Every Acre Counts

The Newfound Watershed Master Plan

A Toolkit for our Future

Newfound Watershed Vision:

We envision a Newfound Watershed where quality of life and economic vitality continue to be fostered by stewardship and sustainable use of the Watershed's natural resources, where land uses and development are balanced with conservation, and where the current water quantity and water quality have been maintained.

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Table of Contents

Volume 2 ~ Supporting Technical Products

Newfound Lake Tributary Assessment: Water/Phosphorus Budget - *University of New Hampshire Center for Freshwater Biology*

Newfound Lake Watershed Assessment – *University of New Hampshire Center for Freshwater Biology*

Geology of the Newfound Watershed – *Newfound Lake Region Association*

Wildlife Habitat in the Newfound Watershed – *New Hampshire Fish and Game Department*

Fish Species within the Newfound Watershed - *New Hampshire Fish and Game Department*

Native Brook Trout Study - *New Hampshire Fish and Game Department*

Forest Resources in the Watershed Communities – *New Hampshire Timberland Owners Association*

Strategic Conservation Efforts in the Newfound Watershed – *Society for the Protection of New Hampshire Forests*

Watershed Population and Housing Demographics – *Jeffrey H. Taylor and Associates*

Assessment of Master Plans and Land Use Regulations – *Jeffrey H. Taylor and Associates*

2007 Survey of Watershed Communities – *Plymouth State University Center for the Environment*

2009 Survey of Watershed Communities– *Plymouth State University Center for the Environment*

Oral Histories of Life in the Newfound Watershed – *Plymouth State University*

Math Lesson Worksheets – *Nancy Stock, Bridgewater Elementary School*

Map Resources

References and Additional Resources Available

- "Innovative Land Use Planning (*New Hampshire Department of Environmental Services*), including:
    - Permanent Stormwater Management (Low Impact Development)
    - Shoreland Protection: The Importance of Riparian Buffers
    - Erosion and Sediment Control During Construction
    - Steep Slopes and Ridgeline Protection
- Statewide Efforts that can Stimulate Stewardship
    - New Hampshire Water Resources Primer - *New Hampshire Department of Environmental Services*
    - New Hampshire Climate Action Plan - *New Hampshire Department of Environmental Services*
    - What's Our Water Worth? – *New Hampshire Lakes Association*
    - New Hampshire Stormwater Manual - *New Hampshire Department of Environmental Services*

Key Watershed Terms:

Aquifers - an underground layer of water-bearing permeable rock or sand/gravel materials.
Catch Basin - A storm drain entrance designed to drain excess rainwater from paved surfaces.
Cultural Eutrophication - the process that speeds up natural eutrophication because of human activity.
Erosion - the removal of solids (sediment, soil, rock and other particles) in the natural environment
Eutrophication - an increase in chemical nutrients (nitrogen or phosphorus) in a lake.
Groundwater - water located beneath the ground surface.
Hydrology - the movement, distribution, and quality of water.
Impervious – a solid surface that will not absorb water.
Infiltration - downward movement of water through soil.
Median - the number separating the higher half of a sample from the lower half.
Nonpoint Source Pollution - water pollution affecting a water body from diffuse sources.
Percolation - the movement and filtering of fluids through porous materials.
Phosphorus – a chemical element that accelerates plant growth.
Porous – a material with spaces that allows water to pass through it.
Rain Barrel - a water tank used to collect and store rainwater.
Rain Garden - a planted depression that allows runoff from roofs, driveways, and other surfaces to be absorbed.
Riparian Buffer - a vegetated area near a stream or river that is usually forested.
Runoff - the flow of water over land from rain, snowmelt, or other sources.
Stormwater - water that originates during precipitation events and flows into surface or groundwater systems.
Substrate - earthy material that exists in the bottom of a surface water (soil, rocks, sand, or gravel).
Tributary – a stream or river which flows into a larger body of water.
Ug/L – Micrograms per liter.
Viewshed - an area of land or water that is visible to the human eye from a fixed vantage point.
Watershed - the entire geographical area drained by a river and its tributaries.

List of Acronyms:

BMPs – Best Management Practices
CFS – Cubic Feet per Second
EPA – Environmental Protection Agency
GIS – Geographic Information Systems
GPM – gallons per minute
LEED – Leadership in Energy and Environmental Design
LID - Low Impact Development
NASD – Newfound Area School District
NHDES – New Hampshire Department of Environmental Services
NHFGD - New Hampshire Fish and Game Department
NHLA – NH Lakes Association
NLCP – Newfound Lake Conservation Partnership
NLRA – Newfound Lake Region Association
PSU - Plymouth State University
PSU-CFE - Plymouth State University Center for the Environment
Q2C - Quabbin-to-Cardigan
UNH – University of New Hampshire
UNH-CFB - University of New Hampshire Center for Freshwater Biology
WAP - Wildlife Action Plan

Executive Summary

Every Acre Counts is the result of a 30-month, $350,000+ regional environmental planning effort to protect the water resources of the 63,150-acre Newfound Watershed (Figure 1). The principal work for this effort was completed between 2007 and 2009. A watershed is the geographic area wherein all water drains to a single outlet. The Newfound Watershed is bounded by the hills and ridges that surround Newfound Lake and its outlet the Newfound River.

At two public sessions held in 2006 over 100 residents from the nine communities that compose the Newfound Watershed provided a clear mandate to the Newfound Lake Region Association (NLRA) to create a Watershed Master Plan for the region. Enthusiasm for the project can be seen in the findings of the 2007 and 2009 Community Surveys performed by Plymouth State University-Center for the Environment (CFE) as well as by attendance at many public meetings held in the Watershed since 2006. From the very beginning of this project it has been very clear that there are many shared interests in the Watershed, and that *Every Acre Counts*!

The Newfound Watershed Master Plan identifies threats to our shared natural resources and specific implementation actions designed to protect them. It helps to promote an understanding of the shared resources in the region, and is a key component in managing those resources on a watershed scale, a scale that goes well beyond individual town boundaries. This plan is a pro-active step toward water resource protection that is more cost effective than restoration efforts would be in the future, and helps protect the environmental quality that supports the local economy. The resulting *Every Acre Counts: The Newfound Watershed Master Plan* provides a comprehensive analysis of the Newfound Watershed and creates a "toolkit" of implementation actions and methods to maintain and improve the environmental quality of the Watershed into the future.

This plan is a pro-active step toward water resource protection that is more cost effective than restoration efforts would be in the future.

Every Acre Counts is designed to provide additional perspective to each of the local communities, and to help guide future planning and regulatory initiatives in the Watershed as a whole. Adoption of this plan by the Watershed communities will enhance their local master plans, and provide the necessary legal foundation for future implementation efforts to guide future land use changes and to proactively protect water quality. *Every Acre Counts* reflects the effort and the knowledge of many Watershed residents and should serve as a common work plan for municipal staff, volunteers, and citizens throughout the Watershed. This is a living document that should be updated and amended as new information and resources become available. The Vision for the Watershed, created by project participants, is as follows:

Newfound Watershed Vision:

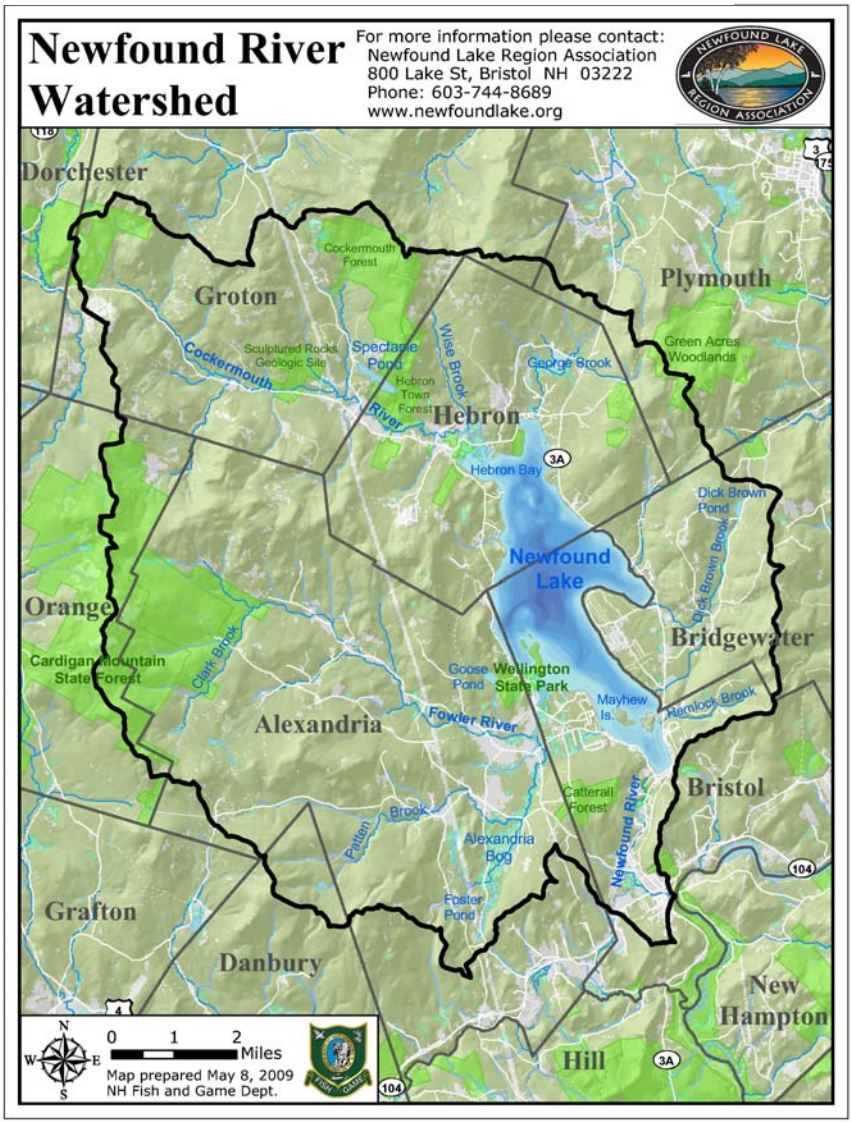
We envision a Newfound Watershed where quality of life and economic vitality continue to be fostered by stewardship and sustainable use of the Watershed's natural resources, where land uses and development are balanced with conservation, and where the current water quantity and water quality have been maintained.

This Vision will be achieved by implementing the following strategies:

- **Creating sound land use plans** in each Watershed community that achieve the vision of the community and the Watershed;
- **Preventing phosphorus and other pollutants from reaching surface waters** through local land use regulations and best management practices;
- **Guiding development away from riparian buffers**, wetlands, steep slopes, and other critical resources;
- **Strategically pursuing conservation opportunities** to protect the ecological health and natural beauty of the Watershed;
- **Creating a sense of stewardship by providing education opportunities** for students, land owners, and visit**o**rs.

Figure 1 - The Newfound Watershed

Source: New Hampshire Fish and Game Department



The completion of *Every Acre Counts* represents the beginning of planning implementation. Currently, 68% of the Watershed is potentially buildable land (see Figure 2), and the majority of this land is zoned for one and two acre lots which is a very suburban development pattern. Figure 2 illustrates the relationship between the existing developed lands (in red), conservation lands (in green), and the remaining land area (in yellow) that is potentially available for development. The rate and character of new development in these areas will impact town finances, water quality and quantity, wildlife habitat and other natural resources, and the Watershed as a whole. Development activity scattered widely throughout the potentially buildable areas will not meet local community vision statements that value our rural character, healthy forests and clean water, and will degrade the many shared natural resources within the Watershed.

