UPPER MERRIMACK RIVER

BUFFER PROTECTION STUDY

Merrimack River, Boscawen and Canterbury near the Concord line

Produced for the

Upper Merrimack River Local Advisory Committee

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Acknowledgments

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1.0 Basis for the Buffer Protection Study

1.1 Background

The regulatory framework that applies to the Upper Merrimack River Watershed is at the heart of the Local Advisory Committee's protection efforts. Both State and local regulations present a series of safeguards to protect the river from various threats. Whereas State regulations – namely the Comprehensive Shoreland Protection Act (RSA 483-B) – offer a uniform level of basic protection, local regulations among the six municipalities vary. Local regulations differ not only in the level of protection each town offers to the Merrimack main stem, but also in the types and levels of protection for associated tributaries, wetlands, and riparian buffers.

The Central New Hampshire Regional Planning Commission (CNHRPC) assessed the levels of buffer protection through a region-wide regulatory audit and a series of mapping exercises. The results of the assessment reveal areas where local regulations could be strengthened and demonstrate graphically the current regulatory status of the Upper Merrimack and its tributaries.

1.2 Intent and Variables Measured

This regulatory audit and associated maps explored and compared the levels of protection among the six UMRLAC communities and with the Comprehensive Shoreland Protection Act (CSPA). The intent of this effort has been to identify opportunities to strengthen local ordinances and land use regulations. Specific points of comparison were examined between each town, and each town with the CSPA. This was accomplished by "asking" a series of water protection-related questions of each community's regulatory framework and mapping the results on a region-wide basis. The regulatory audit's findings address permitted uses and other non-graphic features and enable comparisons, while mapping setbacks as well as floodplains and other features provide a visual comparison along the entire corridor.

2.0 Shoreland Protection Act (RSA 483-B)

2.1 Introduction

The Comprehensive Shoreland Protection Act, codified as RSA 483-B, outlines standards that are designed to reduce shoreland disturbance while allowing for reasonable development. Stormwater runoff resulting from increased impervious surface area and vegetative disturbance along shorelines is the single greatest threat to New Hampshire's public waters. Phosphorus, sediments, and other pollutants reduce water quality. The CSPA's purpose is to combat such impacts to protect water quality throughout the state.

2.2 CSPA Standards

At the most basic level, the CSPA establishes 50, 150, and 250-foot buffers from the reference line of the State's public waters. Within each of these buffer areas are specific standards of protection (namely toxic material usage, septic placement, impervious coverage, and terrain alteration). Floodplain provisions, bluff requirements, and other potential tools are not addressed in the CSPA which can serve as a justification for additional local protection of riparian areas. Map 1 shows the setback and buffers required by the CSPA on the Upper Merrimack River and other protected bodies of water. Specific provisions of the CSPA include:

250 feet from Reference Line – THE PROTECTED SHORELAND:

Impervious Surface Area Allowance: A maximum of twenty percent of the area within the protected shoreland may be impervious. This may be increased up to thirty percent if there are fifty points of tree coverage in each 50'x50' grid segment in the waterfront buffer, and a storm water management is submitted and approved by NHDES.

Other Restrictions:

- No establishment or expansion of salt storage yards, auto junk yards, solid waste and hazardous waste facilities.
- All new lots, including those in excess of five acres are subject to subdivision approval by NHDES.
- Setback requirements for all new septic systems are determined by soil characteristics:
  - Seventy five feet for rivers and areas where there is no restrictive layer within eighteen inches and where the soil down gradient is not porous sand and gravel (perc>2 min.).
  - One hundred feet for soils with a restrictive layer within eighteen inches of natural soil surface.
  - One hundred and twenty five feet where the soil down gradient of the leach field is porous sand and gravel (perc rate equal to or faster than 2min./in.).
- Minimum lot size in the areas dependent on septic systems determined by soil type.
- Alteration of Terrain Permit standards reduced from 100,000 square feet to 50,000 square feet.
- For *new* lots with on-site septic, the number of dwelling units per lot shall not exceed one unit per one hundred and fifty feet of shoreland frontage.

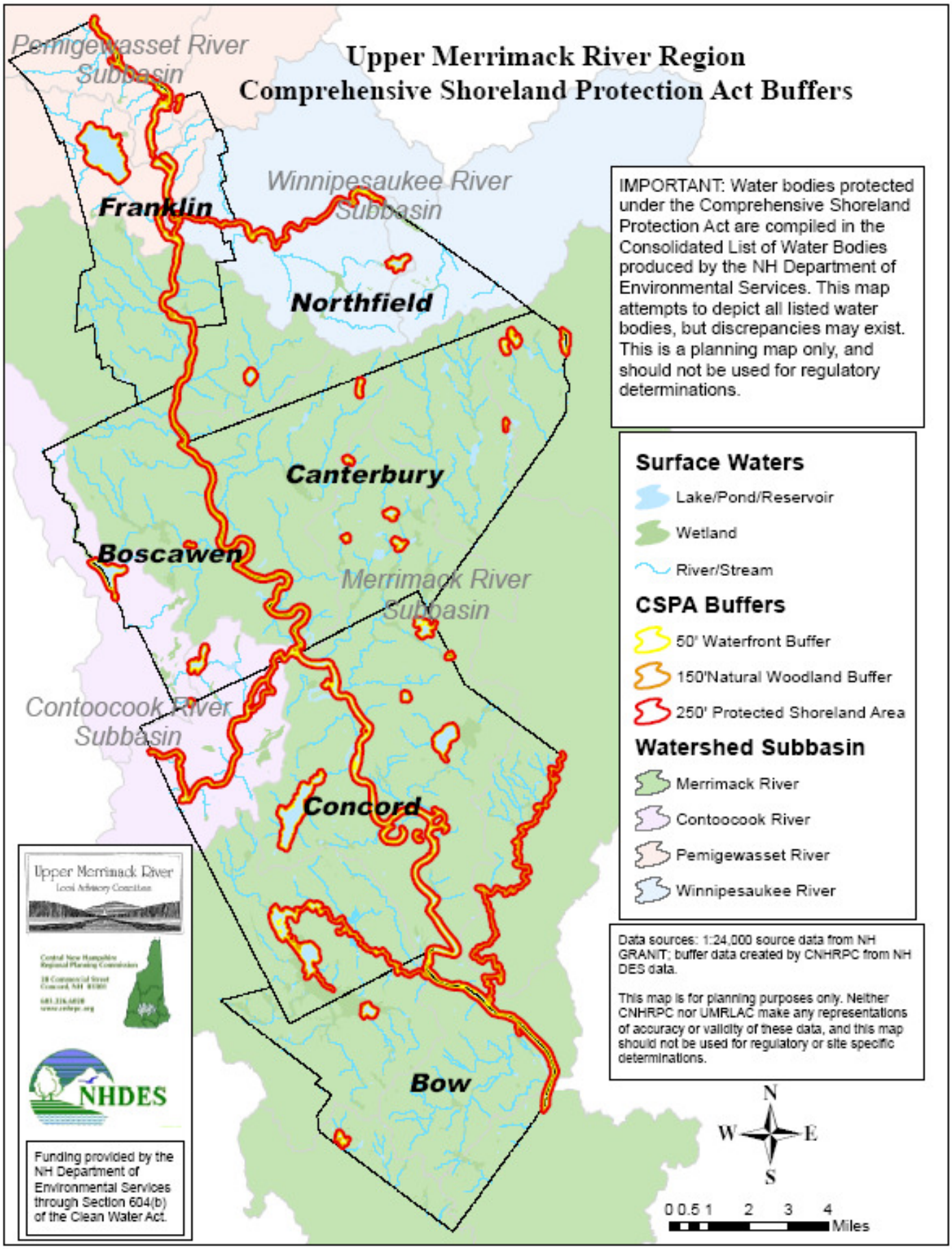
150 feet from Reference Line – NATURAL WOODLAND BUFFER (NWB):

- For lots that contain one half acre or more within the NWB, between fifty feet and one hundred and fifty feet of the reference line, the vegetation within at least fifty percent of the area, exclusive of impervious surfaces, shall be maintained in an unaltered state.

- For lots that contain less than one half acre within the NWB, between fifty feet and one hundred fifty feet of the reference line, the vegetation within at least twenty five percent of the area shall be maintained in an unaltered state.

