NASHUA RIVER WATERSHED

(SQUANNACOOK AND NISSITISSIT SUB-BASINS)

SOURCE WATER STEWARDSHIP
EXCHANGE TEAM REPORT

JULY 2003

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INTRODUCTION

THE STEWARDSHIP EXCHANGE WEEK AND TEAM MEMBERS

The Trust for Public Land (TPL), in partnership with the University of Massachusetts and the USDA Forest Service, is conducting Source Water Stewardship Projects in four pilot watersheds throughout the Eastern United States to demonstrate land conservation and forest management practices for source water protection. This project is designed to integrate and build-upon work already underway in each of the four watersheds, such as state source water assessments and other local planning efforts. Although the partners have been funded to provide technical project support, the Source Water Stewardship Project in each watershed is locally led and driven by a committee representing a broad range of watershed interests.

Each Source Water Stewardship Project consists of three phases:

- Phase I: Analysis and Assessment
- Phase II: Stewardship Exchange
- Phase III: Implementation

During Phase II of this Source Water Stewardship Project, a team of five experts (the "Exchange Team") with the backgrounds requested by the local committee, volunteered to participate in a one-week Stewardship Exchange in the Nashua River (Squannacook/Nissitissit sub-basins) Watershed. (Biographies for each of the Exchange Team Members can be found in Appendix A, and a complete list of the local committee is included in Appendix B.) The purpose of the exchange, which was held the week of May 4th, 2003 was to:

- Conduct a broad-based assessment of the watershed,
- Identify actual and potential impacts to water quality and quantity, and
- Develop suggested strategies and actions to address existing and possible future impacts.

Exchange Team Members included:

Michael Heidorn, a Source Protection Specialist with the Northeast Rural Water Association.
Roger Monthey, a Forest Stewardship Coordinator for State and Private Forestry with the USDA Forest Service.
Jay Sherman, an Independent Environmental Training Consultant
Matt Zieper, Research Director for the Trust for Public Land's Conservation Finance Program.

The local committee coordinated roundtables and meetings during the week that exposed the team members to extensive information on source water issues affecting the watershed. Throughout the week, local committee members worked closely with the Exchange Team to inform them on source water and watershed challenges. Based on the information gathered from the roundtables, the local steering committee and the resources provided, the team developed a set of recommended strategies to protect drinking water in the Squannacook and Nissitissit watersheds. The Exchange Team's recommendations will be the basis for Phase III, the implementation of recommended strategies.

BACKGROUND

The team reviewed a number of studies, reports, and other documents and was briefed by a wide range of local officials and other stakeholders in developing its assessment. It should be noted that the team was impressed with the level of cooperation, support, openness, and leadership from local organizations and individuals associated with the Stewardship Exchange Week, and appreciated the level of preparedness and

involvement demonstrated prior to and during the week of study. A summary list of information provided to the team included:

- Fish Toxics Monitoring Public Request and Year 2 Watershed Surveys, Maietta, Robert J., 1999.
- Assessment of Habitat, Fish Communities, and Streamflow Requirements for Habitat Protection, Ipswich River, MA, USGS, 1998-1999.
- Environmental Contaminants in Fish From the Nashua River, USF & WS, 1997.
- Focus Areas for Wildlife Habitat Protection in the Nashua River Watershed, Ecological Extension Service of Massachusetts, 2000.
- Nashua River Watershed Coordinated Water Quality Sampling Plan, BSC Group, August 2001.
- Nashua River Watershed Coordinated Water Quality Sampling Plan, MA EOEA, April 2001.
- Estimating Concentrations of Road-Salt Constituents in Highway-Runoff from Measurements of Specific Conductance, USGS, 1999.
- Ground Water and Surface Water, A Single Resource - Circular 1139, USGS, 1998.
- Sustainability of Ground-Water Resources - Circular 1186, USGS, 1999.
- Streamflow Measurements, Basin Characteristics, and Streamflow Statistics for Low-Flow Partial-Record Stations Operated in MA from 1989 through 1996, USGS, 1999.
- Streamflow , Water Quality, and Contaminant Loads in the Lower Charles River Watershed, MA, 1999-2000, USGS, 2002.
- Measured and Simulated Runoff to the Lower Charles River, MA, October 1999 - September 2000, USGS, 2002.
- Preliminary Assessment of Streamflow Requirements for Habitat Protection for Selected Sites on the Assabet and Charles Rivers, Eastern MA, USGS, 2001.
- Stream-Aquifer Relations and Yield of Stratified-Drift Aquifers in the Nashua River Basin, MA, USGS, 1991.
- Use of Computer Programs STLK1 and STWT1 for Analysis of Stream-Aquifer Hydraulic Interaction, USGS, 1999.
- Potential Effects of Structural Controls and Street Sweeping on Stormwater Loads to the Lower Charles River, MA, USGS, 2002.
- Simulation of Ground-Water Flow and Evaluation of Water-Management Alternatives in the Upper Charles River Basin, Eastern MA, USGS, 2002.
- Obtaining Streamflow Statistics for MA Streams on the World Wide Web, USGS Fact Sheet, September, 2000.
- Robowell - Providing Accurate and Current Water-Level and Water-Quality Data in Real Time for Protecting Ground-Water Resources, USGS Fact Sheet, July 2002.

THE WATERSHED

The Squannacook and Nissitissit Rivers, which are located in north central Massachusetts and south central New Hampshire, are important tributaries to the Nashua River. These two watersheds comprise approximately 133 square miles and include portions of four counties, two states, and five towns in Massachusetts and six towns in New Hampshire. The topography ranges from upland plateau in the headwater sections to more gently rolling, hilly terrain, to generally flat coastal plain lowland river valleys.

Numerous medium and high yield stratified drift (sand-and-gravel) aquifers are located in the watersheds and serve as the primary drinking water sources for residents in Massachusetts. In New Hampshire, the primary drinking water source is public and private wells in bedrock and till. There are approximately nine community water systems in Massachusetts and three in New Hampshire; however, when including transient and non-transient water systems, there are 21 public systems in Massachusetts and 23 in New

Hampshire.1 Future public drinking water sources will most likely be groundwater supplies associated with thick stratified drift deposits, or possibly water-bearing bedrock fracture zones.

Land use patterns in the watershed are characterized by relatively large blocks of open space divided by linear development along roads, with the most intense development along the state highways. The predominant land cover is forest. More than three-quarters (79 percent) of the Squannacook sub-basin and 66 percent of the Nissitissit sub-basin is forested. Farmland and orchards account for roughly 7 percent of land use.

Currently, developed land uses account for only 13 percent of the total (11 percent residential and 2 percent commercial/industrial), but rapid population growth over the past few decades is quickly changing the landscape. The average population growth rates from 1990 to 2000 for all eleven jurisdictions was 11.9 percent, double the Massachusetts state average of 5.5 percent and slightly higher than the New Hampshire state average (11.4 percent). In recent years, the population growth rate in Brookline, NH has been among the highest in that state.

WATER RESOURCE CONCERNS

In the "water-rich" Northeast, the finite nature of our water resources is often overlooked and underestimated. This approach can result in contaminated aquifers, dry streams and over-pumped wells. According to the MA Department of Environmental Protection ("MA DEP;" Land Use and Ground Water Management Challenges in New England Conference, December 3, 2002), the Ipswich River, located in eastern Massachusetts, has run completely dry several times in the last decade due primarily to over-pumping associated with increased development and demands for water. Similar situations have occurred elsewhere in New England.