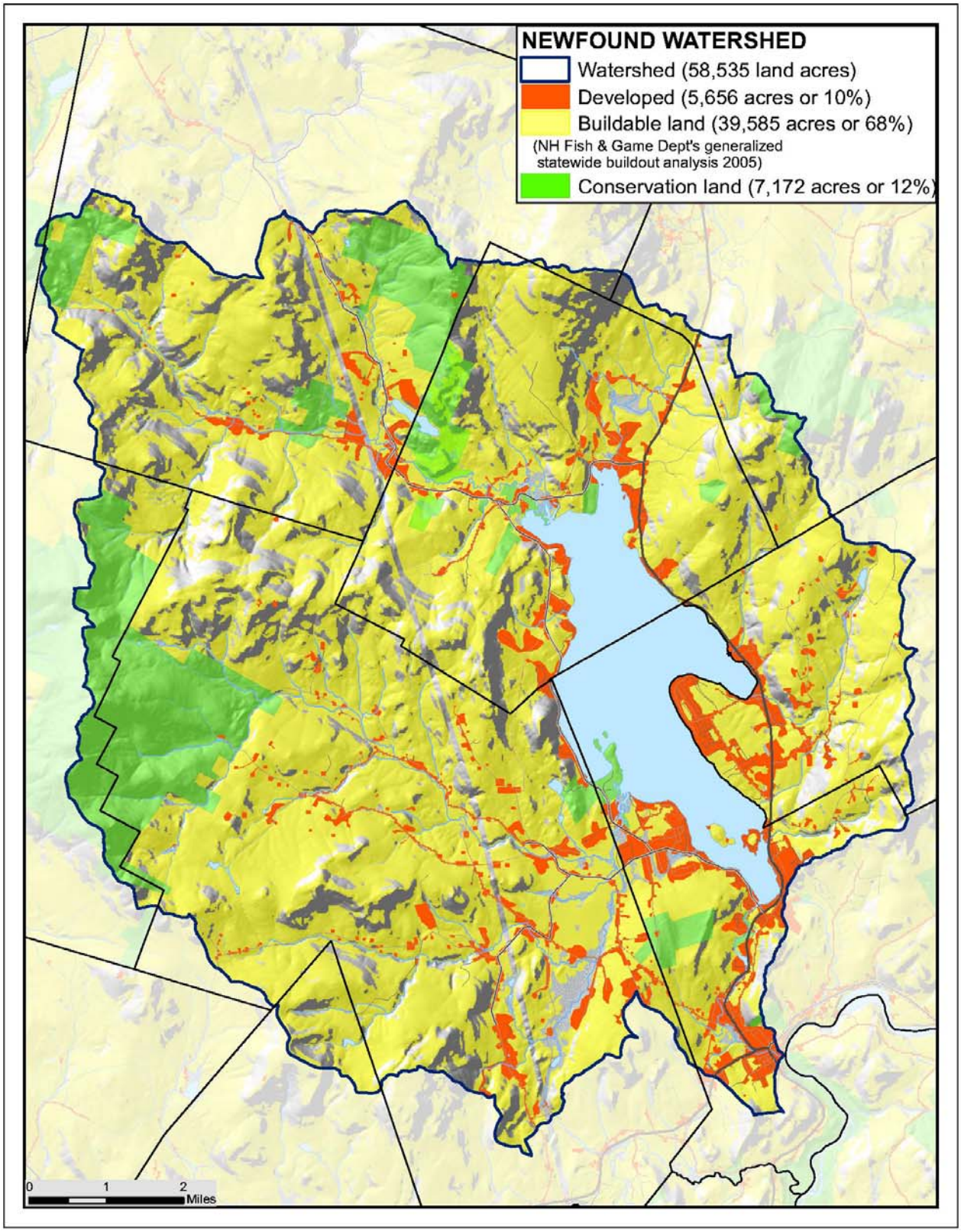
A 2007 State-wide economic survey reported that a perceived decline in water quality and scenery could cause a 33% decline in sales, income, and jobs. Therefore it is critical for our economic health that future growth be guided in a way that balances development with protection of water quality and important natural resources. Regional cooperation on the implementation strategies identified in *Every Acre Counts* will make the Watershed Vision, and the individual town master plan visions, attainable.

The focus of maintaining high water quality is to control and reduce phosphorus levels in stormwater runoff, and to prevent land use changes from degrading surface waters and other natural resources over time. Phosphorus was identified by the NHDES and UNH as the best indicator for water quality. Phosphorus comes from soil, human and animal waste, soaps and detergents, fertilizers and decaying organic materials. It is easily carried through the Watershed by stormwater runoff and into the lake via stormwater and tributaries, where it stimulates plant growth such as weeds and algae. Excessive plant growth can negatively impact water quality as the plants take over their environment. To maintain our high-quality water we need to control phosphorus levels in our surface waters.

The implementation strategies outlined in the Newfound Watershed Vision are focused on a "no net increase in phosphorus" approach. Communities, businesses and individuals will need to adopt low impact development (LID) practices and regulations, and other ecological approaches that encourage infiltration of surface runoff and reduce the amount of phosphorus reaching surface waters to meet this goal. Even existing developments need to be "disconnected from the pavement" to provide opportunities for improving stormwater infiltration to reduce phosphorus loading.

Common Principles. Overall, respondents indicated a willingness to make changes to protect water quality. (2007 Community Survey)

Figure 2 - Buildable Land in the Newfound Watershed
Source: New Hampshire Fish and Game Department



How were these conclusions reached? And how are we going to accomplish all of this? *Every Acre Counts* is a two volume Watershed Master Plan. Volume 1 includes a summary of our shared natural resources, threats to these resources, and implementation strategies and actions. Volume 1 also includes a prioritized list of actions and an indication of which local entity would lead them (Planning or Select Board, State Agency, local nonprofit). If the residents and property owners of the Watershed want to protect water quality some policies will need to change locally. The purpose of the implementation actions outlined in Volume 1 is to protect water quality throughout the Watershed while recognizing the following areas of concern:

- Maintaining and enhancing the natural, scenic, cultural, and recreational features of the watershed;
- Maintaining local control while fostering regional cooperation;
- Continuing public involvement and education efforts;
- Protecting the rights of landowners; and
- Assisting the Watershed communities in the implementation of the shared Watershed Vision.

The technical reports and other resources have been included in Volume 2. Sections of Volume 1 that are also part of a longer technical report will be labeled with this symbol  to remind the user that a complete report can be found in Volume 2 of *Every Acre Counts*.

Implementation Actions

There was a strong mandate to undertake the *Every Acre Counts* project, as expressed by participants at the initial public meetings attended by over 100 people. This mandate can be seen in the vision statements of local master plans, as well in the more recent results of the 2007 CFE Community Survey, the Oral History interviews of 30 residents and growing membership in the NLRA by Watershed towns (Alexandria, Bridgewater, Bristol, Groton and Hebron in 2009).

The vision for the Newfound Watershed will not be achieved without local commitment to implementation. These implementation actions and others that may be identified in the future will require the support of local land use boards, town committees and residents. The implementation process will also be supported by volunteers from the Watershed communities who have agreed to participate in the *Newfound Watershed Coalition*. The *Coalition* will assist the NLRA and other project partners with education and outreach efforts in the Watershed. This Watershed-wide effort will ensure that communication and cooperation continue across town boundaries as we work together to achieve the Watershed vision.

Local Implementation Efforts

The following actions are prioritized based on threats to water quality and are grouped according to the local entity best positioned to implement them:

Planning Board Actions (first 6 months)

- Adopt *Every Acre Counts* as an amendment to the local Master Plan to help support new local and Watershed-wide planning efforts. *According to NH RSA 675:6 this will require that the Planning Board hold a public hearing and that the majority of Board members vote in favor of its adoption.*

Planning Board Actions (1-3 years)

- Adopt local shoreland protection ordinances that will include smaller streams, wetlands and other waterbodies not included in the NH Comprehensive Shoreland Protection Act. *(Zoning Ordinance*)
- Target specific areas and resources for extra protection using "overlay districts" (e.g. aquifer, shoreline, agricultural soils, steep slopes, ridgelines, wetlands, conservation, etc.) *(Zoning Ordinance*)
- Ensure that local regulations prohibit the release of post-development stormwater beyond "naturally occurring" levels. Address stormwater issues using Low Impact Development (LID) techniques. (*Site Plan and Subdivision Regulations*)

Residents perceive rapid changes in the watershed, which should be used to encourage environmentally responsible behaviors and planning efforts. (2007 Community Survey)

- Adopt erosion and sedimentation control regulations. (*Site Plan and Subdivision Regulations*)
- Revise land use ordinances to align with the Vision Statements in the community master plans. *(Zoning Ordinance, Site Plan and Subdivision Regulations*)
- Ensure that a diversity of development densities are identified in the future land use section of the Master Plan. (*Master Plan Review and Update*)
- Require larger minimum lot sizes in areas that are best suited for forestry. *(Zoning Ordinance*)
- Promote Conservation Developments that would allow for continued sustainable forestry on a portion of the parcel where appropriate, and buffer residential development from adjacent logging operations. *(Zoning Ordinance, Site Plan and Subdivision Regulations*)
- Ensure Site Plan and Subdivision regulations require applicants to follow the NH Stream Crossing Guidelines (NHFGD, 2008) for all applicable stream crossings.
- Include the question of Regional Impact (*RSA 36:56*) on the application checklists used by the Planning Board.

Select Board Actions

- Make all permit requests, approvals for land-altering activities, and environmental reports (e.g. septic systems) readily available to the general public to ensure transparency of information.
- Increase town support of exotic weeds prevention programs (e.g. Lake Host, Weed Watchers, aquatic and terrestrial species).
- Require inspection and reporting on septic system age and maintenance every 3-5 years.
- Prohibit the use of fertilizers or pesticides within 50 feet of any water body or stream channel.
- Minimize the use of salt for roadway and parking lot de-icing.
- Monitor forestry and development operations closely, and consider hiring a shared compliance officer with adjoining communities to accomplish this.
- Inventory culverts and stormwater runoff from public roads, and develop standard operating procedures and plans to reduce impacts to surface waters from stormwater.
- Create a stormwater utility in heavily developed portions of communities to provide a mechanism for collecting utility fees from property owners that will fund projects that eliminate stormwater runoff.
- Coordinate town activities to function at the Watershed level. This may include shared code enforcement, planning support, and opportunities to combine town services and increase purchasing power.

Watershed-wide Implementation Efforts

There are many regional entities that can perform critical work towards the Watershed Vision. Some of these resources and key implementation actions are listed below.

Newfound Lake Region Association (NLRA)

- Provide the leadership, coordination, and stewardship of progress required to achieve the shared Watershed vision articulated in *Every Acre Counts*.
- Develop and distribute educational materials to foster a “stewardship ethic”, including curriculum materials at local schools.
- Extend water quality monitoring of tributaries and maintain a public database with findings.
- Pursue funding/grants for an LID stormwater management demonstration project.

- Facilitate a process for NHDES and Watershed towns to establish a framework prohibiting phosphorus discharge to Newfound Lake unless a public hearing process demonstrates that water quality will not be adversely impacted.
- Establish a volunteer monitoring program for land use issues in the Watershed including forestry and development BMPs.
- Assist the New Hampshire Fish and Game Department (NHFGD) and other stakeholders to revise current lake level management policy to stabilize winter water levels and maintain minimum flow in the Newfound River to protect local fisheries while serving other stakeholder needs.
- Promote alternative means for waste water disposal where appropriate (composting toilets, low-flow toilets, waterless urinals, grey water systems and constructed wetlands), and educate residents on the design, maintenance, and permitting issues related to each alternative.

Newfound Land Conservation Partnership (NLCP)

- Work on strategic land conservation initiatives within the Watershed using the best available data, and involve local planning boards and conservation commissions in this effort.
- Develop a network of four-season trails and publish the locations of the trailheads to increase recreational uses in the Watershed and increase support for conservation efforts.

Newfound Area School District (NASD)

- Encourage educators to develop curriculum related to the Newfound Watershed.
- Increase the number of students that participate in NLRA's Floating Classroom.
- Complete the Watershed boundary signage project, and initiate other Watershed related projects that give students a sense of environmental stewardship while implementing *Every Acre Counts*.

University of New Hampshire Center for Freshwater Biology (UNH-CFB)

- Continue water quality monitoring in the Watershed to track phosphorus and other indicators in the lake and tributaries.

Plymouth State University (PSU)

- Develop and distribute educational materials to promote a "stewardship ethic" in the Watershed.
- Provide opportunities for university students and staff to work with the Watershed communities on monitoring and implementation efforts through the NLRA and other partnerships.

