

Lower Merrimack River Corridor Management Plan

December 2022



The Merrimack River as seen from Merrill Park in Hudson.

Prepared by:

Nashua Regional Planning Commission (NRPC)

On behalf of:

Lower Merrimack River Local Advisory Committee (LMRLAC)

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We would also like to thank the members of the Lower Merrimack River Local Advisory Committee for their dedication to the Merrimack River and surrounding communities.

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Chapter 1: Purpose and Need

The lower Merrimack River, pictured in Figure 1 and shown in Map 1, was one of five original rivers protected under the New Hampshire Rivers Management and Protection Program (RMPP). RSA 483:15 designates the stretch as “the main stem from the Bedford-Merrimack town line to the New Hampshire-Massachusetts state line as a ‘community river.’” The first Lower Merrimack River Corridor Management Plan (the Plan) was written in September 1989 pursuant to requirements contained in the RMPP. The Plan’s purpose is to provide guidance to the communities adjacent to the lower Merrimack River as they make decisions affecting the watershed, river corridor, and the river itself.



Figure 1. The Merrimack River

In 1990 the Lower Merrimack River Local Advisory Committee (LMRLAC) was formed to provide an advisory role on matters pertaining to the management of the river and to comment on development proposals which might affect the resources for which the river was designated. The LMRLAC must also update the corridor management plan every five to ten years as necessary, under RSA 483:10.

RSA 483:8-a, III(c) allows the corridor management plan to be adopted as part of a community’s master plan. However, even if adopted within the four corridor communities, responsibility for managing, monitoring, and implementing the corridor management plan will remain with LMRLAC. While the

document is specific to the corridor communities of Merrimack, Litchfield, Hudson, and Nashua, the Plan's goals, objectives, and recommendations are also applicable to decision-makers in neighboring watershed communities.

Competing demands are placed upon the river over its course, including drinking water supply, industrial use, waste assimilation, irrigation, fisheries and wildlife, and recreation. The Plan provides a comprehensive and consistent voice to the management of the river corridor across municipal boundaries in an area where growth rates continue to challenge both manmade and natural environments. In 2020, an estimated 151,826 people lived within the four municipalities of the lower Merrimack River corridor, or approximately 1,384 persons per square mile within Merrimack, Litchfield, Hudson, and Nashua.

To steer its work, LMRLAC has adopted a single guiding principle:

"Preserve the character and integrity of the Merrimack River and its corridor by protecting its natural, historic, and scenic resources and to ensure its continued utilization as a multiple use river."

Scope

While the Merrimack River begins at the confluence of the Pemigewasset and Winnepesaukee Rivers near Franklin, New Hampshire and travels 115 miles past the cities of Concord, Manchester, and Nashua, on into Massachusetts where it empties into the Atlantic Ocean at Newburyport, the scope of this plan is limited to the lower Merrimack River corridor.

The lower Merrimack River corridor is a 15-mile segment of the Merrimack River beginning near the northern borders of the towns of Merrimack and Litchfield, New Hampshire, flowing south through the town of Hudson and city of Nashua to the Massachusetts border. The corridor includes the land area within one-quarter mile from the ordinary high-water mark on each side of the river (or to the landward extent of the 100-year floodplain, whichever distance is greater), as shown in Map 1.

RSA 483:10 requires that the following factors are included in river corridor management plans:

- Permitted recreational uses and activities
- Permitted non-recreational uses and activities
- Existing land uses
- Aquatic connectivity
- Protection of flood plains, meander belts, wetlands, wildlife and fish habitat, and other significant open space and natural areas
- Dams, bridges, and other water structures
- Access by foot and vehicles
- Setbacks and other location requirements
- Dredging, filling, mining, and earth-moving

- Prohibited uses
- State-owned lands within the corridor and tributary drainage areas thereof. The plan shall include a description of the importance of those lands to the characteristics for which the river was designated
- Fluvial geomorphology and risk reduction

The Merrimack River is classified as a “Community River,” which means the natural, scenic, recreation, and community values of the river are to be protected, while still accepting agricultural, residential, and commercial uses of the river that do not impact public instream uses. Public instream uses include activities that are flow-dependent, such as navigation, recreation, fishing, and protection of water quality.

Priority Management Issues

Balancing these competing demands requires prioritizing management issues. In the fall of 2005, LMRLAC distributed approximately 1,600 questionnaires to property owners within the corridor. The 235 responses received from the community included the findings listed in Table 1 below:

Table 1. Priority Management Issues

	Range	Value	Opinion	Related Goals
Strengths	From ten natural resource categories, respondents chose:	Open Space Water Supply Scenic Value	Contribute most to residents’ quality of life.	1, 3, 7
Opportunities	From seven natural resource characteristics, respondents chose:	Water Quality Open Space Wildlife/Waterfowl Habitat	Are most important to considering corridor protections.	1, 3, 6
Threats	From four negative corridor characteristics, residents chose:	Loss of Farmland to Development Abusive Recreational Behaviors	Were most noticeable.	2, 3, 5
Needs	From eight protection measures, residents chose:	Community Education School Education Conservation Planning	Were most necessary.	3, 4, 8

Respondents viewed the existing strengths of the corridor as open space, water supply, and scenic value; three qualities that contribute most to residents’ quality of life. Respondents identified water quality, open space, and wildlife/waterfowl habitat as three characteristics that could be improved or better protected within the corridor. Threats to the character of the corridor included loss of farmland to development and abusive recreational behaviors. Lastly, protection measures identified included community education, school education, and conservation planning. These protection measures –

educating children and the general public and planning for the future – would make it possible to reduce threats to the corridor, seize opportunities, and protect strengths. Goals related to these management issues are found in Chapter 4.

Process and Participants

Corridor Plan Process

The 2022 Plan update began in 2021 when NHDES awarded a Sourcewater Protection Grant to Nashua Regional Planning Commission to update the May 2008 Plan. In the fall of 2021 NRPC staff solicited input from the Conservation Commissions in the four relevant communities, visited known public access points, and worked with LMRAC to update the goals and objectives of this plan. In March of 2022 a survey was distributed electronically to gather public input on public access opportunities to the river. In the spring of 2022 an extensive watershed audit survey was distributed to knowledgeable municipal staff in the four communities. Data included in the 2008 plan was updated and drafts of the plan were reviewed by conservation commission members, LMRAC members, Merrimack River Watershed Council staff, and NHDES staff.