50 feet from Reference Line – WATERFRONT BUFFER & PRIMARY BUILDING SETBACK:

- Effective April 1, 2008, all primary structures must be set back at least fifty feet from the reference line. Towns may maintain or enact their own setback only if it is greater than fifty feet.
- Within fifty feet, a waterfront buffer must be maintained. Within the water front buffer, tree coverage is maintained with a 50' x 50' grid and points system. Tree coverage must total fifty points in each grid. Trees and saplings may be cut as long as the sum of the scores for the remaining trees and saplings in the grid segment is at least fifty points.
- No natural ground cover shall be removed except for a footpath to the water that does not exceed six feet in width and does not concentrate stormwater or contribute to erosion.
- Natural ground cover, including the duff layer, shall remain intact. No cutting or removal of vegetation below three feet in height (excluding lawns) except for the allowable footpaths. Stumps, roots, and rocks must remain intact on the ground.
- Pesticides or herbicide applications must be by a licensed applicator only.
- Low phosphorus, slow release nitrogen fertilizer may be used for the area that is beyond twenty five feet from the reference line. No fertilizer, except limestone, shall be used between the reference line and twenty five feet.



Map 1. Comprehensive Shoreland Protection Act Buffers

2.3 Additional State Protections

The State of New Hampshire provides additional protections to the Merrimack River beyond those articulated in the CSPA. The Rivers Management and Protection Program (RSA Chapter 483) offers several elements of protection, including restrictions on dams and encroachments, water quality and quantity standards, waste disposal standards, fertilizer standards, pesticide standards, recreation use standards, new building standards and buffer removal standards. Table 1 depicts theses standards and how they impact the Merrimack.

Table 1. Rivers Management and Protection Program Standards

Uses allowed	Permissible?
Dams & Encroachments	
Construction of New Dams	No
Reconstruction of Breached Dams	Yes (within 6 years)
Channel Alterations	Yes (with conditions)
Water Quality/Quantity	
Water Quality	Class B
Interbasin Transfers	No
Protected Instream Flow	Yes
Waste Disposal	
New Landfills	No (within 250')
New Hazardous Waste Facilities	No (within 250')
Other New Solid Waste Facilities	No (within 250')
New Septic Systems	No (within 75')
New Auto Junk Yards	No (within 250')
Fertilizer	
Limestone	Yes
Sludge and Septage	No (within 250'); Conditions Apply
Low Phosphorus, Slow Release Nitrogen	No (within 25')
All Other Fertilizers	No (within 25')
Pesticides and Herbicides	
All pesticides and herbicides	Yes (with conditions)
Recreation Use	
Motorized Watercraft	Yes (within 150' of shoreline, only "headway" speed)

Waste disposal seems to be of particular relevance to this regulatory audit. Setbacks from the above listed uses provide a starting point for keeping most contaminating uses back from the river. As discussed below, this is of the utmost importance to protecting the corridor.

3.0 Existing Land Use

CNHRPC completed a land use interpretation based on aerial photos within a 300-foot wide buffer area along the Merrimack River and its tributaries in order to examine the state of riparian buffer areas. Map 2 shows the land use in the buffer area for the entire Upper Merrimack Region. Table 2 summarizes the types of land uses and the

amount of land devoted to each use. This information shows that riparian areas are predominantly forests (54.3%), wetlands (10.1%), or agricultural lands (6.5%). The next most prevalent land use is residential, followed by roads, commercial/industrial, and other developed or disturbed lands. Most of the developed areas are in Bow, Concord, and Franklin where urban development is concentrated. Town-by-town breakdowns by land use type are contained in **Appendix II.** This land use data provides a baseline with which to compare future studies to gauge change in the region. It also demonstrates that the Upper Merrimack's riparian buffers are not currently experiencing severe encroachment. However, without additional protection, that could change. The six communities have the opportunity to extend regulatory protection in order to maintain healthy buffers along the Merrimack and its tributaries.

Using 2009 Conservation Lands data from the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT), CNHRPC calculated that 10,194 acres, or 21.3%, of the 47,911 acre buffer area are currently considered conservation lands. Table 5 shows the breakdown of those lands based on their protection level.

Table 2. Conservation Lands Within the 300-foot Buffer Area

Protection Level	Description	Acres in Buffer Area	% of total Buffer Area
Permanent Conservation Land	Protected by easement, deed restriction, or outright ownership with the intention of permanent conservation	8,340	17.4%
Unofficial Conservation Land	Not under legal conservation, but owned by public or private organization with clear intention to keep land as open space (municipal open space, academic institution open space, county farms, etc.)	1,423	3.0%
Unprotected Water Supply Lands	Land owned or controlled by public drinking water supplier, but not legally conserved	419	0.87%
Developed Public Land	Beaches, picnic areas, ballfields, boat ramps, etc.	10	negligible

Source: 2009 Conservation Lands GIS data layer, NH GRANIT.

CNHRPC also mapped all hazardous materials sites of interest to the Department of Environmental Services. Map 3 shows the locations of all sites, both inside the buffer area and the total in the region. Hazardous material facilities include above ground and underground fuel storage tanks, regulated hazardous chemicals used by businesses, contaminated areas, and spill sites. Of the 420 facilities, 180 or 43% fall within the buffer area. Again, most of those locations are clustered in Concord and Franklin where commercial and industrial uses are present. With a significant number of hazardous material sites already located close to surface waters, there is a clear need to ensure that

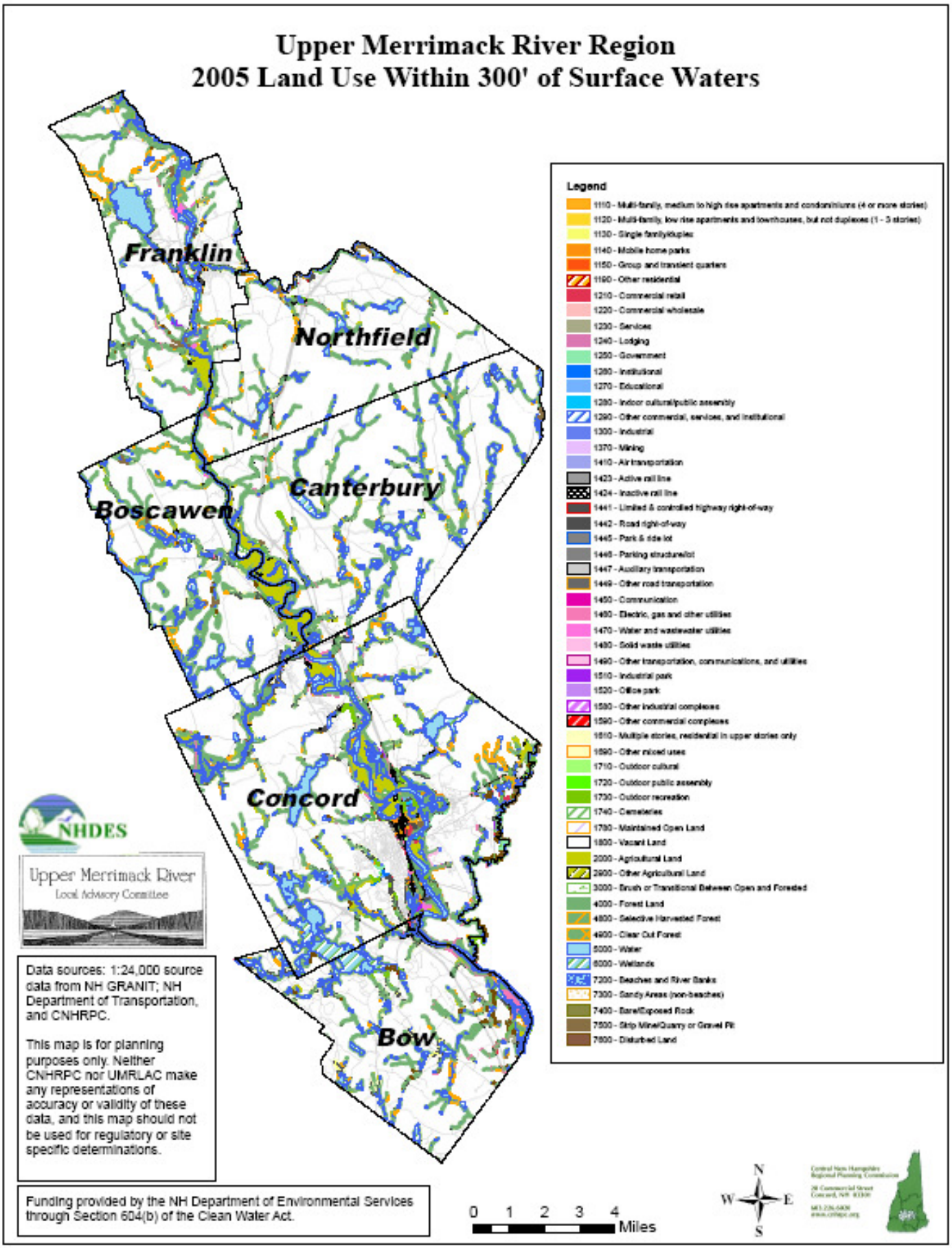
local regulations are in place that limit future development of such sites. Use-based surface water setbacks and aquifer protection overlay districts are important tools for the municipalities to consider.