New Hampshire Department of Environmental Services (NHDES)

- Provide outreach and education, continue enforcement efforts, and assist the Watershed communities and NLRA with other activities related to implementing *Every Acre Counts*.

Volume 1

Every Acre Counts

The Newfound Watershed Master Plan

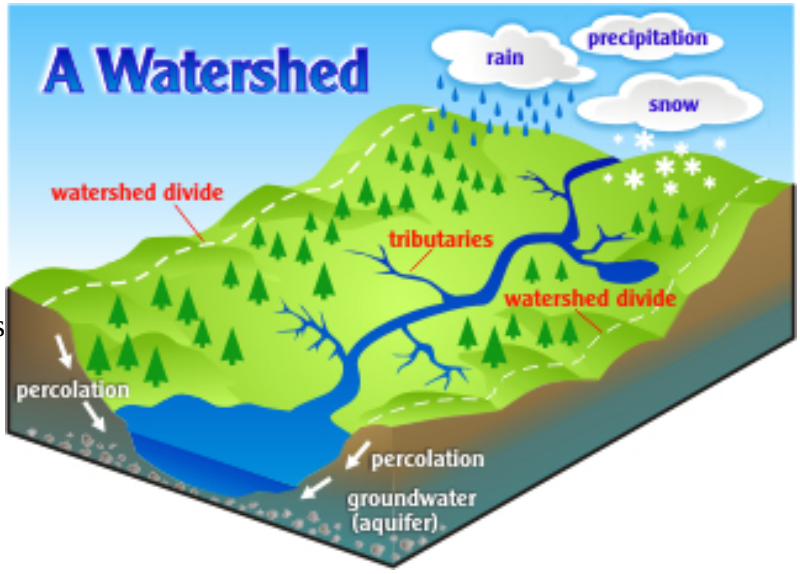


"Make sure that development is well planned...welcomed,
but incorporated with the Watershed needs."
Bruce VanDerven, Bristol

Section 1- The Watershed We Share

What is a Watershed?

The Newfound Watershed is essentially a 63,150-acre bathtub. The Watershed boundary (see Figure 1) that defines the outside edge is the equivalent of the rim of the bathtub and the Newfound River serves as the drain. Rain and snow melt travel through the Watershed across farm fields, forest land, parking lots, roadways, driveways, and back yards. We all live in the watershed and how we use the land impacts water quality in different ways. Water resources link people – and all of our surface and groundwater are supplied by our shared watershed. You, and everyone in the Newfound Watershed, are part of the same community that can impact water quality and other issues even when you are not in sight of Newfound Lake or other surface waters.



Source: Commonwealth of Pennsylvania, Department of Environmental Protection

Physical Setting

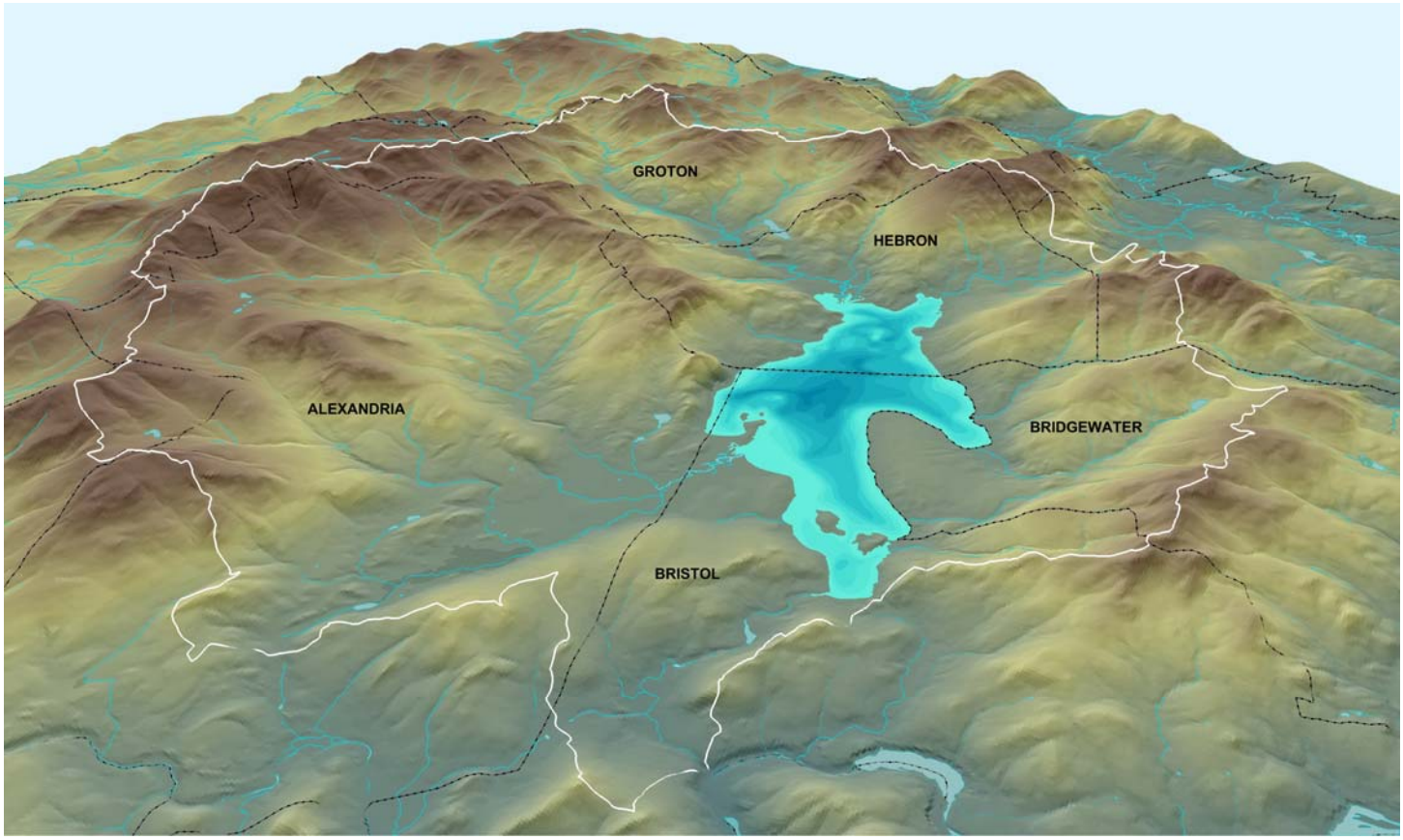
Newfound Lake sits at the center of the predominantly forested Newfound Watershed which is located at the western edge of New Hampshire's Lakes Region. The Lake drains south via the Newfound River through the Town of Bristol to the Pemigewasset River, which subsequently flows to the Merrimack River, reaching the Atlantic Ocean at Newburyport, Massachusetts. Newfound Lake's water level is controlled by a dam located at the southern end of the Lake and operated by the NHDES Dam Bureau.

Newfound Lake is one of the deepest lakes in New Hampshire with a depth of 182 feet. It is the fifth largest of New Hampshire's lakes. Major tributaries to the Lake include the Cockermouth and Fowler River systems and wetland complexes that drain into Georges Brook to the north and Bog Brook to the west. The Newfound Watershed (Figure 1) includes all of the Town of Hebron and portions of the Towns of Alexandria, Bridgewater, Bristol, Danbury, Dorchester, Groton, Orange, and Plymouth. The hills and ridges that surround Newfound Lake and encompass the Watershed form a 50-mile ridgeline ranging in elevation from 350 feet at the juncture of the Newfound and Pemigewasset Rivers to 3,155 feet at Mt. Cardigan's summit.

Figure 3 is a shaded relief map of the Watershed. Darker brown shading indicates higher elevations and darker blue indicates greater water depths. The dark brown also indicates areas of steep slopes. As noted above, topography is highly variable, with flatter lands located in the major river valleys and wetland complexes as well as around the perimeter of Newfound Lake, although some steep-sloped regions abut the Lake such as "the

Ledges" located northwest of Wellington State Park. Viewing the surrounding landscape, one sees hills and mountains in the distance that delineate the headwaters of the Newfound River. The bedrock geology and thin soils, coupled with steep slopes, cause rapid runoff during storm and snowmelt events. During these short-duration and high intensity runoff periods, rainfall and/or melt-waters tend to flow rapidly off the landscape and to concentrate in well-defined stream channels. This rapid runoff and concentrated flow can rapidly erode disturbed soil, adding sediment, phosphorus and other contaminants to streams, wetlands and ponds.

Figure 3 - Shaded Relief Map of the Newfound Watershed



Source: Society for the Protection of NH Forests

Previous Studies

Prior to *Every Acre Counts*, several studies were completed on lake levels, water quality, and other natural resources including:

- Lake Level Data – 1950 to 1974 – Harry Frye
- Newfound Lake Fisheries Management Study -1958 to 1960
- Lay-Lake Monitoring – 1986 to Present – UNH-CFB
- Stream Monitoring Data – Early 1990s – Milt Radimer
- Baseline Aquatic Biodiversity Study of Newfound Lake – Summer 1997 – PSU

This earlier work led to long range planning efforts for the NLRA and the Watershed as a whole:

- NLRA Strategic Plan – Summer 1988 – Neal Pierce and the Strategic Planning Committee
- NLRA Planning Series – early 1990s
  -Newfound Lake: Watershed Study
  -Lake and Tributary Health
  -Environment, Habitats and Wildlife

"We really need to take the proper precautions to ensure the environments clean and to keep the lake region beautiful so people will want to come back and visit the lake." Katie Foster

This earlier work within the Watershed prepared the NLRA for this comprehensive Watershed Master Plan, and provided some of the necessary data for the technical work products developed as part of this effort. All of these previous studies are available at the NLRA office.

Recent Statewide Efforts and Resources

Several new research and policy reports on climate change, water resource management, the economics of recreational water and innovative land-use planning have been released by New Hampshire agencies.

New Hampshire Climate Action Plan, March 2009
http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/documents/032509_nhccptf_final_cap.pdf.

New Hampshire Water Resources Primer, December 2008
http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/water_resources_primer.pdf.

What's Our Water Worth? May 2007
http://nhlakes.org/docs/Economic-Study-Phase-IV-Brochure.pdf

Innovative Land Use Planning Techniques: A Handbook for Sustainable Development, October 2008
http://des.nh.gov/organization/divisions/water/wmb/repp/innovative_land_use.htm

New Hampshire Stormwater Manual, December 2008
http://des.nh.gov/organization/divisions/water/stormwater/manual.htm

Section 2- Our Shared Resources

Surface Water

The purpose of studying the water quality of Newfound Lake and its tributaries is to better understand what condition these waters are in, and to determine the implications of future land use changes. The region will continue to experience development, forestry, and agricultural activity. To preserve the quality of the surface waters that are central to our local economy we need to ensure that these and other land uses take place without degrading our shared natural resources.

Respondents with stronger attachments to the Watershed have higher levels of concern with specific issues: runoff from lawn care fertilizer, insecticides, increased sediment, drinking water quality, invasive plant growth, loss of forest, and the development of hillsides.
(2007 Community Survey)

Newfound Lake has been identified as a High Quality water body by the NHDES. The Lake is considered High Quality under the state's anti-degradation rule due to its low median phosphorus concentration (4 micrograms per liter; ug/l). The existing low phosphorus concentration will be used as a target for land use management practices in the Watershed, thus providing a unit of measure that will continue to be monitored. Changes in phosphorus concentrations will also provide each Watershed municipality with an indication as to whether their current approaches to land use management are working, or whether there is a need for additional management practices (or regulations) to control the location and design of development.