Increased development over prime aquifers has forced other MA and NH municipalities to realize that they are running out of locations for new potable water supplies. For example, the Town of North Reading, located in the headwaters of the Ipswich River Basin, realized too late that their groundwater and surface water resources were "tapped out" (Land Use and Ground Water Management Challenges in New England Conference, December 3, 2002). Luckily, in this case the Town was able to import drinking water from another watershed to meet its needs - however, the process resulted in one of the highest fees for water usage in the state of MA and the Town is now dependent on a source that is not under its direct control.

The growth pressure facing local communities is spreading outward from more urban centers toward more rural areas including the Squannacook-Nissitissit sub-basins. As described above, towns in these basins (such as Brookline and Hollis, NH) are currently experiencing some of the largest growth rates in MA and NH. These large rates of growth, when combined with insufficient local planning, have the potential to adversely impact water resources. Furthermore, development in sensitive aquifer or watershed areas can also adversely impact a community's ability to grow due to limitations imposed on important water uses such as drinking.

Water quality and quantity concerns in the Squannacook-Nissitissit watersheds have not yet reached the crisis levels described in the examples above. However, based on the information reviewed during the Stewardship Exchange Week, the Exchange Team feels that a proactive approach to watershed and source water management should be implemented soon. Such an approach could not only prevent a worst-case water resource scenario but also allow local communities to enjoy and use their rivers and aquifers

[1] Northeast Rural Water Association's "Northeast News Leaks," Spring 2003, pg. 1.

cooperatively and sustainably. To assist the local committee in developing this approach, the Exchange Team has created a series of detailed recommendations as outlined below.

TEAM RECOMMENDATIONS

The team organized their recommendations into five sections:

1. Understanding the watershed: developing a shared understanding of threats to water resources;
2. Public education, outreach and citizen action: developing a message linking watershed protection with clean drinking water and using that message to promote public action;
3. Land Protection and Management: protecting the most critical land for clean water, coordinating protection efforts and encouraging active stewardship;
4. Funding Protection and Management: developing long-term strategies for sustainable funding;
5. Public Policy and Zoning: strengthening the regulatory protections for groundwater.

Throughout the recommendations, the team refers to a series of maps produced by the University of Massachusetts as part of the Source Water Stewardship Project. These maps, included in Appendix B, highlight high priority areas in the Squannacook and Nissitissit watersheds for conservation, restoration and stormwater management. They were created using models that score each parcel for its importance based on a set of characteristics, including soil, slope, land use and aquifer recharge, among others. As with all mapping and modeling tools, these maps are intended as a guide to assist local watershed managers in targeting areas for on-the-ground assessment and potential action. They do not replace the need for physical inspection of potential high priority parcels. Large printouts of these maps and CD's with the images will be available at the NRWA, and electronic versions can be downloaded at www.tpl.org/landandwater/.

The team also refers frequently to ***Source Protection Areas*** – Zone 1 and Zone 2. ***Zone I*** is a set circumference around wellheads that all suppliers must own or control in both Massachusetts and New Hampshire. ***Zone II*** is an area of influence around a wellhead that, in Massachusetts, most large public wells (>100,000 gallons per day) are required to delineate, in which they should adopt local land use controls, either zoning, general bylaws or health ordinances, that restrict certain land uses. They must do this in order to receive state approval to operate; however, some large public wells are grand-fathered. For smaller public wells, it is up to the towns or suppliers to decide on land use controls. New Hampshire has a similar definition, except municipalities and suppliers are only encouraged, not required, to delineate Zone II and enact local land use controls.

UNDERSTANDING THE WATERSHED

CHALLENGE: DEVELOPING A SHARED UNDERSTANDING

In light of the serious risks to water resources posed by rapid growth and land use change throughout the Squannacook-Nissitissit watersheds, the primary challenge faced by local communities is understanding the limitations and values associated with those resources and using that knowledge to sufficiently protect existing and future drinking water supplies.

The protection of both surface water and groundwater resources is critical to maintaining good drinking water quality. Surface water, groundwater, drinking water and wetlands are all strongly interconnected and vital parts of the watershed system. Upstream contamination due to nonpoint pollution sources has the potential to flow into a wellhead protection area and adversely impact drinking water quality. Withdrawal of groundwater for drinking water purposes reduces the amount of water flowing to other parts of the

hydrologic system, and may impact the water quality in nearby streams, rivers and wetlands. There needs to be a watershed-based approach to land and water resource management, an approach that many regional, state and federal initiatives have begun to embrace.

The key to protecting the basin's water resources lies in having a shared understanding of the interconnections between water resources in the basin and the threats to those resources. Improved monitoring and mapping are critical to developing this understanding.

MONITORING:

The Nashua River Watershed Association (NRWA) and the Massachusetts Department of Environmental Protection (MA DEP) have conducted surface water monitoring at a large number of sites in the Squannacook-Nissitissit sub-basins over the last 30 years as part of their volunteer and Strategic Monitoring for Riverbasin Teams (SMART) programs. The data collected over that time period has been very useful for assessing watershed conditions, and the outreach conducted through the monitoring has been impressive and a tribute to the NRWA's persistent efforts. However, it appears that the structure of the monitoring programs could be further enhanced to maximize data collection and address key water quality concerns such as road runoff (including salt), septic system discharges and pesticide/herbicide/fertilizer runoff. In addition, data generated by the volunteer/SMART teams could be better integrated with data from outside those programs, such as USGS streamflow gauging data and data on groundwater levels/quality. To maximize our understanding of the watershed, these data sources should be combined and made available to the public in a database that is both easily accessible and comprehensive. In addition, the implementation of these data collection programs would be most effectively coordinated on a watershed-wide level

MAPPING:

Initial mapping of water conservation and restoration priorities within the watershed has been completed by the University of Massachusetts (UMass) for both surface water and groundwater resources. Once finalized, this innovative and detailed mapping will allow local communities to prioritize their land protection efforts in a state-of-the-art manner. However, the data sources upon which the mapping is based are constantly evolving and being updated – hence, in order for the mapping to function as an effective planning tool in the future, it will also need to be regularly updated and reevaluated. State and local governments are in the process of updating and digitizing critical data layers. Once completed, these layers need to be incorporated into the UMass maps and updated regularly.

RECOMMENDED STRATEGIES

To meet the above challenges, we recommend using state-of-the-art monitoring and mapping techniques, making them easily accessible to the public and developing them as tools to promote a shared understanding of water resources and the threats to those resources. When combined with the education, policy, land protection and funding recommendations presented elsewhere in this report, these techniques can help local communities most effectively plan for future land protection and land management efforts on potential and existing high-yield drinking water sources. Specific recommendations with regards to each of these techniques are presented below. In some cases, potential funding sources are mentioned, but overall, funding for the mapping and monitoring recommendations in the report will most likely be found from federally-funded state and regional grant programs.