Table 3. Land Use Summary*

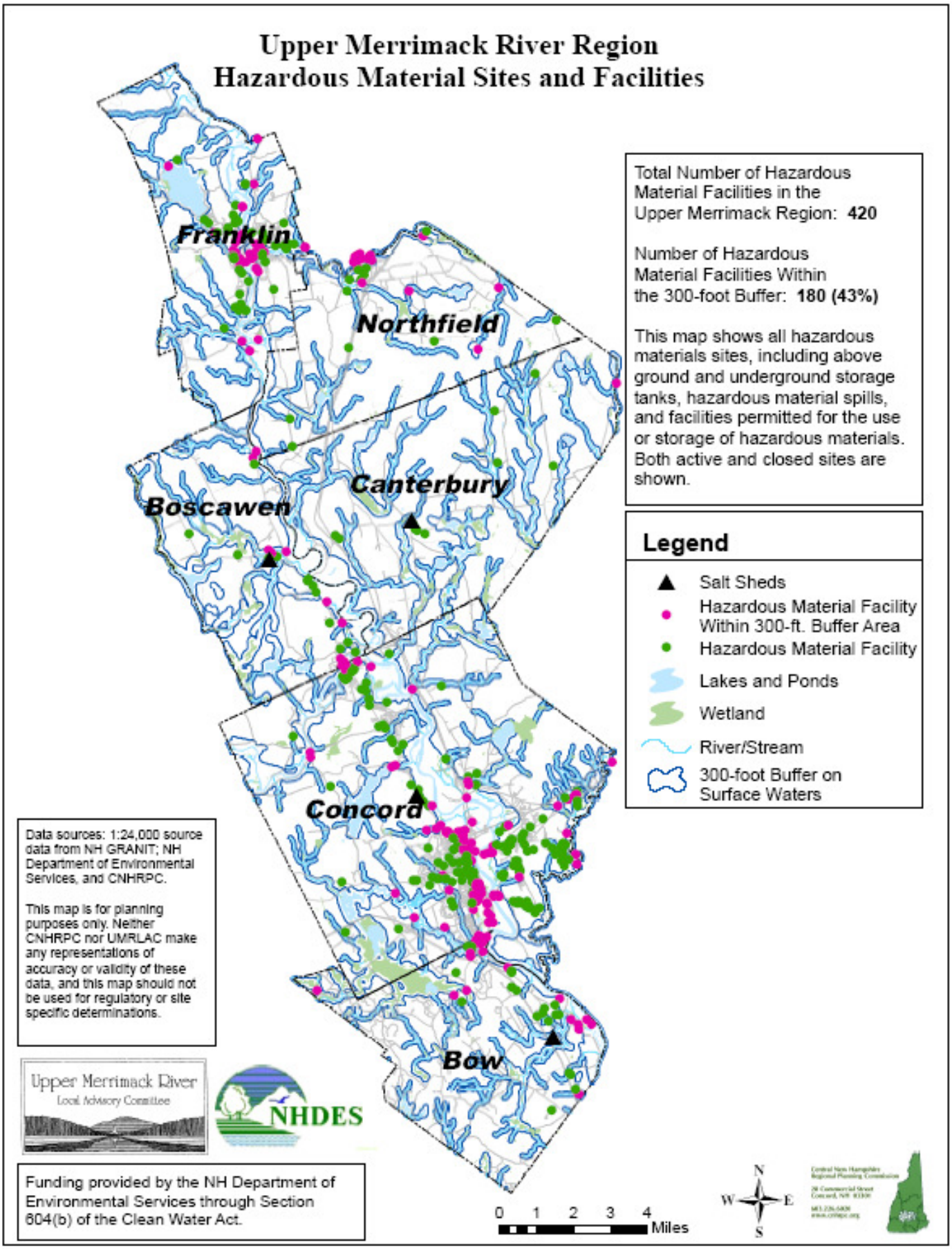
Upper Merrimack Land Use Summary

	Acres	Percentage
Forest	24,652	52.5%
Selectively Harvested Forest	650	1.4%
Clear Cut Forest	192	0.4%
Total Forest	**25,495**	**54.3%**
Water	**5,459**	**11.6%**
Wetlands	**4,765**	**10.1%**
Agriculture	2,932	6.2%
Other Agricultural Land (farm buildings)	106	0.2%
Total Agriculture	**3,038**	**6.5%**
Single Family Residential	2,726	5.8%
All Other Residential	237	0.5%
Total Residential	**2,964**	**6.3%**
Road Right-of-Way	802	1.7%
All other Transportation	548	1.2%
Total Transportation	**1,350**	**2.9%**
Retail	191	0.4%
Industrial	240	0.5%
All other non-residential developed	826	1.8%
Total Non-Residential	**1,257**	**2.7%**
Transitional/Other Vegetated Land	632	1.3%
Maintained Open Land	531	1.1%
Total non-forest, non ag. vegetated land	**1,162**	**2.5%**
Electric, gas, other utilities (mostly power lines, includes PSNH power plant)	578	1.2%
Other Utilities	162	0.3%
Total Utilities	**739**	**1.6%**
Outdoor recreation	**323**	**0.7%**
Cemeteries	**29**	**0.1%**
Gravel Pit/Strip Mine	148	0.3%
Disturbed Land	175	0.4%
All other sandy or barren lands	46	0.1%
Total Disturbed Lands	**369**	**0.8%**
Grand Total	**46,949**	**100.0%**

***Town-by-town land use breakdowns are contained in Appendix II.**



Map 2. Existing Land Use



Map 3. Hazardous Materials Sites and Facilities

4.0 Individual Community Findings

Each municipality has its own regulatory framework with different protective measures in place. A regulatory review and analysis was completed for each of the six communities along the Upper Merrimack River. For each town or city, recommendations are made for improving the level of surface water protection, including the following strategies:

- Wetland protection ordinance
- Merrimack River-specific setbacks and buffer requirements
- Local shoreland protection ordinance
- Aquifer protection ordinance
- Hazardous materials regulations
- Excavation regulations
- Post-construction stormwater management ordinance
- Bluff setbacks
- Impervious Coverage Standards
- Open Space Plan
- Flood Hazard Overlay District

A summary of each strategy is contained in Sections 4.7 and 5.1.

4.1 Boscawen

Boscawen has a few tools in place that provide some level of protection to the river and water resources. First, cluster, or open space developments are permitted in all zones either by right or by special exception. This is an important tool for creating permanent open space. Second, there are maximum impervious coverage requirements which help to protect water quality. Lastly, although not a river management plan per se, the master plan identifies areas along the river that should be protected. This is a good basis for establishing sound corridor protection.

There are several opportunities for Boscawen to improve its water and river protection framework beyond its current regulatory thresholds. First, wetland protection tools such as septic system setbacks, wetland buffers, and a wetland protection ordinance can protect wetlands from various hazards. Second, the Merrimack River can be protected in a similar manner to wetlands with setbacks, buffers, and a shoreland protection ordinance containing more stringent standards than the CSPA. Such measures can and should also apply to third order streams and lower, where appropriate. Third, an aquifer protection ordinance should be considered to protect wells and community drinking water sources. Fourth, hazardous materials can be more tightly regulated to prevent contamination of surface and ground water as well as wetlands. Finally, excavation regulations and setbacks from the Merrimack and other water bodies should be considered. A stronger post-construction stormwater management ordinance could also be of use. Boscawen should also investigate the need the need for bluff setbacks in town.

4.2 Bow

Bow has an extensive framework in place for the protection of surface and ground water as well as wetlands. First, a wetland protection ordinance is in place that retains protected buffers and ensures that septic tanks are set back from wetlands. Second, there are setbacks in place for the Merrimack River as well as third order streams and lower. Third, there are lot coverage restrictions and open space provisions. Fourth, the Aquifer protection ordinance, among other things, regulates hazardous uses over the aquifer. Fifth, Bow has local excavation regulations in place.

In addition to the existing protection framework, Bow could also establish excavation setbacks from wetlands, the Merrimack River, and third order streams and lower. Also, a post-construction stormwater management ordinance may be beneficial. Bow should also investigate the need the need for bluff setbacks in town.