Sources of Data and Technical Assistance

We would like to acknowledge the support of the following agencies that provided funding, data, or assistance with the creation of this plan:

NH Department of Environmental Services, Water Division

Nashua Regional Planning Commission

Lower Merrimack River Local Advisory Committee

Town of Hudson

Town of Litchfield

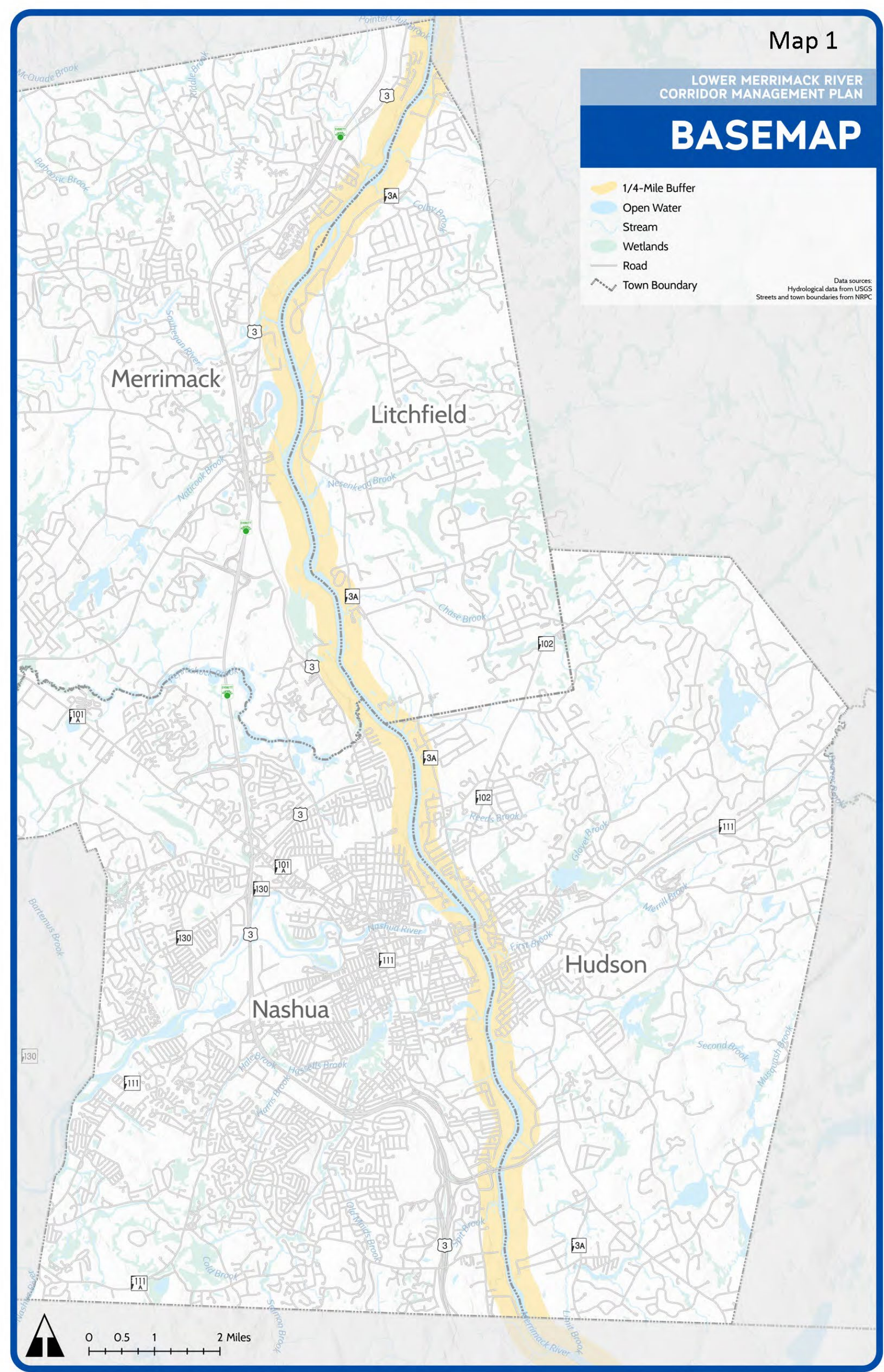
Town of Merrimack

City of Nashua

Pennichuck Water Works

Souhegan Watershed Association

Merrimack River Watershed Council



Map 1. Base Map

Chapter 2: Corridor Resources

2.1 Water Resources

The Merrimack River corridor surface waters, and those of the greater watershed, form an extensive system of rivers, streams, lakes ponds, and wetlands that perform many functions such as providing fisheries and wildlife habitats; conveying flood waters, providing water supplies; power generation; recreational opportunities, and scenic views. Because these water bodies are interconnected, activities such as chemical contamination, damming, or dredge and fill activities that take place in the watershed, even at far distances from the river corridor, can result in impacts in unexpected locations. The river and its major tributaries are shown in Map 2. Active dams on the tributaries are shown on Map 9.

Tributaries

The Souhegan River, Nashua River, and Pennichuck Brook are the three largest tributaries to the lower Merrimack River. Smaller tributaries include Baboosic Brook, Naticook Brook, Salmon Brook, Nesenkeag Brook, Colby Brook, Reeds Brook, and First Brook.

Lakes and Ponds



Figure 2. Robinson Pond in Hudson

The lakes and ponds in the corridor communities and beyond form the headwaters of the tributaries that flow into the Merrimack River. Only Horseshoe Pond in Merrimack empties directly into the river but other waterbodies are indirectly connected. Pollutant discharges into ponds and lakes can eventually end up in the river. Pollutants also accumulate over time in the waterbodies themselves, making them difficult to remove.

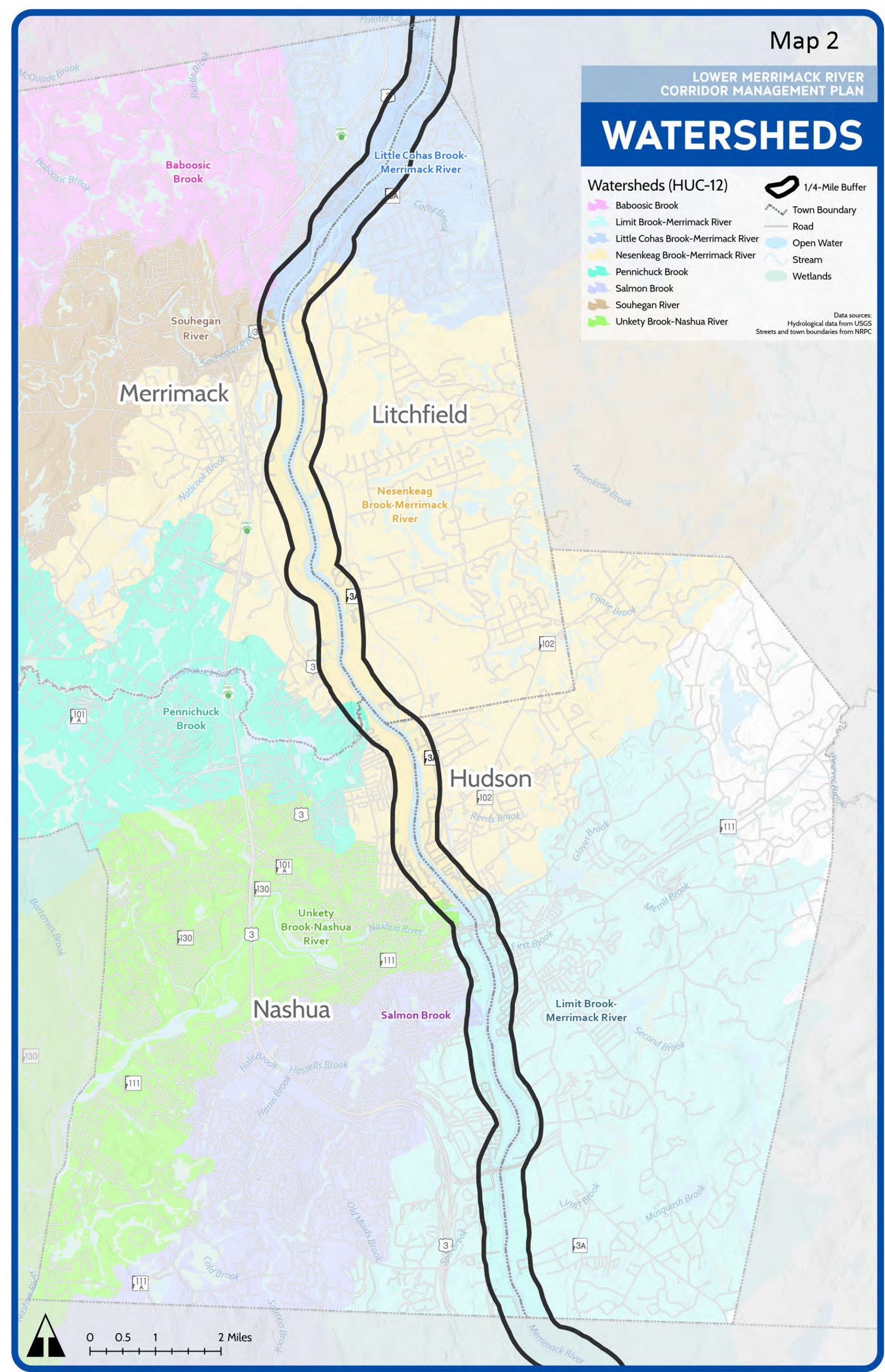
The region's lakes and ponds, including Robinson Pond pictured in Figure 2, provide wildlife habitat: an interconnected network of surface waters can provide useful corridors for animals to travel along; they

