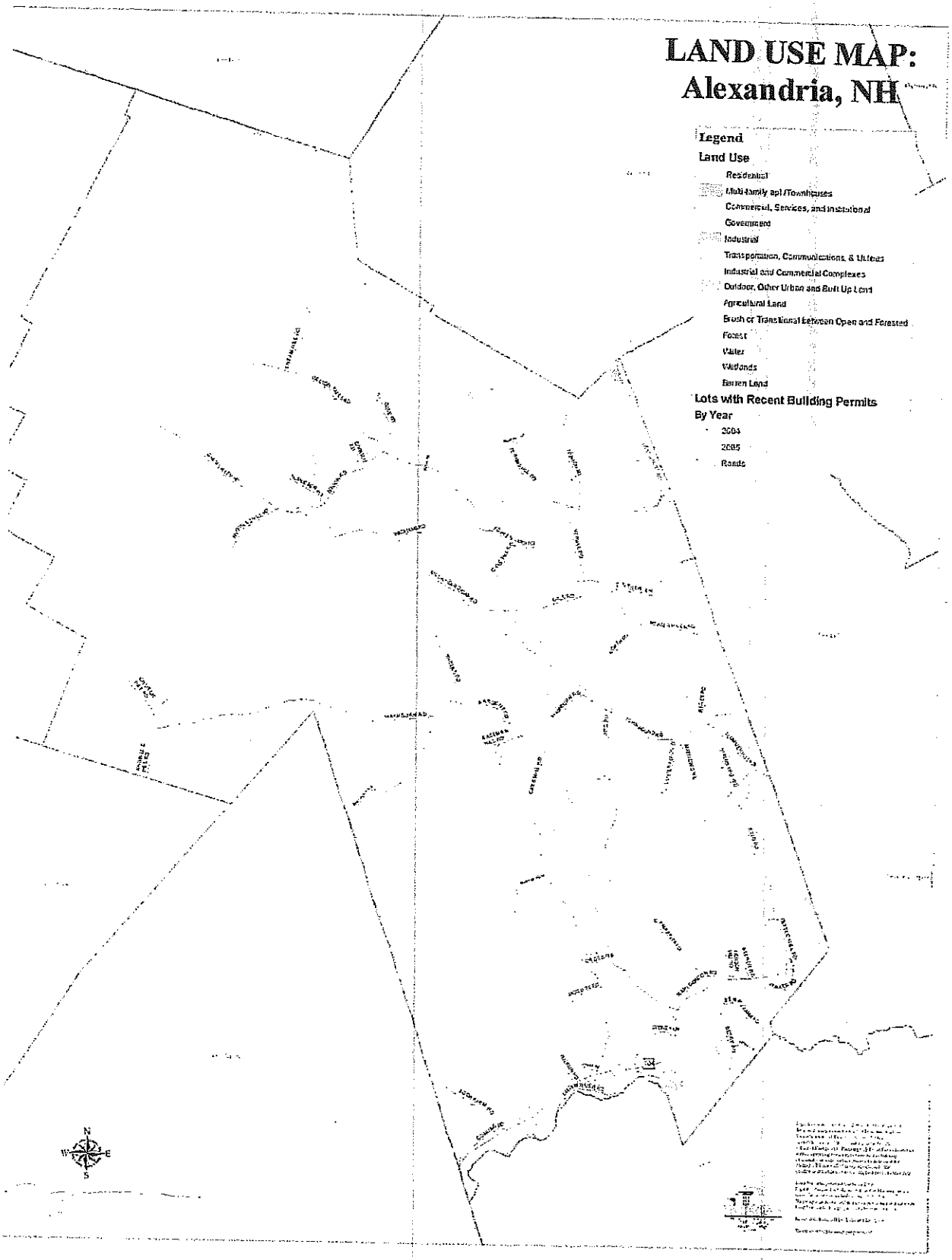


Table II: Alexandria Land use 2009

Land Use/Cover:	Acres	Percent of Total Land Area
Residential (improved and unimproved)	4,775.94	18.47
Commercia/Industrial (does not include utility land)	189.03	0.73
Tax Exempt	1,475.95	5.71
Farm	792.14	3.06
Forest	17,884.54	69.14
Unproductive	176.19	0.68
Wetlands	572.87	2.21
Total	**25,866.66**	**100.00**

Table III: Alexandria Current Use 1994-2013

Year	Acres	Percent of Land Area
2004	18,460	71%
2005	18,472	71%
2006	18,620	72%
2007	18,792	73%
2008	18,859	73%
2009	18,996	73%
2010	19,285	75%
2011	19,291	75%
2012	19,407	75%
2013	19,426	75%

In 2013, 75 percent of the land in Alexandria was in current use[1]. In New Hampshire, the current use program is a form of preferential taxation used to encourage private landowners to keep medium and large parcels of land in their traditional use, preserving open space and maintaining rural character. Land enrolled in current use is assessed, and therefore taxed, at a rate consistent with its traditional and current use (for example agriculture and forestry), not at the economically "highest and best use," which is often for development. The goal of this law is to allow property owners to maintain their land without being taxed at rates that force changes in land use[2]. While this program may encourage preservation of land, it does not provide permanent protection. Land under current use can be subdivided and developed subject to a tax penalty referred to as a change in use tax. In some New Hampshire communities, all or a portion of the change in use taxes received when current use properties are developed is dedicated to conservation programs. This aids in off-setting development pressures by conserving land elsewhere within the community.

From 1994 to 2004, there was a general decline in the amount of land in current use in Alexandria. The most significant change over this 11-year period occurred between 2001 and 2004, when current land use declined from a high of 74% (25,550 acres) to 71% of the land area in Alexandria (18,460 acres)[3].

Land uses occurring within current use lands were also explored over the same timeframe, 1990 to 2004. A trend line was applied to the data to show generalized changes and the magnitude of the changes in land uses. As illustrated in Chart III, the greatest change was seen in the number of acres of current use land that are managed forest. Managed forestland

[1] New Hampshire Association of Regional Planning Commissions
[2] *Eligibility and Enrollment in New Hampshire's Current Use Taxation Program*, UNH
[3] Alexandria Town Records, research by Rosie Homer

in current use increased from a low in 1990 (514 acres) to a high in 2004 (5,283 acres). The amount of recreation land in current use also increased during this period, while farmland, flood and wetlands, and unproductive land in current use experienced declines. These changes can all have community planning impacts. For example, increased logging can have an impact on local roads and drainage.

IV. Constraints to Development

There are a variety of potential constraints to development found in Alexandria. These include conservation lands, prime agricultural soils, surface waters and wetlands, aquifer recharge areas, and steep slopes. Each of these resources has been identified in the Alexandria Natural Resources Inventory in the appendix of this document.

Existing and Potential Future Conservation Lands

Areas where future development cannot occur and where future development is not preferred within Alexandria have been identified. Those lands where future development cannot occur include permanently protected conservation areas.

Table IV: Alexandria Conservation Lands (additional lands have been placed in conservation trust)

Tract Name	Acres	Primary Protecting Agency	Protection Level
Cardigan Mountain State Forest	941	State of New Hampshire	Permanent Conservation Land
Welton Falls State Forest	224	State of New Hampshire	Permanent Conservation Land
Wellington Beach State Park	117.1	State of New Hampshire	Permanent Conservation Land
SPNHF	118	Society for the Protection of New Hampshire Forests	Permanent Conservation Land

*Source: Avitar assessing system

Alexandria participated in the NH Department of Environmental Services (NH DES) Local Resource Protection Priorities program, implemented by LRPC. This program was designed to identify cultural and natural resources that are priorities for protection in communities statewide. The resources identified in Alexandria consist of land and buildings, some of which have been identified in Table IV as permanently protected; the protection status is unknown for other priorities. These resources represent potential constraints to future development to the extent protective covenants are applied.

A. Prime Agricultural Lands

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce

sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding[4].

B. Surface Waters and Wetlands

The major surface waters in Alexandria consist of the Fowler and Smith Rivers and Newfound Lake. Surface waters represent less than five percent of the total area in Alexandria. The Smith and Fowler Rivers play an important role in draining the areas of steep slopes found throughout the community and Newfound Lake functions as a recreational area.

Wetlands refer to any submerged land under freshwater, which include any marsh, swamp, bog, or meadow subject to permanent or periodic flooding. Beyond supporting diverse habitat for flora and fauna, wetlands play an important role in controlling flood hazard by dispersing flood waters over a wide area. They have the ability to act as giant sponges by storing and slowly releasing rainwater. This slow release of water enables some of the stored water to sink deeply into the ground where it replenishes drinking water supplies. Once these lands are disturbed or altered, the natural ability of the soil to absorb flood water and filter drinking water can be destroyed. The 1987 Alexandria Master Plan suggested the following as compatible uses of waterways and wetlands:

- Forestry and tree farming utilizing best management practices to prevent sedimentation.
- Cultivation and harvest of crops according to recognized soil conservation and pollution prevention measures.
- Wildlife refuges.
- Parks and recreational uses.
- Open spaces.[5]

Wetlands comprise 619.4 acres in Alexandria or approximately 2.2 percent of the total land area[6].

C. Groundwater and Aquifers

While no municipal water supply currently exists in Alexandria, the groundwater contained in aquifers that lie below the soil are potential future resources for both the community and residents dependent on well water. These water reserves are invaluable assets that can be permanently impacted by land use decisions today. Leading concerns include disruption of recharge capability and pollution prevention.

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[4] Analysis of Impacts on Prime or Unique Agricultural Lands, US Department of Agriculture
[5] Alexandria Master Plan, June 1987
[6] National Wetlands Inventory, US Fish and Wildlife Service, 2001

Preventing the contamination of groundwater resources is an important public concern. When pollutants are dumped, spilled, or discharged into the ground or into rivers, lakes and streams, they too may seep through the soil and rock and enter into the groundwater. Groundwater is usually assumed to be of high quality, and is often used with little or no treatment. But, if contaminated, it may be decades or even centuries before a contaminated aquifer can be used. In some cases, the contamination can never be removed and the water resource may be lost[7].

The Town endorses the philosophy of Every Acre Counts, A Newfound Watershed Master Plan.

[7] *Drinking Water in New England,* US Environmental Protection Agency

D. Steep Slopes

Steep slopes present unique land development challenges. These challenges include limited capacity for septic systems and increased potential for runoff and erosion. Steep slopes in New Hampshire are typically associated with a limited depth to bedrock. As a result of this thin layer of soil, the capacity for leach fields is limited, and the potential for erosion is increased requiring special prevention measures during the site development process and post development storm water protection measures. Steep slopes are defined in New Hampshire communities in differing ways. Slopes greater than 25 percent (a one foot rise over four feet traveled) are generally referred to as steep and slopes greater than 35 percent are termed very steep. In Alexandria slopes greater than 25 percent represent approximately 18.5 percent of the total land area.

V. Local Planning Tools / Land Use Regulations:

Currently, land development in Alexandria is guided by the 1989, 2005 and 2010 Master Plans and subdivision regulations. These planning tools provide a vision for the future of Alexandria and an approval process for land being divided into smaller developable parcels. The Alexandria Planning Board provides oversight for the periodic update of these planning documents with community input.

Other regulatory programs in place include a Floodplain Ordinance, Hazard Mitigation Plan, building code, a permitting process for driveways, and soils based lot sizing designed to ensure adequate space for onsite private septic systems and wells. Additionally, the Heritage Commission and recently appointed (2005) Conservation Commission provide guidance for the preservation of the community's cultural and natural resources.

The Planning Board explored the relationship between existing planning tools and the Board's desired future, as expressed in the 2009 Community Survey. The committee identified a need for the development of additional tools and resources. These will enhance the local planning process and aid in orderly future community development. These identified needs are outlined in the Vision Chapter as goals and recommendations. The land use planning related recommendations can be categorized as Data Collection, Analysis, and Implementation as described below:

Data Collection

The need for additional and better information about the community will aid in the understanding of options available for the management, preservation and/or expansion of community resources. Several inventories were identified and recommended to be developed that form the baseline for making informed cultural, historic, and natural resources decisions:

- Prepare an historic sites inventory to include buildings, bridges, stonewalls, caves, etc.
- Prepare an inventory of all roads, trails, and passageways.
- Prepare a natural resources inventory to identify water bodies,

streams, wetlands, floodplains, stream banks, woodlands, aquifers, open spaces, wildlife habitat, and forests.

Analysis
The New Hampshire statutes (RSA 674:2 II–III.) that address the development of community master plans identify two mandatory chapters: Vision and Land Use. Beyond these essential chapters are 13 recommended sections that may be included in a local master plan. The preparation of additional sections provides the Planning Board and community with the impetus to examine community strengths, weaknesses, opportunities, and threats for a variety of community needs, e.g. transportation, housing, natural resources, etc.

- Prepare additional Master Plan chapters as recommended in RSA 674:2.

Implementation
Desirable growth patterns are explored in the future land use section of this update. These desired patterns develop more readily with the support of clearly defined guidelines.

- Promote and support best conservation management practices.
- Locate commercial and industrial uses in specific areas in town.
- Implement limited zoning.

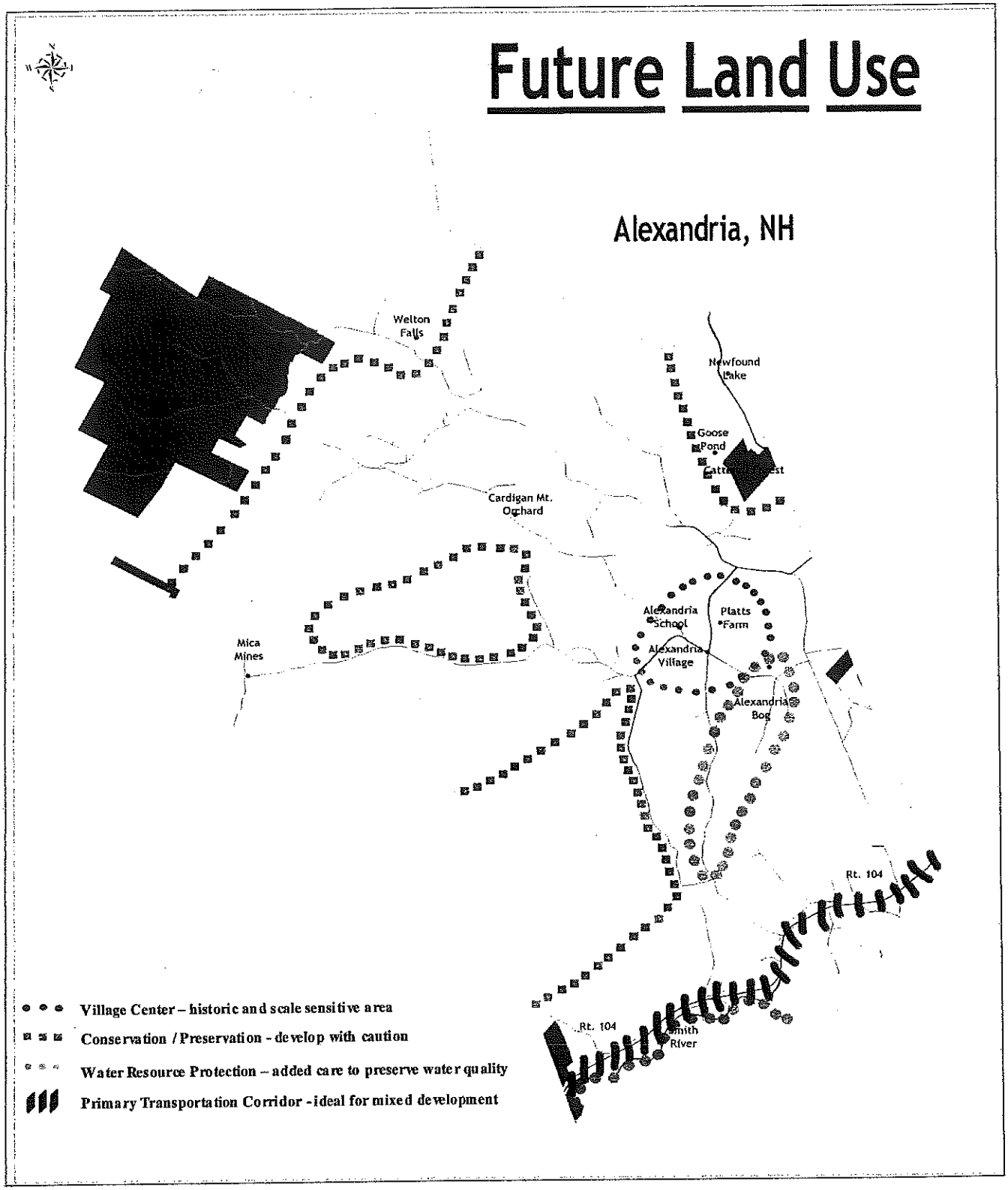
VI. Future Land Use in Alexandria

The Alexandria Planning Board explored the desired pattern of land use development in Alexandria, looking forward twenty years into the future. Through the careful examination of existing land use conditions and resident input expressed through the community survey, a Future Land Use Map was created (see page 22). By design a future land use plan is general and flexible. It is designed to describe a desirable pattern of future development within a community, and does not designate allowable land uses within specified areas.

The Alexandria Future Land Use Map outlines key areas and resources in the community where specified planning principals should be applied. The areas identified on the map are described further below:

Village Center – Alexandria Village and the immediate surrounding land contain municipal services, historic buildings, and prime agricultural soils. The maintenance of the character of this area is of great importance to the community. Future development should blend, in architectural style and scale, with existing historic structures. Small and in-home businesses are envisioned as well as the promotion of agriculture that takes advantage of the rich soils that are present.

Figure 5: Future Land Use Map of Alexandria



Conservation/Preservation Areas – Large, mostly undeveloped tracts of land exist in Alexandria. Many of these areas contain protected resources such as Mt. Cardigan and Catterall Forest. These areas are characterized by steep slopes, diverse wildlife and wildlife habitats, and in many cases dead-end roads. The provision of services such as school busing, police, fire and rescue, and road maintenance can present challenges and increased costs. Future development should adhere to best management practices to minimize soil erosion and fire hazards. The protection of wildlife habitats and further permanent protection of additional resources in these areas is a community priority.