4.3 Canterbury

Canterbury has done well to put several protective measures in place. Canterbury has setbacks from the Merrimack River, including bluff setbacks. Additionally, agricultural and conservation uses are, for the most part, the only permitted uses along the river. The excavation ordinance also stipulates buffers between excavation operations and water bodies. Canterbury permits cluster developments and limits impervious surfaces in the Shaker Village. The town also mandates a 125-foot setback for septic systems from open water and wetlands. Lastly, a special exception is required for the disposal of industrial and commercial waste.

There are several opportunities for Canterbury to strengthen its methods of protection as well. First, a wetland protection ordinance, with buffers, would further guard wetlands. Second, an aquifer protection ordinance would protect the groundwater that provides drinking water to the community. Third, expanding the impervious coverage requirements beyond the Shaker Village and protecting third order streams would round out a diverse and strong water protection framework. Finally, an open space protection plan would offer a way to visualize what areas in town are priorities for protection and would establish a sound basis for expanded protection. A stronger post-construction stormwater management ordinance could also be of use.

4.4 Concord

Concord has extensive protections in place for water resources. There is a wetland protection ordinance in place and setbacks from Great Ponds and fourth order streams, as well as some protections for third order streams and lower. The city's Flood Hazard District restricts new construction in the floodway and 100-year floodplain areas. Concord's Shoreland Protection District requires building and road setbacks of 75 feet from surface waters and the maintenance or restoration of naturally vegetated and woodland buffers. The city also requires setbacks that seek to separate excavation operations from water sources and sets impervious coverage restrictions for all

development types. Concord is currently working on language for an Aquifer Protection Ordinance as well. A stronger post-construction stormwater management ordinance could be an opportunity for the City to enhance protection of water resources.

4.5 Franklin

Franklin has several tools in place that protect water resources in the community. A wetland ordinance, with setbacks, and a local surface water ordinance for Webster Lake provide a sound base for water resource protection. In addition, a large proportion of open space is required for cluster developments. Lastly, impervious coverage requirements have been established for all uses and hazardous materials are regulated in the Webster Lake Overlay District.

Opportunities for improvement include establishing a setback from the Merrimack River as well as third order streams or lower. In addition, town excavation regulations, with setbacks from surface water and wetlands, would provide even greater protection. Lastly, regulating hazardous materials (perhaps in an aquifer protection ordinance) in parts of town other than the Webster Lake Overlay District would be beneficial. Franklin should also investigate the need the need for bluff setbacks in town. A stronger post-construction stormwater management ordinance could also be of use.

4.6 Northfield

Northfield has several strong tools in place for the protection of water resources, including the Merrimack River. First, the Town has its own shoreland setbacks for various rivers and ponds in town. Second, there is a setback from the Merrimack River itself. Additionally, there are setbacks from third order streams and lower. Finally, there are impervious standards for all types of development.

In terms of opportunities to strengthen protection, Northfield should consider adopting local excavation regulations that include setbacks from various surface water bodies and wetlands. A comprehensive open space plan that identifies vital water resources could be a beneficial tool. Northfield should also investigate the need the need for bluff setbacks in town. A stronger post-construction stormwater management ordinance could also be of use.

4.7 Summary

Communities currently offer varying levels of protection of surface water and water resources in the upper Merrimack River corridor. Map 4 shows current local setback and buffer requirements where they are more stringent or more specific than state standards. **Appendix I** contains the detailed results of the regulatory audit. Setbacks from the river itself, as well as its bluffs are some of the strongest and most direct protection methods for the Merrimack. Bow, Canterbury, Concord and Northfield all have setbacks from the Merrimack and Canterbury and Concord both have bluff setbacks. While setbacks from the Merrimack could be beneficial for all communities, bluff setback requirements may not be necessary in all six towns, based on the river's geomorphology. Given these factors, all communities should establish setbacks from the Merrimack River and those that do not have bluff setbacks should investigate the need for them. Concord's zoning ordinance defines a bluff as "A natural cliff or banking consisting of highly erodible soil materials, with some of these materials reposing at slopes steeper than one (1) foot vertically for every three (3) feet horizontally over a minimum vertical distance of twenty-five (25) feet." Canterbury's ordinance does not specifically define the term, only stating that the bluff setback applies "if such a bluff exists in a particular stretch of river." Each municipality may wish to establish its own definition or consider adopting Concord's. Based on the definition used, bluffs may be identified at various points along the Merrimack.

Like setbacks from the Merrimack and its bluffs, setbacks from wetlands and other surface waters can be equally beneficial to the watershed and its resources. Bow, Concord, Franklin and Northfield all have wetland protection ordinances in place – including buffers – and the remaining communities could consider adopting them as well. Setbacks from third order streams and lower exist in Bow, Concord and Northfield and these tools would also be of use in the other communities.

Another vital tool for protecting the Merrimack River watershed are excavation regulations. Although RSA 155:E establishes minimum standards for all communities,

individual municipalities can adopt their own local excavation regulations that provide additional levels of protection. One of the most vital parts of local excavation regulations are setbacks from surface water bodies as well as wetlands. Bow, Canterbury, Concord and Franklin have some form of excavation regulations in place. Concord could enhance these regulations by adding specific setback requirements for wetlands and Franklin could add setback provisions for surface water and wetlands. All communities could also include additional Best Management Practices that are found in other communities, as outlined below in section 5.3. The remaining communities in the corridor should consider adopting their own local excavation regulations.

Permanent and effective stormwater management for every developed site would dramatically reduce the negative water quality impacts associated with pollutants and sediments contained in runoff flowing to the Merrimack River. While large sites require stormwater management plans and permits from either NHDES or the EPA, small sites must be regulated at the local level. All of the communities in the Upper Merrimack corridor have the opportunity to adopt post-construction stormwater management ordinances to help address surface water quality issues. The strategies prescribed by such an ordinance aim to keep and treat as much stormwater onsite as possible, through a variety of mechanisms. These can include limiting maximum impervious cover, non-structural techniques such as rain gardens and swales, or structural stormwater management systems. The model ordinance recommended by NHDES is performance-based, meaning that it sets out the desired outcome of a design without specifying particular techniques or approaches used.

The protection of floodplains and flood storage areas is another key consideration in riparian buffer protection efforts. All six communities in the region have adopted FEMA-required minimum standard floodplain protection ordinances. Unfortunately, the standard language in these ordinances may offer a false sense of protection. For instance, future development is allowed at the base flood elevation, rather than requiring construction to be raised above that level. Buildings constructed at the base flood elevation will likely still face some flood risk. In addition, recent flood events have shown that floods can and increasingly often exceed the base flood elevation. All communities should consider standards that exceed the FEMA minimums. Not only will additional protection be provided, but communities that adopt measures such as flood hazard overlay districts get points toward a reduction in flood insurance rates for residents.