also provide breeding grounds and nursery areas for several species of waterfowl and fish. These habitats need to be protected to ensure the continued diversity of wildlife in the region.

Public surface waters are those that are greater than ten acres in size and therefore regulated according to the Shoreland Water Quality Protection Act, discussed in Chapter 3 of this document. These public waterbodies are depicted on the Wetlands Map (Map 5) and listed in Table 2.

Table 2. Public Ponds and Lakes Within the Corridor Communities

Waterbody	Status	Bordering Towns	Area (in acres)	Approximate Elevation
Baboosic Lake	Natural Lake	Amherst Merrimack	228	231
Green's Pond	Natural Lake	Merrimack	40.0	195
Harris Pond	Artificial Impoundment	Nashua Merrimack	83.0	166
Horseshoe Pond	Natural Lake	Merrimack	37.1	101.5
Naticook Lake	Raised by Damming	Merrimack	71.7	206
Pennichuck Pond	Natural Lake	Hollis Merrimack Nashua	48.8	186
Retention Pond B	Artificial Impoundment	Merrimack	11.4	
Stump Pond	Raised by Damming	Amherst Merrimack	18.1	190
Supply Pond	Artificial Impoundment	Nashua Merrimack	15.5	135
Ayers Pond	Raised by Damming	Hudson	12.0	120
Otternic Pond	Raised by Damming	Hudson	34.0	170
Robinson Pond	Raised by Damming	Hudson	88.0	211
Unnamed Pond	Natural Lake	Hudson	52.7	135
Darrah Pond	Natural Lake	Litchfield	17.3	178
Bowers Pond	Artificial Impoundment	Nashua	88.0	175
Holt Pond	Artificial Impoundment	Nashua	21.4	182
Lovewell Pond	Natural Lake	Nashua	11.9	216
Mine Falls Dam	Artificial Impoundment	Nashua	242	
Nashua River I Dam	Artificial Impoundment	Nashua	50.0	
Round Pond	Raised by Damming	Nashua	13.4	193
Key:				
Natural Lake	Refers to natural lakes and ponds that are > 10 acres in size and have not been raised by a manmade dam			
Raised by Damming	Refers to natural lakes and ponds that are > 10 acres in size and have been raised by damming.			
Artificial Impoundment	Refers to manmade waterbodies (usually impounded by a dam, but some may be dug ponds). Before creation of the pond there was either no natural pond, or the natural pond was less than 10 acres in size.			



Map 2. Watersheds

Floodplains

Floodplains are a natural part of a river system. They are created when excess water moves up onto the land surrounding the river, depositing nutrients and increasing soil moisture. Floodwaters support trees and plants that grow along the river and are accustomed to regular flooding. Small floods occur in the Merrimack every year during the spring snow melt; larger floods also occur regularly. The boundaries of the floodplains are depicted in Map 3. Much of the corridor is within the floodplain, especially in the Litchfield and Merrimack segment and the northern parts of Nashua and Hudson. Damage from flooding is more likely to occur when buildings are located in the floodplain.

To prevent excessive loss from flooding, Congress created the National Flood Insurance Program (FIA) in 1968. To qualify for the Flood Insurance Program, municipalities must have adopted local land use and building construction controls designed to reduce the impact of flooding in compliance with minimum standards established by the FIA. As part of the program, the Federal Emergency Management Administration prepared a series of maps identifying flood-prone areas. Three specific zones were delineated and assigned a flood insurance zone designation based on the probability of a flood event, as follows:

- Zone A:** Special Flood Hazard Areas will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Over a 30-year period, there is about one chance in four (25%) that this level of flooding will occur.
- Zone B:** Moderate flood hazard areas are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.
- Zone C:** Areas of minimal food hazard, which are outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood.

All four communities in the river corridor participate in the Federal Flood Insurance Program and utilize the official Floodway Maps and the Flood Insurance Rate Maps to determine floodplain boundaries. Further discussion on each of the corridor communities' regulation of the floodplain through local ordinance is provided in Chapter 3 of this document. The Special Flood Hazard Areas are generally confined to low-lying areas adjacent to the river and its tributaries, whereas moderate flood hazard areas encompass more extensive areas running the length of the river.

Severe flood events in 2006 and 2007 primarily impacted tributaries to the Merrimack River. The corridor communities have completed some mitigation actions to prevent future severe flooding. For example, the Town of Merrimack acquired residential property along the Souhegan River that was subject to repeat flooding as well as elevated new roads and bridges above the base flood elevation. Litchfield has evaluated and increased the capacity of culverts and storm drains.