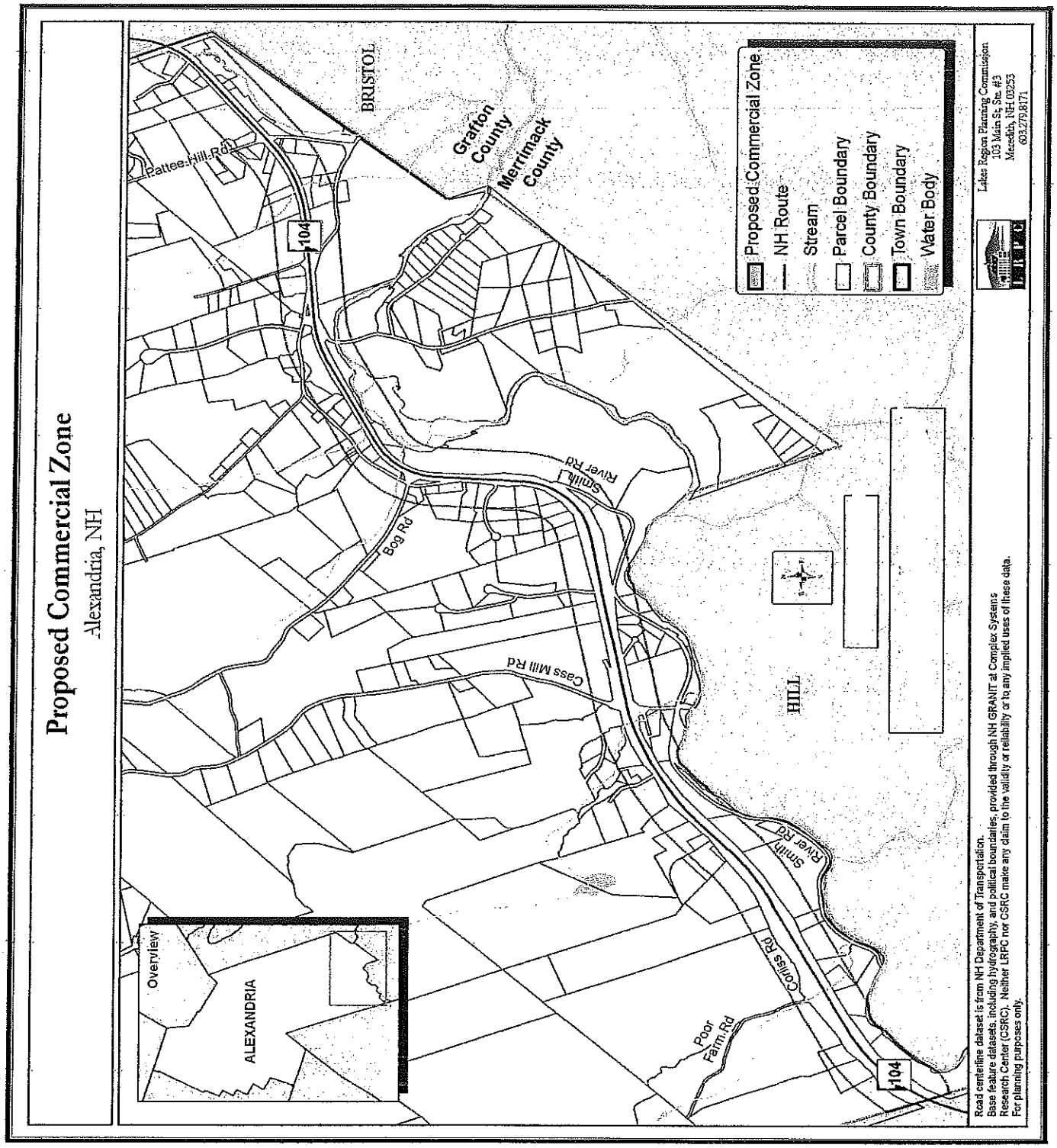
Water Resource Protection Areas – Alexandria contains several important surface and groundwater resources. The quality of these water resources cannot be understated. Areas of particular concern include the Alexandria Bog, and Fowler and Smith Rivers. The Alexandria Bog performs a groundwater purification function in addition to providing wildlife habitat, and community beauty. Protection measures in the Bog area may include limitations on the types of uses allowed, preservation of existing natural vegetative buffers, and forestry/tree farming best management practices.

Primary Transportation Corridor – NH Route 104 which traverses the southern most border of Alexandria is a primary east to west transportation corridor in the community and the region. Close proximity to Bristol and Interstate 93 make this area ideal for a mix of commercial, light industrial, and residential development. Currently this corridor is home to the majority of the commercial activity in the community and is proposed as the Commercial Area for Alexandria (see page 24). As the corridor develops, added care is needed to prevent contamination of the Smith River or limiting the river's important drainage function. Use of stormwater management plans, vegetative riparian buffers, steep slope development limitations, restrictions on the types of chemicals used and stored in the corridor, and other planning methods may be required in this area to aid in the preservation of existing river characteristics.

VII. Other Town Plans

- Town of Alexandria Hazard Mitigation Plan
- Town of Alexandria Emergency Management Plan

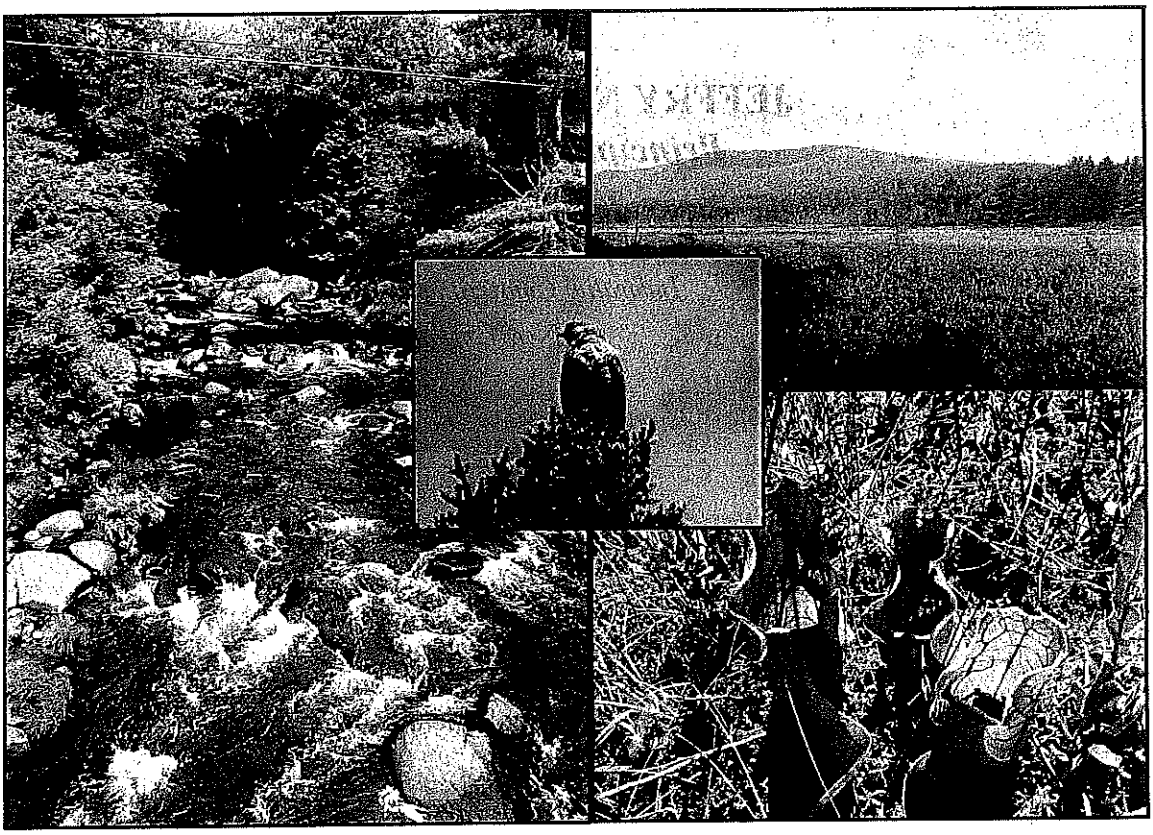
Figure 6: Proposed Commercial Area of Alexandria



Appendix 1: Alexandria Natural Resources Inventory

ALEXANDRIA
NATURAL RESOURCES INVENTORY

Prepared for:
Alexandria Conservation Commission



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ALEXANDRIA
NATURAL RESOURCES INVENTORY

Prepared for:
Alexandria Conservation Commission

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Cover photographs – *Left*: Smith River from Berry Road; *Top Right*: Alexandria Bog viewed from Foster Pond Road with Pine Hill and Forbes Mountain in the background; *Bottom Right*: pitcher plants and brilliant deep-red sphagnum moss observed in a unique peatland ecosystem; *Center*: broad-winged hawk hunting atop a red spruce observed along the headwaters of Patten Brook along Washburn Road.

INTRODUCTION

Natural Resources and Land Use Planning

Currently, New Hampshire's population is growing at a rate that is twofold that of the other New England states. The population has doubled in the forty years leading up to the turn of the century in 2000, and there was a rise in population of 17.2% between 1990 and 2004 alone. This rate of growth is followed by VT (10.4%), RI (7.7%), ME (7.3%), MA (6.7%), and CT (6.7%). Furthermore, it has been projected that the state will experience an increase of 23% from 1997 to 2020. New Hampshire's growth and development pressure will tax the state's natural resources if not managed with diligence.

One of the first steps in planning for growth and development is to conduct a natural resources inventory (NRI). This effort helps to better understand what natural resources are within a town and where they are located. As such, an NRI is a list and description of the natural elements found within and adjacent to a town (or even a watershed or larger region). These can include such elements as wetlands, aquifers, ponds, rivers, forests, plants, soils, and wildlife. These data can be created from existing sources or from field-based assessments to better reflect the extent of natural resources within a community.

New Hampshire statutes mandate that communities shall create an NRI. This is generally the responsibility of the Conservation Commission, whose purpose is "for the proper utilization and protection of natural resources and for the protection of watershed resources" of the town. In particular, RSA 36-A:2 continues to state that "Such commission shall conduct researches into its local land and water areas [and] ... shall keep an index of all open space and natural, aesthetic or ecological areas within the city or town ... with the plan of obtaining information pertinent to the proper utilization of such areas, including lands owned by the state or lands owned by a town or city. It shall keep an index of all marshlands, swamps and all other wetlands in a like manner..."

An NRI can serve as the basis for developing innovative land use planning that can be adopted to help protect various resources, such as wetlands, wildlife habitats, and biological diversity. Biological diversity, or biodiversity, refers to the variety, variability, and complexity of life in all its forms and includes various ecological processes (for

example, nutrient cycling, flooding, fires, wind events, and succession) that have helped to shape species over time.

Biodiversity includes various levels of ecological organization such as individual species and their genes that have evolved over time, as well as the many intricate plant and wildlife populations. It refers to even higher levels of organization including the assemblage of ecological communities[1] and even entire ecosystems, such as wetlands, woodlands, and rivers. Therefore, the concept of biodiversity encompasses all levels of biological organization and the interactions of living organisms within their physical environments. It is at the heart of this understanding of the dynamics of biodiversity that we seek to develop protection strategies, helping to ensure a healthy environment for humans, as well as all other life forms.

Planning for the conservation of natural resources and biodiversity is not a new concept altogether. It has helped in such efforts as the recovery of the American bald eagle; assisted in building preserves and managing other lands for species of conservation concern, as well as our most common species; aided in the identification of biodiversity hot spots; and helped to identify and protect critical wildlife habitats within our landscape. It has been a center piece for natural resources protection, restoration, and adaptive management for the past four decades.

This form of land use planning is not static but one that is ever-changing. It is a vision that should be based on the principles of conservation biology and incorporates the current ecological structure of a given area (such as a town, a watershed, or an entire region). Thus, conservation planning strives to incorporate the socio-economic fabric of our world with that of the ecological structure. This effort can help build more sustainable, more resilient New Hampshire communities into the future as a result of implementing comprehensive land use planning that includes our natural environment and built infrastructure.

The need for this type of informed land use planning is becoming more evident. Ecosystems and their inhabitants have long been susceptible to long-term degradation from overexploitation and misuse of natural resources. This has led to a precipitous

[1] An ecological community is a group of two or more populations of different species found in the same place.

decline in several species, some even resulting in extinction altogether. It has also led to the loss of critical habitats. While the past few decades certainly have seen a positive change in resource management and protection, there has been a distinct rise in conservation planning efforts within the 21st century, especially in New Hampshire.

Statement of Purpose

The Alexandria Natural Resources Inventory (NRI) was initiated in May 2012. The overall purpose was to prepare an NRI to support Alexandria's natural resource protection efforts, provide a basis for informed land use planning, and promote community education. Goals of the project included 1) the development of a series of natural resources maps, and 2) conducting field assessments to document current conditions, verify wildlife habitats, and record wildlife and plant species observations.

These assessments were made from roadside surveys, as well as site visits on properties whose landowners provided access to record such information. This effort helps to achieve two objectives. First, field assessments help to verify existing data on wildlife habitats. For instance, the NH Fish and Game Wildlife Action Plan has mapped a variety of wildlife habitats throughout the state. While this is a great effort at learning about NH's important habitats it is imperative to verify its accuracy. Second, it provides the opportunity to better understand Alexandria's biological diversity and other significant ecological features. A detailed narrative of the site assessments has been included in Appendix A. However, excerpts have been included in the various chapters that follow.

As such, the Alexandria NRI directly addresses various aspects of the 2010 Master Plan. Protection of natural resources is directly addressed in the Vision Statement and is included in two main goals listed in the Master Plan on p. 6, as follows:

- To preserve and protect the predominantly rural character of the Town.
- To identify and protect natural resources: ecological features, bodies of water, streams, wetlands, floodplains, stream banks, woodlands, aquifers, open spaces, wildlife habitats, and forests.

Furthermore, the 2010 Master Plan continues to list explicit goals for topics focused on natural resources protection and town planning. The following is a list of topics, goals, and recommendations that pertain to the Alexandria NRI, as found on pages 7-8 of the 2010 Master Plan:

Land Use

Goal: Locate, identify, and label wetlands, floodplains, protected lands, roads, and placement for future subdivisions

Recommendations:

- Collect data and identify the datasets on maps.
- Map details of existing land use in Alexandria.
- Establish ordinances and regulations designed to preserve and protect the rural character of Alexandria.
- Restrict industrial use to specific areas in town.
- Endorse "green" approach to subdivision regulations.
- Inventory all roads and natural resources.

Conservation

Goal: To protect the environment such as, wetlands, stone fences (land boundaries) water (both surface and groundwater), lakes, streams and wildlife as well as particular locations of unusual trees and flora/fauna.

Recommendations:

- Encourage land donations, conservation easements and land trusts.
- Recommend that the Alexandria Bog be established as a prime wetland.
- Develop and implement environmental education within the community.

Alexandria's Physical Landscape

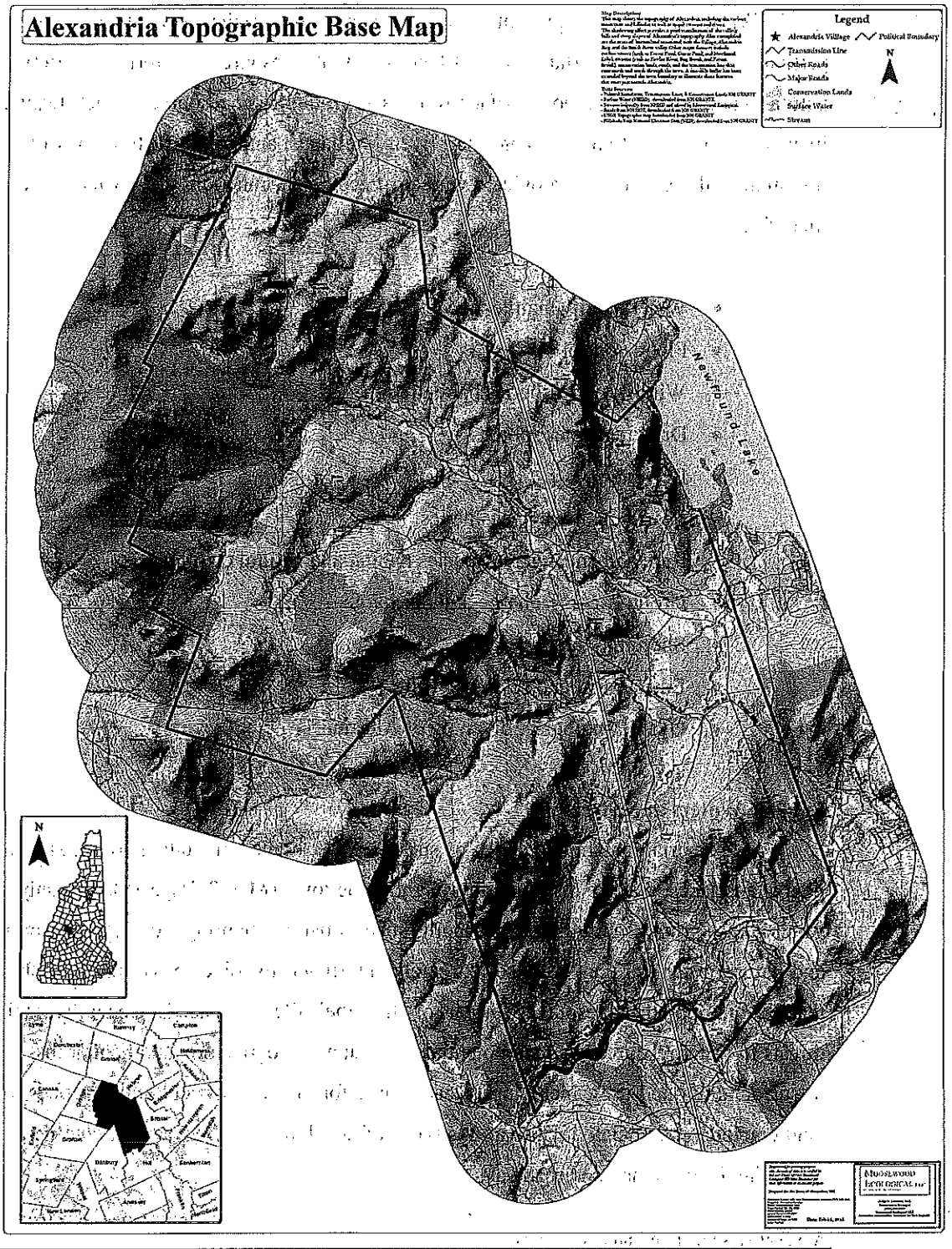
Located in the Lakes Region of New Hampshire, Alexandria is a small, mostly rural community of about 1,500 year-round residents. The town covers nearly 44 square miles, or about 28,000 acres. Much of Alexandria is characterized by its mountainous

terrain with steep slopes and fast-flowing brooks (Map 1, Page 6). The shadowing effect on the topographic map helps to illuminate this fact. In addition, large unfragmented blocks of forests dominate Alexandria's landscape.

The Village and the surrounding area are located in the lowlands, which are mostly flat, having been shaped over time by the Fowler River, Patten Brook, and Bog Brook. Areas along the Smith River are relatively flat as well. In addition to rivers and brooks, other major water bodies include Foster Pond, Goose Pond, and Newfound Lake.