MONITORING:

Improve Surface Water Monitoring Efforts

In order to improve current surface water monitoring efforts:

- NRWA should examine the effectiveness of their current volunteer stream monitoring program relative to the different objectives of outreach vs. science. The outreach effort is effective because large numbers of citizens are mobilized to participate in water sampling, with the basic objective of increasing citizen exposure to the environment and watershed issues. However, while the volunteer data has been accepted by MA DEP for assessment purposes, improvements in the quantity and reliability of the data could be achieved by reevaluating the sampling equipment needs and the sampling team composition/schedule as well as decreasing the dependence on off-site laboratories. NRWA should consider placing an even stronger emphasis on scientific objectives and including a monitoring component specifically designed to maximize the collection of defensible volunteer data that more comprehensively measures watershed conditions at fewer sites.
- For improved data reliability, NRWA staff and/or volunteers should strive to measure basic water quality parameters in the field if at all possible. Participation in the NH Rivers Management & Protection Program may allow volunteer monitors to borrow single-parameter handheld field equipment from New Hampshire Department of Environmental Services (NH DES). If further enhancements to the field monitoring program are desired, NRWA should consider purchasing multiparameter handheld or submersible probes. Such probes afford their users additional deployment options, including long-term monitoring, vertical profiling and in-situ groundwater testing.
- NRWA and MA DEP should track the Volunteer Biological Assessment Program (VBAP) currently under development by the NH Department of Environmental Services (NH DES). VBAP's rapid macroinvertebrate assessment techniques are intended to minimize off-site analysis, increase the speed of analysis and reduce macroinvertebrate mortality rates. If successful, VBAP techniques could be employed in the Squannacook/Nissitissit area to streamline biological sampling efforts.
- NRWA, MA DEP and the NH DES should build on the "Coordinated Sampling Plan for the Nashua River Watershed" completed by the NRWA and the BSC in 2001, which included a review of all current surface water monitoring programs in the watershed, including sampling locations and analytical parameters. Surface water monitoring programs should include specific conductance, coliform and nutrient monitoring at watershed locations identified as key concerns. Such locations include roads proximal to water bodies, farms/lawns with potential for significant pesticide/herbicide/fertilizer runoff, and high density septic areas. Routine program reviews should incorporate modifications as needed to account for changing water quality concerns and achieve evolving NRWA/MA DEP/NH DES objectives most efficiently.
- Support for the maintenance of USGS real-time flow gauging stations in the watershed should be voiced to the appropriate funding agencies to reduce the likelihood that the stations will be discontinued. While these particular stations have not been proposed for dismantling as far as the Exchange Team is aware, several stations in NH have due to ever-tightening budget restrictions. Flow data, particularly real-time flow data, are absolutely critical to assessing long term water quality impacts.

Improve Groundwater Monitoring Efforts

Municipalities should consider sponsoring free water testing days (to test individual wells), to evaluate town-wide groundwater quality, as was done recently in Londonderry, NH. They could potentially partner

with NRWA to implement this strategy. A complementary way to approach this is to develop local ordinances/regulations that require new developments to submit water quality test results to the municipalities as part of the site permitting process. For more information on how the town of Salem, NH did this, see the following website: http://www.des.state.nh.us/dwspp/source/spring03.pdf

In order to improve groundwater monitoring in the Source Protection Areas, water suppliers should:

- Form source protection committees as part of their source protection planning efforts. An important focus of these committees would be to monitor land uses as well as groundwater and surface water conditions in their Source Protection Areas. The committee's monitoring needs could be integrated into existing volunteer monitoring programs to streamline data collection efforts.
- Focus groundwater and surface water monitoring efforts in primary recharge areas (Zone I and II Source Protection Areas (SPAs) in MA and Wellhead Protection Areas (WHPAs) in NH. Surface water monitoring efforts should also focus on Zone III or their equivalent in NH. Zone III represents secondary recharge areas.
- Purchase or share the above-referenced handheld or submersible probes in partnership with NRWA as part of developing a comprehensive surface water and groundwater monitoring program.

Integrate and Focus Monitoring Data

Wherever possible, water monitoring groups on both the local and state level should investigate opportunities to improve the collection and synthesis of physical, chemical and biological data that represent conditions throughout the entire watershed. Physical, chemical and biological data collected as part of both surface water and groundwater monitoring programs should be integrated into an accessible yet comprehensive database. The Exchange Team recognizes that this is an ambitious goal but strongly recommends, at a minimum, incorporation of the goal into routine management activities so that opportunities for integration are not overlooked.

Although it would be helpful to make the database available to others on a website, it is most important to have analysis available on the web that is organized in a way that can inform land use and land management decisions. One example that the team recommended looking at as a possible model is the Mill River Watershed Project –
http://www.millriverwatershed.org/project_overview/assessments.html

NRWA should continue to evaluate the possibility of hiring a technical coordinator, which had once been a goal of the former Massachusetts Watershed Initiative Nashua Team. The technical coordinator's key roles would be to track the collection of watershed data by various agencies, evaluate the data and integrate it into a publicly accessible database. Alternatively or complementarily, the MA Executive Office of Environmental Affairs (EOEA) should consider reviving its Watershed Initiative and assigning a watershed coordinator with broader responsibilities similar to those of the former Nashua Team Leader. If the Initiative is not revived, the NRWA should consider how best to ensure that the former Team Leader's role is still fulfilled in the watershed.

MAPPING:

Update University of Massachusetts maps with available data layers and identify important layers for future use.

More refined mapping will increase the capabilities of more accurately locating key land for source water protection. While the mapping process from Phase One provides a solid foundation for identifying these areas, there are several additional tasks that need to be undertaken.

- GW restoration index should include high density septic areas and active groundwater contamination areas.
- SW conservation index should eventually be updated with new Massachusetts and New Hampshire soils data, when these data layers are complete. Consider making distance to nearest open space a priority ranking criterion in the SW conservation index.
- As parcel mapping is completed for other jurisdictions, aside from Townsend, Ashby and Pepperell, they should be added to the GW and SW conservation maps.

The updated conservation and restoration maps should be made publicly accessible in conjunction with the watershed monitoring data, preferably in an internet-based GIS application. A link should be made to Massachusetts Community Preservation site, which has zoning and build-out maps for all communities in Massachusetts – http://commpres.env.state.ma.us/community/cmty_list.asp.

The Trust for Public Land's new GIS staff is working on developing an internet-based GIS technology and service for TPL, which is still in a beta phase, but would be happy to talk with local participants about what this entails and what assistance TPL may be able to provide.

Develop and digitize other key data layers for future integration

- Towns should prepare digital parcel mapping in a format compatible with standard GIS software. The parcel mapping should be integrated with the conservation and restoration maps to identify and rank parcels of particular significance. Townsend and Ashby appear to be the only towns that have this.
- USDA should expedite preparation of digital soil maps for MA and rectify differences between existing soil maps for NH.
- Identify sewered vs. septic areas, particularly high density and/or older septic areas.
- Potential contamination sources identified in Source Protection Plans should be mapped, but existing data may not be reliable (may not have been ground-truthed) and may not be available in a digitized form.
- For groundwater supplies in NH that may have a hydraulic connection to surface water (presumed to include most shallow stratified drift aquifers as well as fractured bedrock aquifers in direct connection with surface water), NH DES should consider identifying Zone III-like protection areas for the purposes of focusing surface water monitoring and protection efforts.
- MA DEP should identify and map future sources of drinking water. The New Hampshire DES has already done this mapping for all communities in the state, although it needs to be verified on the ground, and has developed a map of stratified drift aquifers throughout the state. NH DES' Favorable Gravel Well Analysis procedure should be used to characterize the remaining portions of stratified drift aquifers in the watershed which are suitable for source development. While this type of work has not been done in Massachusetts, the Water Assets Project, which has been proposed in the state's current budget, will analyze hydrogeology, zoning and projected growth to identify likely local and regional water sources and create "tool kits" for water suppliers. Assuming it continues to be funded, it would be ideal for the Squannacook-Nissitissit towns to be undertaken

first as a pilot case. An outreach and advocacy effort to state environmental officials could be led by NRWA to get this region at the head of the line.