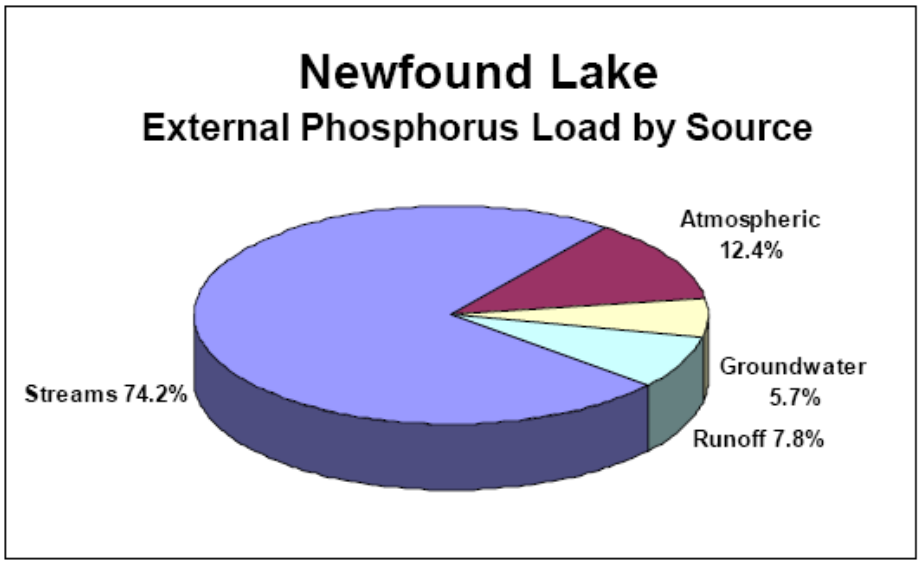
Two extensive and comprehensive surface water studies were completed as part of *Every Acre Counts*:

- Newfound Lake Tributary Assessment: Water/Phosphorus Budget (2006-2007)
- Newfound Lake Watershed Assessment (2007-2008)

Overall, the studies found that in Newfound Lake there is a gradient of water quality from north to south. Newfound Lake south of Mayhew Island has the poorest water quality indicated by: lower oxygen, less water clarity, more phosphorus, and more chlorophyll. This location is at the down-stream and down-wind end of the Lake, and is surrounded by the highest development density, including both the shore line and surrounding hill sides.

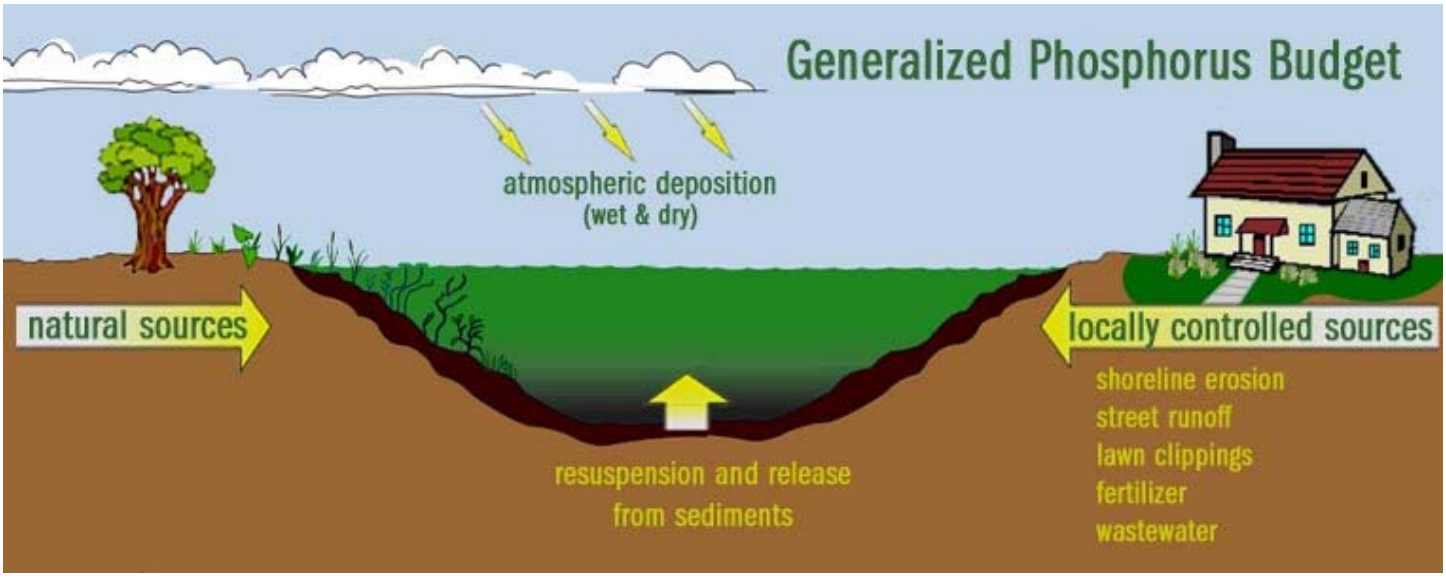
Figure 4 shows a schematic of a generalized phosphorus budget. The Newfound Lake Water/Phosphorus Budget determined that phosphorus enters Newfound Lake primarily through its major tributaries (74%),

while direct measurements and visual observations indicate that non-point sources of pollution (atmospheric deposition, groundwater and direct runoff) contribute to the remainder (26%).



Newfound Lake forms a large retention basin where ~30% of incoming phosphorus accumulates over time in the bottom sediments. The accumulation of phosphorus and sediments is part of the natural lake aging process, referred to as eutrophication, which normally occurs over thousands of years. However, this natural aging process can be accelerated through poorly planned land-use often associated with development, that releases unnatural quantities of sediment and phosphorus to surface water. Future development activity in the Watershed must address stormwater and runoff issues appropriately to ensure that phosphorus concentrations do not increase at an unnatural rate and trigger cultural eutrophication or rapid aging of Newfound Lake.

Figure 4 Phosphorus Budget



What's all the Fuss over Phosphorus?

Phosphorus is relatively sparse in natural soils and exists primarily as the phosphate molecule that tends to stick to soil as water moves through it. In the absence of human activity, phosphorus concentrations in surface water tend to be very low. As development, erosion and stormwater runoff increase, more phosphorus is carried into the lake as part of the sediment load. Sources of phosphorus typically include:

* Soil from erosion (construction sites, forestry, road banks, shoreline disturbance, lawns & gardens)
* Runoff from impermeable surfaces (roads, roofs, parking lots, driveways, lawns)
* Lawn clippings
* Excess lawn fertilizer runoff
* Sewage from leaky pipes or failing septic systems

Excess phosphorus accelerates plant and algal growth, speeding up the lake aging process through cultural eutrophication. We need to keep phosphorus out of surfaces water by "disconnecting" our impervious surfaces from nearby surface waters, use of best management practices (BMPs) and local education and enforcement.

Implementation Actions

Much of the Newfound Lake Watershed is very steep sloped and is particularly susceptible to water quality problems due to the extremely rapid runoff. Increases in impervious cover and the removal of natural forest canopy associated with development will alter the hydrology and can increase the height and velocities of streams and their erosion potential. Impervious surfaces also reduce groundwater recharge which can threaten private wells by depleting the available water supply.

Key actions to protect surface water quality include:

- Future land-uses should minimize the number of impervious surfaces such as roads and buildings that tend to concentrate stormwater runoff and increase the potential for erosion and phosphorus loading. Modern LID methods are cost-effective means to achieving this objective.

- Protect, maintain and replant riparian vegetation to minimize stormwater runoff.

- Adopt land use regulations that address stormwater issues by retaining runoff and eliminating phosphorus from the runoff of any individual project to (at least) maintain predevelopment levels.

Tips for Property Owners

Steps you can take to protect your water:
• Encourage shoreside and streamside vegetation and protect wetlands;
• Disconnect downspouts from driveways by incorporating rain barrels and/or rain gardens
• Limit fertilizer applications;
• Limit organic matter loading;
• Maintain septic systems;
• Limit the loss of vegetative cover and the creation of impervious surfaces; and
• Discourage the feeding of ducks and geese.

- Communities should join in a Watershed-wide effort and request that the NHDES classify Newfound Lake as having "exceptional resource quality and value or sensitive recreational uses". With this classification new developments would be prohibited from releasing additional phosphorus into the Lake unless the developer could prove an overriding social and economic justification for the project and that no reasonable alternatives to the proposed degradation exist.

- Individually, or collectively, Watershed towns should increase their local capacity to monitor and enforce land use regulations and BMPs.

Case Study – Bank Undercutting Controlled by Vegetative Buffer

Many of Newfound Lake's tributaries are characterized by extensive bank undercutting that reflects the erosive force of stream flow. However, extensive streamside (riparian) forest extends along most of the tributaries, stabilizing their stream banks. Retaining riparian forest cover is critical to the stream bank stability that prevents erosion and protects water quality critical and fishery habitat. Riparian buffers also serve as travel corridors for various wildlife species.

Groundwater

Groundwater comes from rain and snow melt that soaks into the ground and is stored in the pores of sand/gravel materials or in fractures within the underlying bedrock. Where there is enough groundwater available for human use, sand/gravel and bedrock water supplies are called aquifers. Essentially all drinking water in the Newfound Watershed comes from groundwater. Bristol's Fowler River well pumps nearly 800 gallons per minute (gpm) from a 100-foot thick sand/gravel aquifer and serves roughly 1,500 customers. The remaining watershed residents are supplied by private wells that can produce as little as one gpm and are typically drilled hundreds of feet into bedrock. During summer months, the roughly 10,000 residents in the Watershed also depend on groundwater for drinking and other uses.

Groundwater is replenished by infiltration of rain and snow into the ground. Where steep slopes, shallow soils or impervious surfaces (pavement, houses, lawns) are present infiltration is lower and surface water runoff is higher. In areas of gentler slopes and deeper, more porous soils (river valleys) infiltration is higher and surface water runoff is lower. The upper surface of saturated sand/gravel or bedrock is called the water table, which can be seen by peering into shallow (dug) wells, or where it meets the land surface in the form of a spring (e.g. the Breck-Plankey spring in Bristol). Groundwater also helps maintain stream and wetland hydrology during summer and winter conditions.

Groundwater quality and quantity vary with land use. In forested and pristine watersheds water quality and quantity both tend to be high. If an area becomes overly developed, less pervious to infiltration and with more contaminants such as road salt, fertilizer and petroleum by-products, water quality and quantity tend to decline. Because groundwater moves much more slowly than surface water and lacks the biological processes that break down many common contaminants, once groundwater quality is polluted it is very hard and very expensive to clean up. In times of drought, or when we lose power to our well pumps, the importance of water quantity becomes immediately clear.

Protecting groundwater resources is critical, as we depend on them for all aspects of our lives and because cleanup is so expensive and difficult. High priority areas for protection include existing aquifers located along the lower Fowler and Cockermouth River valleys, George's Brook and the southern end of Newfound Lake. Other high-priority areas include the many smaller streams that feed the larger rivers and recharge groundwater as they reach the valley bottoms. Wetlands, especially at higher elevations, are critical recharge areas as well as valuable wildlife habitats. In large part protecting surface water quality also protects groundwater quality, thus yielding good land management "bang for the buck".