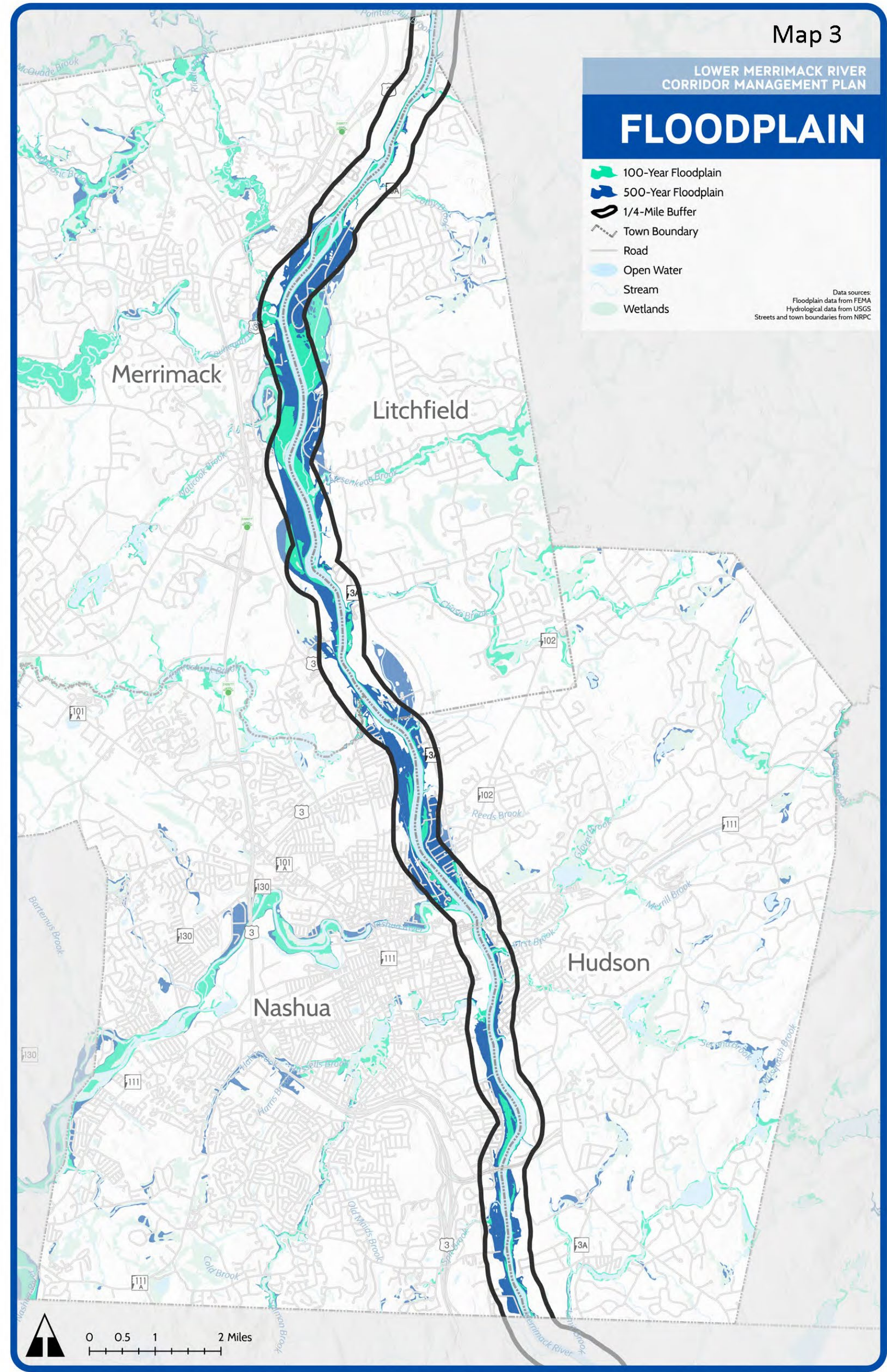
The FEMA Flood maps for Hillsborough County are due to be updated, although the timeline for update keeps changing. As of September 2022, the preliminary maps have not yet been released and are currently scheduled to be updated in 2023. The updated maps will likely reflect the changing weather patterns, as Southern New Hampshire has been experiencing more heavy rain events than historically and will continue to do so: the Climate Mapping for Resilience and Adaptation tool predicts that by mid-

century (2035 to 2064) southern New Hampshire will receive approximately 3 more inches of rain per year but will have 4 to 5 more days without rain (U.S. Federal Government 2022). The *Nashua Region Water Resiliency Action Plan* (NRPC 2016) describes in more detail potential vulnerabilities related to increased flooding and drought.

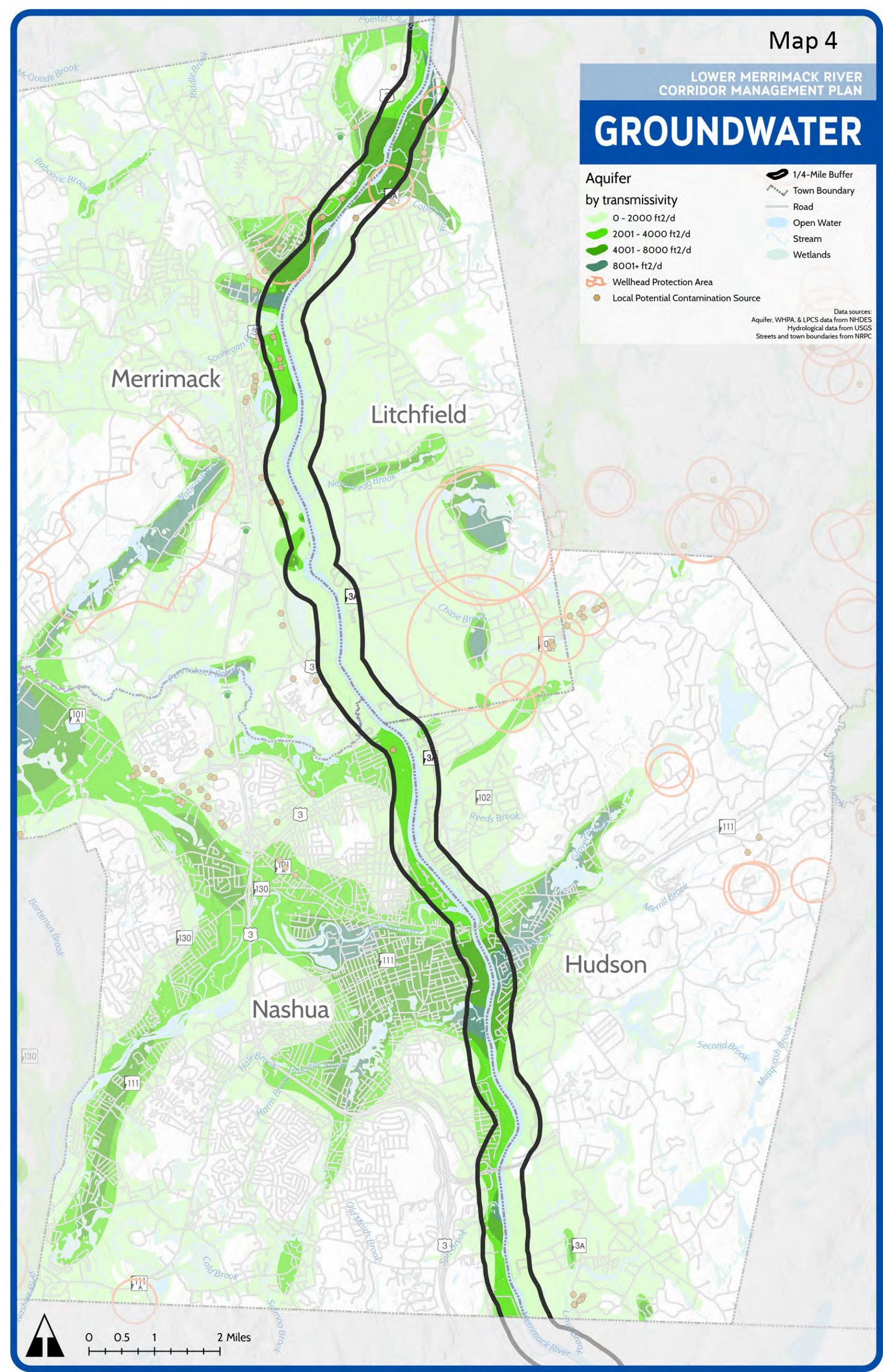
Aquifers and Groundwater

Stratified drift deposits are composed of sand and gravel that have been sorted and deposited by glacial meltwaters. Extensive, coarse deposits of stratified drift deposits can store large columns of water. The storage capacity of the aquifer is directly related to the size of the soil particles and the degree of sorting. The high porosity of the coarse-grained aquifers allows groundwater to flow through quite readily. Porosity in a well-sorted aquifer is greater than in a poorly sorted aquifer; therefore, the larger pore size allows water to be transmitted more easily and increases the speed of water withdrawal.