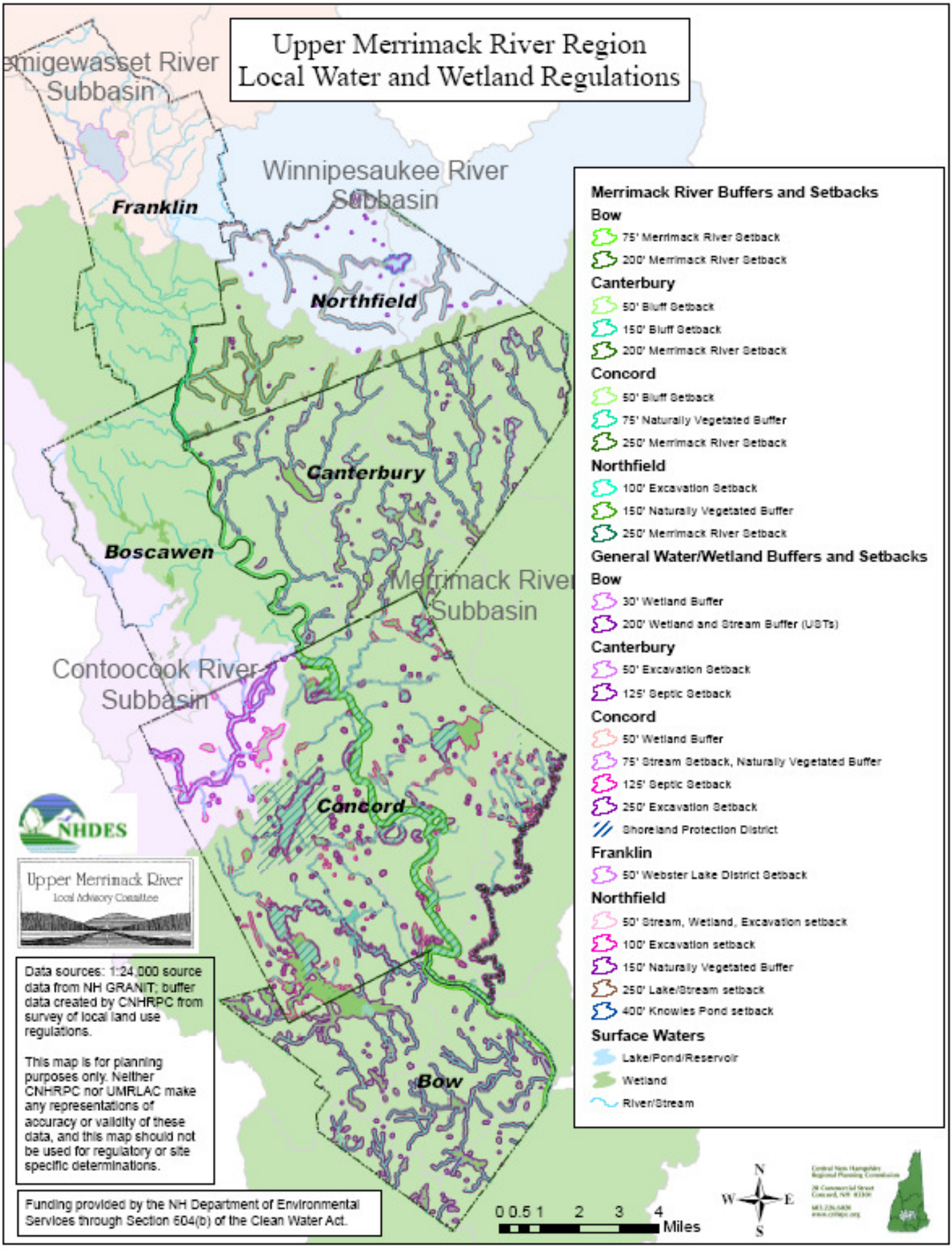
Finally, aquifer protection ordinances commonly regulate uses over aquifers, in particular, those uses that include hazardous materials. The communities of Bow and Northfield have aquifer protection ordinances in place and the other communities could employ similar ordinances. Canterbury requires a special exception for the disposal of industrial and commercial waste and this could be another tool that the other communities may seek to adopt.

Table 3 outlines the opportunities for each community with regard to increasing the protection of the Merrimack River Corridor and the watershed.

Table 3. Recommended Protection Tools

		Protection Tools Recommended											
		Wetland Protection Ordinance (w/Setbacks)	Aquifer Protection Ordinance	Excavation Regulations: Establish OR create/enhance setbacks	Expand/Establish Impervious Coverage Standards	Protect 3rd Order Streams and Lower	Create Open Space Plan	Merrimack River Setback	Investigate Need for Bluff Setbacks	Local Surface Water Setbacks	Improved Hazardous Material Regulation	Post-Construction Stormwater Management Ordinance	Create or Enhance Flood Hazard Overlay District
Municipality	Boscawen	X	X	X		X		X	X	X	X	X	X
	Bow			X					X		X	X	X
	Canterbury	X	X		X	X	X				X	X	X
	Concord										X	X	
	Franklin			X		X		X	X	X	X	X	X
	Northfield			X			X		X		X	X	X

Note: An "X" in the table above indicates the potential need for a protective measure to be implemented in the community.



Map 4. Local Water and Wetland Regulations

5.0 Summary of Corridor Needs

5.1 Overview of Corridor Needs

In terms of the corridor, there is uneven protection due to absent regulation (no local use-based Merrimack River setback, for example) or varying requirements within local land use regulations (for instance, Merrimack River setbacks vary from 75' to 250'). As such, additional tools could be put in place within the corridor and ideally there should be some degree of commonality with regard to the levels of protection that each tool provides.

Stormwater runoff is a major issue in the corridor and post-construction stormwater management ordinances are needed corridor-wide. There are high lot-coverage requirements which can be problematic, and innovative stormwater management efforts can help to minimize resulting effects. Whereas traditional stormwater management focuses upon solutions that redirect stormwater to existing water sources in the area (wetlands, rivers, etc.) a post-stormwater management ordinance focuses on better infiltration. The benefit to such a strategy is that it addresses the runoff in the same way that nature would – recharge – as opposed to simply redirecting it. No community has any such ordinance in place and the Upper Merrimack Management and Implementation plan from 2007 established such ordinances corridor-wide as a goal (Objective # W.Q3). Second, given that most of the communities have high lot-coverage standards, a stormwater management ordinance would be an effective tool to put in place until lot-coverage standards could be reduced.

Although five communities have the FEMA-required minimum standard for floodplain protection, enhanced ordinances such as Concord's flood hazard overlay district would provide real benefits, not only in terms of actual flood protection, but also potential reductions in property owners' flood insurance rates.

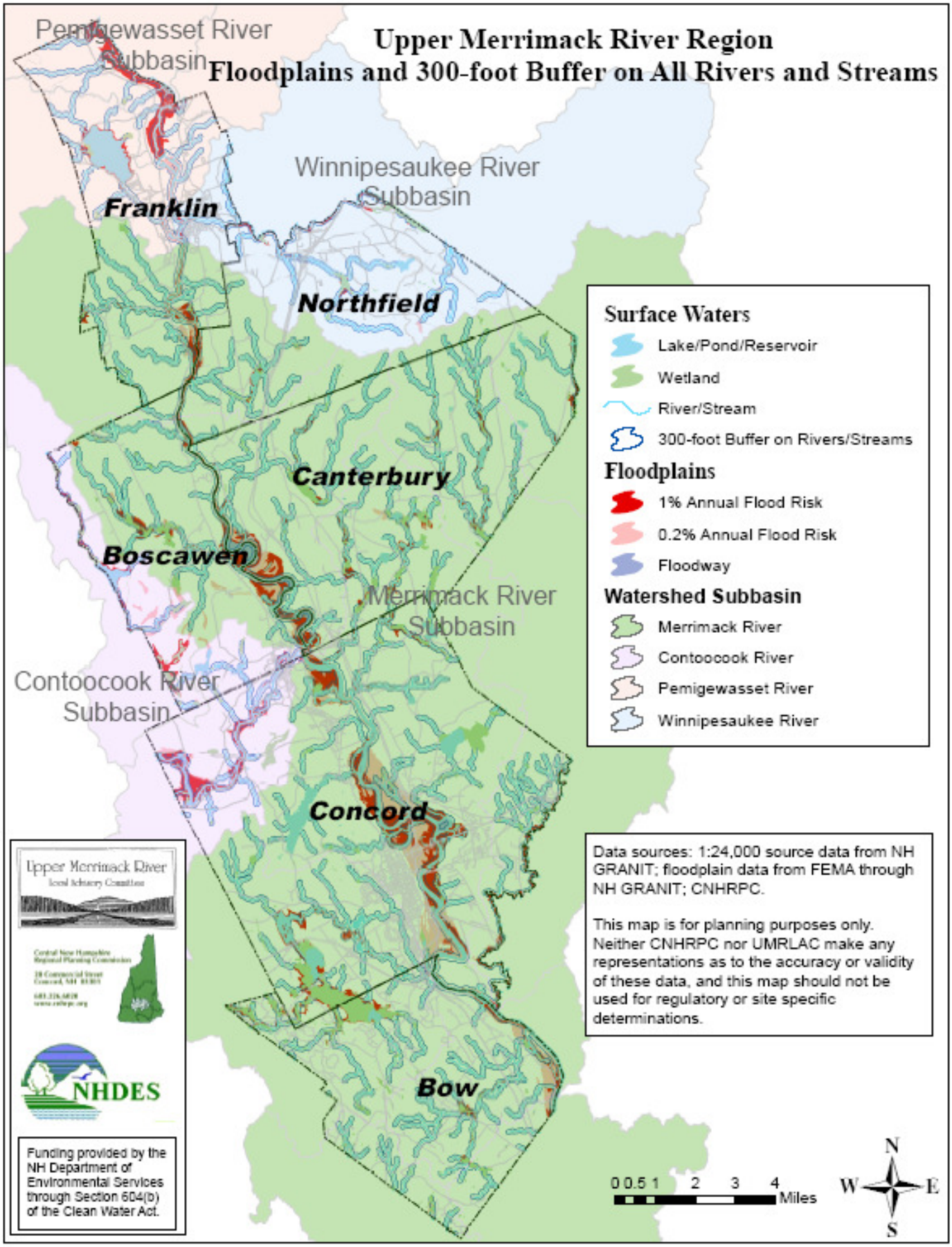
Another major concern is the use and proximity of hazardous materials to water resources. Most of the communities in the corridor could add to their hazardous material regulatory tool box. Hazardous material waste disposal regulations and stronger setbacks for uses of hazardous materials all could be improved upon corridor-wide. Half of the corridor lacks aquifer protection ordinances which are very useful tools for protecting groundwater from hazardous materials. A land use interpretation exercise performed by the Central New Hampshire Regional Planning Commission further illustrated the need for increased hazardous material regulation as it identified that 43% of all hazardous materials in the six communities are located within 300 feet of surface waters. As such, increasing hazardous material regulation corridor-wide is of the utmost priority.