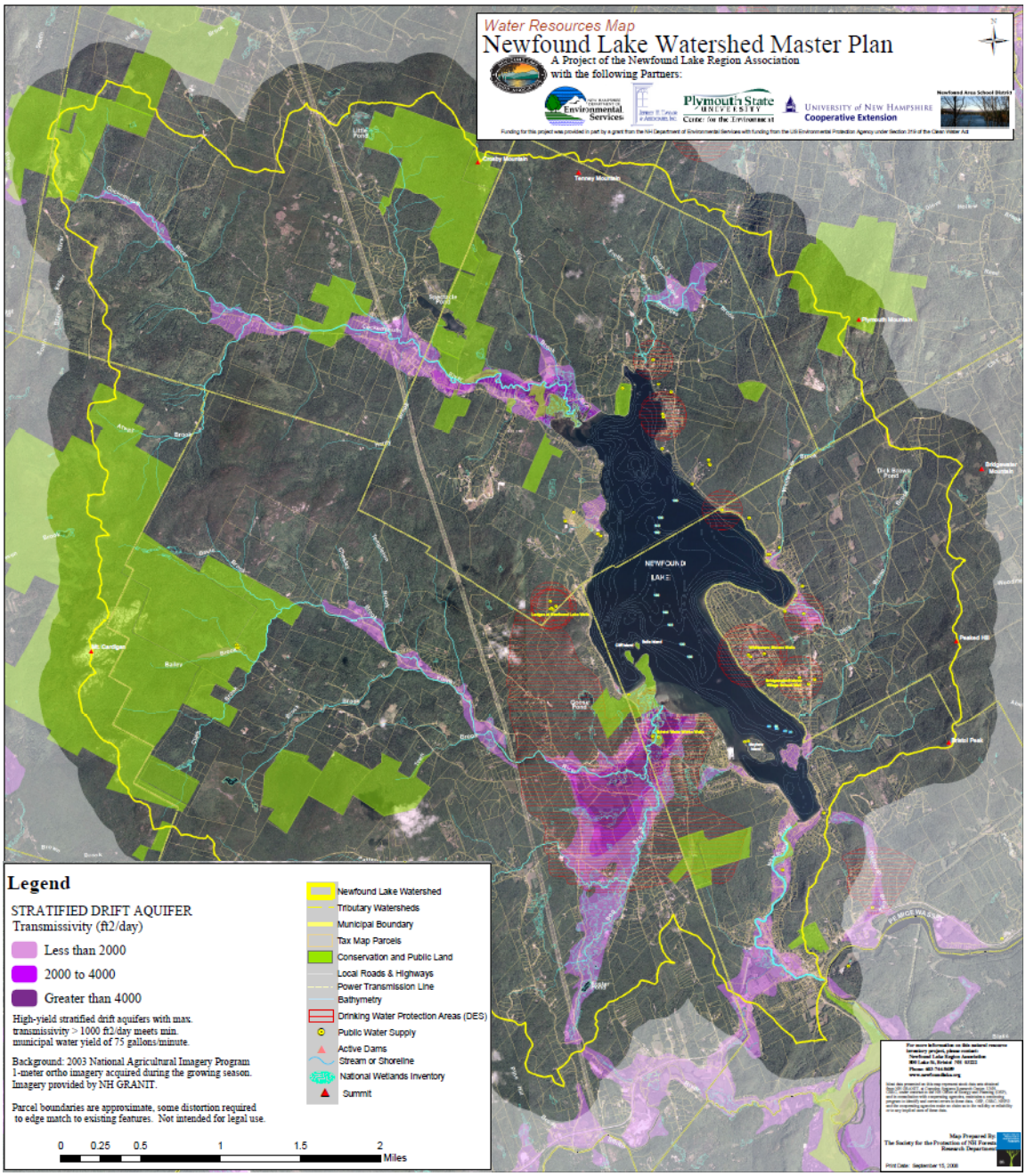
Figure 5 shows the location of critical groundwater resources. Sand and gravel aquifers are shown in purple (increasing shade indicates increasing aquifer productivity). Red lines indicate existing groundwater protection areas registered with the NHDES. Increasing thickness of streams (in blue) indicates increasing volume of water.

Implementation Actions

Key actions to protect our groundwater resources include:

- Identify critical aquifer recharge areas, and limit the types of development in and around these critical areas.
- Control the amount of potential contaminants (fuel storage, fertilizers, herbicides/pesticides, septic systems, road salt) used and stored in critical recharge areas.
- Maintain natural vegetation between surface water and developed areas, including roads. These vegetative buffers provide natural filters for surface contaminants and promote infiltration and groundwater recharge.

Figure 5 Water Resources

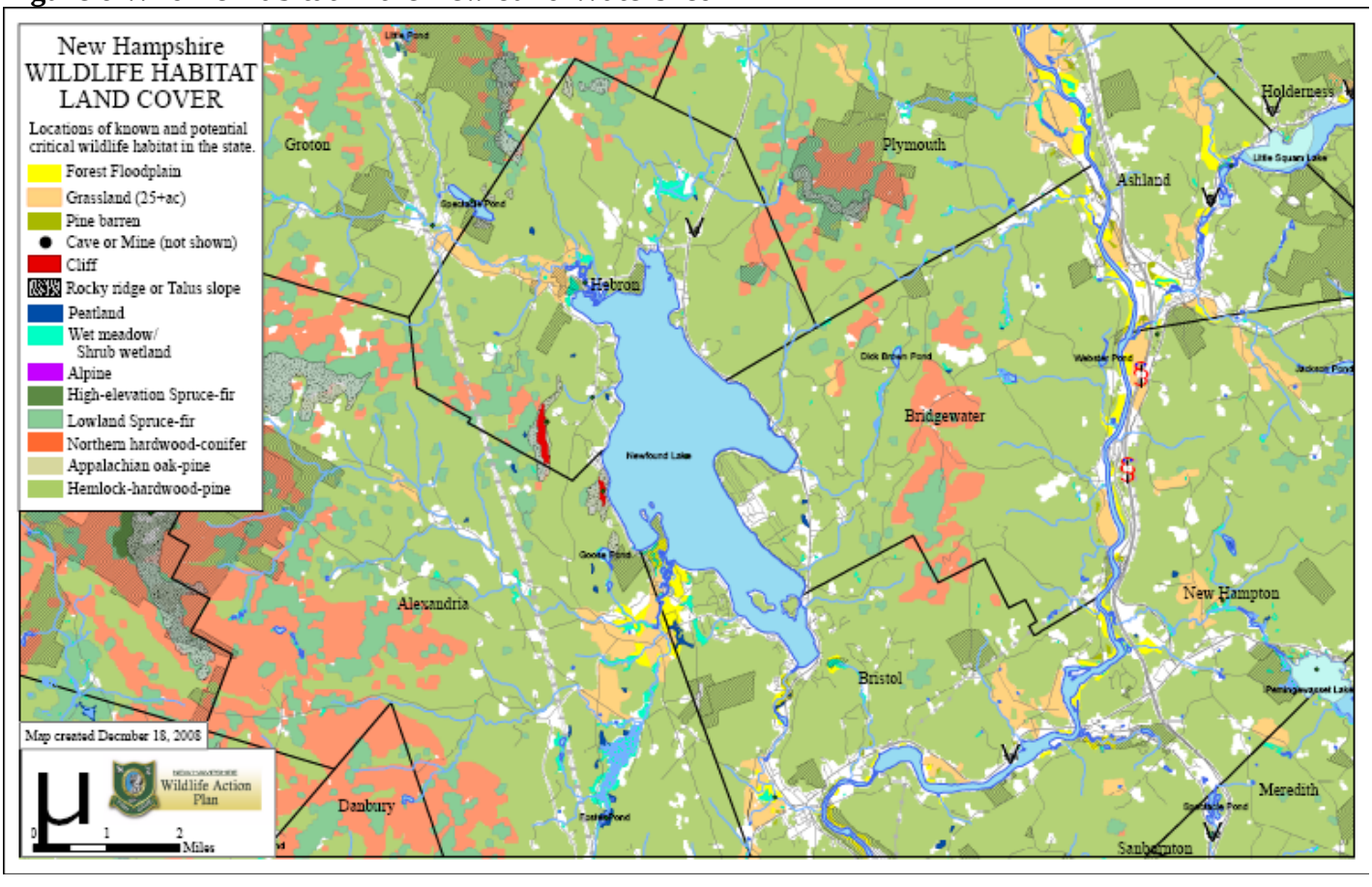


Wildlife Habitat

According to the New Hampshire Wildlife Action Plan (WAP) the Newfound Watershed has a significant amount of the State's highest ranking wildlife habitat with its rich biological diversity, high-value landscape, and low human influence (Figure 6). Loss of habitat due to development is one of the biggest threats to all habitats and species, but other threats such as recreation and energy and communication infrastructure also exist. Recognizing and identifying threats to wildlife habitat should be a priority for local decision makers.

The WAP is a blueprint to keep species from becoming endangered and is the most comprehensive wildlife and habitat assessment ever undertaken in New Hampshire. Completed in 2005 by NH Fish and Game Department staff and their conservation partners, the WAP provides New Hampshire landowners, local leaders and conservationists with important tools for maintaining and restoring critical habitats. It pulls together a vast amount of data to assess ecosystem health and support key conservation strategies. It is a proactive effort to define and implement strategies that will help keep species off rare and endangered species lists, and in the process save taxpayers millions of dollars. The WAP will help prioritize conservation planning in the Newfound Watershed.

Figure 6 Wildlife Habitat in the Newfound Watershed



In general, the Newfound Watershed has unfragmented blocks of undeveloped land that support a rich diversity of wildlife habitat. Habitats include a large amount of mixed pine/hardwood, northern hardwood-conifer,

lowland spruce-fir and floodplain forests, grasslands, cliffs, rocky ridge or talus slope, wet meadow/shrub wetlands and peat lands. Many common species use these habitats including white tailed deer, black bear, gray fox, and American crow, to name a few. The lowland spruce-fir habitat and dense hemlock forests provide prime deer wintering areas which are critical for this common species to survive harsh winters.

In 2008 the NLRA established the Newfound Tracking Team, trained by professional forester, tracker and wildlife photographer, Sue Morse of Keeping Track in Jericho, VT (www.keepingtrack.org). These "citizen scientists" have learned to recognize different types of wildlife habitat through track and other marking identification based on habits and life cycles of six focal species: moose, bobcat, bear, mink, otter and fisher. Their goal is to "ground-truth" the WAP data in the Newfound Watershed and to aid towns in identifying the presence and movement of these species, as well as identifying high quality habitats and wildlife corridors for future conservation. The team meets frequently for field tracking days in different locations around the Watershed.

When asked what objectives are most important for the management of the watershed, respondents indicated that clean water supplies for public use, healthy water bodies supporting fish and other aquatic life, and habitat for wildlife are of highest importance. (2007 Community Survey)

Implementation Actions

The WAP and Newfound Tracking Team ground-truthing should be consulted as strategic conservation initiatives are developed. These sources can also help Watershed communities with their land use plans and regulations because they compliment other water quality and land use objectives identified in *Every Acre Counts*. Animals do not recognize human boundaries and are critical to the long-term sustainability of the Watershed. Land use regulations that protect water quality and quantity by preserving riparian buffers, wetlands and steep slopes will also protect critical wildlife habitat.

Fisheries

According to the NHFGD, the Newfound Watershed contains twenty-two different fish species. Of these, six species have been identified as requiring special consideration in the WAP. Newfound Lake is a popular year round fishery for New Hampshire anglers. A survey conducted during February and March of 1999 estimated that anglers spent over 7,000 hours ice fishing on Newfound Lake. In 2009 sixteen bass tournaments are scheduled to be held on Newfound Lake.

Ben Nugent and Matt Carpenter, NHFGD fisheries biologists

Rivers, streams and their adjacent riparian zones and floodplains are essential for fish and wildlife. Access to spawning and feeding areas in conjunction with the ability to re-colonize and disperse into new areas is essential for the survival of fish populations. Tributaries not only provide permanent habitat for resident fish species but also some lake species depend on these streams and rivers for spawning and feeding migrations. Smelt, rainbow trout, brook trout, fallfish, suckers and landlocked salmon ascend tributaries from Newfound Lake seasonally to spawn. Other fish species follow the spawning fish into the tributaries and prey upon eggs as a seasonal food source. Spawning adults can be sensitive to stream bottom conditions (sandy, rocky, woody debris etc.). In general, fish will avoid areas impacted by excessive siltation and sedimentation which can be caused by poorly designed stream crossings, impacts to riparian areas upstream and erosion from adjacent developments.

Streams and rivers are dynamic features and require thoughtful consideration when a new road or development is proposed. The removal of vegetation and an increase in impervious surfaces can dramatically increase runoff rates and water temperatures. Increased runoff rates, especially in areas with removed vegetation, can erode exposed soils and deposit silt, sand and other containments into streams. As sediment loads increase, significant alterations to the streambed may occur. Deep pools become shallow, and stream widths increase. The macro-invertebrate community (a primary food source) can become altered as water temperatures increase.

Retaining native vegetation along streams, wetlands, ponds, and lakes is also a cost-effective management strategy to maintain water quality and protect wildlife habitat. Preventing the disturbance of vegetated buffers along aquatic habitats helps prevent costly flood damage and the need for wetland mitigation and stream restoration projects. Native vegetation along streams and shorelines creates wildlife corridors and reduces habitat fragmentation.