- Mapping of potential high yield bedrock sources should be completed in towns where stratified drift aquifer resources appear inadequate to meet future demand or where additional future drinking water supplies are desired. Bedrock mapping should include both office (fracture trace mapping, literature review) and field (bedrock mapping, geophysics) investigations, as warranted. Towns usually do this only when they are looking for another source and the stratified drift options have been eliminated. However, it's a basic assessment tool that could "complete the big picture" for the towns in terms of "where are all my source options?".
- Land use build-out analyses should be completed in all NH towns, similar to the analysis completed for all Massachusetts towns as part of the Community Preservation Program. This is typically done by the state or through Regional Planning Commissions.

PUBLIC EDUCATION, OUTREACH, AND CITIZEN ACTION

CHALLENGE: DEVELOPING A MESSAGE AND BROADENING THE COMMUNITY

There is an apparent lack of understanding among the public and some decision makers as to the relationship between watershed protection and clean drinking water. It is a major priority to educate the public and its officials as to this vital relationship. This education should be designed to result in informed and motivated change, running along the spectrum of individual action to improvements in public policy.

All public education and action initiatives need a clear, simple, and consistent message that the public can understand. In this case, that message needs to address the fact that watershed protection efforts are closely linked to drinking water, and that, indeed, clean drinking water depends upon effective protection of natural systems. Here is a sample possible message:

"Good Drinking Water Depends Upon the Wise Conservation of Nature." The team does not suggest this message exactly, but urges the community to develop a message that works in these watersheds and can help mobilize their citizens.

It is clear that conservationists alone cannot achieve the outcome of reliable, healthy, clean drinking water. Among others, the team recommends integrating forthcoming efforts with landowners, public health advocates, the business community, water suppliers, and the social justice community.

RECOMMENDED STRATEGIES

Research, Develop, and Disseminate a "Watershed Report Card"

A Watershed Report Card should be developed that answers the question, "How is the Watershed doing and how good is our drinking water?" The report is not hard science, but a marriage of science and public education. It should be a catalyst for action, not just information, and should be a vehicle to help conservation groups be more strategic in their work in integrating conservation and drinking water issues. An excellent model for such a report card is the Chesapeake Bay Foundation's State of the Bay Report, which can be found at www.cbf.org - click on "State of the Bay" in the left-hand navigation bar.

A well-developed and well-publicized report card will have the joint benefit of educating and raising awareness of citizens on critical water resource issues and helping conservation and environmental organizations be more strategic about developing programs and action strategies. As the report card gains momentum and begins to show trends, programs that will improve scores should be developed for each indicator, programs that run the spectrum of individual action to public policy change.

The most likely source of funding for a report card is private sources – either foundations, corporations or individuals. CBF funded their State of the Bay report through foundation grants. Initial development of the indicators and report card could be funded through foundations, but with good media coverage and momentum, publication of future reports could be sponsored by corporations or individuals who would benefit from being associated with it.

Following are suggestions for developing a report card and using it strategically:

- Agree on Categories (Pollution, Habitat, Harvest or HIPPO— Habitat Loss, Invasive Species, Pollution, Population, and Over-harvesting)

- Identify specific indicators reflecting Ecological and Public Health.
- Utilize monitoring data whenever possible, but do not be limited by it.
- Quantify individual indicators and give an aggregate score for the Watershed as a whole.
- Issue the report annually and strategically disseminate it to the media, public officials, organizational leaders, and participating landowners.
- Develop goals with timetables for each indicator and communicate to public officials.

Develop an Internet Advocacy and Communication System

An internet advocacy and communication system should be developed that can be used for education and advocacy around protecting existing programs, securing funding for programs and creating new programs. (For example, it could be used to inform participants of potential changes in key state funding programs and the need for lobbying state legislators.) This tool could be used to keep the community informed, to allow participating landowners to communicate with each other and to promote actions precipitated by the Watershed Report Card. This tool is not a panacea in itself; it should be integrated with traditional lobbying strategies and techniques. The Environmental Defense Action Network could be looked to as a potential tool or model for developing this system. At www.actionnetwork.org, you can find more information on how the Action Network functions and how to become a participating partner.

Develop Educational Campaigns, Materials, and Training Sessions

Implement an education campaign that focuses on the link between watershed management and safe drinking water. Key audiences need to be identified through strategic planning, but would likely include forest landowners, water suppliers, local elected officials, journalists and owners of private wells. For each audience, appropriate materials and outreach strategies need to be developed. The following are some suggested strategies:

- Produce a public education tool, such as a video, that links watershed management issues with drinking water. There is a need to have a tool that can be widely distributed and used in a variety of forums that makes this link and encourages residents and decision-makers to think of drinking water protection when they think about watershed management.
- Develop watershed-wide education, outreach, and technical assistance programs for forest landowners to increase their knowledge of the relationship between forests and drinking water. See the "Be Woods-Wise" program from Maine as a very effective example: http://www.maine.gov/doc/mfs/woodswise/
- Identify existing educational materials for homeowners and water suppliers that enumerate Best Management Practices, and distribute them to target audiences. There are many existing BMP documents to draw from. Some examples can be found at http://www.epa.gov/safewater/protect.html. Conduct a search titled "Source Water Protection Practices Bulletin" for EPA's BMP fact sheets and links to other resources.
- Conduct outreach aimed at private well-owners that provides helpful information on lawn care, forestry, etc. to protect the wells.
- Train landowners to train other landowners, (e.g. COVERTS – see David Kittredge at Umass.)
- Work with water suppliers to upgrade their capacity to do effective outreach, or conduct outreach in partnership with them, to landowners on the impacts of land management practices on safe drinking water. NeRWA could help develop partnerships with suppliers.
- Develop on-site environmental education programs for local decision makers and journalists that show first-hand the relationship of land use to water supply. Useful materials might be found at USGS or EPA websites.

Increase NRWA's resources to implement education and outreach strategies.

As the only entity whose geographic focus area covers the entire watershed, and as a well-established and well-respected association, the NRWA is an obvious organization to take the lead in coordinating many of the recommendations around education and outreach. In order to take on those roles, they will need additional resources. The team did not have any specific suggestions for fundraising, as they are unfamiliar with NRWA's current revenues, but they wanted to emphasize in this report the need for additional support for NRWA if they are to take action on any of these strategies.

LAND PROTECTION AND MANAGEMENT

CHALLENGE: IDENTIFYING AND PROTECTING THE MOST CRITICAL LANDS FOR CURRENT AND FUTURE WATER SUPPLY

Forests and the wetlands and small stream networks that run through them, are critical for protecting water resources. Forest land, particularly wetlands, absorbs rain, traps and filters pollutants, refills underground aquifers, slows storm runoff, sustains late season flows and maintains watershed stability and resilience. The percent of forest land in a watershed is the greatest indicator of water quality, and increases in developed land can be directly linked to increased treatment costs. According to extensive research on the role of forests in maintaining water quality and quantity, water quality begins to decline measurably when the percent of forested land decreases below 75 percent. It is fortunate that forest cover in the Squannacook River watershed is currently about 79 percent; although the Nissitissit River watershed is at 66 percent, or slightly below the threshold.

Projected growth across the Squannacook-Nissitissit region has the potential to impair a high quality water supply and alter the rural character of the area. Municipalities in the watershed have experienced rapid population growth over the past few decades. The average population growth rates from 1990 to 2000 for all eleven jurisdictions was 11.9 percent, double the Massachusetts state average of 5.5 percent and slightly higher than the New Hampshire state average (11.4 percent). Groton, MA and Brookline, NH experienced the greatest percent increases, 27 percent and 73 percent, respectively.