Gravel pit excavation can be just as dangerous to ground and surface water as hazardous materials. Excavation can cause avulsions, contaminate ground water and result in siltation and other materials running into surface water. Although the State regulates gravel pits with RSA 155:E, municipalities have the opportunity to develop

local regulations with additional controls. As it stands right now, four out of the six communities in the corridor should establish or enhance existing gravel pit regulations.

The Merrimack River contains bluffs in some areas where the river has deeply eroded over time. Protecting these resources is vital for two reasons. First, protecting bluffs protects the character of these portions of the river. Second, given that bluffs rise steeply from the river, a development may be closer to the river in terms of a straight-line distance than a development located in an area without bluffs. Given that bluffs are only present in certain areas, it is reasonable to expect that some communities would not have bluff setbacks. But, due to the importance of protecting such features, those communities that do not have bluff setbacks in place should investigate their need. Conservation Commissions should determine if there are bluffs in the community, according to an established definition. The definition of a "bluff" should be determined by each individual community. If bluffs are identified, setbacks should be established at least 50 feet from the top of the bluff.

Finally, the most direct and immediate way to protect the Merrimack River is by establishing setbacks for the river as well as third order streams and lower. Ideally, there should be some degree of consistency in setback distances. The 2007 Upper Merrimack Management and Implementation Plan indicates that a 300-foot setback is ideal. Map 5 shows what uniform setbacks on all rivers and streams would look like in the Upper Merrimack region, as well as how such setbacks relate spatially to existing floodplain areas. Two of the six communities do not have local setbacks from the Merrimack and three lack setbacks from third order streams or lower. Those towns that lack setbacks from the Merrimack River and third order streams should consider establishing them Setbacks from the Merrimack should vary from 100' to 300' depending upon uses, and setbacks from third order streams and lower should vary between 75' and 250' depending upon uses.



Map 6. 300-foot Buffer Area and Floodplains

5.2 Town-Specific Recommended Changes

In light of the needs of each community and the corridor, each community should consider adopting the following provisions for the protection of the River, its tributaries and the watershed:

Boscawen:

i. Establish a wetland protection ordinance that contains setbacks of at least 50 feet from wetlands. A Conditional Use Permit process could also be included for any wetland crossing proposed provided the applicant can show that there is no other way to cross a wetland. In the absence of such justification the Conditional Use Permit shall not be granted.

ii. Create an Aquifer Protection Ordinance that restricts most hazardous material uses over the aquifer. When mildly hazardous material uses cannot be avoided in the overlay district they should be regulated by requiring a Conditional Use Permit based upon evidence of compliance with current Best Management Practices.

iii. Establish a Surface Water Protection Ordinance that:

   a. Creates setbacks from the Merrimack River between 100 and 300 feet depending upon the use;

   b. Creates setbacks from third order streams and lower between 50 and 200 feet depending upon the use;

   c. Prohibits hazardous material usage inside the setback, or when a use is justified in the setback, by requiring a Conditional Use Permit based on evidence of compliance with current Best Management Practices.

iv. Establish Excavation Regulations that add additional standards to protect water resources, to include 300-foot setbacks from the Merrimack River, its tributaries, wetlands and any surface waters.

v. Adopt a town-wide Special Exception permitting process for the disposal of industrial or commercial waste. The Special Exception can only be granted based on evidence of compliance with current Best Management Practices.

vi. The Conservation Commission should investigate the presence of bluffs along the Merrimack River and, if needed, Boscawen should consider establishing a 50-foot setback from the top of the bluff.

vii. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

viii. Adopt an enhanced flood hazard overlay district to replace existing floodplain ordinance. It is recommended that the ordinance require new structures and major additions to be built at least two feet above base flood elevation.

Bow:

i. Edit existing Earth Excavation Ordinance to require a 300-foot buffer between excavations and the Merrimack River or its tributaries, surface water, third order streams or lower, and wetlands.

ii. Adopt a town-wide Special Exception permitting process for the disposal of industrial or commercial waste. The Special Exception can only be granted based on evidence of compliance with current Best Management Practices.

iii. The Conservation Commission should investigate the presence of bluffs along the Merrimack River and, if present, Bow should consider establishing a 50-foot setback from the top of the bluff.

iv. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

v. Adopt enhanced flood hazard overlay district to replace existing floodplain ordinance. It is recommended that the ordinance require new structures and major additions to be built at least two feet above base flood elevation.

Canterbury:

i. Establish a wetland protection ordinance that contains setbacks of at least 50 feet from wetlands. A Conditional Use Permit process should also be included for any wetland crossing proposed provided the applicant can show that there is no other way to cross a wetland. In the absence of such justification the Conditional Use Permit shall not be granted.

ii. Create an Aquifer Protection Ordinance that restricts most hazardous material uses over the aquifer. When mildly hazardous material uses cannot be avoided in the setback they should be regulated by requiring a Conditional Use Permit based upon evidence of compliance with current Best Management Practices.

iii. Canterbury currently employs an impervious coverage requirement of not more than 50% in the Shaker Village. The Town should also establish impervious coverage requirements in the rest of town of not more than 20% for residential uses and not more than 40% for non-residential uses.

iv. Create setbacks from third order streams and lower between 50 and 200 feet depending upon the use; and prohibits hazardous material usage inside the setback or when a use is justified in the setback, by requiring a Conditional Use Permit based on evidence of compliance with current Best Management Practices.

v. Develop an open space plan that prioritizes areas for protection along the Merrimack River.

vi. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

vii. Adopt enhanced flood hazard overlay district to replace existing floodplain ordinance. It is recommended that the ordinance require new structures and major additions to be built at least two feet above base flood elevation.

<u>Concord:</u>

i. Adopt a town-wide Special Exception permitting process for the disposal of industrial or commercial waste. The Special Exception can only be granted based on evidence of compliance with current Best Management Practices.

ii. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

Franklin:

i. Revise Excavation Regulations to add additional standards to protect water resources, to include 300-foot setbacks from the Merrimack River, its tributaries, wetlands and any surface waters.

ii. Establish a Surface Water Protection Ordinance that:

   a. Creates setbacks from the Merrimack River between 100 and 300 feet depending upon the use;

   b. Creates setbacks from third order streams and lower between 50 and 200 feet depending upon the use;

   c. And, prohibits hazardous material usage inside the setback, or when a use is justified in the setback, by requiring a Conditional Use Permit based on evidence of compliance with current Best Management

iii. The Conservation Commission should investigate the presence of bluffs along the Merrimack River and, if present, Franklin should consider establishing a 50-foot setback from the top of the bluff.

iv. Adopt a town-wide Special Exception permitting process for the disposal of industrial or commercial waste. The Special Exception would only be granted based on evidence of compliance with current Best Management Practices.

v. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

vi. Adopt enhanced flood hazard overlay district to replace existing floodplain ordinance. It is recommended that the ordinance require new structures and major additions to be built at least two feet above base flood elevation.

Northfield:

i. Establish Excavation Regulations that add additional standards to protect water resources, to include 300-foot setbacks from the Merrimack River, its tributaries, wetlands and any surface waters.

ii. Create an open space plan that prioritizes areas for protection along the Merrimack River.

iii. The Conservation Commission should investigate the presence of bluffs along the Merrimack River and, if present, Northfield should consider establishing a 50-foot setback from the top of the bluff.

iv. Adopt a town-wide Special Exception permitting process for the disposal of industrial or commercial waste. The Special Exception can only be granted based on evidence of compliance with current Best Management Practices.

v. Adopt a post-construction stormwater management ordinance that requires infiltration of stormwater instead of redirecting it to existing storage areas. This will also require that Subdivision Regulations and Site Plan Regulations are reviewed to ensure consistency with the Ordinance.

vi. Adopt enhanced flood hazard overlay district to replace existing floodplain ordinance. It is recommended that the ordinance require new structures and major additions to be built at least two feet above base flood elevation.