Wetlands are scattered throughout the town and are relatively small due to widespread steep slopes. These small wetlands can be found at the headwater streams that form at the base of the steep slopes. Larger wetlands can be found around the Village. The most notable and well known wetland is the Alexandria Bog. This is the largest and most diverse wetland complex in town.

Alexandria includes two state-owned conserved lands. A portion of Cardigan Mountain State Forest is located in the northwest part of town. Wellington State Park can be found adjacent to Newfound Lake, extending into Bristol. Other tracts of privately-owned conservation lands exist as well. The largest area can be found on Hutchins Hill, mostly located within the Fowler River watershed.


Alexandria Topographic Base Map
Legend
Alexandria Village
Political Boundary
Transmission Line
Other Roads
Major Roads
Conservation Lands
Surface Water
Stream
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Newfound Lake
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WATER RESOURCES

Water resources represent some of our most fragile ecosystems and are particularly sensitive to certain types of land use. Water resources comprise a variety of natural features, including both surface water and groundwater resources. Such features include our ponds and lakes, streams and rivers, wetlands, and aquifers. In terms of their importance, these resources provide a variety of ecological functions and societal values, including:

- Water quality maintenance
- Flood control
- Wildlife and fisheries habitat
- Drinking water sources
- Recreation
- Visual quality and aesthetics
- Rare and endangered species habitat and natural communities
- Groundwater recharge and discharge
- Shoreline stabilization
- Educational and scientific value
- Overall biological diversity of Alexandria

Surface Waters and Streams

Alexandria contains a variety of surface water bodies, including rivers, streams, ponds, and lakes, that are distributed throughout the town (Map 2, Page 18). Not only do water bodies provide a multitude of benefits such as fishing, hunting, boating, swimming, and nature watching, they are also extremely significant for diverse wildlife and plants that depend upon these resources for part or all of their life cycle needs. Generally, major threats to water resources include potential water quality degradation and habitat loss due to surrounding land uses, including unsustainable forestry and agricultural practices and land conversion associated with various types of developments (residential, commercial, industrial, institutional, and roadways).

Lakes and ponds in Alexandria cover approximately 81 acres, including three named water bodies (Table 1). Although Newfound Lake totals 4,451 acres, there are only 60 acres located within the town boundary. These water bodies have been recognized and labeled as such by the NH Dept. of Environmental Services and/or the US Geological Survey. Two of the waterbodies, Newfound Lake and Goose Pond, are included on the NH Dept. of Environmental Services Consolidated List of Water Bodies subject to the Shoreland Water Quality Protection Act under RSA 483-B[2]. The third water body is Foster Pond along Bog Road.

Table 1. Summary of ponds and lakes in Alexandria.

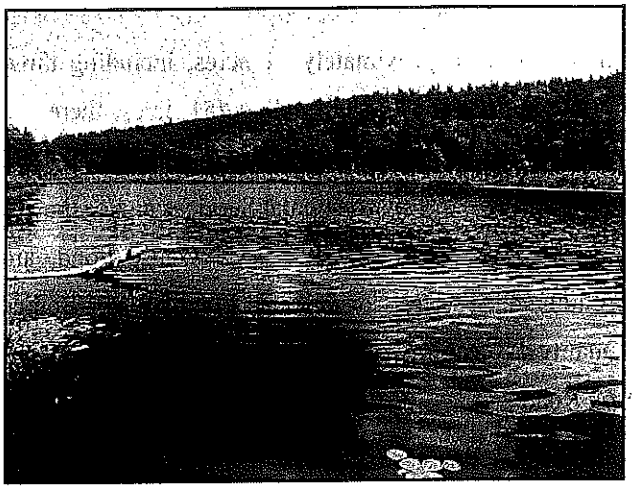
Surface Water Body Name	Size
Newfound Lake	4,450.7 acres*
Goose Pond	15.5 acres
Foster Pond	5.9 acres

SOURCE: USGS topography, GRANIT hydrogrpahy datasets, NH DES RSA 483-B.

Water bodies in **bold type** are jurisdictional designations by NH DES and subject to the Shoreland Water Quality Protection Act under RSA 483-B.

* This is the total acreage of Newfound Lake. There are roughly 60 acres of Newfound Lake that occurs in Alexandria.

[2] The Shoreland Water Quality Protection Act (RSA 483-B) is a state statute that was prepared to protect water quality for designated public waters. The Act establishes minimum standards for various setbacks from the reference line based on land use within the designated 250-foot buffer. For most new construction, as well as land excavating and filling, a state permit may be required (certain exemptions apply). All great ponds (greater than 10 acres), fourth order streams or higher, and state-designated rivers have been identified by the NH Dept. of Environmental Services (NH DES) as those water bodies that are subject to the Act. For more details on the Act, as well as certified administrative rules, refer to the NH DES at http://des.nh.gov/organization/divisions/water/wetlands/cspa/index.htm



Foster Pond as viewed from Bog Road is a very familiar pond in Alexandria. Foster Pond is part of a much larger wetland associated with Alexandria Bog. This open water habitat helps to increase and maintain biological diversity, offering habitat for many species such as waterfowl, river otter, amphibians, and fish.

Nearly 90 miles of rivers and streams have been mapped in Alexandria (Table 2, Page 10). The most commonly known waterways include Smith River, Fowler River, Patten Brook, Bog Brook, Brock Brook, and Clark Brook. Many of the other streams form the headwaters that feed these waterways, which are significant for providing cold, well-oxygenated water for fish and other aquatic life. Most of these headwater streams form high on mountain slopes, including Oregon Mountain, Mowglis Mountain, Cardigan Mountain, Orange Mountain, Crane Mountain, and Brown Mountain. Of the many rivers and streams, two are included on the NH DES Consolidated List of Water Bodies subject to the Shoreland Water Quality Protection Act under RSA 483-B, including the Fowler River and Smith River. The Fowler River comes under the jurisdiction of the Act at the juncture at Bog Brook, whereas the Smith River is jurisdictional along its entire length through Alexandria.

Table 2. Summary of rivers and streams in Alexandria.

Stream Name	Length
Fowler River	4.2 miles
Smith River	12.5 miles
Patten Brook	6.9 miles
Bog Brook	5.1 miles
Brock Brook	3.3 miles
Clark Brook	5.7 miles
Other Streams	52.1 miles

SOURCE: USGS topography, GRANIT hydrography datasets, and NH DES RSA 483-B.

Watercourses in **bold type** are jurisdictional designations by NH DES and subject to the Shoreland Water Quality Protection Act under RSA 483-B.

The upper section of Patten Brook roughly parallels Washburn Road before heading southeast where it meets Alexandria Bog. This section can be viewed from Bog Rd. Streams provide significant habitat for aquatic and semi-aquatic wildlife such as fish, insects, beaver, mink, and river otter. The adjacent forested riparian habitat serves as wildlife corridors for many mammals as they travel throughout the town.

Wetlands

Wetlands are not always wet. They generally include familiar places such as marshes, wet meadows, beaver impoundments, swamps, fens, bogs, and other surface water bodies. As noted above, they perform a variety of ecological functions, such as providing significant habitats for wildlife and plants, maintaining good water quality, providing storage during a flood event, and sources for recreation. In New Hampshire,

wetlands are defined as "an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soils conditions." They are regulated by the NH Dept. of Environmental Services Wetlands Bureau[3].

The US Fish and Wildlife Service's National Wetlands Inventory (NWI) and US Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) hydric soils were mapped to better understand the extent of wetlands within Alexandria. These combined datasets provide for a more balanced approach at wetlands mapping.

The NWI is a hierarchal system of classification that was designed to map wetlands throughout the contiguous United States. The purpose was to determine wetlands loss over time. It also serves as a systematic method for comparing wetlands within a defined geographic location (i.e., town or watershed). The NWI provides some very useful information including the type of wetland as well as its hydrology, associated plant communities, water chemistry, and other modifiers such as human dams and beaver influence.

Alexandria is estimated to have roughly 700 acres of wetlands dispersed throughout the town (Map 2, Page 18). Several smaller wetlands can be found in the higher elevations associated with headwater streams. Examples can be seen along Clark Brook and Brock Brook along relatively flat areas where runoff collects from Orange Mountain, Crane Mountain, and Brown Mountain. Another high elevation wetland is located at the headwaters of Davis Brook as water sheds from the Mount Cardigan ridgeline. A small wet meadow can be viewed from Washburn Road along Patten Brook.

As one descends into the Village, wetlands are generally larger. They are found along the lower portions of Patten Brook, Bog Brook, and Fowler River. Other significant wetlands are located along the Smith River in the southern part of Alexandria near NH Route 104.

[3] As defined by RSA 482-A:2.

This wet meadow along Patten Brook can be seen from Washburn Road. It was once a beaver pond. As beaver dams age and become inactive, they will become unstable. This can result in the dam breaking and the pond draining, leaving a mud flat. Typically, wetland plants will quickly start colonizing the area and change the habitat once again. Beavers are responsible for altering habitats thereby increasing biological diversity in Alexandria.

The best known and by far the largest wetland in town is the Alexandria Bog. At approximately 319 acres, this large wetland is a complex of various habitat types, from marsh to forested and shrub swamps to open water. These various habitats provide for high biological diversity of plants and wildlife. When compared to the rest of the wetlands in town, Alexandria Bog is expected to be among the highest ranked wetlands for ecological functions and values. High functional values include its wildlife habitat, scenic quality, educational and recreational value, flood water storage capabilities, water quality maintenance (sediment and nutrient trapping), rare species, and an exemplary natural community. The Bog is situated above the town's largest contiguous aquifer system that has the highest yield of water flow. Alexandria Bog is one of the most significant wetlands in town. Conducting a wetlands evaluation of the wetland would help to illuminate the importance of this ecosystem.

Another significant wetland ecosystem can be found to the west of Alexandria Bog. This wetland is also noted for its high ecological functions and values. It is a great example of a peatland ecosystem with various habitats, including shrub and forested swamps, sedge meadow, emergent marsh, and open water with pond lilies.

This red maple swamp can be found along the margins of Alexandria Bog. Hemlock-dominated swamps can be found as well. Forested swamps such as this one can help provide flood storage, as well as to slow floodwaters, helping to prevent downstream erosion from occurring. They help to trap sediments and toxicants from roadways, which helps to maintain good water quality. They also provide habitat for many species, including wood turtle and northern leopard frog.

Stratified Drift Aquifers

Groundwater resources are stored in two main types of aquifers and can serve as sources for drinking water. Aquifers can be located within saturated areas of sand and gravel deposits or in fractured bedrock (*bedrock aquifers*). In the past, as glaciers melted they left behind layers of coarse sediments including sand and gravel. The space between these sediments provides opportunity for groundwater storage and flow. Groundwater stored in *stratified drift aquifers* can serve as an excellent source for drinking water. Locating and protecting these geologic features can help to ensure a clean supply of drinking water for the community as these areas are vulnerable to contamination.

Alexandria contains just over 2,700 acres of stratified drift aquifers (Table 3, Page 14 and Map 2, Page 18). The Smith River aquifer system is approximately 1,490 acres in comparison to the largest aquifer (1,801 acres) in Alexandria located beneath Bog Brook/Alexandria Bog and the lower section of Fowler River. It is this aquifer system that contains some of the highest estimated yields of groundwater found just north of the Village. Therefore, wetlands and uplands associated with this aquifer system have the potential to help maintain a healthy, clean source for drinking water.

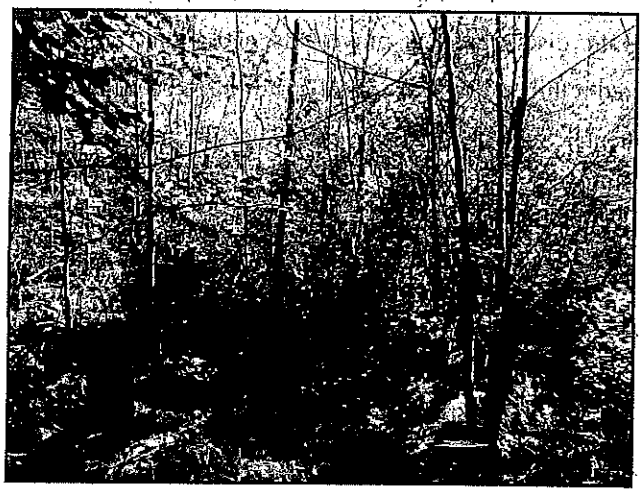
Aquifers are divided into categories based on *transmissivity*, which is the rate at which water moves through an aquifer and is measured in square feet per day (ft^2/day). Therefore, higher rates of transmissivity correspond to potentially higher yields of groundwater. Most of the aquifers in Alexandria have a transmissivity rate of less than

3,000ft^2/day. However, one area in particular is predicted to have as much as 4,000ft^2/day or even more. In fact, nearly 150 acres of this area is estimated to have a transmissivity rate greater than 6,000ft^2/day.

Table 3. Summary of aquifer transmissivity rates in Alexandria.

Aquifer Transmissivity	Size
less than 3,000 sq. ft. per day	2,377.3 acres
4,000-6,000 sq. ft. per day	179.5 acres
greater than 6,000 sq. ft. per day	147.3 acres

Source: USGS stratified drift aquifers (GRANIT 2000).



Wetlands, such as this shrub swamp, found along roadways can help trap excessive sediments, nutrients, and other harmful runoff that can be detrimental for water quality, both surface and groundwater resources. Wetlands in these areas are even more important if they function to recharge aquifers beneath the wetland.

Wellhead Protection Areas

The NH Department of Environmental Services has mapped wellhead protection areas throughout the state. This assists the agency with setting drinking water protection priorities within these areas to prevent the contamination of the groundwater source. A wellhead protection area delineates the area that supplies groundwater to a productive public well supply. The size of the area generally depends on the maximum daily withdrawal of water from the well, as well as existing data on the groundwater resource. Wellhead protection areas in Alexandria include the Village and areas to the north and east extending into Bristol to Newfound Lake. This occupies about 3,250 acres and

includes the zone associated with the highest yield aquifer in Alexandria (Map 2, Page 18).

Threats to Water Quality

In an effort to better understand potential threats to water quality, and particularly threats to groundwater resources within wellhead protection areas, the NH Department of Environmental Services documents known and potential contamination sources. These include both above and below ground storage tanks.

There are 17 sites that have been identified as known or potential threats to water quality (Map 2, page 18). These include areas associated with faulty septic systems, non-petroleum hazardous waste, non-hazardous holding tank, hazardous spill, wastewater lagoons, leaking oil tanks, wastewater discharge sites, gravel pits, and a junkyard. Many of the sites are no longer considered a threat. Eleven of the 17 sites have been closed by the NH Department of Environmental Services. This means protective measures have been put in place and no further action is required.

Water Protection Buffers

Water protection buffers extend 250 feet on either side of surface waters, streams, and wetlands. This accounts for approximately 4,940 acres in Alexandria (Map 2, Page 18). Water protection buffers include riparian zones[4] and their adjacent vegetative buffers, which provide a range of natural services that are essential in maintaining biodiversity and proper ecological functions.

Maintaining appropriate buffers along water features can help to ensure healthy, intact wildlife habitats. They provide space for safe wildlife movement as they move from one habitat to another. They also provide habitat for more localized species such as small mammals, birds, amphibians, and some reptiles. Forested buffers help to keep stream temperatures cool, a necessity for brook trout and the food supply they depend upon. They also support a thriving soil community, providing food web support and nutrients for plant growth.

[4] A riparian zone forms the area between the land and water. This includes areas adjacent to ponds, streams, rivers and wetlands.

Water protection buffers help to maintain clean water for swimming and drinking. Intact upland forests help to slow water in rain events as it moves across the surface of the land. The various parts of the groundcover (leaves, stems, downed trees, and plants) help to trap harmful runoff that may otherwise enter a stream or pond, and potentially an aquifer system. They also help to reduce the effects of downstream flooding by storing rising water levels in floodplains.

This forested buffer along the Smith River acts as a buffer for road salts and other toxicants that are washed off the adjacent state highway during rain events. This helps to maintain good, clean water. The forested buffer also affords the opportunity for wildlife to travel safely along the river as they move from one habitat to another.

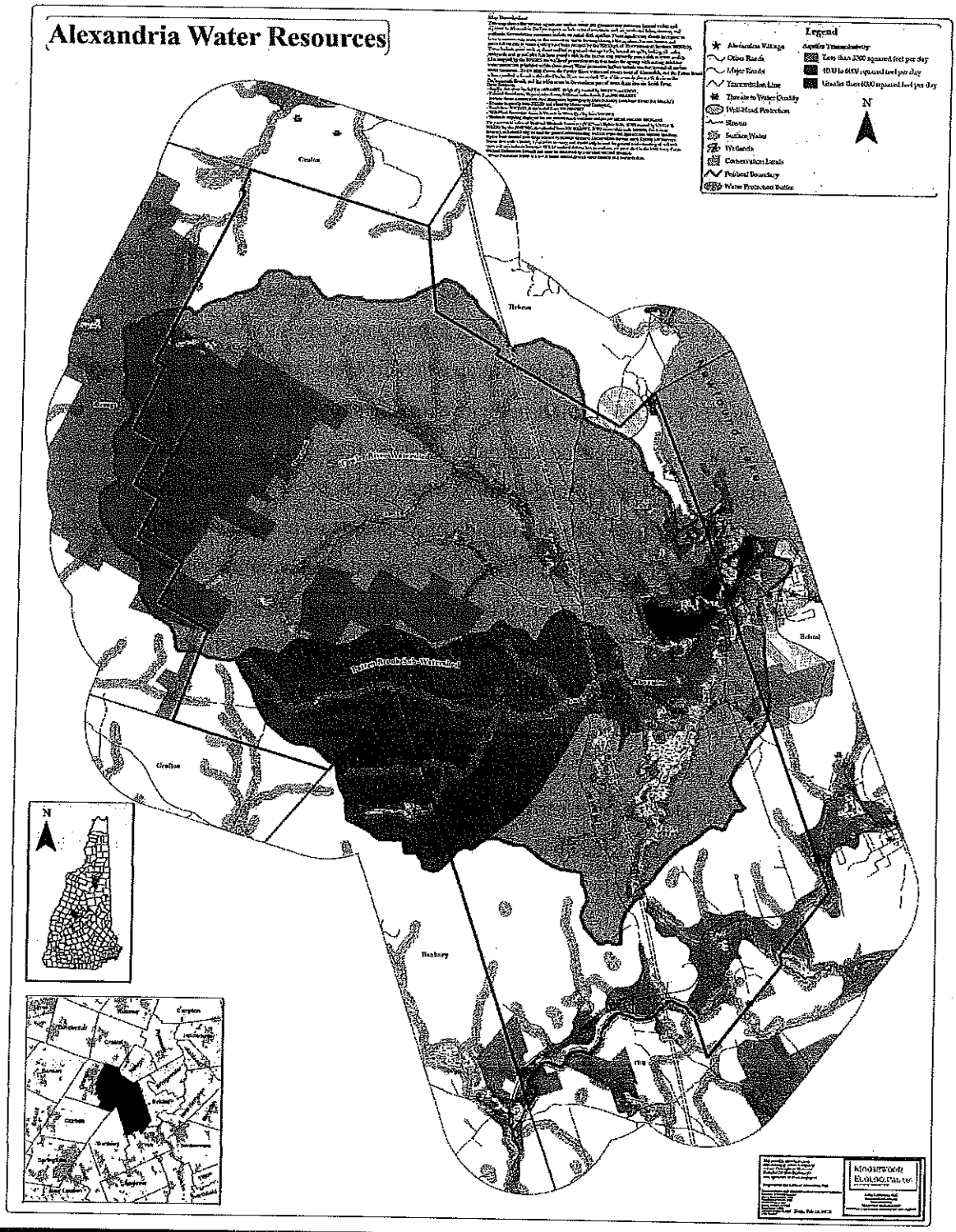
Watersheds

All of the previously discussed water resources reside in a watershed. A watershed is the area that drains to a common water resource. This may be a wetland, stream, or lake. The land use within a particular watershed can have a direct effect on the quality and quantity of surface waters and the underlying aquifers. Land use planning that uses a watershed approach can have a great impact on a town's water resources. This is important since we all depend upon clean water to help sustain life.