Aquatic vegetation and water levels in Newfound Lake and the Newfound River are also vital for a wide and diverse range of fish and wildlife species. The sustainability of several fish species at several different life stages is intimately dependent on these habitats. Aquatic vegetation, particularly when found in dense masses, is utilized for protection from predation, for egg incubation and for feeding. Of primary concern regarding the

NHDES' current lake level management plan is the fall drawdown and its impacts to lake trout and round whitefish eggs. Fertilized eggs deposited in the rocky shallows from mid-October to mid-December may become exposed to open air or frozen within the ice as water levels drop over the winter. Over time, this impact may lead to serious population declines. Flow stability and consistency are also essential to resident fish species found in the Newfound River.

To assess the status of brook trout within the Newfound Lake Watershed, the NHFGD, Pemigewasset Valley Trout Unlimited, and the NLRA conducted electrofishing surveys during the summer of 2009. The surveys show that all three sub-watersheds within the Newfound Lake Watershed have intact populations of wild brook trout. The residents that live within the Watershed have the fortunate opportunity to protect rather than restore habitat needs of wild brook trout. The abundance of wild brook trout in the Watershed far exceeds other adjacent watersheds in this region of the state. The complete *Native Brook Trout Study* prepared by NHFGD has been included in Volume 2 of *Every Acre Counts.* The plan also identifies strategies for the conservation of wild brook trout including headwater stream protection, stream crossing inventories, and public outreach and education.

Implementation Actions

Key actions to protect our fishery resources include:

- Maintain and improve vegetated buffers. In general, the wider the vegetative buffer, the more environmental benefits that are provided. Recommended buffer widths range from 100 to 300 feet, depending on the desired level of protection. A 100-foot buffer will provide adequate water quality protection but is not optimal for protecting fish habitat or wildlife corridors.

- Adopt the New Hampshire Stream Crossing Guidelines (2008) as a resource for local land use regulations. This document provides direction to designers that promote structures that minimize impacts to aquatic ecosystems, and can be referenced as a resource in local site plan and subdivision regulations.

- Inventory existing stream crossing structures throughout the Newfound Lake Watershed to determine where inappropriately sized structures create excessive erosion or sedimentation or inhibit passage of fish or wildlife. A database with this information would help prioritize areas if funding for replacement structures becomes available.

- Maintain or increase lake water levels from October 15th through April (ice-out)". Since round whitefish and lake trout eggs generally hatch before spring, this strategy will still accommodate spring flooding events. This recommendation is similar to previous Newfound Lake management plans and the current strategy for Lake Winnipesaukee.

- Provide a minimum flow of 100 cfs in the Newfound River, assuming this amount is available from Newfound Lake.

Forest Resources

Forestry and the forest products industry have, and continue to be, an important part of the history, culture, economy, and environment in the Newfound Watershed. Since the area was settled in the 1700s, trees have been an important resource, one that provides lumber for building, firewood for heating, and fiber for papermaking and for the generation of electricity. The history of timberland management and land use in the Watershed is not unlike that which has occurred throughout New Hampshire. It is estimated that by the end of the 1800s, as much as eighty percent of New Hampshire's landscape was cleared. With the Civil War in the mid-1800s and westward expansion around the same time, many farms, homesteads, and, in some instances, entire communities were abandoned and then lost to returning forests. Now the Newfound Watershed is home to healthy forests that need to be well managed. Locally enforcing the use of BMPs during timber harvests will prevent erosion and loss of forest soil as well as protect surface waters and other important resources.

The forest resource data used herein comes from the nine-town Watershed region. While the data reflect activity within the Watershed communities, it is not possible to capture more specific information. Note that the Watershed accounts for roughly 30% of the land in this nine-town region.

Property tax data from the New Hampshire Department of Revenue Administration (NH DRA) indicates that 64% of the nine-town acreage is assessed as timberland or forestland in the Current Use Program. The amount of total forest cover is much greater.

In addition to their economic value, forest lands provide aesthetic and environmental benefits and recreational opportunities. Similar to the Current Use assessment reduction for forest management plans, landowners can also reduce their tax assessment if they agree to keep their land open for foot traffic and other non-motorized recreation. Currently 57,220 acres within the Watershed towns receive this reduction (55% of Current Use land within the nine town area).

The forests of the Newfound Watershed provide significant economic activity. Based on 2007 data published by the North East State Foresters Association, on average each acre of timberland annually provides $475 of economic activity; $252 from forest-based manufacturing value of shipments and $2 from Christmas tree and maple product production. The remaining $221 comes from forest-related recreation/tourism. Multiplying the forest-based manufacturing value of shipments and Christmas tree and maple product production annual economic activity factors by the Current Use land within the Watershed communities shows that $48.6 million is generated in annual economic activity.

In addition to direct economic activity, forest management and wood processing also provide indirect economic value. This includes money paid to communities in the form of timber and property taxes and revenues generated by dollars circulating through the local economy. Because most forest-related work occurs locally the indirect economic activity from this industry is significant.

Implementation Actions

Benefits of responsible timber management include healthier forests, improved wildlife habitat, protected water supply, recreational opportunities, and substantial economic value to the landowner and surrounding community. By understanding and caring for forest lands, they can yield these benefits for years to come.

Key actions to protect our forest resources include:

- Ensure that areas best suited for forestry (based on soils, tree species, etc.) are not zoned for incompatible uses such as small (1-2 acre) minimum lot sizes.

- Adopt and promote Conservation Development regulations for new development that allow continued sustainable forestry on a portion of the parcel where appropriate, and buffer residential development from adjacent logging operations.

- Commit to local enforcement actions to ensure that BMPs are followed.

Case Study – Erosion Control and Phosphorus Loading

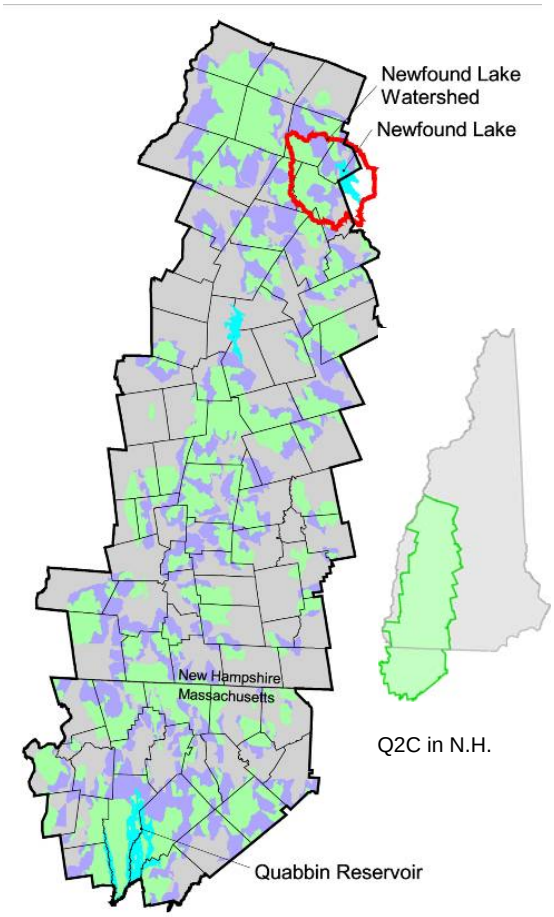
The Black Brook tributary inlet is a good example of how land clearing and home site development can have a profound impact on Newfound Lake water quality. Water quality measurements made in June and July 2006 indicated high total phosphorus concentrations in Black Brook. Erosion control measures constructed as part of a residential subdivision, including a rip-rap culvert and a plunge pool, were compromised when observed in August 2007. Sediment had been deposited into the rip-rap and plunge pool. The sediments then entered Black Brook and eventually Newfound Lake carrying elevated phosphorus levels. Therefore, best management practices should be designed on a site-specific basis and require a regular maintenance schedule if they are to function optimally and protect water quality.

Strategic Conservation Efforts

As in many other attractive, changing communities in New Hampshire, the question being posed is how to balance growth and development with natural and scenic resource protection. Underlying this question is whether the balance is best achieved by regulating development or protecting land through conservation easements and/or fee simple ownership.

One way to answer these questions is to understand *why* land is conserved, and then to measure those goals against the landscape that people care about. Land is protected for wildlife habitat - both animals and plants, for its agricultural productivity and local food production, for the economic and ecologic values of unbroken forests, for the way it frames a view, and perhaps most importantly Watershed residents and visitors, for the sake of water quality. Since all of these values are inextricably knitted together as a whole, one can see that the process of deciding where and what to conserve is more complicated than might be expected.

The Society for the Protection of New Hampshire Forests (SPNHF) and a broad group of local, state, and federal stakeholders has been grappling with this question of land conservation for the last few years in a 3,000-square-mile strategic planning area called the Quabbin-to-Cardigan corridor, or Q2C for short. This study area reaches from the southern edge of the White Mountains, follows the height of land between the Connecticut and Merrimack Rivers, all the way to the Quabbin Reservoir in north-central Massachusetts. Roughly 75% of the Newfound Watershed lies within this planning area. Recent GIS mapping and analysis work to identify strategic conservation priority areas within the Q2C have brought the Newfound Watershed into sharper focus for expanded, collaborative conservation project planning.



Almost 28,000 acres, or 44% of the Newfound Watershed is comprised of Q2C core focus areas; another 20,000 acres are important supporting landscapes. That means that more than three-quarters of the entire Watershed qualifies as top priority for land conservation according to the Q2C plan. It is clear that we cannot protect all of this land permanently, but we can adopt local regulatory tools that will guide development activity and complement strategic conservation efforts in these areas.

The Q2C strategic plan is not intended to be a complete water resources protection plan for the Newfound Watershed, but it does provide an excellent, science-based foundation for identifying the most sensitive and critical lands necessary to preserve the Lake's water quality. Combined with the consensus-oriented approach to stewardship articulated in *Every Acre Counts*, Q2C and local conservation efforts will result in maintaining and managing natural land cover in the critical headwaters of the Watershed.

Implementation Actions

A strengthened commitment to conservation efforts in the Watershed will provide a balance to future development activity. This non-regulatory approach can be even more effective Watershed-wide if it is matched by local land use regulations that are also striving to protect critical natural resources, and are not encouraging sprawling development patterns.

> When asked whether they would like to see less, more, or the same amount of various land uses in the watershed in the future residents expressed a desire for more wildlife habitat, forest or woodlands, more wetlands and agriculture, and more local businesses. These responses demonstrate a clear priority for natural resource conservation. (2007 Community Survey)

Key strategies to protect our highest-value forest and water resources include:

- Work collaboratively with agencies and organizations to establish conservation easements in sensitive areas.
- Create clear future land use plans that identify areas suitable for future development and areas that need to be conserved to the maximum extent possible.
- Encourage Conservation Subdivisions or require them in certain districts to ensure future development impacts are minimized and important natural resources protected.
- Adopt Resource Overlays (for wetlands, steep slopes, and riparian buffers) to help balance conservation and development in accordance with local future land use plans and the Watershed Vision.