It is understood that some of these suggestions may not be feasible from a political standpoint, but the aforementioned recommendations should be thought of as a target. If they cannot be achieved in full it is recommended that they are pursued to the extent possible.

5.3 Best Practices Within the Region

Within the Upper Merrimack River Corridor there are communities who have tools in place that can serve as a model for other communities. For each of the following regulatory mechanisms, a town is identified that could provide such a model, at least as a starting point. Model ordinance language for several protective measures can also be found in the NHDES Innovative Land Use Handbook: http://des.nh.gov/organization/divisions/water/wmb/repp/innovative_land_use.htm.

- Wetland protection ordinance: Bow

- Aquifer protection ordinance: Bow

- Surface water protection ordinance: Concord
- Setbacks from third order streams or lower: Northfield
- Excavation Regulations: Canterbury
- Special permitting for disposal of industrial or commercial waste: Canterbury
- Bluff setbacks: Canterbury and Concord
- Post-construction stormwater management ordinance: none in region – see NHDES Innovative Land Use Handbook model ordinance
- Impervious coverage requirements: Boscawen
- Open space plan: Concord
- Setbacks from the Merrimack River: Concord
- Flood hazard overlay district: Concord

As with any regulatory changes, the Regional Planning Commission is often a good resource to consult, and before anything is put forward for adoption, it is highly recommended that Town Counsel review it for any potential legal concerns.

5.4 Final Thoughts

The corridor as a whole has some effective tools in place that protect portions of the river, its tributaries, other surface waters and the watershed as a whole. However, there are some opportunities to further strengthen its protection. First, there are areas where tools could be put in place. Second, some existing tools can be improved upon and enhanced to create more unified and effective protection for the corridor as a whole.

Areas where municipalities have put effective, and in some cases, innovative tools in place include Boscawen's impervious coverage requirements, Bow's aquifer protection ordinance, Canterbury's special permitting for the disposal of industrial or commercial waste, Concord's setbacks from the Merrimack River and surface waters as well as Northfield's setbacks from third order streams and lower. All of these efforts represent an understanding of the need for, and an effort to protect water resources in the watershed. These communities should be commended for their efforts.

In addition to the existing tools there is a great opportunity and need to further improve the level of protection of the river and the watershed. First, hazardous materials present an urgent threat to the river and watershed. Most of the communities in the corridor should adopt protective measures (such as an aquifer protection district and/or waste

permitting process similar to Canterbury). Second, gravel pits are a potential threat and several communities should consider adopting or expanding the gravel pit regulations they currently have in place with a keen eye toward introducing setbacks from water resources. Third, stormwater runoff is a major issue as well. Every community should think about adopting stricter impervious coverage standards or adopt post-construction stormwater management regulations, or both. Finally, there is a need for corridor-wide setbacks of similar distances from the river, tributaries, and surface waters.

Moving forward, each community should discuss the recommended ordinances and begin public outreach to build support. The discussion, preparation, and development of regulatory language can take time. Communities with a town meeting legislative structure should consider the time needed to write proposed regulations and conduct public outreach in order to introduce warrant articles for the next town meeting cycle. Concord and Franklin operate through a City Council form of government and are not bound by seasonal or annual time constraints.

As more stringent protections are adopted, the corridor will have a roughly uniform level of protection and an implicit corridor-wide acknowledgement of the need to protect the river and its watershed. Achieving this level of consistency would be a model for the rest of the state.

Appendix I: Regulatory Audit Findings

		Municipality					
	Ordinances	**Boscawen**	**Bow**	**Canterbury**	**Concord**	**Northfield**	**Franklin**
From Management Plan	Dates of last update/ amendment (month/yr) of each ordinance	3/10/2009	May-08	3/13/2007	Mar-08	3/11/2008	8/6/2007
	Density and/or Minimum Lot Size Requirements (1 residential unit)	1/4 acres to 2 acres	2 acres	2, 3, 5, & 10 acres	7,500 sf to 2 Ac; 5,000 sf to 20,000 BUILDABLE	0.5 to 5 Acres	1/4 acre to 5 acres (10,000sf, 15,000sf, 1, 1.5, 2.5, & 5 acres)
	Septic System Setbacks from Wetlands or Open Water	No	75 to 150 feet	125 feet	75' to 125'	75'	75' from wetlands
	Wetland Protection Ordinance	No	Yes	No	Yes	Yes	Yes
	Wetland Buffer Requirements	No	30 to 200 feet depending on the type of wetland & use	None	50'	50'	75' in Webster Lake District

	Ordinances	Boscawen	Bow	Canterbury	Concord	Northfield	Franklin
	Shoreland Protection Zones or Districts	No	No	Not a specific district, but there are buffer and setback requirements along the Merrimack River	Yes, Great Ponds, fourth order streams or greater; Penacook Lake District	Not specific district, but setbacks in each zoning district: Winnipesaukee: 50-250; Sandogarty Pond: 250', Tioga River: 50-250, Knowles Pond: 400'	Yes, 50' setback for Webster Lake Overlay District
	Setbacks from Merrimack River	No	75 to 200	200 feet	Partial (depending upon use & part of river), 250'	250'	No
	Shoreland Ordinances for Streams Third Order or Lower	No	75 to 200	None	75', depends upon use	50' to 250'	No
	Open Space Requirements within Conservation and Watershed Districts	No, but open space requirements are part of the cluster development ordinance; cluster developments permitted by right in all districts except the R2 Zone where it is permitted by Special Exception. Cluster development ordinance conflicts as it states that all applications require a Special Exception	A minimum of 50% of original lot area must be open space; ≥25% of open space must be buildable land; original tract size must be 10 acres	Not specifically water or conservation district, but Cluster Subdivision ordinance stipulates that between 50% and 60% shall be retained as open space	Maximum Density: 1/4 a unit per buildable acre; Minimum Tract Requirements: 70% minimum open space, 5% maximum lot coverage	Included in Cluster Development Requirements	66% open space required in cluster developments

	Ordinances	Boscawen	Bow	Canterbury	Concord	Northfield	Franklin
	Impervious areas restrictions for Aquifer protection of other Zones	There is no aquifer protection zone, but each zoning district has a maximum impervious coverage requirement	No Aquifer protection coverage limits defined; Dimensional Requirements contain impervious coverage requirements per zone between 30% & 80%	No, but Shaker District, not more than 50%	15%	In general max 70% commercial and max 30% residential	In Webster Lake Overlay:30% Impervious surface **AND** 20% to 2,500 sf, whichever is greater; stormwater & erosion plan consistent with Stormwater Management and Erosion and Sedimentation Control Handbook for Urban and Developing Areas in NH
	Bluff Setbacks	None	None	50 to 150 feet (if top of the river bluff is less than 150 feet from river)	50' horizontal, uphill; entire ravine when bottom of bluff is ravine	None	No
	Preserving Naturally Vegetated Buffers	No	30 to 200 feet depending on the type of wetland/water body & use	Yes, varies along Merrimack River	75' to 250'	150'	75' in Webster Lake District
	Allows for Alternative Development Types (ex. Cluster)	Yes; cluster developments	Yes; open space	Yes; cluster developments	Yes; Cluster, PUD,	Yes; Open Space	Yes; Cluster developments

Additional Regulatory Components	**Ordinances**	**Boscawen**	**Bow**	**Canterbury**	**Concord**	**Northfield**	**Franklin**
	Hazardous Material Regulation	No	Some uses permitted in Aquifer Protection District by Special Exception	No, but a Special Exception is required for the disposal of industrial and commercial waste	Not specifically, but some uses prohibited in SP; gasoline sales subject to supplementary regs	Groundwater Protection Ordinance regulates uses; some permitted by a Special Exception	Somewhat; some provisions in the Webster Lake Overlay
	Town Excavation Regulations	No	Yes	Yes	Yes	No	Not really; 1 requirement for reclaiming after 1 month, other than that relies upon 155E
	Town-level excavation setback requirements from Merrimack River	No	Not specifically	200 feet from Merrimack River	up to 250' along portions of the river per SP overlay district requirements	100'	No
	Town-level excavation setback requirements from Surface Water	No	Not permitted beneath or adjacent to inland surface water in such a manner that permit from state or federal agencies	50 to 100 feet	75' to 250' per requirements of SP overlay district	50 to 100 feet	No