The Fowler River watershed is the largest in Alexandria (Map 2, Page 18). At 23,023 acres, it covers over 75% of the town. Part of the Cardigan Mountain State Forest is located within the upper reaches of the watershed, as well as the large, privately-owned conserved tract on Hutchins Hill. One of the main sub-watersheds is Patten Brook (4,156 acres), which eventually flows into Alexandria Bog and Bog Brook before entering Fowler River just north of Fowler River Road. In general, water quality within these

watersheds is expected to be good due to relatively little development and expansive forest cover. Northern parts of town drain into the Cockermouth River watershed. Southern parts drain into the Smith River watershed.

Signs of black bear were very common throughout Alexandria. This bear scat was observed on top of a *Sphagnum* peat mat. Peatlands are unique types of wetlands that provide habitat for a variety of plants not found in other wetlands.


Alexandria Water Resources
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Well Head Protection
Stream
Surface Water
Wetlands
Conservation Lands
Political Boundary
Water Protection Buffer
Aquifer Transmissivity
Less than 2000 squared feet per day
4000 to 6000 squared feet per day
Greater than 6000 squared feet per day
N
Groton
Hebron
Bristol
Danbury
N

Biological Resources

Wildlife Habitats

The NH Fish and Game Department, in cooperation with other agencies, organizations, and individuals, produced the NH Wildlife Action Plan (WAP) in 2005 (habitats revised 2010). This document was designed as a planning and educational tool for federal, state, and municipal governing bodies, conservation commissions, land trusts and other conservation organizations, and private landowners, as well as the general public, to promote the conservation and management of NH's biological diversity. The WAP provides a resource for developing informed land use decisions and land management planning. The intent was to ensure an adequate representation of various wildlife habitats are maintained across our landscape, keeping common species common in NH and working to prevent the loss of our rare and endangered species. Each of the WAP habitats is considered to be critical for the long term survival of various species.

The WAP identified approximately 11 different types of large and medium-scale wildlife habitats for Alexandria in their revised habitat mapping in 2010. However, since these habitats were based on computer models, they only *predict* where these habitat types may be present. Ground-truthing is essential to better understand the extent of habitats. Limited site visits and roadside observations were made to better understand the types and extent of the WAP habitats. This resulted in the elimination of one habitat type (pine barrens) and the documentation of two additional fine-scale habitats (rocky ridges and talus slopes). It also provides a more representative understanding of the true extent of wildlife habitats in Alexandria.

A total of 10 wildlife habitats as recognized by the WAP were mapped for Alexandria (Table 4, Page 20 and Map 3, Page 23). Habitat that was eliminated included five small patches of pine barrens adjacent to the Smith River. An assessment of aerial photography and roadside observations led to the conclusion that pine barrens most likely do not exist as originally mapped.

Table 4. Summary of wildlife habitats in Alexandria.

Wildife Habitat Type	Size
Wet Meadow/Shrub Wetlands	425.3 acres
Peatlands	68.9 acres
Ponds and Lakes	81.3 acres
Rivers and Streams	89.4 miles
Floodplain Forests	308.1 acres
Lowland Spruce-Fir Forest	4,723.0 acres
High Elevation Spruce-Fir Forest	107.5 acres
Northern Hardwood-Conifer Forest	5,650.6 acres
Hemlock-Hardwood-Pine Forests	16,359.5 acres
Ridge or Talus Slopes	889.9 acres
Cliffs	12.9 acres
South-facing Slopes	15,419.4 acres
Grasslands	1,855.3 acres

Source: GIS Slope Analysis by Moosewood Ecological; NH Fish and Game Department Wildlife Action Plan and NH hydrography datasets from GRANIT.

Rocky ridges and talus slopes can be found on Mowglis Mountain and Oregon Mountain, as well as Mt. Cardigan. In fact, this habitat is considered as an exemplary example, which further recognizes its ecological significance. Smaller examples of this habitat type were also observed on Hutchins Hill, and most likely exist in other highlands, especially with steep slopes. High elevation spruce-fir forests appear only to exist on Mount Cardigan. This forest type is generally found at elevations from 2,500 feet to 3,500 feet. Other forests that characterize Alexandria's highlands include lowland spruce-fir forests and northern hardwood-conifer forests. Examples of these can be found on Hutchins Hill, as well as other highlands in the western and northern parts of town, including Brown Mountain, Braley Hill, and Pine Hill among others. Other features found in association with higher elevations include cliffs. The WAP has mapped the cliff habitat for Sugarloaf, which can be viewed from West Shore Road. Cliff habitat may also be present on Mount Cardigan, Mowglis Mountain, and Oregon Mountain.

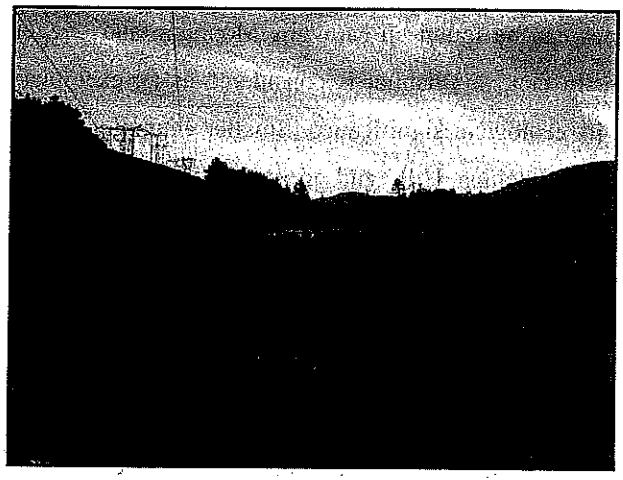
As one begins to move into to the lower elevations and along waterways such as Smith River, Fowler River, Patten Brook, Alexandria Bog, and Bog Brook hemlock-hardwood-pine forest communities tend to dominate. In fact, this forest type occupies

almost 60% of Alexandria. Occasionally lowland spruce-fir swamps are found in association with the hemlock-hardwood-pine forest.

As discussed above, wetlands, mostly small in nature, can be found scattered throughout the town. Alexandria contains about 425 acres of wet meadows/shrub wetlands. This does not include forested swamps, which are not mapped as part of the WAP. Peatlands are another type of wetland habitat. These are generally found where water moves slowly or becomes stagnant. In Alexandria, there are approximately 69 acres of peatlands. These are mainly located in the lowlands near Alexandria Bog and Foster Pond. In fact, the Alexandria Bog contains an exemplary example of a peatland.

Floodplains are probably slightly more prevalent along Smith River than what is predicted by the WAP. A red maple floodplain forest was observed along the river. The floodplains within the Village area are most likely more prevalent and include grasslands, as well as forests. Grasslands are a human-modified habitat and mostly exist as active farmlands. Many of these can be viewed in the Village and along Smith River.

For a more detailed description on the various wildlife habitats observed during the site assessments see Appendix A. This summary addresses on-site assessments within the Patten Brook watershed and greater Alexandria Bog area, as well as from roadside observations throughout Alexandria.



This wetland is arguably another significant wetland ecosystem. It contains a variety of wildlife habitats, including open water and a peatland characterized by interesting natural communities. Pitcher plants can be found scattered throughout, and river otter and bear scat was observed as well.

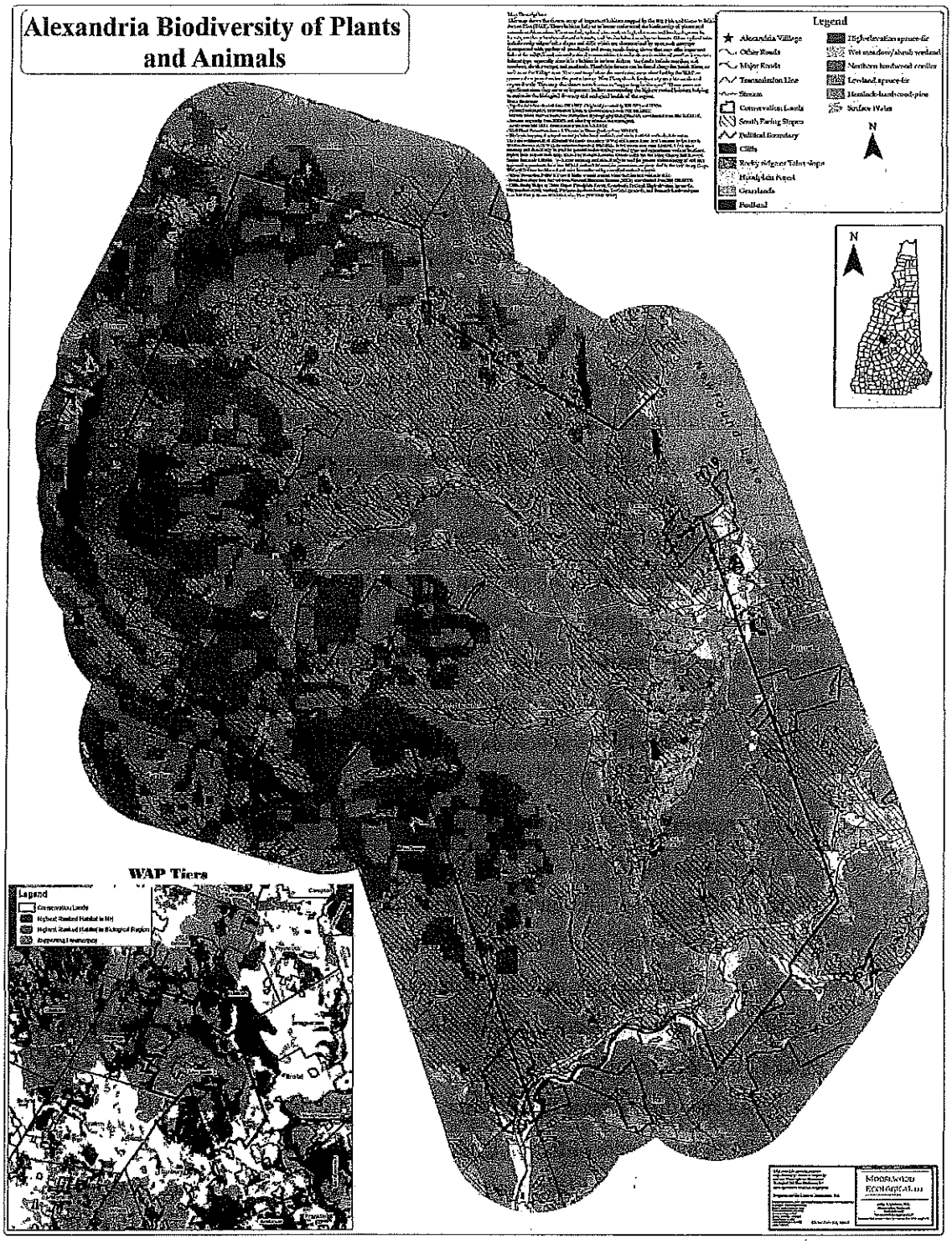
Additional habitats recognized but not mapped in the WAP included potential vernal pools, shrublands, and bat hibernacula. Vernal pools and shrublands are predicted to be more widespread throughout Alexandria and are best mapped during ground-truthing exercises. A bat hibernacula is known to occur in Alexandria. This site was not observed in 2012 but it was previously reported to the NH Natural Heritage Bureau. These habitats are significant for bats as they overwinter in the state. Mapping of these important wildlife habitats was beyond the scope of the WAP.

One final habitat type was created and mapped for the Alexandria NRI. This habitat type is not recognized by the WAP. This includes steep, south-facing slopes, representing over 15,400 acres in Alexandria. When associated with talus slopes, especially beneath cliffs, this habitat can serve as important den sites for various mammals, including coyotes, fox, porcupine, and bobcat. These areas can also be important sunning areas for bobcat in the winter months. Snakes will typically overwinter in such rocky areas. Lastly, these sites may also be associated with rare plants and communities due to their southern exposure creating much warmer habitats.

Wildlife Action Plan Habitat Rankings

As part of the WAP, the NH Fish and Game developed habitat rankings based on a variety of biological and human factors. Biological factors included attributes such as the size and condition of habitats, presence of rare species, and overall biological diversity. Human impacts included conditions such as the degree of development and pollution. To assist with conservation planning efforts in the state, each habitat type was ranked by its condition.

As seen in the inset figure in the bottom left corner of the Biodiversity of Plants and Wildlife map, some of these high rankings can be found in Alexandria (Map 3, Page 23). The pink color represents areas that have the highest ranked habitats state-wide. This ranking also considered the various biological regions in the state. The green coloration denotes areas that have high significance in the region. Finally, in order to maintain the health of the highest ranked habitats, it is important to protect the adjacent areas. The orange areas show the supporting landscapes that can help to insure the long term viability of the highest ranked areas.


Alexandria Biodiversity of Plants and Animals
Legend
Alexandria Village
Other Roads
Major Roads
Transmission Line
Stream
Conservation Lands
Small, Facing Slopes
Political Boundary
Cliffs
Rocky ridges/Talus slopes
Hemlock/Red Spruce
Grasslands
Peatland
High-elevation spruce-fir
Wet meadow/shrub wetland
Northern hardwood conifer
Lowland spruce-fir
Hemlock-hardwood-pine
Surface Water
N
N
WAP Tiers
Legend
Conservation Lands
Highest Ranked Habitat in NH
Highest Ranked Habitat in Biological Region
Supporting Landscape
Moosewood Ecological

Wildlife Diversity

The 2012 site assessments were used to catalogue the diversity of wildlife throughout Alexandria. These observations were then combined with existing data, including a report on the Alexandria Bog by the Audubon Society of New Hampshire and NH Natural Heritage database. A total of 127 wildlife species have been documented (Appendix A). This includes 93 birds, 19 mammals, 10 amphibians, and 5 reptiles. These lists are not meant to be a comprehensive list rather it should serve as a supplement to existing and future lists for Alexandria.

Wildlife observed within the Patten Brook watershed was quite diverse. These included wildlife mostly using forested habitats but were also associated with forest edges, small forest openings, riparian habitats along Patten Brook, and an abandoned beaver pond. These species included red-tailed hawk, broad-winged hawk, Cooper's hawk, pileated woodpecker, black-capped chickadee, white-breasted nuthatch, hermit thrush, common raven, American crow, blue jay, veery, least flycatcher, eastern wood-pewee, common yellowthroat, indigo bunting, magnolia warbler, red-eyed vireo, blue-headed vireo, wild turkey, and cedar waxwing. Also reported were American woodcock (a species of conservation concern). Mammals included white-tailed deer, moose, black bear, coyote, weasel, red squirrel, porcupine, and bobcat. In terms of amphibians and reptiles seven species were recorded, including American toad, green frog, red-spotted newt, spring peeper, pickerel frog, gray tree frog and garter snake.

Given the wide range of habitats, wildlife within Alexandria Bog included a variety of species using terrestrial, wetland, and aquatic habitat types. Species observed using open water, emergent marsh and shrub swamp habitats included American bittern, great blue heron, mallard, wood duck, red-winged blackbird, kingfisher, mourning dove, cedar waxwing, American crow, barn swallow, chimney swift, eastern phoebe, eastern kingbird, alder flycatcher, northern parula, common yellowthroat, northern waterthrush, gray catbird, eastern towhee, song sparrow, swamp sparrow, chipping sparrow, vesper sparrow, yellow warbler, American goldfinch, broad-winged hawk, red-tailed hawk, garter snake, spring peeper, green frog, bullfrog, pickerel frog, deer, moose, coyote, bear, raccoon, skunk, mink, and otter, as well as old and new beaver sign. These observations also included those using the edge habitats associated with the adjacent forested areas, as

well as the power line corridor. Species of conservation concern previously documented in Alexandria Bog included ribbon snake, wood turtle, Virginia rail, northern harrier, veery, purple finch, rusty blackbird, and eastern meadowlark.

Species observed within the upland forests surrounding Alexandria Bog included northern goshawk, barred owl, pileated woodpecker, hairy woodpecker, blue jay, American crow, common raven, black-capped chickadee, winter wren, veery, hermit thrush, red-eyed vireo, blue-headed vireo, ovenbird, scarlet tanager, chipmunk, red squirrel, coyote, deer, moose, bear, wood frog, gray tree frog, and red-spotted newt.

Other interesting species included peregrine falcon (state threatened), spotted turtle (state threatened), and a sandhill crane. While they were not observed this year, peregrine falcon and spotted turtle have been documented in undisclosed locations in Alexandria. One very unusual visitor included a sandhill crane that was observed in the village in May 2012. This species is generally found in Canada and the northern part of the Midwest during the breeding season.

Rare and Invasive Plants

No rare plants were observed during the field assessments. In addition, no rare plants have been reported to the NH Natural Heritage Bureau. However, this NRI does not constitute a comprehensive inventory of plants in Alexandria. Sampling over the various seasons would provide a better snapshot of plants throughout the town.