Potential forest fragmentation and loss from new residential development is one of the most critical threats in the Nissitissit and Squannacook sub-basins. With increasing development in forested land in the drainages, it is the right time to conserve and protect the land necessary to protect existing and future drinking water sources as well as help maintain and further develop the economic viability and sustainability of forest management in the watersheds, as active forestry reduces the likelihood of landowners selling their property for development.

RECOMMENDED STRATEGIES

Identify and protect the most important lands to ensure safe and abundant water supplies.

Use the maps created by the University of Massachusetts during Phase One of this project to identify high priority lands for conservation. All parts of the watershed are not created equal in terms of providing water quality protection. The mapping process done by Dr. Paul Barten has highlighted the importance of riparian forests throughout the watershed; the location of large contiguous patches of forests and wetlands, and challenges associated with development in or around riparian and aquatic ecosystems. Protecting large, contiguous parcels of forestland can play a critical role in preserving water quality; on the flip side, development of these forested parcels can lead to substantial degradation of water quality.

Develop a list of all water suppliers throughout the watershed and map land that is currently owned or controlled by those suppliers. Work with suppliers to protect additional parcels that are critical to protecting their supply.

Identify and protect land critical to future drinking water supplies

Given the growth projected for the towns in the watershed, there is the immediate need to identify those future sources of water that will be essential to accommodate a growing population, lest inadvertent growth

occur and spoil these sources. The New Hampshire DES has already done this mapping statewide and the newly created Water Assets Project in Massachusetts plans to identify likely local and regional water sources as part of their effort. Once complete, the data layers for potential future drinking water sources should be incorporated into the UMass maps to revise conservation priorities.

Establish linkages between existing public lands to enhance water supply protection and decrease potential forest fragmentation in the future.

Much of the forested land in the watershed is owned by private landowners on small-to-mid-sized tracts, which leaves them highly vulnerable to development. The protection of the existing 75 percent forest cover, particularly in contiguous tracts in riparian areas which connect existing protected public lands, should be a primary goal throughout the watershed. The 11 percent of public lands in the watershed can, with more targeted efforts, be expanded to focus on wellheads, aquifer recharge areas, and wetlands that can support supply and quality of drinking water.

Forward additional Forest Legacy proposals for consideration by the MA Forest Legacy Committee and the NH Forest Stewardship Committee.

The Nashua River watershed is within the area eligible for conservation projects under the Forest Legacy Program. One Forest Legacy project, Belmont Springs, is currently underway in the watershed incorporating 265 acres. There is potential for future projects as willing landowners are identified in the watershed and as Federal funding for the Forest Legacy Program continues to rise as it has in recent years.

Proposals that include multiple landowners with contiguous land holdings, working together cooperatively, should be encouraged because they are strong competitors for limited funds.

Conserve productive agricultural land under farmland preservation programs (APR program in Massachusetts) and pursue high value agricultural strategies.

Agricultural land, which comprises roughly 10 percent of the Squannacook-Nissitissit sub-basins (6,000 acres), is being rapidly developed. Although agricultural production can often contribute to water quality problems, agricultural best management practices allow farms to remain economically viable while maintaining water quality. Farms are a critical resource for local communities as they contribute to the economy, local scenery and quality of life. They also contribute to water resources by preventing increased impervious surfaces and allowing groundwater infiltration. The Agriculture Preservation Restriction (APR) Program is a State of MA program that can be used for farmland conservation. Funds are used to purchase development rights on high quality farmland. NH also has a farmland preservation program

In addition to using farmland preservation programs to protect farms from development, strategies should be undertaken by the local Chamber of Commerce and Farm Bureau to support the economic viability of farms. Some of these strategies could include:

- Farmers markets
- Community Supported Agriculture (CSA)
- Direct to restaurants
- Direct to consumers

CHALLENGE: COORDINATING LAND PROTECTION EFFORTS

Land protection along the Nashua River and its major tributaries, the Squannacook and Nissitissit Rivers, has been an on-going activity by NRWA, landowners, land trusts, local, state and federal agencies. For almost 34 years, the Nashua River Clean-Up Committee and subsequently the NRWA has worked to create a continuous corridor of conservation, or Greenway, along the rivers. Almost half of the length of the rivers have been protected; 17 miles of riverbank with more than 1,550 acres on the Squannacook; 7 miles with more than 500 acres on the Nissitissit, and 52 miles with more than 4,800 acres on the Nashua. Approximately 18% of the Squannacook drainage is permanently protected; and about 7% in the Nissitissit.

The region is fortunate that there are so many active groups working on land protection including land trusts, individual conservation commissions, and state agencies. However, at present there is no integrated approach to land protection by these individual entities that is directed towards the protection of lands critical to drinking water protection.

RECOMMENDED STRATEGIES

Create a regional entity to coordinate drinking water focused land protection activities in the Squannacook-Nissitissit region.

In order to facilitate collaboration on land conservation activities, a partnership needs to be formed that would include local conservation commissions, land trusts, water suppliers, the New England Forestry Foundation, Beaver Brook Association, the Society for the Protection of New Hampshire Forests, and the Trust for Public Land. The coordinating entity should be an organization whose geographic focus incorporates the Squannacook/Nissitissit sub-basins, such as the NRWA or TPL. The Nashua River Watershed Association could be a logical organization to lead such an effort, given their long experience in assisting with land protection work, their established relationships with proposed partners and their commitment to protecting drinking water quality in the Squannacook-Nissitissit region.

Such an entity would be the logical group to pursue large-scale private forestry conservation initiatives like the Tully Initiative, described below. It would also ideally assist with a number of other critical land protection activities: 1) help communities pass local conservation finance measures; 2) collaborate with water suppliers to help them conserve land important to source water protection; 3) assist with outreach and education efforts to get private landowners to participate in current use taxation programs such as Chapter 61 and 61A (MA).

The North Quabbin Regional Partnership, in north central Massachusetts, could be used as a model. This partnership consists of state agencies like the MDC, DFW, DEM, along with local conservation commissions, local and regional land trusts, (notably Mt.Grace Land Trust) and statewide conservation groups such as the Trustees of Reservations. They meet on a regular basis and have established close working relationships that allow them to collaborate effectively on land conservation projects and to best deploy their resources. As a result of their work, the former EOEA Secretary chose the Mt. Grace Land Trust, one of the lead members of the Partnership, to help carry out the ambitious Tully Valley Initiative, a substantial private forestry project completed in 2002. (Discussed below.)

Develop a local initiative to protect private forests, using the Tully Valley Private Forest Lands Initiative as a model.

The Tully Valley Initiative is a joint project of state and regional agencies and non-profit organizations with the goal of permanently protecting land while maintaining its active use for forestry, agriculture and recreation. Over a two year period, the State of MA Executive Office of Environmental Affairs and the Mount Grace Land Conservation Trust worked to acquire development rights to more than 9,000 acres

from more than 100 different landowners in the partnership. Much of the land was selected to provide links between other protected lands in the area.

Protection agreements with landowners, such as the agreements used in the Tully Valley Initiative, are known as Conservation restrictions or easements and can be designed for permanent land protection. The landowner agrees not to develop the land, but retains ownership and rights to conduct forestry, agriculture, and other agreed-upon open space land uses. A landowner may agree to allow public access, although this access is not necessarily included. The Forest Legacy Program administered by the USDA Forest Service provides funds for purchase of Conservation easements in States with an approved plan (Assessment of Need or AON). Both MA and NH are eligible to receive funds within areas delineated in the AON.