	Ordinances	Boscawen	Bow	Canterbury	Concord	Northfield	Franklin
	Town-level excavation setback requirements from Wetlands	No	Not specifically	50 feet	Not specifically	50 to 100 feet	No
	Town-level excavation setback requirements from third order streams (or lower)	No	Not specifically	50 feet	75' per requirements of SP overlay district	50 to 100 feet	No
	What uses are permitted along the Merrimack River?	All uses	All uses except for those in the Rural, Institutional, or Civic districts	Agricultural/Conservation uses are the only permitted uses allowed along the Merrimack River	* See Sheet 3	* See Sheet 4	Residential; recreation; inside storage fuel storage (SE); professional; wireless tower; restaurants; gravel pits; light industry/manufacturing various public uses; various agriculture

	Ordinances	Boscawen	Bow	Canterbury	Concord	Northfield	Franklin
	Is there a community Open Space plan that recommends land preservation along the Merrimack River?	There is not a specific open space plan along the river, per se, but the 2001 Master plan depicts some areas of existing protection along the river	Bow does not seem to specifically have an open space plan; 2004 Master Plan contains an existing conservation lands map; there is a 2000 Open Space Trail System Plan; There is a significant wild life habitat study from 2000	No	Yes; select locations along the river	No	Unknown
	Is there an aquifer protection overlay District along the Merrimack River	No	Yes	No	Working on language	Yes	No
	Lot Coverage Requirements	20%-40%	30% to 80%, in general zoning lot density matrix	Only Shaker District, not more than 50%	10% to 85%	In general max 70% commercial and max 30% residential	Just the provisions of the Webster Lake Overlay District; see above
	Do site plan regulations govern pre-construction stormwater management?	Yes	Yes	Somewhat	Yes	Somewhat	Yes
	Do site plan regulations govern post-construction storm water management	Yes	Yes	Somewhat	Yes	Somewhat	Yes

	Ordinances	Boscawen	Bow	Canterbury	Concord	Northfield	Franklin
	Does community have a floodplain development ordinance?	Yes (FEMA-required minimum)	Yes (FEMA-required minimum)	Yes (FEMA-required minimum)	Yes	Yes (FEMA-required minimum)	Yes (FEMA-required minimum)
	What uses are permitted in an aquifer protection overlay district along the Merrimack River?	No Aquifer Protection District	By Right: those that do not endanger groundwater	No Aquifer Protection District	Aquifer Protection District in process	Everything in underlying district with the exception of landfills, snow dumping, and various potentially toxic uses	Webster Lake Overlay: everything but livestock within 200'; pesticides within 200'; no manure within 200'; no filing wetlands; vegetated buffer; no driveways within 50 of surface or wetland; impervious controls; no septic within 100' of water/wet no underground storage tanks
	What Innovative Land Use Techniques are being used by the community (RSA 674:21)	Cluster Subdivision (aka Conservation Subdivision)	Impact Fees, Cluster development	Cluster Developments	Cluster Developments; planned unit developments; performance districts;	Open Space Developments; Impact Fees	Cluster Subdivision

Appendix II. Land Use Breakdown by Municipality Within 300-ft. Buffer of Surface Waters

Upper Merrimack Buffer Land Use Breakdown by Municipality												
	Boscawen		Bow		Canterbury		Concord		Northfield		Franklin	
	Acres	Percentage	Acres	Percentage	Acres	Percentage	Acres	Percentage	Percentage	Percentage	Acres	Percentage
Forest	3,487	57.4%	2,976	50.2%	5,283	63.7%	6,653	42.4%	2,410	66.1%	3,547	52.9%
Selectively Harvested Forest	140	2.3%	65	1.1%	50	0.6%	186	1.2%	30	0.8%	180	2.7%
Clear Cut Forest	55	0.9%	41	0.7%	13	0.2%	12	0.1%	37	1.0%	34	0.5%
Total Forest	**3,682**	**60.7%**	**3,082**	**52.0%**	**5,346**	**64.4%**	**6,850**	**43.6%**	**2,477**	**68.0%**	**3,761**	**56.1%**
Water	**504**	**8.3%**	**373**	**6.3%**	**654**	**7.9%**	**2,334**	**14.9%**	**242**	**6.6%**	**1,182**	**17.6%**
Wetlands	**596**	**9.8%**	**1,034**	**17.4%**	**1,019**	**12.3%**	**1,568**	**10.0%**	**314**	**8.6%**	**222**	**3.3%**
Agriculture	643	10.6%	41	0.7%	515	6.2%	1,348	8.6%	57	1.6%	316	4.7%
Other Agricultural Land (farm buildings)	21	0.3%	0	0.0%	22	0.3%	42	0.3%	4	0.1%	12	0.2%
Total Agriculture	**663**	**10.9%**	**41**	**0.7%**	**537**	**6.5%**	**1,390**	**8.9%**	**61**	**1.7%**	**328**	**4.9%**
Single Family Residential	244	4.0%	576	9.7%	318	3.8%	895	5.7%	215	5.9%	475	7.1%
All Other Residential	12	0.2%	3	0.0%	10	0.1%	138	0.9%	25	0.7%	47	0.7%
Total Residential	**256**	**4.2%**	**578**	**9.8%**	**328**	**4.0%**	**1,034**	**6.6%**	**240**	**6.6%**	**522**	**7.8%**
Limited & Controlled Road Right of Way	0	0.0%	35	0.6%	7	0.1%	144	0.9%	10	0.3%		0.0%
Road Right-of-Way	49	0.8%	66	1.1%	46	0.5%	331	2.1%	32	0.9%	77	1.1%
Road Right-of-Way	50	0.8%	102	1.7%	53	0.6%	475	3.0%	42	1.2%	77	1.1%
All Other Transportation	35	0.6%	69	1.2%	45	0.5%	295	1.9%	67	1.9%	35	0.5%
Total Transportation	**84**	**1.4%**	**171**	**2.9%**	**97**	**1.2%**	**770**	**4.9%**	**110**	**3.0%**	**112**	**1.7%**
Retail	3	0.1%	26	0.4%		0.0%	138	0.9%	1	0.0%	21	0.3%
Industrial	42	0.7%	39	0.7%		0.0%	146	0.9%	7	0.2%	7	0.1%
All other non-residential developed	39	0.6%	140	2.4%	6	0.1%	480	3.1%	47	1.3%	107	1.6%
Total Non-Residential	**84**	**1.4%**	**205**	**3.5%**	**6**	**0.1%**	**764**	**4.9%**	**55**	**1.5%**	**135**	**2.0%**
Transitional/Other Vegetated Land	108	1.8%	23	0.4%	129	1.6%	259	1.6%	33	0.9%	66	1.0%
Maintained Open Land	24	0.4%	44	0.7%	108	1.3%	151	1.0%	59	1.6%	144	2.1%
Total non-forest, non ag. vegetated land	**132**	**2.2%**	**68**	**1.1%**	**239**	**2.9%**	**410**	**2.6%**	**92**	**2.5%**	**210**	**3.1%**
Electric, gas, other utilitites	6	0.1%	248	4.2%	14	0.2%	222	1.4%	10	0.3%	69	1.0%
Other Utilities	7	0.1%	0	0.0%	1	0.0%	49	0.3%	5	0.1%	100	1.5%
Total Utilities	**13**	**0.2%**	**248**	**4.2%**	**15**	**0.2%**	**270**	**1.7%**	**15**	**0.4%**	**169**	**2.5%**
Outdoor recreation	**10**	**0.2%**	**33**	**0.6%**	**19**	**0.2%**	**190**	**1.2%**	**14**	**0.4%**	**25**	**0.4%**
Cemeteries	**1**	**0.0%**	**4**	**0.1%**		**0.0%**	**19**	**0.1%**		**0.0%**	**5**	**0.1%**
Gravel Pit/Strip Mine	24	0.4%	10	0.2%	20	0.2%	18	0.1%	23	0.6%	27	0.4%
Disturbed Land	13	0.2%	82	1.4%	1	0.0%	62	0.4%	1	0.0%	8	0.1%
All other sandy or barren lands	8	0.1%	2	0.0%	18	0.2%	17	0.1%	0	0.0%	0	0.0%
Total Disturbed Lands	**45**	**0.7%**	**94**	**1.6%**	**39**	**0.5%**	**97**	**0.6%**	**24**	**0.7%**	**35**	**0.5%**
TOTALS	**6,070**	**100.0%**	**5,931**	**100.0%**	**8,299**	**100.0%**	**15,696**	**100.0%**	**3,645**	**100.0%**	**6,706**	**100.0%**