Invasive plants appear to be not as prevalent as in some other communities in New Hampshire, especially those towns associated with more developed and disturbed areas. The most abundant and widespread invasive plant is Japanese knotweed. This species can be found along sections of Bog Brook/Alexandria Bog, Smith River, and the lower section of Patten Brook where it meets Alexandria Bog. The latter location represents the largest patch of knotweed and can be easily observed along either side of Bog Road at the point where it crosses Patten Brook. Another smaller site was noted on the town-owned lot on Bog Road. Autumn olive was also noted in this location. One purple loosestrife plant was noted along Bog Road at the crossing of Bog Brook adjacent to the powerline right-of-way. Japanese knotweed was also observed along Walker Road where it crosses a small brook that leads to Smith River. With its proximity to the Smith

River and the overall general ecology of Japanese knotweed, it is most likely that this species, as well as additional invasive plants, may be found in other areas along the banks and floodplains of the Smith River and other streams.

Japanese knotweed and buckthorn were noted within the powerline right-of-way. It is likely that other invasive species also exists along the right-of-way. Invasive species were not observed within the upland forests of the Patten Brook watershed. This assessment does not represent a comprehensive survey of invasive plants in Alexandria. However, it does represent an assessment of a small portion of the Patten Brook watershed and Alexandria Bog area.

Invasive plants can dramatically change habitats, affecting both native plants and wildlife. These invaders have developed a variety of strategies to quickly colonize an area. This site shows an infestation of Japanese knotweed along Patten Brook where it meets Alexandria Bog. Dense patches have formed here, out-competing native plants and altering floodplain habitat for various wildlife.

LAND RESOURCES

Alexandria is rich with important soils for both forest management and agriculture. These areas represent some of the best soils for the production of forest products and food, feed, and fiber from farming. Understanding these natural resources provides insight into the best use of the landscape.

Important Farmland Soils

In response to the Farmland Protection Policy Act of 1981[5], farmland soils were mapped by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Based on a variety of physical and chemical properties (i.e., drainage, texture, hydric regime, pH, erodibility factor), these soils have been identified as being among the most productive lands for many types of farming practices. These include prime farmland soils, farmland soils of statewide significance, and farmland soils of local significance. Each is defined below by the USDA NRCS:

Prime Farmland

- Soils that have an aquic or udic moisture regime and sufficient available water capacity within a depth of 40 inches to produce the commonly grown cultivated crops adapted to New Hampshire in 7 or more years out of 10.
- Soils that are in the frigid or mesic temperature regime.
- Soils that have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches.
- Soils that have either no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to New Hampshire to be grown.
- Soils that have a saturation extract less than 4 mmhoc/cm (millimhos per centimeter, which is a measure of electric conductance) and the exchangeable sodium percentage is less than 15 in all horizons within a depth of 40 inches.
- Soils that are not frequently flooded during the growing season (less than a 50% chance in any year or the soil floods less than 50 years out of 100).
- The product of the erodibility factor times the percent slope is less than 2.0 and the product of soil erodibility and the climate factor does not exceed 60.
- Soils that have a permeability rate of at least 0.06 inches per hour in the upper 20 inches.

[5] As defined by the USDA NRCS: "The Farmland Protection Policy Act of 1981 was established to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses, and to assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with state, unit of local government, and private programs and policies to protect farmland."

- Soils that have less than 10 percent of the upper 6 inches consisting of, rock fragments larger than 3 inches in diameter.

Farmland of Statewide Importance

These soils refer to land that is not prime or unique but is considered farmland of statewide importance for the production of food, feed, fiber, forage and oilseed crops. Criteria for defining and delineating farmland of statewide importance are determined by a state committee chaired by the Commissioner, New Hampshire Department of Agriculture, Markets and Food, with members representing the University of New Hampshire Cooperative Extension, New Hampshire Association of Conservation Districts and the New Hampshire Office of State Planning. The NRCS State Soil Scientist serves on this committee in an advisory capacity. The original criteria were established on June 20, 1983. They were updated on December 7, 2000.

Soils of statewide importance are soils that are not prime or unique and:

- Have slopes of less than 15 percent.
- Are not stony, very stony or boulder.
- Are not somewhat poorly, poorly or very poorly drained.
- Includes soil complexes comprised of less than 30 percent shallow soils and rock outcrop and slopes do not exceed 8 percent.
- Are not excessively drained soils developed in stratified glacial drift, generally having low available water holding capacity.

Farmland of Local Importance

Farmland of local importance is farmland that is not prime, unique or of statewide importance, but has local significance for the production of food, feed, fiber and forage. Criteria for the identification and delineation of local farmland are determined on a county-wide basis by the individual County Conservation District Boards. The original criteria were established on June 20, 1983. Updates are noted according to the county initiating the update. The criteria for soils of local importance in Grafton County are as follows:

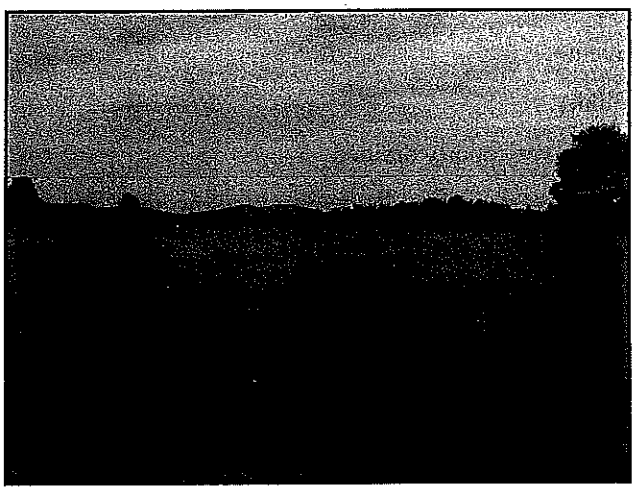
- Soils that are poorly drained, have artificial drainage established and are being farmed.
- Specific soil map units identified from the NRCS county soil survey legend, as determined by the Conservation District Board.
- All land that is in active farm use.

Important farmland soils cover approximately 6,110 acres in Alexandria, or roughly 22% (Table 5 and Map 4, Page 35). These soils are widely distributed throughout the town. Prime farmland soils make up about 9% of the total acreage, and generally occur along stream drainages and in the Village. Farmland soils of local and statewide significance make up the bulk of the acreage of these soil types. These are found to be more widespread in Alexandria.

Table 5. Summary of important soils for farm production in Alexandria.

Important Farmland Soil Type	Size
Prime Farmland Soils	542.3 acres
Other Farmland Soils of Signficance	5,567.7 acres

SOURCE: GIS Analysis (Moosewood Ecological 2012) of USDA Natural Resources Conservation Service soils.



Active farmlands promote a sense of place and rural identity. The various products that are produced on these farmlands contribute to the local economy.

Important Forest Soils

Forest resources within New Hampshire are significant for many reasons. They provide sources of employment, a multitude of forest products, promote local economies, recreation and tourism, provide clean air, help sequester carbon, and provide substantial habitats for wildlife and plants, as well as diverse ecological functions (such as nutrient cycling, carbon sequestration, water quality maintenance through sediment trapping). For these reasons, it is important to maintain large tracts of forest lands and to better understand where important forest soils exist in Alexandria.

The USDA Natural Resources Conservation Service has mapped the distribution of important forest soils and has classified them according to their capacity to grow trees. These soils signify areas as providing the most productive lands for timber production. The NRCS has identified three soils groups within this category and have described each as follows:

Forest Soil Class IA

This group consists of the deeper, loamy textured, moderately well, and well-drained soils. Generally, these soils are more fertile and have the most favorable soil moisture relationships. The successional trends on these soils are toward stands of shade tolerant hardwoods, i.e., beech and sugar maple. Successional stands frequently contain a variety of hardwoods such as red oak, beech, sugar maple, red maple, white birch, yellow birch, aspen, and white ash in varying combinations with red spruce, hemlock, and white pine. Hardwood competition is severe on these soils. Softwood regeneration is usually dependent upon persistent hardwood control efforts.

Forest Soil Class IB

The soils in this group are generally sandy or loamy over sandy textures and slightly less fertile than those in group IA. These soils are moderately well and well drained. Soil moisture is adequate for good tree growth, but may not be quite as abundant as in group IA soils. Soils in this group have successional trends toward a climax of tolerant hardwoods, predominantly beech. Successional stands, especially those which are heavily cut over, are commonly composed of a variety of hardwood

species such as red oak, red maple, aspen, paper birch, yellow birch, sugar maple, and beech, in combinations with white pine, red spruce, balsam fir, and hemlock. Hardwood competition is moderate to severe on these soils. Successful softwood regeneration is dependent upon hardwood control.

Forest Soil Class IC

The soils in this group are outwash sands and gravels. Soil drainage is somewhat excessively to excessively drained and moderately well drained. Soil moisture is adequate for good softwood growth, but is limited for hardwoods. White pine, red maple, aspen, and paper birch are common in early and mid-successional stands. Successional trends on these coarse textured, somewhat droughty and less fertile soils are toward stands of shade tolerant softwoods, i.e., hemlock and red spruce. Hardwood competition is moderate to slight on these soils. Due to less hardwood competition, these soils are ideally suited for softwood production. With modest levels of management, white pine can be maintained and reproduced on these soils. Because these soils are highly responsive to softwood production, especially white pine, they are ideally suited for forest management.

Important forest soils represent nearly 17,900 acres, or approximately 64% of Alexandria (Table 6 and Map 4, Page 35). Forest soil groups 1A and 1B make up the majority of this resource and are most ideally suited for hardwood production. Soil group IC appears to be more restricted to stream drainages where outwash sands and gravels were deposited by glacial activity about 11,000 years ago. These soils tend to be well-drained, a characteristic that ideally suits white pine and other softwoods. These areas include sites along Smith River and Fowler River.

Table 6. Summary of important forest soils for timber production in Alexandria.

Important Forest Soil Type	Size
Hardwood Production (1A and 1B)	16,678.7 acres
Softwood Production IC)	1,193.0 acres

SOURCE: GIS Analysis (Moosewood Ecological 2012) of USDA Natural Resources Conservation Service soils.

This enriched northern hardwood forest was observed along a north-facing slope near Washburn Road in the upper parts of the Patten Brook watershed. This site has been identified to have important soils for a productive hardwood forest. Areas identified as such have the capabilities of producing good quality timber products that contribute to the local economy.

Unfragmented Landscape

The inset figure found in the lower left corner on the Land Resources Map shows the unfragmented landscape in Alexandria (Map 4, Page 35). These data were developed as part of the WAP. For the purposes of this project, fragmenting features were defined as 500 feet on either side of existing roadways, including all state and town roads but excluding Class VI roads and trails, as well as private driveways. This is the area where most developments are predicted to occur in relation to roadways. Unfragmented blocks of land includes a variety of natural habitats such as forests, wetlands, streams, and ponds but also can include human-modified areas such as farmlands and shrublands.

The fragmentation of land can negatively affect species' survival rates, including mortality, lowered rates of breeding success, or species loss altogether. The degree of fragmentation depends upon many aspects, such as the size and shape of unfragmented block, the species in question, the extent of loss of natural habitats, intensity of human use, and colonization of invasive species.

Large blocks of unfragmented areas are widely known to support greater biodiversity than smaller blocks. As forest blocks become smaller due to the construction of roadways and developments their biodiversity will generally be reduced. This fragmentation affect has less immediate impact on generalist species or those with small home ranges (such as gray squirrels, raccoon, many amphibians, and small rodents) while affecting and potentially eliminating area-sensitive specialists that need large forested

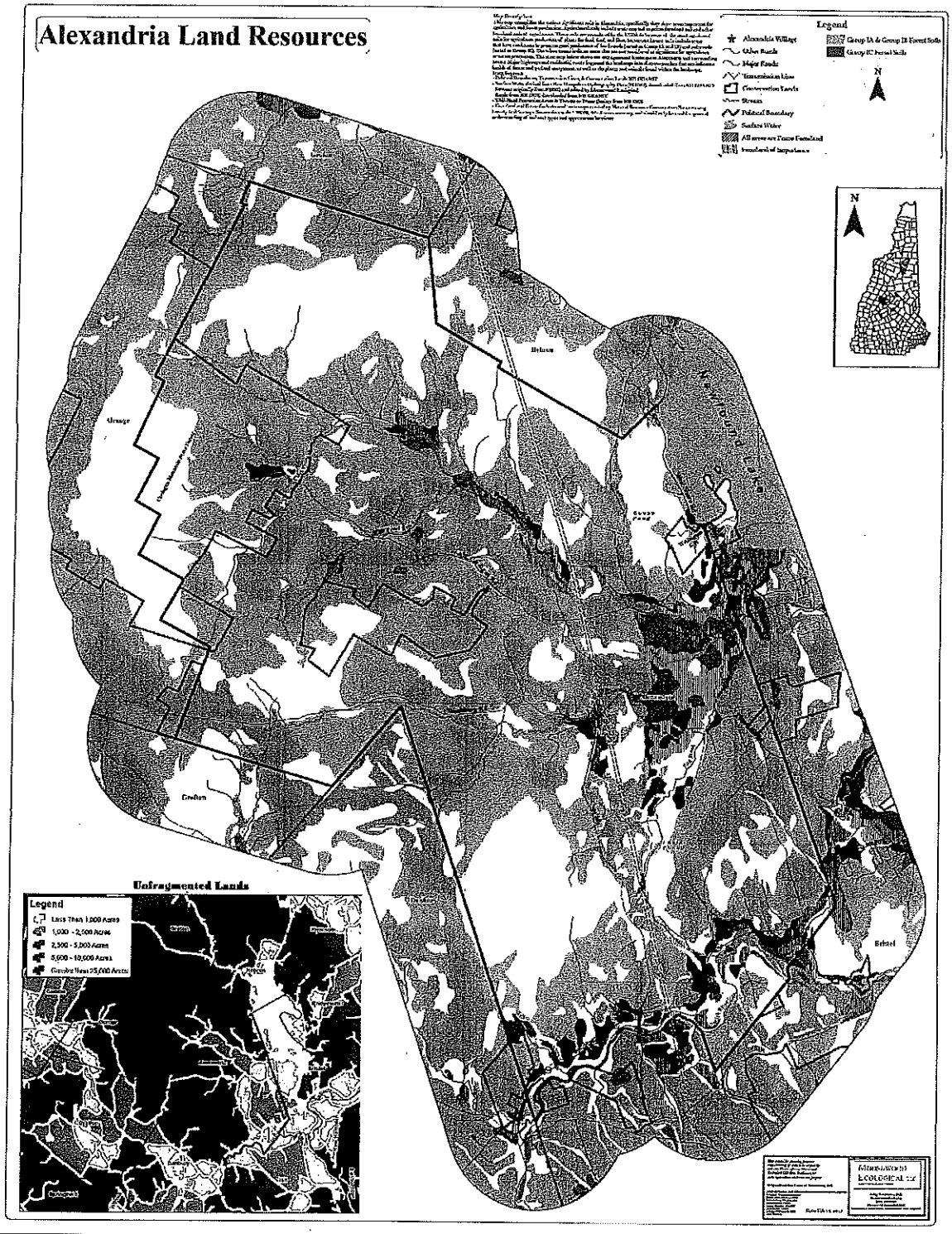
blocks in order to maintain their home ranges and for long-term survival (such as bear, bobcat, moose, some reptiles, wood thrush, and goshawk). Table 7 (Page 34) provides a general list for habitat block size requirements for wildlife to help illustrate this point.

Another function of large landscapes is to allow wildlife movement and habitat connectivity. By maintaining connectivity between critical habitats it may be possible to provide permanent wildlife corridors within the built environment. Wildlife travel corridors function as areas that one or many species may use to move from one habitat to another. This movement can be based on traveling to various areas for feeding, breeding, nesting, or shelter. Wildlife must be able to travel safely throughout the landscape in order to meet their biological needs. Many depend upon a variety of habitats for their survival and may utilize many natural features for travel. These may include features such as riparian zones of wetlands, ponds, and streams, ridgelines, utility rights-of-way, and forest patches acting as a safe route between two or more habitats. A variety of wildlife can be associated with these corridors, including otter, muskrat, fox, coyote, bobcat, deer, moose, fisher, mink, and bear.

Wildlife corridors are not only significant for mammals but are equally important for amphibians, reptiles and migratory birds. Both amphibians and reptiles begin to move from their wintering habitats to their respective breeding and nesting grounds in the spring. This is the time of year that most mortality can be noticed as these species travel across roadways in search of suitable habitats. This effect can often be exacerbated as the same individuals must return back to their wintering habitats. Thus, there is a great significance in maintaining habitat connectivity, as well as understanding where these patterns of movement are taking place. This latter point can be a very important educational tool for community awareness about corridors across roadways. It can provide a means to adjust transportation patterns to help eliminate potential road mortality.

Table 7. Habitat block size requirements for wildlife.

1-19 Acres	20-99 Acres	100-499 Acres	500-2,500 Acres	>2,500 Acres
raccoon	raccoon	raccoon	raccoon	raccoon
	hare	hare	hare	hare
				coyote
small rodent	small rodent	small rodent	small rodent	small rodent
	porcupine	porcupine	porcupine	porcupine
				bobcat
cottontail	cottontail	cottontail	cottontail	cottontail
	beaver	beaver	beaver	beaver
				black bear
squirrel	squirrel	squirrel	squirrel	squirrel
	weasel	weasel	weasel	weasel
		mink	mink	mink
				fisher
	woodchuck	woodchuck	woodchuck	woodchuck
		deer	deer	deer
muskrat	muskrat	muskrat	muskrat	muskrat
			moose	moose
red fox	red fox	red fox	red fox	red fox
songbirds	songbirds	songbirds	songbirds	songbirds
		sharp-shinned hawk	sharp-shinned hawk	sharp-shinned hawk
			bald eagle	bald eagle
skunk	skunk	skunk	skunk	skunk
		Cooper's hawk	Cooper's hawk	Cooper's hawk
		harrier	harrier	harrier
		broad-winged hawk	broad-winged hawk	broad-winged hawk
			goshawk	goshawk
		kestrel	kestrel	kestrel
			red-tailed hawk	red-tailed hawk
		great-horned owl	great-horned owl	great-horned owl
			raven	raven
		barred owl	barred owl	barred owl
		osprey	osprey	osprey
		turkey vulture	turkey vulture	turkey vulture
		turkey	turkey	turkey
most reptiles	most reptiles	reptiles	reptiles	reptiles
	garter snake	garter snake	garter snake	garter snake
	ring-necked snake	ring-necked snake	ring-necked snake	ring-necked snake
most amphibians	most amphibians	most amphibians	amphibians	amphibians
		wood frog	wood frog	wood frog


Alexandria Land Resources
Legend
Alexandria Village
Other Roads
Major Roads
Transmission Lines
Conservation Lands
Streams
Political Boundary
Surface Water
Soils of Importance
Group IA & Group IB Forest Soils
Group IC Forest Soils
N
Bristol
Unfragmented Lands
Legend
Less Than 1,000 Acres
1,000 - 2,500 Acres
2,500 - 5,000 Acres
5,000 - 10,000 Acres

LAND CHARACTERISTICS

A variety of land characteristics can create challenges or constraints for various types of land use activities (Table 8, Page 37 and Map 5, Page 38). This can include various land uses from residential subdivisions and industrial developments to forestry and farming. Major challenges include water resources such as streams, lakes, ponds, and wetlands, especially as they are governed by state and/or town regulations. Other challenges include the steep slopes characteristic of much of Alexandria's landscape.