The regional partnership described above would be the coordinating entity and the organization leading that partnership would be the lead agency in developing this local model in the watershed. Clearly any effort at the town level for a project of this magnitude would rely heavily upon extensive public education and a substantial funding source. While state funding was essential in the Tully initiative, it may not be available now due to the change in Administration and the shifting fiscal fortunes of the state. This should not preclude an effort to establish local funding for local land protection.

CHALLENGE: ENCOURAGING ACTIVE STEWARDSHIP

Projected growth has the potential to reduce the extent of stewardship, or the active interaction of landowners with their land. This interaction is essential to valuing the resource. With value comes commitment to protect or enhance the current value of the land for water quality and quantity, forest management, biodiversity, and wildlife.

RECOMMENDED STRATEGIES

Increase the number of forest landowners enrolled in current use programs, in the MA and NH Forest Stewardship Programs and in NRCS programs.

Encourage conservation and active management of forested land, and increase the likelihood of permanent forestland protection by increasing the number of forest landowners enrolled in current use programs (Chapter 61 and 61A in MA and the current use program in NH), in the MA and NH Forest Stewardship Programs (which are supported by funds from the USDA Forest Service, State and Private Forestry), and in Natural Resources and Conservation Service (or NRCS) programs under the Farm Bill (e.g., Wildlife Habitat Incentives Program or WHIP; Environmental Quality Incentives Program or EQIP). For more information on NRCS programs, visit the NRCS website (http://www.nrcs.usda.gov).

Programs that encourage conservation and the preservation of existing forest, farm, and recreational land include Chapters 61, 61A, and 61B, and the current use program in NH. These are real estate tax classifications that reduce the landowner costs of retaining open space. These classifications do not provide permanent protection, because land uses can be changed after payment of a roll-back tax. These programs can be used by landowners who want to keep their land in open space, but are not able or willing to execute a conservation agreement.

The number of acres in the current use programs are quite low (891 - 2,337 acres) in towns within the MA portion of the watersheds and several times higher in NH (8,500 – 9,100 acres). The following table shows acres in current use by Town:

Town	Acres	# Parcels
Ashby	2,013	37
Groton	1,490	43
Pepperell	1,195	14
Shirley	891	11
Townsend	2,337	62
Brookline	6,328	170
Hollis	8,509	359
Mason	9,111	211

The relatively low number of acres in these tax classifications, especially in Massachusetts, provides an opportunity and a challenge to provide education and outreach to increase the number of landowners in these programs. Enrollment will hopefully encourage permanent protection of these lands in the future under Conservation easements, as landowners become more actively engaged in stewarding their land and more appreciative of the value of their natural resources.

Currently, there are very few landowners enrolled in the Forest Stewardship Program in the Squannacook-Nissitissit sub-basins. Under the new Forest Land Enhancement Program (FLEP) recently approved under the 2002 Farm Bill and administered by the USDA Forest Service, landowners that complete an approved forest stewardship plan can qualify for cost-share funds to implement actions approved under FLEP and outlined in the forest stewardship plan. Some of the goals of FLEP include:

1. Enhance the productivity of water, wetlands, riparian buffers, soil, timber, habitat for flora and fauna, and air quality of these lands;
2. Assist owners and managers to more actively manage non-industrial private forestland in order to enhance and sustain the long-term productivity of timber and non-timber resources; and
3. Encourage and leverage State, Federal, and local resource management expertise, financial assistance and educational programs.

FUNDING LAND PROTECTION AND MANAGEMENT

CHALLENGE: SECURING SUBSTANTIAL, RELIABLE FUNDING

The central ingredient to implementing a successful long-term conservation strategy is substantial, reliable funding from a wide range of sources. By drawing upon a range of funding sources -- local, state, federal and private-- it will be possible to make steady progress on achieving conservation goals. Relying upon the occasional federal or state grant will mean that only occasional conservation projects can be undertaken, with development threatening the protection of important lands identified as part of this project.

RECOMMENDED STRATEGIES

Assemble a funding quilt that combines a broad range of funding sources, ensures maximum leverage and puts the heaviest reliance on local funding.

A funding quilt is the combination of funding sources —state, local, federal and private— that are brought together to help achieve conservation objectives, such as the protection of land critical to source water protection. Central to the funding quilt is the role that one funding source plays in leveraging other sources. The combination of funding sources that help accomplish these conservation goals may take many forms — state and federal, state and local, federal and local, etc.— and may also shift over time. However, the most reliable form of funding to achieve conservation objectives over the long-term is local funding. Due to the competition for state, federal and private funding, these sources must be viewed as supplements or incentives, but not as the central funding sources for a program.

Maintain or Increase Local Dedicated Funding for Land Conservation:

There are a range of funding options that are available to local communities in the Squannacook and Nissitissit sub-basins that should be considered.

Massachusetts: The Community Preservation Act (CPA) gives watershed communities the ability to levy a dedicated property tax surcharge (up to 3%) and use a portion of the proceeds to protect open space (in addition to affordable housing and historic preservation). CPA funds are also matched by the state, with communities currently receiving a 100% match. While more than 60 communities have adopted CPA statewide, none of the 5 communities in the watershed have adopted CPA. Voters in Ashby and Shirley both rejected CPA measures with a 3% surcharge and may want to seek passage again at a lower surcharge. Pepperell and Townsend have not sought passage of CPA and should examine whether this is a viable option for them. The Community Preservation Coalition, a statewide non-profit, (www.communitypreservation.org) can provide assistance in passing CPA.

Alternatively, any of the communities in the watershed may also consider adopting local general obligation bond measures to support land conservation for source water protection. While CPA or bond measures are the preferred funding options, annual Town Meeting appropriations can be an alternative, albeit with no long-term reliability.

New Hampshire: Both Hollis and Brookline Town Meetings have supported substantial bond authorizations for land conservation. Over the past 3 years, Hollis has increased this authorization from $2.5 to $3.5 to $5 million; Brookline voters approved a $1 million authorization in 2001. Bond authorizations require 2/3 support of Town Meeting; specific land purchases require subsequent approval by Town Meeting. Although both communities have already made very significant investments in land

conservation, they should continue to maintain or increase these levels of investment in order to cope with the strong growth that is anticipated.

A Land Use Change Tax (LUCT) is assessed against land that is removed from the current use taxation program, at the time the land is removed from the program. This tax equals 10% of fair market value. Communities can elect to allocate some or all of this revenue into a Conservation Fund. Of the six towns in the Nissitissit – Squannacook region, Brookline and Mason allocate 100%, Hollis and New Ipswich allocate 50%, and Greenville and Milford allocate 0%. As a source of consistent, albeit modest, revenue for land protection, all towns in the watershed should consider increasing their allocation to conservation, if below 100%

Water Utilities: Water utilities are a logical source of potential funding for watershed land protection, since they have the direct responsibility for providing a reliable supply of clean, safe drinking water. Across the country, a number of water suppliers have established dedicated fees that are allocated to watershed land protection. For example, in Salt Lake City, customers pay a 50-cent monthly surcharge on their water bill, which has enabled the City to protect more than 1,400 acres of land. While there are only a handful of public water suppliers in the Squannacook-Nissitissit sub-basins, they should examine how to incorporate such a surcharge on their bills, and seek outside assistance to protect land.