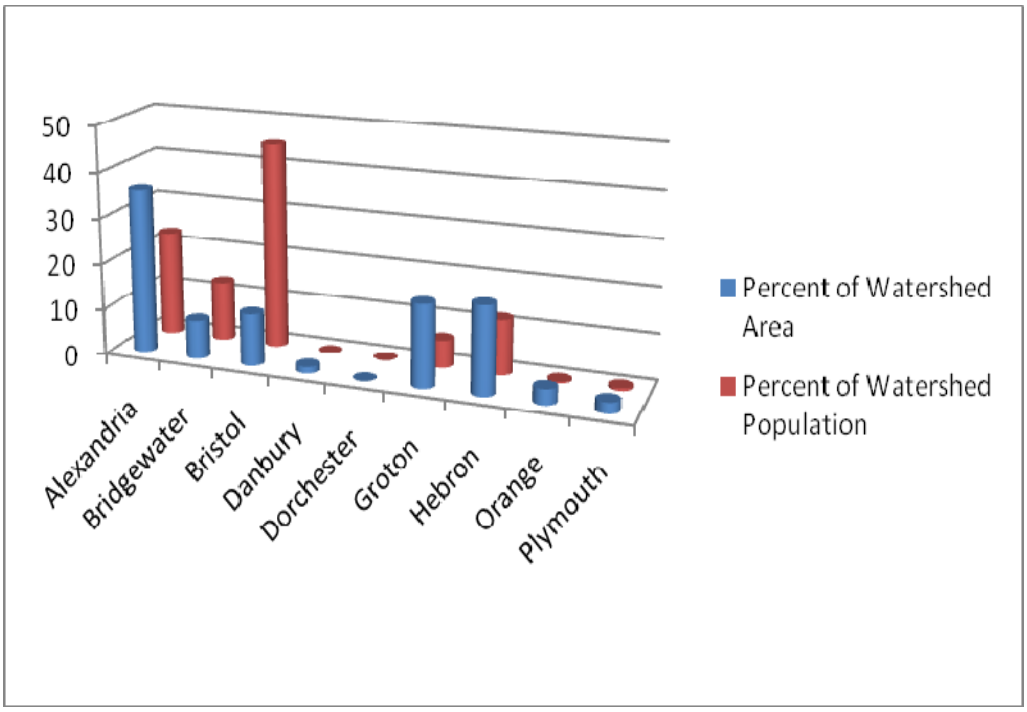
Conservation Collaboration

In March 2009 representatives of SPNHF, the Lakes Region Conservation Trust and the Newfound Lake Region Association gathered to sign a Memorandum of Understanding (MOU) officially establishing the Newfound Land Conservation Partnership (NLCP) to expand conservation opportunities for Watershed landowners. Funding to undertake this initiative was provided to the NLRA by the New Hampshire Charitable Foundation and private donations.

Representatives of the NLRA, SPNHF, and Lakes Region Conservation Trust sign the Conservation MOU.

Watershed Population and Housing Demographics

For communities to prepare for the future they need to understand how Watershed population and housing characteristics are expected to change. Changes in population and housing are directly related to land use decisions that affect the overall health and character of the Watershed. The well-being of the Watershed, in turn, affects the value of the region and its economic development. If population growth and development continue without the appropriate regulatory tools in place, the impacts on our shared Watershed resources and the local economy could be significant.



Five Watershed communities (Alexandria, Bridgewater, Bristol, Groton, and Hebron) account for 93% of the Watershed's area and 99% of its population. The Watershed has a year-round population of approximately 4,500. The arrival of the seasonal population during the summer months doubles the population. Year-round and seasonal population growth are increasing pressure on the community and natural resources within the Watershed. However, an increasing population also creates the potential for economic opportunity. There is a need to balance growth and conservation to protect the long-term health and sustainability of the Watershed for generations to come.

From 2005 to 2030 the Watershed population is expected to increase by 19% (average population growth of 3% every five years). This is much lower than the 132% rate of population growth experienced in the Watershed from 1970 – 2005.

Important Population and Housing Facts:

- The Newfound Watershed clearly has an older population than the State, which recently tied with Florida as the 4th oldest state with an average age of 40. The average age within the Watershed is 43. Bristol is on the lower end of the age spectrum with a median age of 38.5 and Hebron is at the upper end of the spectrum for the Watershed and the state with a median age of 50.

- Households (number of persons / house) in 2009 are smaller than ever before, with a growing number of single-parent households and non-family households (i.e., roommates, cohabiting couples and singles).

Shrinking household size is a national trend as more people live alone, couples have fewer children and the divorce rate increases.

- The housing situation in the Watershed is fairly complex because of the high percentage of seasonal units (45%) and the continued conversion of these units into year-round homes. From 1990 to 2000 the watershed experienced a reduction in seasonal housing units overall, and an increase in year-round units.

- The largest employers are generally located outside of the Watershed area itself**,** such as Freudenberg-NOK, Shop 'n Save and the Newfound Area High School. Within the Watershed the largest employers are the municipalities, the Bridgewater Elementary School and Shackett's Grocery in Bristol.

- Seventy six percent (76%) of workers commute alone using an automobile. The average commute time is 27 minutes. Top commuting destinations include Bristol, Plymouth, Concord, Laconia, Meredith, Franklin, New Hampton, and Tilton.

"I've started to notice a lot of erosion around the streams near Newfound Lake... causing the streams and creeks to change their flow and this is definitely bad for everyone."
Charlie Huntoon

Implementation Actions

It is clear from this demographic and growth assessment that the Watershed is changing. Not only is the population growing, but the composition of the population is changing, posing new challenges for the future. Overall, the population is aging, living together in smaller numbers, and shifting toward more year-round residency.

Key strategies to prepare for projected demographic and housing trends include:

- Review local zoning to allow for a range of housing types to serve this changing population.

- Plan and zone for future development that creates local employment and transportation options.

- Prepare for the expected construction of several hundred new residential units by selecting appropriate areas for variable-density development.

Assessment of Community Master Plans and Land Use Regulations

Existing master plans and land use regulations were assessed for each of the nine Watershed towns to better understand the level of planning and regulation currently in place at the municipal level. This assessment identified important tools already adopted and opportunities for new language and tools that may be adopted during future master plan and regulation updates.

The purpose of *Every Acre Counts* is to help Watershed towns work toward a shared vision using whatever means they feel are most appropriate for their community. Any of the model language presented in Volume 2 of *Every Acre Counts,* or found in other planning resources, will need careful review and adaptation to meet the needs and conditions found within individual communities.

Legally, each town's master plan serves as the foundation for all local land use regulations. Local regulations should help the community implement its unique vision as outlined in their master plan. The majority of local master plans have been prepared since 2002. Although they differ somewhat in the extent of their inventory and implementation details, they all provide a clear sense of what the community would like to work toward from a land use perspective. Throughout the nine master plans there is a strong sense of stewardship and of the importance of protecting natural resources within the Watershed.

"Developed in an ecological safe way, using cluster development, using techniques that will not destroy land...there is an awful lot that can be done."
Ken Weidman, Bridgewater

There is a great deal of similarity between the various Watershed communities' vision statements. All of the local master plans identify the elements of their community's character, the importance of natural resource protection and the need for balancing the various forces of growth and development into the future as top priorities. These common principles were reinforced by the results of the 2007 Community Survey as well as by the public input sessions that initiated *Every Acre Counts*. The strong similarities between the various vision statements provide an assurance that the Watershed communities can join together to work toward a common vision.

Existing land use regulations were reviewed to better understand their extent and the likelihood that they will guide future changes toward both the individual community visions and the Watershed Vision. Eight Watershed towns have zoning in place. Alexandria, the one community that does not currently have zoning, regulates the subdivision of land, development on the floodplain, and earth excavation. With the exception of some overlay districts, the majority of the Watershed falls under some form of a rural residential zoning district. As a result, most of the Watershed has a minimum lot size of 1-2 acres, and a minimum road frontage requirement of 150 to 200 feet. This is potentially a very suburban pattern of development, and not one that matches community or Watershed vision statements.

Very few statistically significant differences exist across the responses from residents of different towns in the watershed, which is encouragement for all towns to work together for the common good of the watershed. (2007 Community Survey)

Some communities have also made a point of including, in their local review process, a provision to assess "regional impacts." Having this provision in the land use regulations and regulatory checklists helps remind board members and applicants that any Planning Board may determine an application to be a development of regional impact according to NH RSA 36:54. This is a tool that may become more useful within the Watershed as each community begins to understand the potential impacts new development proposals may have on their shared resources.

Implementation Actions

Because the majority of the Watershed falls under some form of a rural residential zoning district there is a need for new regulatory approaches that will guide land use changes toward the community and watershed visions.

Key actions that should be pursued locally to address this pattern of development include:

- Revise land use ordinances to align with Vision Statements in the community master plans.
- Ensure that a diversity of development densities are identified in the future land use section of the master plan based on the existing resources, and concentrate new development (in villages or new nodes of development) while fostering open space, conservation lands, agriculture and working forests with lower development densities.
- Create riparian buffer overlay districts that are a minimum of 100 feet wide for all perennial and annual streams.
- Target specific areas and resources for extra protection using "overlay districts" (e.g. aquifer, shoreline, high-value soils, steep slopes, ridgeline, wetlands and habitat.)

Section 3- What's the Word in the Watershed?

Property Owner Surveys

Two public opinion surveys were administered in the Watershed communities by the PSU-CFE. The surveys were distributed to a random sample of property owners in the Watershed communities. Some of the individuals surveyed were year-round residents, some were seasonal residents, and others live outside the watershed boundary in one of the nine watershed communities. The last group is important to understand because they will be asked to vote on new regulatory initiatives at the local level as each community begins to implement *Every Acre Counts*.

"The quality of Newfound Lake doesn't just consist of the people who live directly on it or next to it. It has a huge watershed area, so what occurs in the pretty distant radius of the lake affects its quality."
Jeff Shackett , Bristol

The first survey was designed and administered in 2007. A total of 1,938 questionnaires were mailed with a 41% response rate. These results are very encouraging. The survey raised public awareness while providing residents and property owners an opportunity to express their views and desires for the future. In addition, this level of response makes the survey data statistically valid and useful for a wide range of future analysis.

The second survey was designed and administered during the summer of 2009. A total of 1,500 questionnaires were mailed with a 30% response rate. This is an excellent representation for a community planning survey, and the data will be useful for understanding property owners' desires and values when planning for the future of the region. The purpose of the second survey was to gauge the effectiveness of outreach and education efforts during the three year project, and to gauge the willingness of respondents to support specific implementation actions at the local and watershed level. The Project Team is grateful to both past and future survey respondents!

There are many encouraging findings from the 2007 survey regarding future efforts to protect water quality in the Newfound Watershed. To make best use of the information, a focused series of key findings and recommendations for future communications are presented in Volume 2 of *Every Acre Counts.*

Key findings from the 2007 Community Survey include:

- Residents expressed a desire for more wildlife habitat, forest or woodlands, more wetlands and agriculture, and more local businesses. These responses demonstrate a clear priority for natural resource conservation.

- Respondents expressed strong agreement that the economic stability of their community depends on good water quality.

- Respondents indicated that clean water supplies for public use, healthy water bodies supporting fish and other aquatic life, and habitat for wildlife are of highest importance.

- Respondents with stronger personal connections to the Watershed gave more importance to ensuring clean water, open space, wildlife habitat, and ensuring local master plans are up-to-date.

- Older respondents did not favor the internet as a source of information while younger respondents did not favor town or community meetings. The NLRA was recognized as an important and credible source of information.

- Most encouragingly, overall respondents indicated a willingness to make changes to protect water quality, particularly if explicit connections between desired conditions and the need for such changes are clearly established.

Key findings from the 2009 Community Survey include:

- Respondents are very supportive of the plan and are aware of its creation. 80.3% of respondents rated it as “important” or” very important.”

- Respondents consider all the goals of the master plan listed to be of high importance. However, the goal in *Every Acre Counts* considered most important by respondents is protecting water quality.

- Respondents indicate a high level of concern for all the specific environmental issues asked about in this survey, with little variation in responses. Not surprisingly, concerns about invasive species are especially high.

- There is considerable variation in respondents’ level of support for regulatory measures that may be recommended as part of *Every Acre Counts*, but overall there is support for all the measures identified.

- The most variation among respondents in their levels of support for possible regulations concerned compliance issues. These are especially controversial and should be addressed accordingly.

- Seasonal residents are far more supportive of zoning regulations and ensuring protection of specific natural resource areas, suggesting that any education and outreach efforts would be more successful if audience segmentation is considered.

- Respondents who have served on town boards or commissions place more importance on the goals of retaining a rural lifestyle and encouraging stewardship at the town level than respondents who have not served in such a capacity.