As previously mentioned, certain water bodies and rivers are protected under the Shoreland Water Quality Protection Act (RSA 483-B). These include Newfound Lake, Goose Pond, Fowler River and Smith River. The Act establishes minimum standards for various setbacks from the reference line based on land use within the designated 250-foot buffer. Wetlands, including rivers and water bodies, are also protected by state statutes (RSA 482-A: Fill and Dredge in Wetlands). Water resources in the state were "found to be for the public good and welfare of this state to protect and preserve its submerged lands under tidal and fresh waters and its wetlands... from despoliation and unregulated alteration." This includes the adverse affects on wildlife and habitats, commerce, recreation, aesthetic enjoyment, flood storage capabilities, and water quality.

In recognition of the significance of water resources, Alexandria has enacted regulations that define a minimum of 250 feet setback for buildings in a subdivision. This is the area defined as orange hatching adjacent to surface water resources. It states that "this area must be left as green/open space and conform to conservation efforts."

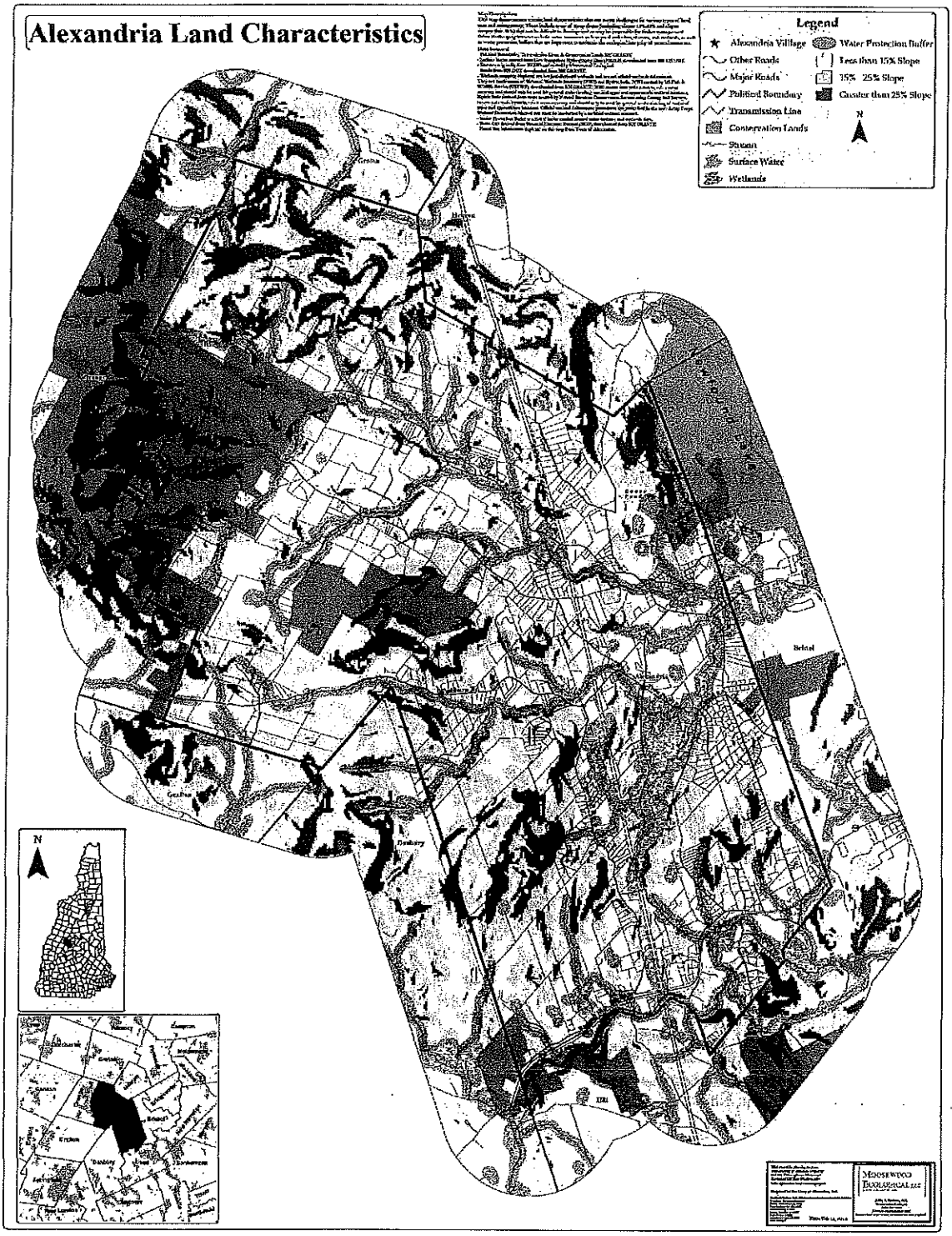
Finally, steep slopes can present a variety of challenges for certain types of land uses. These include the development of buildings, roads, and septic systems, increased potential for erosion, and inoperability for timber management. Many of Alexandria's steep slopes have a very thin layer of soil (or may even be exposed bedrock), making these areas vulnerable to increased runoff and erosion, which contributes to lower water quality. Almost half of Alexandria has slopes that are greater than 15%. Of this area 4,406 acres are greater than 25%, presenting some of the most challenging terrain in town.

Table 8. Summary of land characteristics that may present challenges on various types of land use.

Land Characteristics Description	Size (acres)
Wetlands	702.3 acres
Surface Waters	
Newfound Lake	4,450.7 acres*
Goose Pond	15.5 acres
Foster Pond	5.9 acres
Streams	
Fowler River	3.9 miles
Smith River	12.5 miles
Patten Brook	6.9 miles
Bog Brook	5.1 miles
Brock Brook	3.3 miles
Clark Brook	5.7 miles
Other Streams	52.1 miles
Water Protection Buffer	4,93.93 acres
Steep Slopes	
15% - 25% Slope	9,144.1 acres
Greater than 25% Slope	4,406.4 acres

SOURCES: USDA Natural Resources Conservation Service soils, US Fish and Wildife Service National Wetlands Inventory, USGS topography, digital elevation models, and NH hydrography datasets

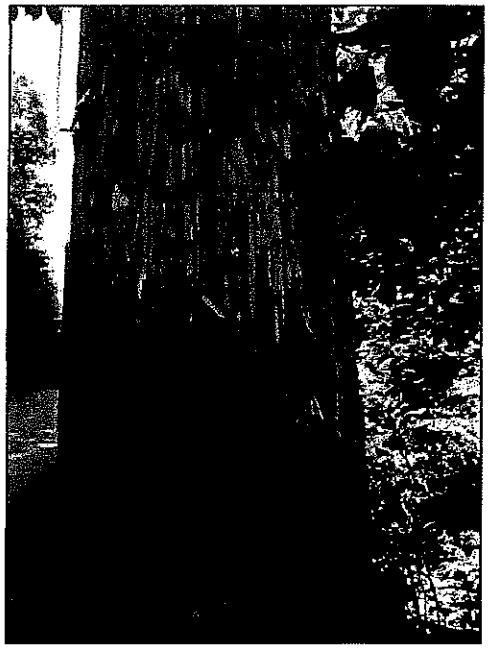
* This is the total acreage of Newfound Lake, most of which does not reside in Alexandria.


Alexandria Land Characteristics
Legend
Alexandria Village
Other Roads
Major Roads
Political Boundary
Transmission Line
Conservation Lands
Stream
Surface Water
Wetlands
Water Protection Buffer
Less than 15% Slope
15% - 25% Slope
Greater than 25% Slope
N
Bristol
Danbury
Moosewood Ecological LLC

CONCLUSION

Alexandria has a wide range of natural resources that host a diversity of species, including some of conservation concern. These include rivers and water bodies, wetlands, high quality and unique examples of wildlife habitats, rare and endangered species habitats, and Alexandria's large unfragmented forests. Alexandria also boasts significant natural resources that are vital for the working landscape. These include active farmlands and important soils, which signify specific areas as providing the most productive lands for agriculture and timber production. The Alexandria NRI was created to better understand where these significant natural resources are located and why they are important.

Planning for the protection of the rural landscape and biological diversity is an ongoing process as more is learned from research and the effects of land use. Fortunately, today we are better equipped with various tools to assist with informed decision making. One such tool is the Alexandria NRI. This report should be viewed as a work in progress. It should be reviewed and updated regularly to reflect new data, including on-site assessments, additional conservation lands, new regulatory policies, and regional conservation priorities.



Driving along many of the roads in Alexandria will certainly reveal sign that bears have been moving through the area. This utility pole has been bitten several times by a black bear. By examining the number of poles and intensity of bites it is possible to understand areas that are heavily used by bears. Based on "hit" utility poles, it appears that bear are crossing the northern section of Bog Road just south of Patten Brook to and from Alexandria Bog. Additional sign along the edge of the Bog in this area helps to confirm this statement.

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GLOSSARY

Alluvial – pertaining to soils deposited a stream.

Aquic Moisture – pertaining to soils that are free of dissolved oxygen because the soil is saturated by water.

Aquifer – an underground area containing water in either bedrock or sand and gravel that can be used as a source for drinking water.

Biodiversity – the amount of variation of life forms, including plants and animals.

Bog – a type of peatland that only receives water through rain and snow and is typically colonized by acid-loving plants; bogs typically do not have an inlet or outlet stream (compare to fen).

Degradation – the process of deterioration over time, such as the decline of water quality over time due to increased pollution.

Ecosystem – a community of living organisms (plants and animals) within the non-living environment (soil and water).

Ecological Community – a group of two or more populations of different species found in the same place.

Emergent Marsh-Shrub System – a type of wetland ecosystem that includes marsh and shrub habitats.

Erodibility Factor – a description of the inherent erodibility of a particular soil type.

Exemplary Communities – includes all rare types of natural communities as well as common types that are in excellent condition.

Fen – a type of peatland that receives water through multiple sources, including streams, ponds, and rain, and is less acidic than bogs; fens typically have an inlet and/or outlet stream (compare to bog).

Genes – a unit of heredity found in living organisms (plants and animals) that can be passed from one generation to the next

Hibernacula – the location chosen by an animal for hibernation.

Hydric – pertaining to a wet or moist environment.

Hydrology – pertaining to the science of water.

Impoundments – an area enclosed to contain something, such as a beaver pond.

Natural Communities – combinations of distinct plant assemblages, their physical environments, and the ecological processes that affect them; includes both uplands and wetlands such as forests and woodlands, talus slopes, shorelines, marshes, forested swamps, peatlands, and floodplains.

Nutrient Cycling – process by which living (plants and animals) and non-living (soil and water) elements of the environment return to help produce and/or feed living organisms.

Peatland – a type of wetland that produces peat from decaying plants; Sphagnum mosses are typically found in peatlands.

Riparian – the area where land and water meet along the edge of a river, stream, lake, pond, or wetland.

Sedge Meadow – a type of wetland that typically forms in abandoned beaver impoundments, is noted by a lack of surface water, and includes various kinds of sedges and grasses.

Sequester Carbon – the act of capturing and storing carbon dioxide.

Species of Concern – includes all rare species as well as species that are in decline.

Stratified Glacial Drift – sediments (sand, clay, silt, and rock) that have been sorted and layered by size as a result of melting glaciers.

Successional Trend – the direction in which a forest changes over time; these are in response to disturbances such as logging, fire, and wind events (such as hurricanes), which can set the trend back to an earlier state.

Temperate Minerotrophic Swamp System – a type of wetland ecosystem that is dominated by trees and has some mineral enrichment important for plant growth; includes red maple swamps.

Terrestrial – pertaining to things associated with land (as opposed to air or wetlands).

Transmissivity – the rate at which water moves through an aquifer and is measured in square feet per day (ft^2/day).

Udic Moisture – a type of soil moisture regime that is found in humid climates but are not saturated by water long enough to deplete oxygen (compare to aquic moisture).

Unfragmented Blocks – undeveloped areas of land and water that are not broken up by Roadways, serving as critical habitat for a variety of species.

Vernal Pools – temporary pools of water associated with periodic drying that are free of fish, serving as critical habitats for many species, particularly amphibians that need this habitat for long-term survival.

Wetlands – defined by the NH Dept. of Environmental Services Wetlands Bureau as "an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soils conditions."

APPENDIX A
2012 FIELD ASSESSMENT SUMMARY

Field Notes from Site Assessments in Alexandria, NH

A total of five (5) days of field work were allocated to ground-truth various natural resources. Roadside surveys and on-site assessments were used to collect data on wildlife, plants, habitats, and natural communities. All observations of wildlife were noted, including visual and auditory observations as well as other signs such as feeding, browsing, tracks, scat, and scent stations. Invasive plants were also noted. A GPS unit and digital camera was used to record significant ecological attributes.

Patten Brook Watershed

Habitats and Natural Communities:

The Patten Brook watershed contains a variety of important wildlife habitats and natural communities. The upper slopes of Hutchins Hill and Braley Hill support a northern hardwood-conifer forest ecosystem, comprising various natural communities, including northern hardwood spruce-fir-forest, sugar maple-beech-yellow birch forest, and hemlock-spruce-northern hardwood forest. The semi-rich mesic sugar maple forest community occurs in smaller patches within the larger forested ecosystem, particularly where the soil increases in moisture and nutrient enrichment. Rich mesic forests may also be present. It is suspected that the same forest communities may also occur on Brown Mountain and Pine Hill, as well as the north side of Alexander Hill. The top of Hutchins Hill supports a mature stand of a lowland spruce-fir forest community, and through aerial photography interpretation it appears that this spruce-fir forest also exists on top of Braley Hill and Pine Hill. The south-facing slope of Hutchins Hill also supports rocky outcrops and small cliffs. This area provides habitat for snake hibernacula, as well as winter sunning areas for bobcat and denning sites for other mammals such as porcupine.

As one begins to move into the lower elevations and along Patten Brook hemlock-hardwood-pine forest communities tend to dominate with the occasional lowland spruce-fir swamp. Areas lower in the watershed dominated by hemlock may be serving as deer wintering areas (or deeryards). In addition, a few older trees were observed scattered throughout the watershed, including a few 2.5-3 feet yellow birches, 2.5 feet white ash, and a 3.5 feet sugar maple, as well as some older hemlocks. These trees are estimated to be about 150-250+ years old.

Patten Brook appears to be a fairly healthy, intact brook. Throughout its stretch from high in the watershed until it meets its confluence with the Alexandria Bog and Bog Brook, Patten Brook remains mostly a forested stream. An old beaver impoundment was observed along Washburn Road just east of the brook's origin. Approximately five road crossings occur along its length, as well as various driveways. In the upper portion of the watershed Patten Brook is fairly narrow with a variety of in-stream habitats, including small cascades, riffles, and pools. These varied habitats create for a biologically diverse aquatic ecosystem. As one moves into the lower portion of the watershed Patten Brook becomes much broader and is mainly characterized by riffle habitat. This habitat can be observed from the bridge on Washburn Road along the flats west of the Village.

Wetlands within the watershed are quite limited. The abandoned beaver impoundment noted above most closely resembles a small sedge meadow marsh community. This meadow marsh is the result of a breached dam that drained an abandoned beaver pond. Prior to the development of the beaver dam it appears that the

wetland was most likely a peatland (fen). Along the margins of the current wetland one can observe species associated with peatlands, including sphagnum moss, sundews, and marsh St. John's-wort. As beavers move into peatland ecosystems and build dams they strongly influence plant composition and structure by changing the hydrology of the wetland. The result includes a mix of species associated with both peatlands and marsh ecosystems.

Natural Communities*

Ecosystem Type	Natural Community Type(s)
Lowland Spruce-Fir/Swamp System	Lowland Spruce-Fir Forest Red Spruce-Heath-Cinquefoil Rocky Ridge Red Spruce Swamp Acidic *Sphagnum* Forest Seep
Northern Hardwood-Conifer System	Northern Hardwood Spruce-Fir Forest Sugar Maple-Beech-Yellow Birch Forest Hemlock-Spruce-Northern Hardwood Forest Hemlock-Oak-Northern Hardwood Forest Semi-rich Mesic Sugar Maple Forest Rich Mesic Forest
Hemlock-Hardwood-Pine System	Hemlock Forest Beech Forest Hemlock-Beech-Oak-Pine Forest Hemlock-White Pine Forest Red oak-Pine Rocky Ridge Semi-rich Mesic Sugar Maple Forest Rich Mesic Forest
Emergent Marsh/Shrub Swamp System	Sedge Meadow Marsh Highbush Blueberry-Winterberry Shrub Thicket

* = This list represents the suite of natural communities that were observed or may be present within this study area.

Wildlife:

Wildlife observed within the Patten Brook watershed was quite diverse. These included wildlife mostly using forested habitats but were also associated with forest edges, small forest openings, riparian habitats along Patten Brook, and an abandoned beaver pond. These species included red-tailed hawk, broad-winged hawk, Cooper's hawk, pileated woodpecker, black-capped chickadee, white-breasted nuthatch, hermit thrush, common raven, American crow, blue jay, veery, least flycatcher, eastern wood-pewee, common yellowthroat, indigo bunting, magnolia warbler, red-eyed vireo, blue-headed vireo, wild turkey, and cedar waxwing. Also reported were American woodcock

(a species of conservation concern). Mammals included white-tailed deer, moose, black bear, coyote, weasel, red squirrel, porcupine, and bobcat. In terms of amphibians and reptiles seven species were recorded, including American toad, green frog, red-spotted newt, spring peeper, pickerel frog, gray tree frog and garter snake.

Unique/Rare and Invasive Plants:

No rare species were observed within the Patten Brook watershed. Invasive species included Japanese knotweed, which was prevalent near the confluence with Bog Brook on either side of Bog Road. Invasive species were not observed within the upland forests of the Patten Brook watershed. This assessment does not represent a comprehensive survey of rare and invasive species within the watershed. However, it does represent an assessment of a small portion of the watershed.

Alexandria Bog and Vicinity

Habitats and Natural Communities:

The Alexandria Bog wetland is a large complex of marsh, shrub swamp, forested swamp, and peatland communities. Due to its size and array of habitats wildlife within the wetland is expected to be highly diverse. Based on landowner permissions, limited access to the wetland was provided. Access mainly included fringe areas of the wetland in a few locations and viewing the wetland from the roadside. As such, additional sampling would be needed to more accurately classify and map the natural communities associated within this wetland complex.