Stratified drift aquifers have been the focus of groundwater investigations in the northeast United States because of their ability to store and rapidly transmit large volumes of water. The entire study corridor, except for a few locations at higher elevations, is identified as being part of an extensive, interconnected network of stratified drift deposits that extends along both sides of the river. While the majority of the corridor is underlain by finely-grained stratified drift deposits with transmissivity of less than 2,000 square feet per day, there are a number of coarse grained drift deposits with greater transmissivity. Aquifer transmissivity zones are shown on Map 4. It is important to protect these zones from hazardous spills because any contaminants that are introduced into the aquifer can spread rapidly along with the water. Aquifers are important sources of drinking water and once contaminated may be impossible to remediate.



Map 3. Floodplain



Map 4. Groundwater

Wetlands

Wetlands such as swamps, bogs, marshes, forested wetlands, wet meadows, and vernal pools are protected for several reasons: they provide habitat for a diversity of wildlife species; storage for waters during storm events, which helps to reduce flooding for surrounding upland areas; they are aesthetically pleasing and add diversity to the visual quality of a landscape; and finally, they purify water by filtering out sediments, nutrients, and chemicals. Their ability to store and release water is especially important considering the increase of severe rainfall events associated with climate change.

The State of New Hampshire Wetlands Bureau defines a wetland as “an area that, either through surface water or groundwater, is wet enough and wet for long enough to support a predominance of vegetation that grows in saturated soil conditions. For an area to be deemed a wetland, all three of the following must be present:

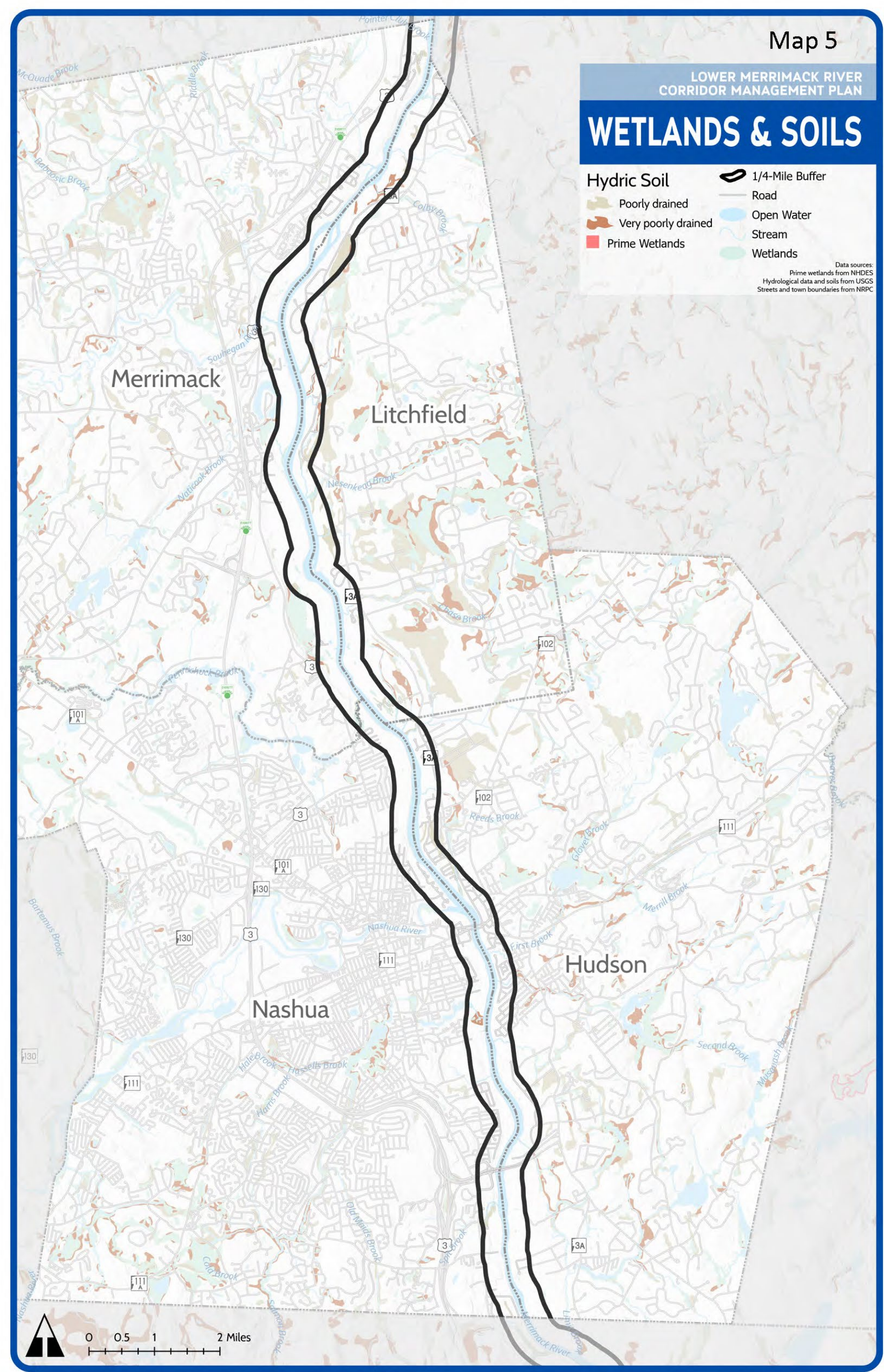
- Hydric soils – soils that are saturated or flooded during the growing season sufficient to produce anaerobic conditions in the upper soil layers.
- Hydrophytic Vegetation – greater than 50% of the vegetation present is adapted for life in saturated soil conditions.
- Hydrology – evidence exists that demonstrates the soils in the area are inundated with water either permanently or periodically throughout the growing season.”

This definition is consistent with federal wetland definitions, which can be found in the 1987 US Army Corps of Engineers Wetlands Delineation Manual.

A useful tool in wetlands identification is the US Fish and Wildlife Service’s National Wetlands Inventory (NWI). This inventory is accessed through a web-based Wetlands Mapper which shows “wetland type and extent using a biological definition of wetlands.” Communities should also consider on-the-ground surveys for a more exact wetland delineation and to help to identify vernal pools.

Large wetland areas are present throughout each of the corridor communities, as pictured in Map 5. Many of these areas are adjacent to the river and its tributaries. Litchfield contains the largest amount of wetland acreage in the river corridor. Few wetland areas are identified within the Hudson and Nashua portions of the corridor, possibly due to the steepness of the riverbank or the intensity and timing of development. These few wetland areas are very important, however, since they contribute to the health and stability of the greater ecological community.

Existing regulations in the four corridor communities provide a wide range of protection levels for wetlands, which are discussed in more detail in Chapter 3.