Sustain state investments in land conservation

In recent years, both Massachusetts and New Hampshire have made very significant investments in land conservation, providing matching grants to local governments and also acquiring land directly through state acquisition programs. In Massachusetts, more than 100,000 acres was protected by the state over a three year period (1998-2001), with an additional 42,000 acres protected in 2002. These land protection activities have been funded largely through state bond authorizations, which had become exhausted by mid 2002.

In August 2002, a $707 million bond authorization was signed into law that provides $245 million for land protection, including $20.5 million for the acquisition of watershed lands (including $14.5 million for Aquifer Land Acquisition Program), $46 million for the Department of Environmental Management's state acquisition (parks and forests), $20 million for the Department of Fisheries and Wildlife (DFW), $9 million for Bioreserves (like the Tully Valley project) and $20 million for Self-Help Grants to local governments. The Squannacook-Nissitissit region has benefited greatly in recent years from Self-Help grants and DFW acquisitions and is a potential candidate for a Bioreserve or Aquifer Land Acquisition grant, although high land prices pose a problem. The Executive Branch determines all bond spending, and local supporters of protecting watershed land in the Squannacook-Nissitissit region should reach out to the Administration in support of inclusion as a Bioreserve, to push for DFW acquisitions. In addition, local communities and water suppliers should seek Self-Help and ALA grants.

While there is abundant legislative authorization for these land protection programs, the 2004 House Budget would cut all state bond spending (environmental, transportation, housing, etc.) by one-third from $1.2 billion annually to $800 million. Given the state's difficult fiscal situation –multi-billion shortfalls, layoffs, program cuts— it is not surprising that capital spending is also being sought. A cut of this magnitude would likely reduce the spending on land conservation programs by at least 50% since transportation bond spending is roughly $400 million.

In order to ensure that there is adequate state land conservation spending moving forward, local conservation organizations and watershed supporters should mount a strong effort to persuade the Senate to keep bond spending at the current $1.2 billion level in the 2004 budget.

With New Hampshire also facing a difficult budget picture, there have been proposals to reduce LCHIP's annual funding from its current $6 million to $1.5 million with only $500,000 of that for grants and the rest for loans. (The supporters of LCHIP originally sought $12 million per year). Supporters of LCHIP within the Squannacook- Nissitissit region should reach out to their legislators to continue funding for LCHIP at the highest level possible.

PUBLIC POLICY AND ZONING

CHALLENGE: STRENGTHENING REGULATORY PROTECTIONS OF GROUNDWATER

Some of the most important policies that determine the quality of our drinking water as related to watershed management are set at the local and state level. We must monitor existing policies, support adequate enforcement and funding of them, and propose new measures as needed. We must make sound substantive choices, and make sure that an educated constituency stands behind us.

The team recognizes the complexity of proposing and adopting public policy at the local and state level. However, in the interests of submitting a comprehensive set of recommendations, we decided to address a few of these policies and regulations on their merits, rather than on their political viability or level of controversy. We do not pretend to know the opportunities or landmines related to these issues, but offer these perspectives to round out our other tools and mechanisms.

For local communities interested in pursuing any of the public policy and zoning recommendations, a wide variety of model local ordinances and bylaws for watershed management are offered at: http://www.stormwatercenter.net/ and http://www.epa.gov/owow/nps/ordinance/index.htm

RECOMMENDED STRATEGIES

Complete Source Protection Plans for all public water supplies in the watershed.

Once SPAs/WHPAs have been delineated through the state SWAP programs, Source Protection Plans (SPPs) should be completed for all public water supplies. SPPs focus on parcel-by-parcel land use inventories and recommended actions for managing land use and educational outreach. SPPs also include plans for emergency situations and contingencies. SPPs are a basic but very important component of water resource protection efforts, and technical assistance with plan preparation and implementation is available through Northeast Rural Water Association.

Implement land use controls to protect Source/Well-Head Protection Areas in all towns.

Groundwater is the primary drinking water source throughout the watershed and many communities draw from shallow groundwater sources that are highly vulnerable to contamination from land use activities. Source Water Assessments in New Hampshire showed inappropriate land use in the sanitary radius of many of the public water supplies, including sewer lines, septics and storage of regulated material. Both states are encouraging suppliers and municipalities to improve their water supply protection strategies through stricter zoning and ordinances and through acquisition. The State of Massachusetts further requires that all suppliers own or control land in Zone I, which none of the suppliers in this Squannacook-Nissitissit sub-basins do. The towns of Townsend, MA and Walpole, NH have adopted groundwater protection district bylaws that may serve as examples for other communities. Guidance on creating groundwater protection district bylaws is also provided in "Making Wellhead Protection Work in Massachusetts" (MA DEP, December 1997) and New Hampshire's Department of Environmental Services offers model ordinances online at http://www.des.state.nh.us/dwspp/ordinanc.htm. General bylaws or health regulations may also be considered as land use control options for SPAs/WHPAs, particularly in more developed areas where control over existing land uses may be desired.

The Massachusetts Department of Environmental Protection provides a model zoning bylaw on its website -- http://www.state.ma.us/dep/brp/dws/protect.htm. This model zoning bylaw is available to assist communities and public water suppliers in protecting public wells in the source approval process and the Water Management permit program. Authority - MGL Ch. 40 A Revisions

The Model Groundwater Protection District Bylaw/Ordinance is a zoning tool for controlling land uses in Aquifer Protection Districts and Zone II areas around public drinking water wells. The model complies with the wellhead protection requirements in the Massachusetts Drinking Water Regulations 310 CMR 22.21. January 2002.

Identify model septic policies and adopt them in all towns that do not currently have them.

With the rural nature of development in the Squannacook and Nissitissit sub-basins, new development will bring a proliferation of individual septic systems and the likelihood of those systems eventually leaking and malfunctioning if not properly monitored and regulated. The Source Water Assessments in New Hampshire showed consistently inappropriate land use, particularly septics, in the sanitary radii of the towns' water supplies. This could pose a significant threat to public health if leaking systems contaminate groundwater sources with fecal coliform, pathogens or organics. The high number of private wells exacerbates this challenge, as those sources are even more vulnerable to contamination from septics and usually have minimal treatment, if any.

Consider adopting road salt policies in all towns that do not currently have them.

According to the Source Water Assessments in Massachusetts, the primary threat to groundwater is increasing development and the roads that come with it. Sodium and Chloride (road salts) are already at high levels in the groundwater in Townsend and West Groton and are likely problems in other towns, although information is limited. New roads in groundwater recharge areas could increase levels to the point where expensive treatment will be required.

Adopt storm water regulations in all towns that do not currently have them.

According to the Source Water Assessments in Massachusetts and New Hampshire, the primary threat to groundwater in the towns in our study area is increasing residential and commercial development and the roads that come with it. Even with growth management and land protection strategies, new development is inevitable and towns need to be finding ways to incorporate that development with minimal impact to water resources. Stormwater regulations are one tool that towns can use to address this threat.

Nominate the Nissitissit River for participation in the New Hampshire Rivers Management Protection Program.

With state assistance, a local or regional agency or non-profit could nominate the Nissitissit River as a Designated River in the above-referenced program. Acceptance as a Designated River creates an enhanced protection status for the river and ultimately results in the development of a river corridor management plan. More information on this program may be reviewed online at http://www.des.state.nh.us/rivers/.

Protect potential future sources of drinking water.