Most of Alexandria Bog is characterized as an emergent marsh-shrub swamp ecosystem with small pockets of the medium level fen ecosystem (a type of peatland). The emergent marsh-shrub swamp ecosystem consisted of large patches of wet meadow and emergent marsh, transitioning to open to dense shrub swamps. A few small patches of peatlands exist as well. The best example of the medium level fen ecosystem can be found along the edge of Foster Pond. This ecosystem comprised many types of natural communities, including a leather-leaf – sweet gale shrub bog and a floating marshy peat mat communities.

Along various edges of Alexandria Bog the wetland graded into forested swamps. These swamps included the hemlock-cinnamon fern forest and seasonally flooded red maple swamp. Some of these swamps may be functioning as vernal pools. In addition, two vernal pools were observed within the upland forest adjacent to Alexandria Bog.

An additional wetland complex was observed west of the Alexandria Bog. This wetland appears to be in excellent condition, consisting of peatland and emergent marsh-shrub swamp ecosystems. The upper portion of the wetland complex most likely contains a combination of a medium level fen ecosystem and poor level fen/bog ecosystem, comprising various natural communities. Among these included highbush blueberry-mountain holly wooded fen, mountain holly-black spruce wooded fen, leather-leaf - sheep laurel dwarf shrub bog, and large cranberry-short sedge moss lawn. Additional sampling would be needed to more accurately classify and map the natural communities associated within this wetland complex. Lastly, the middle of this wetland complex included an open water pond and its associated aquatic bed of pond lilies.

The upland forests surrounding the Alexandria Bog primarily consists of the hemlock-hardwood-pine ecosystem. Forest communities observed within this ecosystem included hemlock forest, hemlock-beech-oak-pine forest, and hemlock-white pine forest. Some areas within hemlock-dominated forests may be functioning as deer wintering areas (or deeryards). A small floodplain forest was observed along Patten Brook between Cass Mill Road and Bog Road. Adjacent to this area it appears that a hemlock-oak-northern hardwood forest exists on a small, north-facing slope.

Several open areas adjacent to Alexandria Bog and along side of Bog Road provide great turtle nesting habitat. The power line right-of-way was one such place. Another site included the town-owned property along Bog Road.

Natural Communities*

Ecosystem Type	Natural Community Type(s)
Hemlock-Hardwood-Pine System	Hemlock Forest Hemlock-Beech-Oak-Pine Forest Hemlock-White Pine Forest
Northern Hardwood-Conifer System	Hemlock-Oak-Northern Hardwood Forest
Emergent Marsh-Shrub Swamp System	Emergent Marsh Cattail Marsh Tall Graminoid Meadow Marsh Mixed Tall Graminoid - Scrub-Shrub Marsh Aquatic Bed Highbush Blueberry-Winterberry Shrub Thicket Alder Alluvial Shrubland
Medium Level Fen System and Poor Level Fen/Bog System	Highbush Blueberry-Mountain Holly Wooded Fen Leather-leaf – Black Spruce Leather-leaf – Sheep Laurel Shrub Bog Large Cranberry-Short Sedge Moss Lawn Speckled Alder Wooded Fen Hairy-fruited Sedge-Sweet Gale Fen Floating Marshy Peat Mat
Temperate Minerotrophic Swamp System	Hemlock-Cinnamon Fern Forest Seasonally Flooded Red Maple Swamp

* = This list represents the suite of natural communities that were observed or may be present within this study area.

Wildlife:

Given the wide range of habitats, wildlife within this study area included a variety of species using terrestrial, wetland, and aquatic habitat types. Species observed using open water, emergent marsh and shrub swamp habitats included mallard, wood duck, red-winged blackbird, kingfisher, mourning dove, cedar waxwing, American crow, barn swallow, chimney swift, eastern phoebe, eastern kingbird, alder flycatcher, northern parula, common yellowthroat, northern waterthrush, gray catbird, eastern towhee, song sparrow, swamp sparrow, chipping sparrow, vesper sparrow, yellow warbler, American goldfinch, broad-winged hawk, red-tailed hawk, garter snake, spring peeper, green frog, bullfrog, pickerel frog, deer, moose, coyote, bear, raccoon, skunk, mink, and otter, as well as old and new beaver sign. These observations also included those using the edge habitats associated with the adjacent forested areas, as well as the power line corridor.

Species observed within the upland forests included northern goshawk, barred owl, pileated woodpecker, hairy woodpecker, blue jay, American crow, common raven, black-capped chickadee, winter wren, veery, hermit thrush, red-eyed vireo, blue-headed vireo, ovenbird, scarlet tanager, chipmunk, red squirrel, coyote, deer, moose, bear, wood frog, gray tree frog, and red-spotted newt.

Unique/Rare and Invasive Plants:

No rare plants were observed. Japanese knotweed was the most predominant species associated with the Alexandria Bog area. As noted above, a major infestation site was observed at the confluence of Patten Brook and Bog Brook. Another smaller site was noted on the town-owned lot on Bog Road. Autumn olive was also noted in this location. One purple loosestrife plant was noted along Bog Road at the crossing of Bog Brook adjacent to the powerline right-of-way. Japanese knotweed and buckthorn were noted within the powerline right-of-way. Burning bush was observed in the Village. It is predicted that other invasive species also exists along the right-of-way. This assessment does not represent a comprehensive survey of rare and invasive species within the Alexandria Bog study area.

Town-wide Windshield Surveys

Habitats and Natural Communities:

Based on roadside windshield surveys it appears that most of the Wildlife Action Plan (WAP) forested habitats are mapped correctly for Alexandria. These included northern hardwood-conifer, lowland spruce-fir, and hemlock-hardwood pine forests. More detailed sampling would be needed to confirm the extent of these forests since past land use history (mainly logging) has altered species composition and has created a variety of age classes throughout Alexandria, including early and mid successional forests, which can hinder the identification of natural communities from roadsides. As such, the lowland spruce-fir forest is most likely exaggerated. For example, the WAP shows this forest community to exist at the end of Perkins Hill Road. However, it was determined that it was not actually present. Also, based on roadside assessments and aerial photography it is highly likely that the pine barren habitat does not exist in Alexandria.

The rocky ridge/talus slope and cliff habitats are mostly correct. As noted above, rocky ridge/talus slope habitat was also observed on the south face of Hutchins Hill. It is likely that there are additional small patches on other south facing slopes in Alexandria. Grasslands appear to be over estimated. Grasslands mapped along the roadways are fairly correct. However, after reviewing aerial photography some of the grasslands within the core forested areas (out of view from roadsides) do not exist. These include areas such as the powerline right-of-way near Alexandria Bog, as well as most of the grasslands mapped around the rocky ridge/talus slope habitat on Oregon Mountain to the north.

Forest floodplains are probably slightly more prevalent along Smith River and include red maple floodplains. The floodplains in the Village are most likely more prevalent but include grasslands as well as forests. Wet meadow/shrub wetlands and peatland habitats are also mostly correct with two exceptions. As noted above, the relatively large wetland west of Alexandria Bog is actually mostly a peatland as is the southern portion of Alexandria Bog at the powerline right-of-way.

A few additional natural communities were observed that are not included in the lists above. The Red Maple Floodplain Forest community was observed along the Smith River from River Road. Also, the Alder Alluvial Shrubland community was observed along Bog Brook adjacent to Bog Road just northwest of the intersection of Route 104.

Wildlife:

The following wildlife observations are in addition to the lists developed while conducting on-site visits within the Patten Brook watershed and the Alexandria Bog area. Within and adjacent to the many grasslands, hayfields, corn fields, and pastures the following wildlife were observed: broad-winged hawk, turkey vulture, American robin, American crow, song sparrow, bobolink, chipping sparrow, tree swallow, barn swallow, chestnut-sided warbler, eastern bluebird, red-winged blackbird, and mourning dove. Along the Smith River and its adjacent forest birds included kingfisher, chestnut-sided warbler, least flycatcher, American goldfinch, American robin, blue jay, common yellowthroat, chipping sparrow, northern parula, song sparrow, American redstart, great-crested flycatcher, blue-headed vireo, and red-eyed vireo.

Unique/Rare and Invasive Plants:

No rare plants were observed from roadside windshield assessments. Japanese knotweed was observed along Walker Road where it crosses a small brook that drains into Smith River. With its proximity to the Smith River and the overall general ecology of Japanese knotweed it is most likely that this species, as well as others invasive plants, may be found in other areas along the banks and floodplains of the Smith River and other streams. This assessment does not represent a comprehensive survey of rare and invasive species within the Town of Alexandria.

Wildlife of Alexandria

The following lists of wildlife were based on the five field assessments (Littleton 2012), as well as existing information, including a report on the Alexandria Bog (Audubon Society of New Hampshire 1993) and NH Natural Heritage (2012). It includes 93 birds, 19 mammals, 10 amphibians, and 5 reptiles. This list is not meant to be a comprehensive list rather it should serve as a supplement to existing and future lists for

Alexandria. Species listed in bold are considered species of conservation concern by the NH Fish and Game (2005 and 2009). Species noted with an asterisk (*) are listed in the Big Game Management Plan of the Wildlife Action Plan (NH Fish and Game 2005). Species noted with one (1) are listed as threatened in NH. Those noted with two (2) are listed as endangered in NH. One very unusual visitor included a sandhill crane that was observed in the village in May 2012. This species is generally found in Canada and the northern part of the Midwest during the breeding season.

Birds

Great blue heron
Canada goose
Wood duck
Mallard
Sandhill crane
Turkey vulture
Northern harrier[2]
Broad-winged hawk
Red-tailed hawk
Northern Goshawk
Cooper's hawk
Sharp-shinned hawk
Peregrine falcon[1]
Ruffed grouse
Wild turkey*
Virginia rail
Killdeer
American woodcock
Solitary sandpiper
Mourning dove
Ruby-throated hummingbird
Belted kingfisher
Yellow-bellied sapsucker
Downy woodpecker
Hairy woodpecker
Northern flicker
Pileated woodpecker
Eastern phoebe
Eastern wood-pewee
Great-crested flycatcher
Eastern kingbird
Least flycatcher
Alder flycatcher
Blue jay
Common raven
American crow
Tree swallow
Bank swallow
Barn swallow
Chimney swift
Black-capped chickadee
Tufted titmouse
Red-breasted nuthatch
White-breasted nuthatch
Brown creeper
Winter wren
House wren
Golden-crowned kinglet
Ruby-crowned kinglet
Gray catbird
Hermit thrush
Veery
Eastern bluebird
American robin
Cedar waxwing
Red-eyed vireo
Blue-headed vireo
Warbling vireo
Tennessee warbler
Northern parula
Yellow warbler
Chestnut-sided warbler
American redstart
Magnolia warbler
Black-throated blue warbler
Yellow-rumped warbler
Black-throated green warbler
Prairie warbler
Black-and-white warbler
Ovenbird
Common yellowthroat
Northern waterthrush
Dark-eyed junco
Purple finch
Evening grosbeak
American goldfinch
Scarlet tanager
Indigo bunting
Rose-breasted grosbeak
Eastern towhee
Chipping sparrow
Song sparrow
Swamp sparrow
White-throated sparrow
White-crowned sparrow
Fox sparrow
Field sparrow
Vesper sparrow
Red-winged blackbird
Eastern meadowlark
Rusty blackbird
Common grackle
Bobolink
Baltimore oriole

Mammals

Eastern coyote
Red fox
American beaver
Moose*
White-tailed deer*
Snowshoe hare
River otter
Fisher
Ermine (short-tailed weasel)
Mink
Weasel
Raccoon
North American porcupine
Deer or White-footed mouse
Eastern chipmunk
Red squirrel
Black bear*
Shrew

Amphibians

Spotted salamander
Redback salamander
Red-spotted newt
American toad
Gray tree frog
Spring peeper
Bullfrog
Green frog
Pickerel frog
Wood frog

Reptiles

Eastern painted turtle
Wood turtle
Spotted turtle[1]
Eastern ribbon snake
Eastern garter snake

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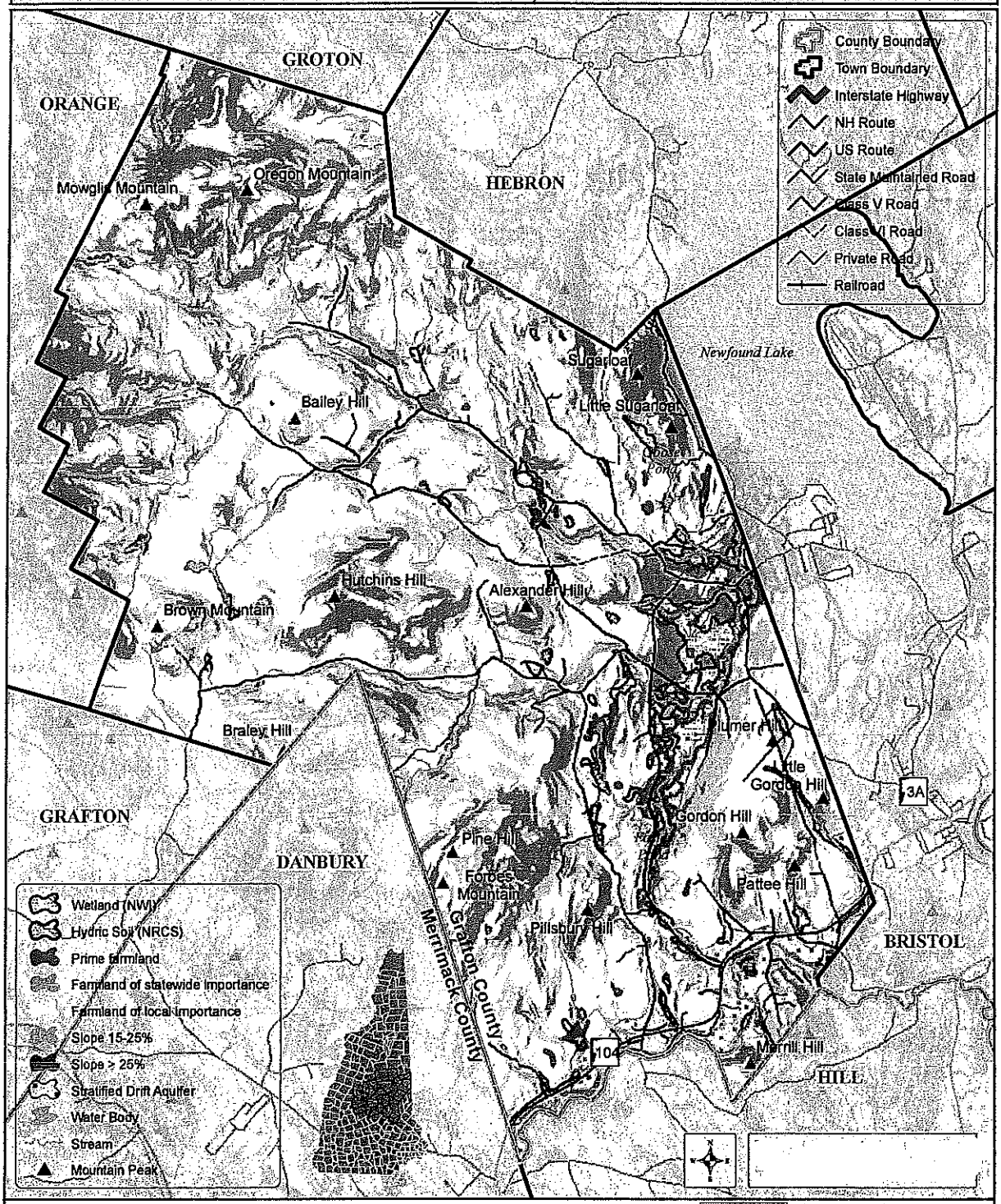
Natural Resources
Alexandria, NH



Wetland (NWI) from GRANIT. Slope from SPNHF. Aquifer from NH DES. Soils of Importance and Hydric Soil from NRCS. Mountain Peak from ESRI. Road centerline dataset is from NH Department of Transportation. Base feature datasets, including hydrography, and political boundaries, provided through NH GRANIT at Complex Systems Research Center (CSRC). Neither LRPC nor CSRC make any claim to the validity or reliability or to any implied uses of these data.