Map 5. Wetlands & Soils

2.2 Water Quality & Quantity

According to New Hampshire's 2020-2022 303(d) list of impaired waters (NHDES, no date "Water Quality"), the quality of the water in the Merrimack River is considered marginally impaired (level 5-M) for its designated uses. For Aquatic Life Integrity, the pH and aluminum levels exceeded recommended levels, and for Primary Contact Recreation, creosote and chlorophyll-a exceeded recommended levels. A Total Maximum Daily Load study is required for each of these parameters but have not been completed yet, and it is a low priority to do so. Pennichuck Water Works treats the water that they source from the river to bring it up to drinking water quality standards.

Today's marginal impairment is a vast improvement from conditions in the 1960s, when the Merrimack was considered one of the ten most polluted rivers in the country. This achievement is primarily due to the construction of municipal waste treatment facilities and NPDES limitations on discharges, both results of the federal Clean Water Act (CWA) of 1972.

The New Hampshire Department of Environmental Services provides access to water quality data and assessments through a web-based platform called NHDES Surface Water Quality Assessment Viewers. The US Geological Survey provides access to water quality data through their National Water Information System.

Point Sources of Pollution

Point source pollution includes discharge from an identifiable source, such as a pipe, and requires a permit under the National pollutant Discharge Elimination System (NPDES). A total of 9 Individual NPDES Permits are active within the lower Merrimack River basin and are listed in Table 3. Sites covered by a General NPDES Permit, such as for Municipal Separate Storm Sewer System (MS4) or industrial stormwater runoff, are numerous and not listed here. General permits cover dischargers with similar profiles while individual permits are specific to a site. NPDES permits specify the effluent limitations, compliance schedules, and monitoring and reporting requirements. Within the river corridor, insufficient treatment of municipal wastewater is a significant point source pollutant.

Table 3. Industrial Discharges Within the Lower Merrimack River Basin (Individual NPDES Permits)

Facility Name	Location	Receiving Stream	Type of Discharge	Date of Issuance
Brox Industries	Hudson	Glover Brook	Minor industrial	6/16/2004
Derry WWTF	Derry	Merrimack River	Major municipal, aerated lagoons	12/28/2010
Merrimack WWTF	Merrimack	Merrimack River	Major municipal, activated sludge	3/20/2014
Nashua WWTP	Nashua	Merrimack River	Major municipal, activated sludge	3/6/2015
Fish Hatchery - Nashua National	Nashua	Nashua River	Minor, fish hatchery	5/29/2009
Fish Hatchery - Milford	Milford	Purgatory Brook	Minor, fish hatchery	8/8/2011

Facility Name	Location	Receiving Stream	Type of Discharge	Date of Issuance
Greenville WWTF	Greenville	Souhegan River	Minor municipal, activated sludge	12/8/2008
Milford WWTF	Milford	Souhegan River	Major municipal, activated sludge	8/31/2020
Greenville WWTP	Greenville	Souhegan River	Water filtration facility	12/8/2008

Combined sewer overflows (CSOs), which are discharges of stormwater mixed with untreated human and industrial waste, toxic materials, and debris from antiquated sewer systems that combine storm water and wastewater, are a major water pollution concern for the lower Merrimack River and will take time and hundreds of millions of dollars to address.

Some progress to reduce CSOs in the river has been made. The City of Nashua completed a study of their nine CSOs at a cost of approximately \$373,000 in 1992. The City has spent almost \$70 million to minimize CSO events on projects including the Wet Weather Flow Treatment Facility, the Screenings and Disinfection Facility and improvements at specific overflow locations (City of Nashua, no date). In 2021 there were CSO events on 28 days in the City of Nashua. They are listed in Table 4 below.

While outside the lower Merrimack River corridor, Manchester is just upstream. The City of Manchester estimates that more than 200 million gallons of combined sewage is released into the Merrimack River annually. While the City spent \$58 million in the early 2000s to reduce CSO discharge by 99%, in 2020 the City settled with the US Environmental Protection Agency and the State of New Hampshire to spend \$231 million over the next 20 years to further reduce that amount to 73 million gallons (Alterisio, 2020).

Pennichuck Water Works regularly collects water samples from the Merrimack River where their intake is located, and tests them for a variety of contaminants. Evidence of the CSOs can be clearly seen in their sample results for *E. coli* over a five year period, from 2017 through the fall of 2022, shown below in Figure 3. While many of the samples show very high levels of *E. coli* in the water, the majority of the samples contain little *E. coli*, falling well below NHDES's threshold for advising against swimming, 88 MPN/100mL. The standards for drinking water are even more stringent and any *E. coli* is removed through the water treatment process.

Table 4. Combined Sewer Overflows in Nashua, 2021

Date	CSO 003 Farmington Rd.		CSO 004 Burke St.		CSO 005 East Hollis St.		CSO 006 Nashua River		CSO 008 Broad St.		CSO 009 Lock St.		CSO 014 Bridge St.	
	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)	Total Flow (MG)	Total Duration (Min.)
1/16/2021	0.001	85	0.232	70	-	-	0.008	15	0.041	175	-	-	2.078	90
2/16/2021	-	-	-	-	-	-	-	-	0.004	25	-	-	-	-
5/5/2021	-	-	-	-	-	-	-	-	0.039	160	-	-	-	-
6/8/2021	0.026	45	-	-	-	-	-	-	-	-	-	-	-	-
6/12/2021	-	-	-	-	-	-	-	-	0.001	15	-	-	-	-
6/15/2021	-	-	-	-	0.118	25	-	-	0.012	25	0.001	10	0.384	30
6/30/2021	-	-	-	-	-	-	-	-	0.054	25	-	-	-	-
7/1/2021	-	-	-	-	-	-	-	-	0.086	100	-	-	-	-
7/2/2021	-	-	-	-	-	-	-	-	0.037	55	-	-	-	-
7/9/2021	0.383	175	0.973	105	0.780	105	2.117	105	0.054	185	-	-	5.587	125
7/12/2021	-	-	0.021	15	0.008	15	0.013	15	0.034	160	-	-	1.990	90
7/18/2021	-	-	0.023	25	0.213	45	1.034	40	0.074	85	0.002	10	2.335	60
7/20/2021	-	-	-	-	-	-	-	-	0.001	10	-	-	-	-
7/23/2021	-	-	-	-	-	-	-	-	0.005	20	-	-	-	-
7/29/2021	0.024	45	0.213	50	1.154	80	2.250	70	0.428	90	0.004	35	5.328	95
8/10/2021	-	-	-	-	-	-	-	-	0.011	75	-	-	-	-
8/19/2021	-	-	-	-	-	-	-	-	0.025	95	-	-	-	-
8/23/2021	-	-	-	-	0.002	15	-	-	0.100	35	-	-	-	-
9/1/2021	-	-	-	-	0.016	25	0.020	35	0.032	125	-	-	0.270	10
9/2/2021	0.018	140	0.089	50	0.171	95	0.579	110	0.066	250	-	-	6.950	265
9/9/2021	0.016	55	0.228	60	0.311	85	0.351	50	0.010	45	-	-	1.690	70
9/13/2021	-	-	-	-	-	-	-	-	0.014	20	-	-	-	-
9/24/2021	-	-	-	-	-	-	-	-	0.004	20	-	-	-	-
10/16/2021	-	-	-	-	-	-	-	-	0.002	50	-	-	-	-
10/30/2021	-	-	-	-	-	-	-	-	0.010	40	-	-	-	-
10/31/2021	-	-	-	-	-	-	-	-	0.001	15	-	-	-	-
11/12/2021	0.030	85	1.410	130	0.920	80.000	2.166	70	0.030	90	-	-	6.081	100
12/11/2021	-	-	-	-	-	-	-	-	0.019	35	-	-	-	-

Notes: CSO 002 at Salmon Brook and CSO 007 at Tampa St. did not experience any CSO events in 2021. Source: City of Nashua (no date).