On a local or regional level, existing water supplies may not be sufficient to meet future demand or contingency needs. Every water supplier in the watershed should routinely assess their system's ability to satisfy those needs, and enact appropriate conservation measures to ensure that leakage is minimized. In order to protect water resources for future needs, towns should consider adopting aquifer overlay districts in all medium-to-high yielding stratified drift aquifer areas. In NH, towns should further consider groundwater reclassification in those areas, to enable municipal enforcement of land use BMPs. Guidance on developing zoning controls such as overlay districts is provided in "Making Wellhead Protection Work in Massachusetts" (MA DEP, December 1997) and online at http://www.des.state.nh.us/dwspp/ordinanc.htm. A description of groundwater reclassification is provided online at http://www.des.state.nh.us/dwspp/reclass.htm.

In Massachusetts, amend 40B such that housing projects cannot override aquifer protection.

In Massachusetts, amend Chapter 40B such that housing projects cannot override aquifer protection zoning. Chapter 40B is a state law that permits mixed income (min. 25% affordable) development projects to seek state approval, bypassing local zoning laws in communities that are not meeting state requirements for affordable housing (10 percent of total housing stock). Although there is much debate about whether 40B is the appropriate vehicle to create affordable housing, it is hard to argue that developments should be permitted in Zone 1 or Zone 2 aquifer protection districts. The NRWA along with other local supporters should reach out to their legislators to get 40B amended so that drinking water protection bylaws remain in force, even in the event of a proposed 40B housing project.

APPENDICES

APPENDIX A: EXCHANGE TEAM BIOGRAPHIES

Michael Heidorn - Source Protection Specialist, Northeast Rural Water Association (NeRWA). Mike has spent over fourteen years providing effective solutions for environmental concerns throughout the Northeast and across the nation. As a Professional Geologist, Certified Water System Operator and Licensed Environmental Professional, he is currently assisting water suppliers and community leaders with source protection planning efforts and the implementation of plan recommendations. From 1997 to 2002, Mike managed the Vermont/New Hampshire office of Tighe & Bond where he provided expert oversight in the assessment and remediation of contaminated properties as well as the identification, testing and protection of potable groundwater supplies. He has been involved with a wide variety of water resource projects over the course of his career, including the development of groundwater and surface water monitoring strategies, the delineation of wellhead protection zones, the determination of safe yields for potable supply wells and the evaluation of stream and wetland impacts due to over-pumping and droughts. Mike recently co-supervised the delineation of Zone I, II and III recharge areas at over two dozen wellfields for the State of Massachusetts as part of their Source Water Assessment Program, and is currently spearheading the development of a comprehensive physical, chemical and biological monitoring program and management plan for the Cold River Watershed in southwest New Hampshire..

Roger Monthey – Forest Stewardship Coordinator, USDA Forest Service, State & Private Forestry, Durham, NH. Roger is a forest stewardship specialist with the Forest Resources Management staff. He disseminates forest stewardship and biodiversity information to the stewardship community in form of a newsletter, "Forest Stewardship Information Exchange". He provides technical assistance in areas such as forest management, biodiversity, special forest products, forest fragmentation issues, wildlife and fisheries management, and computer software to assist small landowners and resource consultants (e.g. the NED family of software). Roger works closely with the state stewardship coordinating committees. Roger has a B.S. in Wildlife Ecology from the University of Wisconsin - Madison, a M.S. in Water Resources Management from the University of Wisconsin – Madison, and a Ph.D. in Forest Resources from the University of Maine. Roger worked with the Bureau of Land Management in Oregon for about 20 years, having been involved in old growth, salmon, watershed, and spotted owl issues in the Pacific Northwest. He has been with the Durham Field Office since July, 1998.

Jay Sherman - Independent Environmental Training Consultant. He currently is a consultant to the National Wildlife Federation, the World Bank, the Environmental Law Institute, the Guanabara Bay Institute in Rio de Janeiro, and the Hope Fellowship Program. He is an approved member of the Fulbright Senior Specialists Roster as well as an experienced trainer, lobbyist, organizer, and educator. He served as the Director of Outreach and Training at the Chesapeake Bay Foundation (CBF) from 1988 through June of 2002, where he was responsible for the development of organizational outreach, training, and grassroots strategy. Mr. Sherman currently serves on the board of directors of the Janelia Foundation, previously as president. Appointed by the Governor, he served on the Maryland Advisory Council on Environmental Justice in 1998 and 1999. He has served on the boards of the Center for Watershed Protection, the Alliance for the Chesapeake Bay and the Maryland Citizens' Campaign for the Environment. He has been actively involved in working committees of the State Environmental Leadership Program (SELP). Jay Sherman taught as an adjunct professor at the Washington Public Affairs Center of the University of Southern California and at the University of Iowa. He received his BS from Drexel University and his MLA from Iowa State University.

Matthew Zieper--Research Director for Trust for Public Land's Conservation Finance Program. Matt directs the team of researchers whose intelligence-gathering work underpins TPL's ability to pass ballot measures, shape legislation and influence public policy. He has been a lead participant in a number of TPL efforts to help communities pay to implement their conservation visions. Matt has also led TPL's efforts to publish Land Vote, an annual comprehensive review of conservation ballot measures, and Keeping Our Commitment, a report outlining policies to protect 1 million acres in the Chesapeake Bay Watershed. Prior to joining TPL, Matt Zieper was a legislative aide in the Massachusetts Senate and a fiscal and economic policy consultant. A graduate of the University of Massachusetts at Amherst and Harvard University's Kennedy School of Government, Matt lives in Norwell, Massachusetts with his wife Debra and baby daughter Ellie.

APPENDIX B: THE STEERING AND LOCAL COMMITTEE

The Steering Committee

- Joanne Carr- Nashua Team Leader, Mass. Watershed Initiative
- Mary Jo Feuerbach - US EPA New England Office
- Al Futterman - Nashua River Watershed Association
- Bob Pine - Squannassit/Petapawag ACEC Initiative
- Charlie Thompson - New England Forestry Foundation
- Carol Hall - New England Regional Office (Massachusetts), Trust for Public Land
- Julie Iffland - Northern Northeast Field Office (New Hampshire), Trust for Public Land
- Jennifer Palmiotto – Northeast Rural Water Association

The Local Committte

- Mark Archambolt - Hollis-Brookline Town Planner, Nashua Regional Planning Commission
- Amanda Amory - Principal Planner, Montachusett Regional Planning Commission
- Peter Baker - Chair, Hollis Conservation Commission
- Elizabeth Ainsley Campbell - Executive Director, NRWA
- Renee D'Argento - Middlesex Conservation District
- Ellen Fisher - Conservation Administrator, Town of Pepperell
- Stephen Fitzgerald - Brookline Conservation Commission
- Roberta Flashman - Ashby Conservation Commission
- Leslie Gabrilska - Administrator, Townsend Conservation Commission
- Betsy Hahn - Environment Planner, Nashua Regional Planning Commission
- Bob Hanninen - Consultant, NRWA/ACEC
- Russell Hicks - Manager, Witches Brook Water Supply
- Jack Jackson - Forester, Massachusetts DEM
- Patty McCloy - Townsend Conservation Land Trust
- Ed McNierney – NRWA, Groton Conservation Trust
- Martha Morgan - Water Resource Advisor, NRWA
- Bob O'Connor - Land & Forest Policy, EOEA
- Heidi Roddis - Senior Policy Specialist, Massachusetts Audubon
- Chris Rodstrom - The Trustee of Reservations
- Paul Susca - NH Department of Environmental Services
- Peter Smith - Beaver Brook Association, Nissitissit River Land Trust
- Randy Troupe - Water Superintendent, Town of Pepperell

APPENDIX C: UNIVERSITY OF MASSACHUSETTS MAPS

In separate attachment.