Thoughts on Implementation

The Community Survey data clearly indicate that residents are concerned about rapid changes in the Watershed, have good knowledge of stewardship principles, and are concerned about how future changes may affect the region in which they live. There is a strong desire to ensure the beauty of the region into the future, and to have communities work together to protect the Watershed landscape. *Every Acre Counts* is an essential step in the process of the long-term planning for and protection of the Newfound Watershed. Residents of the region and project partners are encouraged to use the Community Survey results to better understand the human dimensions of many issues in the Watershed as they pursue specific implementation actions.

"There are more boats, there are more houses on hills. I notice there's a change in the lake... it's still clean but there are plants growing on the bottom."
Helen Robinson, Bristol

Oral Histories

In the fall of 2007 fifteen PSU students in Professor Marcia Schmidt-Blaine's New Hampshire and New England History class conducted interviews with 30 people connected to the Newfound Watershed. Many references within the interviews show the deep connection between the people in the region who value and wish to preserve the personality of the Watershed. In Volume 2 of *Every Acre Counts* all of the analyses students conducted after their interviews, and after reading other interview transcripts, have been included with the interview transcripts. Quotes from the interviews have been used throughout this plan to share the human dimension and voice that reflects the deep appreciation and stewardship expressed by those interviewed. Our thanks to all of you who participated in this aspect of *Every Acre Counts*!

All of the interviewees appreciate the region they live in. They value the people in the region and, even when they disagree with their neighbors, believe that all are trying to do what they think is best. The controversy regarding the extension of sewer lines in Bristol to Newfound Lake is a perfect example. Each side strongly feels that their ideas will be most effective in keeping the lake clean.

Most interviewees enjoy year-round outdoor activities and mentioned the thrill of seeing otter, mink, beaver, moose, red fox and bear in their explorations of the Watershed. While some trust the depth of the lake and the many springs that flow into the lake to maintain its purity, most believe that varying degrees of increased regulation are necessary to preserve the area.

Most respondents recognize that the economic stability of their community is dependent on good water quality. (2007 Community Survey)

Implementation Actions

Almost without exception, the interviewees listed growth as the Watershed's greatest challenge. For many, the condominiums that sprang up in the 1990s awakened them to the threat of losing what they valued: the pristine beauty of the Watershed. Many people suggested that a regional approach is needed. One resident, a member of a local Select Board, mentioned that there have been regional meetings among watershed Select Boards. Yet, because of the authority granted town boards as opposed to some sort of larger geographic area, it's clear that much work must be done on a town-by-town basis. For some, this is quite frustrating. Residents worry about the loss of the rural nature of the area, as the high ground is now being cleared and lake-view houses built. They fear that the region will eventually be caught in the "Winnipesaukee effect", with increased traffic, commercialization and environmental degradation. At the same time, they do not want the area to suffer economically. They seek some sort of balance that will preserve the timelessness of the region.

Curriculum Development for Public Schools

Newfound Middle and High Schools

The Newfound Area School District has been an important part of the *Every Acre Counts* project. Middle School students attended and filmed an April 2007 Watershed planning meeting. High School students designed, built and installed an informational kiosk at the popular Breck-Plankey spring in Bristol, and worked with PSU students on survey design. A small group of high school students also worked to craft language and a design for Watershed boundary signage. The hope is that this signage will be installed in 2009 to inform residents and visitors as to the size and location of this extensive Watershed. A letter has been drafted to the New Hampshire Department of Transportation and the Watershed communities to gain permission to install these signs in the rights-of-way.

NHS *Awakening the Senses* students and teachers at the Breck-Plankey Spring in Bristol, Spring 2007.

Bridgewater Elementary School

Nancy Stock, a fourth grade teacher at Bridgewater Elementary School worked with project advisor Chris Duggan to introduce Newfound Watershed related activities into her classroom during the 2008 / 2009 school year. Her work included posting a Newfound Watershed map in the classroom for the months of September and October and using it for mapping activities with the students. The students also built small watersheds in class out of clay and then larger replicas of the Newfound Watershed on the playground out of sand.

The class also journeyed onto the Lake for a visit to Mayhew Island, and observed the high points throughout the Watershed. During this visit to the Lake and back in the classroom they discussed issues related to water run-off, pollution and tourism. The students completed writing activities regarding why they love where they live, and then created a bulletin board for the school hallway that featured Newfound Lake at the center and the world branching out from the Lake. In the future students within the Watershed could also take a ride on the NLRA's Floating Classroom for a day of exploring and learning.

A number of worksheets from Nancy's class can be found in Volume 2. The worksheets were used in the fourth grade class during math lessons. Nancy is using *Everyday Math* (an elementary math curriculum), and replaced or added to lessons that the program already had in place. Every student in the class was given a copy of the Watershed Demographic Study, completed as part of *Every Acre Counts*, to refer to during lessons.

Nancy is currently piloting a science program called *Water*. It was specifically selected for the fourth grade to fit in with their study of New Hampshire history and the Newfound Watershed. This program has been a

success and the school is hopeful that science materials, like this pilot, will be purchased for all the fourth grade teachers. If this unit is part of the curriculum at Bridgewater Elementary School in the fall, Nancy plans to add new activities, as she did with the math program, to further integrate it with the Newfound Watershed. The project team is grateful to Nancy and her students and to Chris Duggan for their leadership in Watershed learning!

Implementation Actions

Education efforts involving students from the Watershed communities create an opportunity for a deeper understanding and appreciation of the Newfound Watershed. Student education creates a stronger stewardship ethic among Watershed residents that is essential to its long term health.

Key actions to strengthen Watershed education and student experiential learning opportunities include:

- Encourage more educators to develop curricula related to the Newfound Watershed. This may require some financial support for training, time for curriculum development and purchasing materials.

- Increase the number of students that participate in the NLRA Floating Classroom.

- Complete the Watershed signage project and initiate other Watershed-related projects that give students (and their families) a sense of ownership while educating the public about the Watershed.

Section 4- Achieving the Watershed Vision

Implementation Actions

There was a strong mandate to undertake the *Every Acre Counts* project, as expressed by participants at the initial public meetings attended by over 100 people. This mandate can be seen in the vision statements of local master plans, as well in the more recent results of the 2007 CFE Community Survey, the Oral History interviews of 30 residents and growing membership in the NLRA by Watershed towns (Alexandria, Bridgewater, Bristol, Groton and Hebron in 2009).

The vision for the Newfound Watershed will not be achieved without local commitment to implementation. These implementation actions and others that may be identified in the future will require the support of local land use boards, town committees and residents. The implementation process will also be supported by volunteers from the Watershed communities who have agreed to participate in the *Newfound Watershed Coalition*. The *Coalition* will assist the NLRA and other project partners with education and outreach efforts in the Watershed. This Watershed-wide effort will ensure that communication and cooperation continue across town boundaries as we work together to achieve the Watershed vision.

Local Implementation Efforts

The following actions are prioritized based on threats to water quality and are grouped according to the local entity best positioned to implement them:

Planning Board Actions (first 6 months)

- Adopt *Every Acre Counts* as an amendment to the local Master Plan to help support new local and Watershed-wide planning efforts. *According to NH RSA 675:6 this will require that the Planning Board hold a public hearing and that the majority of Board members vote in favor of its adoption.*

Planning Board Actions (1-3 years)

- Adopt local shoreland protection ordinances that will include smaller streams, wetlands and other waterbodies not included in the NH Comprehensive Shoreland Protection Act. *(Zoning Ordinance*)
- Target specific areas and resources for extra protection using "overlay districts" (e.g. aquifer, shoreline, agricultural soils, steep slopes, ridgelines, wetlands, conservation, etc.) *(Zoning Ordinance*)

Residents perceive rapid changes in the watershed, which should be used to encourage environmentally responsible behaviors and planning efforts. (2007 Community Survey)

- Ensure that local regulations prohibit the release of post-development stormwater beyond "naturally occurring" levels. Address stormwater issues using Low Impact Development (LID) techniques. (*Site Plan and Subdivision Regulations*)
- Adopt erosion and sedimentation control regulations. (*Site Plan and Subdivision Regulations*)
- Revise land use ordinances to align with the Vision Statements in the community master plans. *(Zoning Ordinance, Site Plan and Subdivision Regulations*)
- Ensure that a diversity of development densities are identified in the future land use section of the Master Plan. (*Master Plan Review and Update*)
- Require larger minimum lot sizes in areas that are best suited for forestry. *(Zoning Ordinance*)
- Promote Conservation Developments that would allow for continued sustainable forestry on a portion of the parcel where appropriate, and buffer residential development from adjacent logging operations. *(Zoning Ordinance, Site Plan and Subdivision Regulations*)
- Ensure Site Plan and Subdivision regulations require applicants to follow the NH Stream Crossing Guidelines (NHFGD, 2008) for all applicable stream crossings.
- Include the question of Regional Impact (*RSA 36:56*) on the application checklists used by the Planning Board.

Select Board Actions

- Make all permit requests, approvals for land-altering activities, and environmental reports (e.g. septic systems) readily available to the general public to ensure transparency of information.
- Increase town support of exotic weeds prevention programs (e.g. Lake Host, Weed Watchers, aquatic and terrestrial species).
- Require inspection and reporting on septic system age and maintenance every 3-5 years.
- Prohibit the use of fertilizers or pesticides within 50 feet of any water body or stream channel.
- Minimize the use of salt for roadway and parking lot de-icing.
- Monitor forestry and development operations closely, and consider hiring a shared compliance officer with adjoining communities to accomplish this.
- Inventory culverts and stormwater runoff from public roads, and develop standard operating procedures and plans to reduce impacts to surface waters from stormwater.
- Create a stormwater utility in heavily developed portions of communities to provide a mechanism for collecting utility fees from property owners that will fund projects that eliminate stormwater runoff.
- Coordinate town activities to function at the Watershed level. This may include shared code enforcement, planning support, and opportunities to combine town services and increase purchasing power.

Watershed-wide Implementation Efforts

There are many regional entities that can perform critical work towards the Watershed Vision. Some of these resources and key implementation actions are listed below.

Newfound Lake Region Association (NLRA)

- Provide the leadership, coordination, and stewardship of progress required to achieve the shared Watershed vision articulated in *Every Acre Counts*.

- Develop and distribute educational materials to foster a "stewardship ethic", including curriculum materials at local schools.
- Extend water quality monitoring of tributaries and maintain a public database with findings.
- Pursue funding/grants for an LID stormwater management demonstration project.
- Facilitate a process for NHDES and Watershed towns to establish a framework prohibiting phosphorus discharge to Newfound Lake unless a public hearing process demonstrates that water quality will not be adversely impacted.
- Establish a volunteer monitoring program for land use issues in the Watershed including forestry and development BMPs.
- Assist the New Hampshire Fish and Game Department (NHFGD) and other stakeholders to revise current lake level management policy to stabilize winter water levels and maintain minimum flow in the Newfound River to protect local fisheries while serving other stakeholder needs.
- Promote alternative means for waste water disposal where appropriate (composting toilets, low-flow toilets, waterless urinals, grey water systems and constructed wetlands), and educate residents on the design, maintenance, and permitting issues related to each alternative.

Newfound Land Conservation Partnership (NLCP)

- Work on strategic land conservation initiatives within the Watershed using the best available data, and involve local planning boards and conservation commissions in this effort.
- Develop a network of four-season trails and publish the locations of the trailheads to increase recreational uses in the Watershed and increase support for conservation efforts.

Newfound Area School District (NASD)

- Encourage educators to develop curriculum related to the Newfound Watershed.
- Increase the number of students that participate in NLRA's Floating Classroom.
- Complete the Watershed boundary signage project, and initiate other Watershed related projects that give students a sense of environmental stewardship while implementing *Every Acre Counts*.

University of New Hampshire Center for Freshwater Biology (UNH-CFB)

- Continue water quality monitoring in the Watershed to track phosphorus and other indicators in the lake and tributaries.

Plymouth State University (PSU)

- Develop and distribute educational materials to promote a "stewardship ethic" in the Watershed.
- Provide opportunities for university students and staff to work with the Watershed communities on monitoring and implementation efforts through the NLRA and other partnerships.

New Hampshire Department of Environmental Services (NHDES)

- Provide outreach and education, continue enforcement efforts, and assist the Watershed communities and NLRA with other activities related to implementing *Every Acre Counts*.