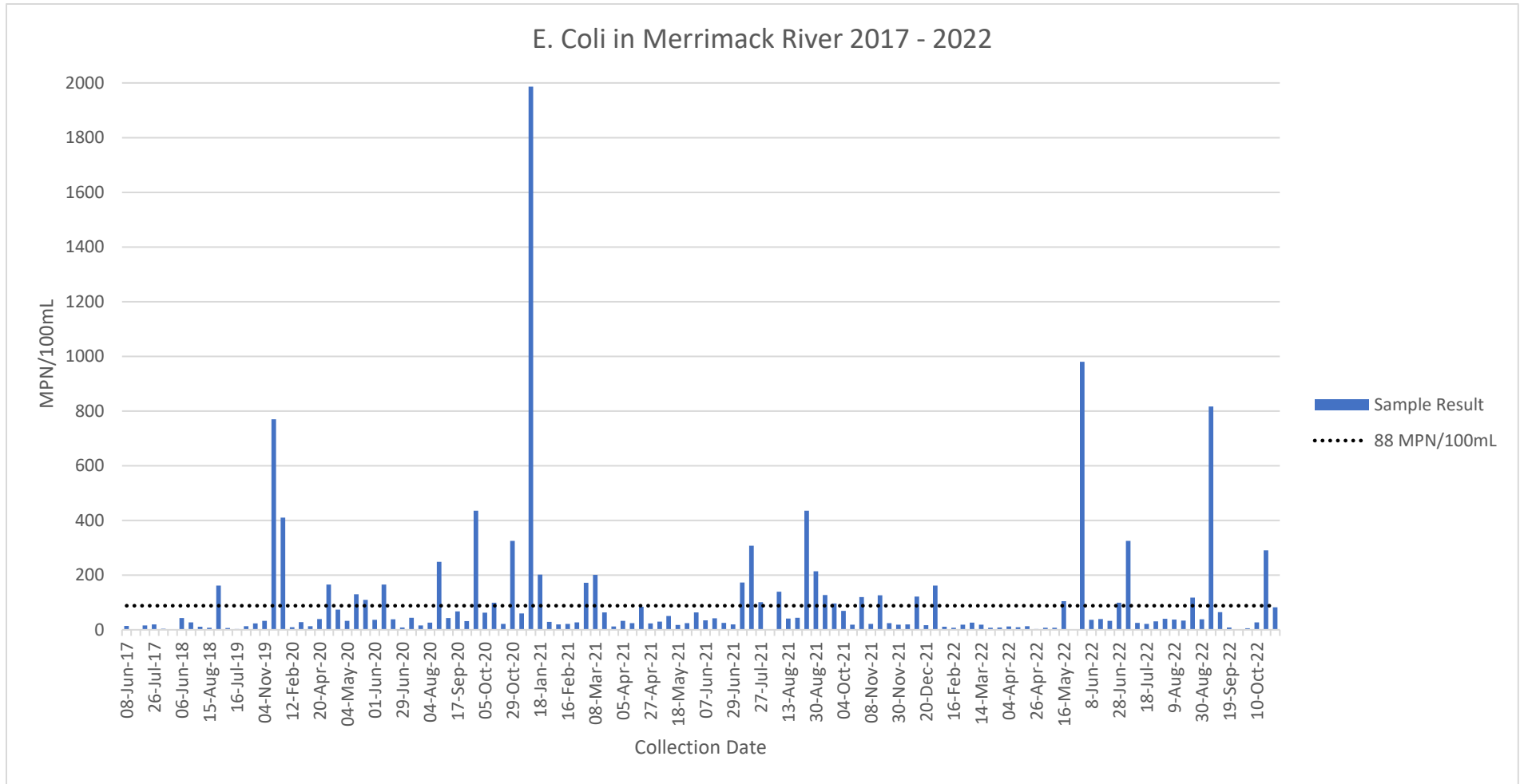


Figure 3. *E. coli* sample results from 2017 to 2021. Source: M Day 2022 October 11, personal communication.

The Souhegan Watershed Association (SWA) collects water samples throughout the Souhegan River Watershed, including locations on the Merrimack River ranging from Manchester to Tyngsboro, Massachusetts. They sample for *E. coli*, like Pennichuck, as well as for dissolved oxygen (DO) and pH. The SWA volunteers sample only during summer months, although they sample at many locations, eight of which are relevant to our focus area. Since the SWA samples at multiple sites on the same day, their data illustrates how a CSO flows down the river, leading to large spikes of *E. coli* at certain locations but low levels at other locations. In the summer of 2022, the SWA's data captured two *E. coli* spikes, one on July 19 and the other on August 30 as seen below in Figure 4. In addition to *E. coli* from CSO events, even a small amount of rain after a long dry period can wash waste into the river, increasing the amount of *E. coli*. Southern New Hampshire experienced drought conditions in the summer of 2022 and heavy rains leading into fall, which is becoming a more common weather pattern in the region.