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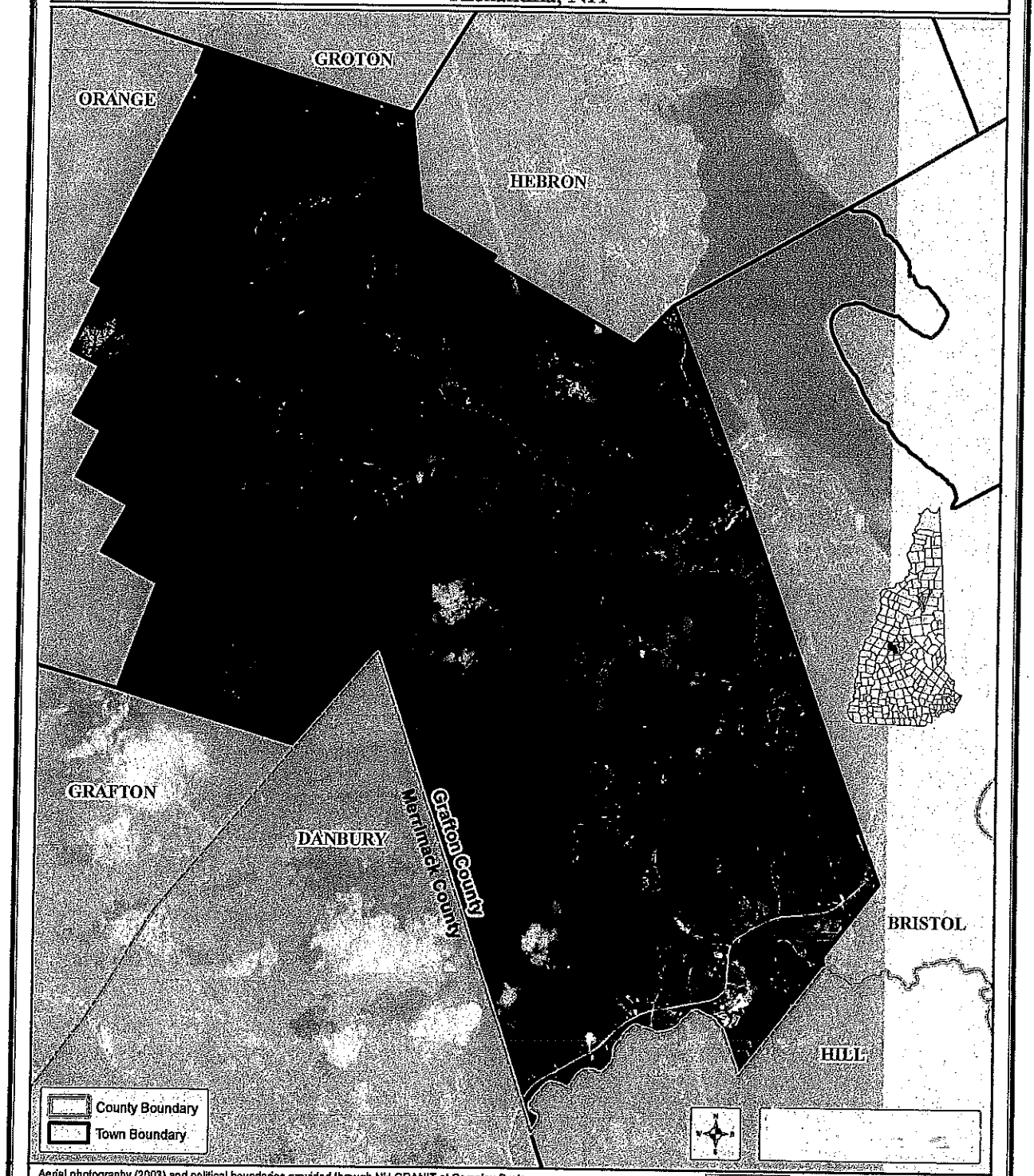
Meredith, NH 03253
603.279.8171 : lakesrpc.org

Aerial Photography

Alexandria, NH



Aerial photography (2003) and political boundaries provided through NH GRANIT at Complex Systems Research Center (CSRC). Neither LRPC nor CSRC make any claim to the validity or reliability or to any implied uses of these data.
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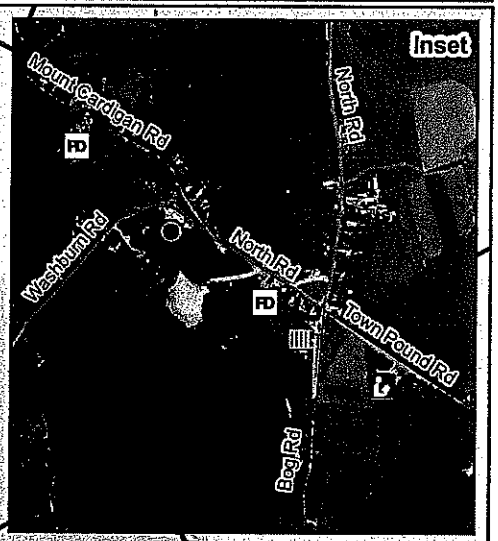
Community Facilities
Alexandria, NH



GROTON

ORANGE

HEBRON

BRISTOL

GRAFTON

DANBURY

HILL

Mount Cardigan Rd

Washburn Rd

Fowler River Rd

See Inset

Thissell Rd

Burns Hill Rd

Cass Mill Rd

Bog Rd

Grafton County
Merrimack County

3A

104

Community Facilities

- FD Fire Department
- Library
- FD Police Department
- Public Works\Hwy Dept
- School
- Town Hall
- Transfer Station

- County Boundary
- Town Boundary
- NH Route
- State Maintained Road
- Local Road
- Non-Maintained Road
- Private Road

Community Facilities dataset created by LRPC (2007). Road centerline dataset is from NH Department of Transportation. Base feature datasets, including hydrography, and political boundaries, provided through NH GRANIT at Complex Systems Research Center (CSRC). Neither LRPC nor CSRC make any claim to the validity or reliability or to any implied uses of these data. For planning purposes only.

Lakes Region Planning Commission
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Appendix 2:
Highway Inventory

Alexandria 2014 RSMS - All Town Roads A - Z

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Akita Rd				Gravel	0.09	low	low	Routine-2	Good-2
Bailey Rd				Paved	0.93	high	medium	Reconstruct-8	Good-8
Belser Rd				Paved	0.35	low-med	low	Preventive-3	Good-3
Berry Farms Rd				Gravel	0.40	low-med	low-med	Routine-4	Good-4
Berry Rd	1	NH104	End of pavement	Paved	0.45	medium	medium	Rehabilitate-6	Good-6
Berry Rd	2	End of pavement	End of road	Gravel	0.44	medium	low-med	Routine-5	Good-5
Bog Rd	1	Town Pound Rd	Karl Gordon Rd	Gravel	3.22	medium	med-high	Reconstruct-7	Good-7
Bog Rd	2	Karl Gordon Rd	NH104	Paved	0.04	medium	med-high	Rehabilitate-7	Good-7
Borough Rd		Walker Rd	Bristol TL	Paved	0.06	medium	medium	Preventive-6	Good-6
Brook Rd	1	Fowler River Rd	Pavement	Gravel	0.85	high	high	Routine-10	Good-10
Brook Rd	2	Pavement Begins	Mt Cardigan Rd	Paved	0.29	high	high	Reconstruct-10	Good-10
Bucklin Rd				Gravel	0.14	low	low	Routine-2	Good-2
Burns Hill Rd				Gravel	0.87	med-high	medium	Routine-7	Good-7
Cass Mill Rd	1	Hill TL	NH104	Paved	0.20	low-med	low	Reconstruct-3	Good-3
Cass Mill Rd	2	NH104	Cross Rd	Paved	1.22	high	med-high	Reconstruct-9	Good-9
Cass Mill Rd	3	Cross Rd	State Maint.	Paved	1.40	high	med-high	Reconstruct-9	Good-9
Cole Hill Rd				Gravel	0.23	low	low	Routine-2	Good-2
Copatch Rd				Gravel	0.18	low	low	Reconstruct-2	Good-2
Corliss Rd				Gravel	0.88	low	low	Routine-2	Good-2
Cream Hill Rd				Gravel	0.70	medium	low	Routine-4	Good-4
Cross Rd				Gravel	0.30	low-med	low-med	Routine-4	Good-4
Crouse Rd				Gravel	0.29	low	low	Routine-2	Good-2
Eastman Hill Rd				Gravel	0.20	low	low	Routine-2	Good-2
Fairview Ln				Paved	0.47	medium	medium	Reconstruct-6	Good-6
Fletcher Farm Rd				Gravel	0.20	low-med	low	Routine-3	Good-3
Foster Pond Rd		Town Pound Rd	Class VI	Gravel	1.05	low-med	low-med	Reconstruct-4	Good-4
Fowler River Rd	1	Verrill Rd	Cemetery	Paved	1.09	high	high	Reconstruct-10	Good-10
Fowler River Rd	2	Cemetery	Brook Rd	Paved	1.51	high	high	Reconstruct-10	Good-10
Fox Hollow Rd				Gravel	0.19	low	low	Routine-2	Good-2
Gale Rd E		Fowler River Rd	Class VI	Gravel	0.09	low	low	Routine-2	Good-2
Gale Rd W		Mt Cardigan Rd	Class VI	Gravel	0.18	low	low	Routine-2	Good-2
Gordon Hill Rd				Gravel	0.55	low-med	low-med	Routine-4	Good-4
Gove Rd				Gravel	0.66	low-med	low-med	Routine-4	Good-4
Grafton Rd				Gravel	0.55	med-high	medium	Routine-7	Good-7
Hutchins Hill Rd				Gravel	0.10	low	low	Routine-2	Good-2
Karl Gordon Rd				Paved	0.85	high	medium	Reconstruct-8	Poor-8
King Rd		Plumer Hill Rd	Class VI	Gravel	1.13	med-high	medium	Routine-7	Good-7
Knowles Hill E		Shem Valley Rd	Class VI	Gravel	0.59	medium	low-med	Routine-5	Good-5
Knowles Hill W		Washburn Rd	Class VI	Gravel	0.32	low	low	Routine-2	Good-2
Kummerer Rd				Gravel	0.50	low	low	Reconstruct-2	Good-2
Linfield Rd				Gravel	0.08	low	low	Routine-2	Good-2
Lyle Gale Rd				Gravel	0.15	low	low	Routine-2	Poor-2
Mathews Rd				Gravel	0.53	medium	low-med	Routine-5	Good-5
McMurphy Rd				Gravel	0.76	medium	low-med	Routine-5	Good-5
Morrison Rd				Gravel	0.33	low	low	Routine-2	Good-2
Mountain View Rd				Paved	0.38	low-med	low-med	Rehabilitate-4	Good-4
Mt Cardigan Rd	1	Washburn Rd	Gale Rd W	Paved	1.21	high	high	Reconstruct-10	Good-10
Mt Cardigan Rd	2	Gale Rd W	Hodgdon Rd	Paved	1.31	high	high	Reconstruct-10	Good-10
Mt Cardigan Rd	3	Hodgdon Rd	Brook Rd	Paved	1.47	high	high	Reconstruct-10	Poor-10
Pattee Hill Rd				Gravel	0.57	low-med	low-med	Routine-4	Good-4
Patten Rd				Gravel	0.26	low	low-med	Routine-3	Good-3
Perkins Hill Rd				Gravel	0.92	high	medium	Reconstruct-8	Good-8
Plumer Hill Rd				Paved	0.77	high	high	Reconstruct-10	Good-10
Poor Farm Rd				Gravel	0.70	low	low	Routine-2	Good-2
Sargent Rd				Gravel	0.33	low	low	Routine-2	Good-2
Shem Valley Rd				Gravel	1.55	medium	med-high	Reconstruct-7	Good-7
Solar Acres Rd				Paved	0.11	low	low	Preventive-2	Good-2
Stoney Ln				Gravel	0.25	low	low	Routine-2	Good-2
Sye Ali Rd				Gravel	0.06	low	low	Routine-2	Good-2
Thissell Rd				Paved	0.35	high	high	Reconstruct-10	Good-10
Thomas Rd				Gravel	0.45	low	low	Routine-2	Good-2
Town Pound Rd				Paved	0.72	high	high	Rehabilitate-10	Good-10
Verrill Rd				Gravel	0.76	high	medium	Routine-8	Good-8
Wadhams Rd				Gravel	0.30	low	low	Routine-2	Good-2
Walker Rd				Paved	0.67	med-high	med-high	Reconstruct-8	Good-8
Washburn Rd	1	Cass Mill Rd	Patten Rd	Paved	0.25	high	high	Reconstruct-10	Good-10
Washburn Rd	2	Patten Rd	Grafton Rd	Gravel	3.63	high	high	Routine-10	Good-10
Welton Falls Rd				Gravel	1.23	high	medium	Routine-8	Good-8

Total: 43.83

Alexandria 2014 RSMS - Paved Town Roads by Maintenance Category

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Mt Cardigan Rd	3	Hodgdon Rd	Brook Rd	Paved	1.47	high	high	Reconstruct-10	Poor-10
Brook Rd	2	Pavement Begins	Mt Cardigan Rd	Paved	0.29	high	high	Reconstruct-10	Good-10
Fowler River Rd	1	Verrill Rd	Cemetery	Paved	1.09	high	high	Reconstruct-10	Good-10
Fowler River Rd	2	Cemetery	Brook Rd	Paved	1.51	high	high	Reconstruct-10	Good-10
Mt Cardigan Rd	1	Washburn Rd	Gale Rd W	Paved	1.21	high	high	Reconstruct-10	Good-10
Mt Cardigan Rd	2	Gale Rd W	Hodgdon Rd	Paved	1.31	high	high	Reconstruct-10	Good-10
Plumer Hill Rd				Paved	0.77	high	high	Reconstruct-10	Good-10
Thissell Rd				Paved	0.35	high	high	Reconstruct-10	Good-10
Washburn Rd	1	Cass Mill Rd	Patten Rd	Paved	0.25	high	high	Reconstruct-10	Good-10
Cass Mill Rd	2	NH104	Cross Rd	Paved	1.22	high	med-high	Reconstruct-9	Good-9
Cass Mill Rd	3	Cross Rd	State Maint.	Paved	1.40	high	med-high	Reconstruct-9	Good-9
Karl Gordon Rd				Paved	0.85	high	medium	Reconstruct-8	Poor-8
Bailey Rd				Paved	0.93	high	medium	Reconstruct-8	Good-8
Walker Rd				Paved	0.67	med-high	med-high	Reconstruct-8	Good-8
Fairview Ln				Paved	0.47	medium	medium	Reconstruct-6	Good-6
Cass Mill Rd	1	Hill TL	NH104	Paved	0.20	low-med	low	Reconstruct-3	Good-3
					14.00				

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Town Pound Rd				Paved	0.72	high	high	Rehabilitate-10	Good-10
Bog Rd	2	Karl Gordon Rd	NH104	Paved	0.04	medium	med-high	Rehabilitate-7	Good-7
Berry Rd	1	NH104	End of pavement	Paved	0.45	medium	medium	Rehabilitate-6	Good-6
Mountain View Rd				Paved	0.38	low-med	low-med	Rehabilitate-4	Good-4
					1.59				

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Borough Rd		Walker Rd	Bristol TL	Paved	0.06	medium	medium	Preventive-6	Good-6
Belser Rd				Paved	0.35	low-med	low	Preventive-3	Good-3
Solar Acres Rd				Paved	0.11	low	low	Preventive-2	Good-2
					0.51				

Total Paved: 16.10

Alexandria 2014 RSMS - Gravel Town Roads by Maintenance Category

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Perkins Hill Rd				Gravel	0.92	high	medium	Reconstruct-8	Good-8
Bog Rd	1	Town Pound Rd	Karl Gordon Rd	Gravel	3.22	medium	med-high	Reconstruct-7	Good-7
Shem Valley Rd				Gravel	1.55	medium	med-high	Reconstruct-7	Good-7
Foster Pond Rd		Town Pound Rd	Class VI	Gravel	1.05	low-med	low-med	Reconstruct-4	Good-4
Copatch Rd				Gravel	0.18	low	low	Reconstruct-2	Good-2
Kummerer Rd				Gravel	0.50	low	low	Reconstruct-2	Good-2
					7.42				

Road Name	Section #	From	To	Surface Type	Length (mi)	Importance	Traffic	Maintenance Category	Drainage
Brook Rd	1	Fowler River Rd	Pavement	Gravel	0.85	high	high	Routine-10	Good-10
Washburn Rd	2	Patten Rd	Grafton Rd	Gravel	3.63	high	high	Routine-10	Good-10
Verrill Rd				Gravel	0.76	high	medium	Routine-8	Good-8
Welton Falls Rd				Gravel	1.23	high	medium	Routine-8	Good-8
Burns Hill Rd				Gravel	0.87	med-high	medium	Routine-7	Good-7
Grafton Rd				Gravel	0.55	med-high	medium	Routine-7	Good-7
King Rd		Plumer Hill Rd	Class VI	Gravel	1.13	med-high	medium	Routine-7	Good-7
Berry Rd	2	End of pavement	End of road	Gravel	0.44	medium	low-med	Routine-5	Good-5
Knowles Hill E		Shem Valley Rd	Class VI	Gravel	0.59	medium	low-med	Routine-5	Good-5
Mathews Rd				Gravel	0.53	medium	low-med	Routine-5	Good-5
McMurphy Rd				Gravel	0.76	medium	low-med	Routine-5	Good-5
Berry Farms Rd				Gravel	0.40	low-med	low-med	Routine-4	Good-4
Cream Hill Rd				Gravel	0.70	medium	low	Routine-4	Good-4
Cross Rd				Gravel	0.30	low-med	low-med	Routine-4	Good-4
Gordon Hill Rd				Gravel	0.55	low-med	low-med	Routine-4	Good-4
Gove Rd				Gravel	0.66	low-med	low-med	Routine-4	Good-4
Pattee Hill Rd				Gravel	0.57	low-med	low-med	Routine-4	Good-4
Fletcher Farm Rd				Gravel	0.20	low-med	low	Routine-3	Good-3
Patten Rd				Gravel	0.26	low	low-med	Routine-3	Good-3
Lyle Gale Rd				Gravel	0.15	low	low	Routine-2	Poor-2
Akita Rd				Gravel	0.09	low	low	Routine-2	Good-2
Bucklin Rd				Gravel	0.14	low	low	Routine-2	Good-2
Cole Hill Rd				Gravel	0.23	low	low	Routine-2	Good-2
Corliss Rd				Gravel	0.88	low	low	Routine-2	Good-2
Crouse Rd				Gravel	0.29	low	low	Routine-2	Good-2
Eastman Hill Rd				Gravel	0.20	low	low	Routine-2	Good-2
Fox Hollow Rd				Gravel	0.19	low	low	Routine-2	Good-2
Gale Rd E		Fowler River Rd	Class VI	Gravel	0.09	low	low	Routine-2	Good-2
Gale Rd W		Mt Cardigan Rd	Class VI	Gravel	0.18	low	low	Routine-2	Good-2
Hutchins Hill Rd				Gravel	0.10	low	low	Routine-2	Good-2
Knowles Hill W		Washburn Rd	Class VI	Gravel	0.32	low	low	Routine-2	Good-2
Linfield Rd				Gravel	0.08	low	low	Routine-2	Good-2
Morrison Rd				Gravel	0.33	low	low	Routine-2	Good-2
Poor Farm Rd				Gravel	0.70	low	low	Routine-2	Good-2
Sargent Rd				Gravel	0.33	low	low	Routine-2	Good-2
Stoney Ln				Gravel	0.25	low	low	Routine-2	Good-2
Sye Ali Rd				Gravel	0.06	low	low	Routine-2	Good-2
Thomas Rd				Gravel	0.45	low	low	Routine-2	Good-2
Wadhams Rd				Gravel	0.30	low	low	Routine-2	Good-2
					20.31				

Total Gravel: **27.73**

Appendix 3:
Energy Plan

Alexandria Energy Plan

The results of the Master Plan survey make it clear that the Town of Alexandria needs to develop a plan to address reliable and cost-effective energy practices. The intended outcomes of the plan should include greater energy efficiency, less energy waste, lower monthly energy bills and a cleaner environment.

Mission: To reduce energy costs while simultaneously protecting the natural resources of the Town.

Goals:

- To reduce municipal energy consumption through adoption of low-energy lighting and reduction in heating fuel use
- To seek out energy efficient equipment when replacing or repairing municipal vehicles or HVAC systems in municipal buildings
- To encourage green practices in new construction or building renovation
- To educate residents regarding renewable energy and energy-efficient equipment at home
- To encourage the expanded use of homeowner energy audits and renewable domestic energy resources
- To promote understanding of energy efficiency and green energy practices by publicizing and encouraging participation in regional meetings, seminars, and classes
- To reduce municipal and residential waste
- To work with power companies (NELCO, PSNH) to clear electric lines and thereby avoid power shortages
- To maintain a focus on the reduction of energy costs

The implementation of this proposed energy plan shall be left to the Selectboard, except in areas of subdivisions and/or gravel pits, where the Planning Board will provide the initiative.