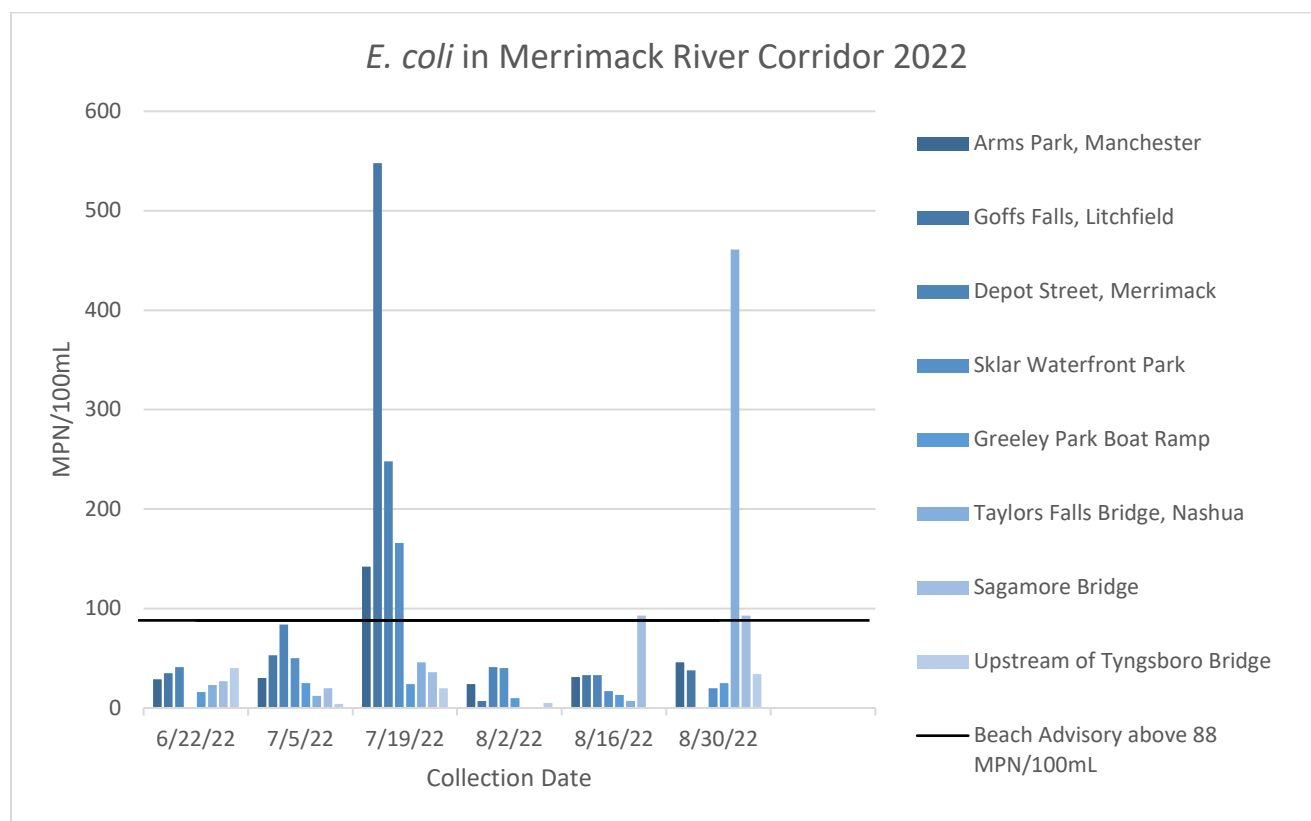


Figure 4. *E. coli* sampling results from the Souhegan River Watershed Association.

Dissolved oxygen is a measure that is important to aquatic wildlife as fish need enough oxygen in the water to thrive. The dissolved oxygen levels in the Merrimack River are typically above 5 mg/L which means they are in a healthy range. Results from the 2022 season can be seen below in Figure 5.

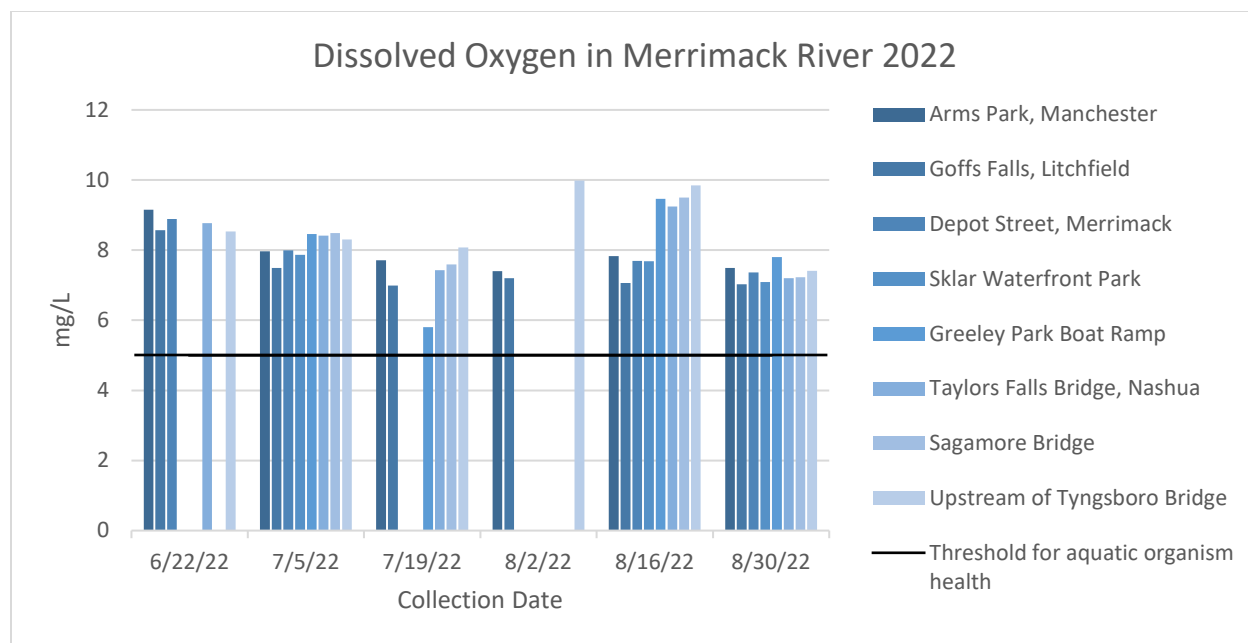


Figure 5. Dissolved Oxygen sampling results from the Souhegan River Watershed Association.

As mentioned above, in this section of the river pH is considered impaired for Aquatic Life Integrity. A pH between 6.5 and 8 is considered acceptable for Class B waters. SWA tests for pH at fewer locations, but their data still shows that pH is consistently above 7, which means the water tends to be more alkaline than acidic. At one location, upstream of the Tyngsboro Bridge, the pH inched upwards quite significantly during the summer of 2022, measuring just below 9 in mid-August (Figure 6).

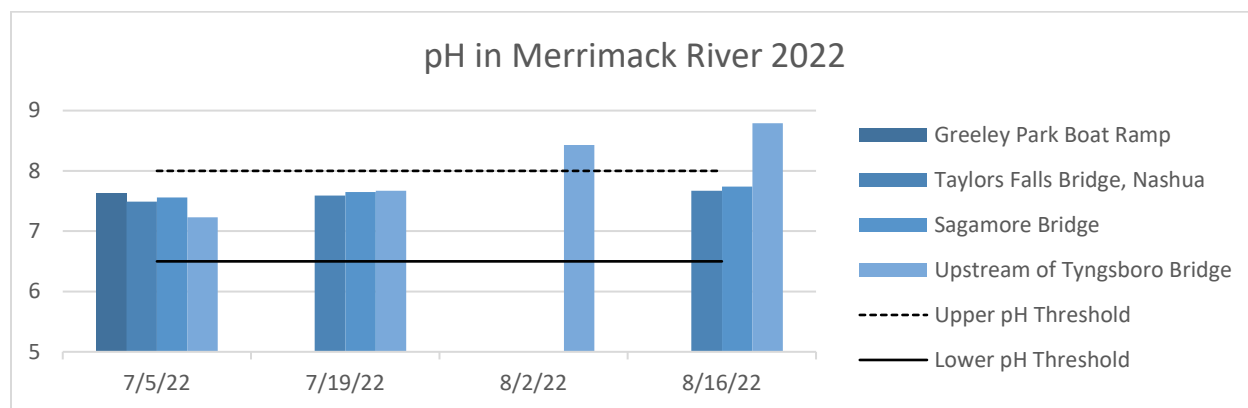


Figure 6. pH sampling results from the Souhegan River Watershed Association.

Nonpoint Sources of Pollution

Nonpoint sources of pollution usually have more than one origin and are difficult to assess and regulate. Nonpoint sources include runoff from agricultural activities, septic system effluent, runoff from construction sites, erosion, road salting, microplastics, and urban stormwater runoff, which often flows directly into the river through stormwater outfalls. Nonpoint sources of pollution are also a serious and recognized threat to the water quality of the Merrimack River.

Map 6 shows stormwater outfalls, which are potential routes for hazardous pollutants to reach the lower Merrimack River and its tributaries if Best Management Practices are not followed. Anywhere stormwater runs off of roads, roofs, or other hard surfaces it carries pollutants into smaller water bodies and eventually into the river. Map 6 also shows the existing water quality monitoring stations that have been established on the Merrimack River.

Road Salt

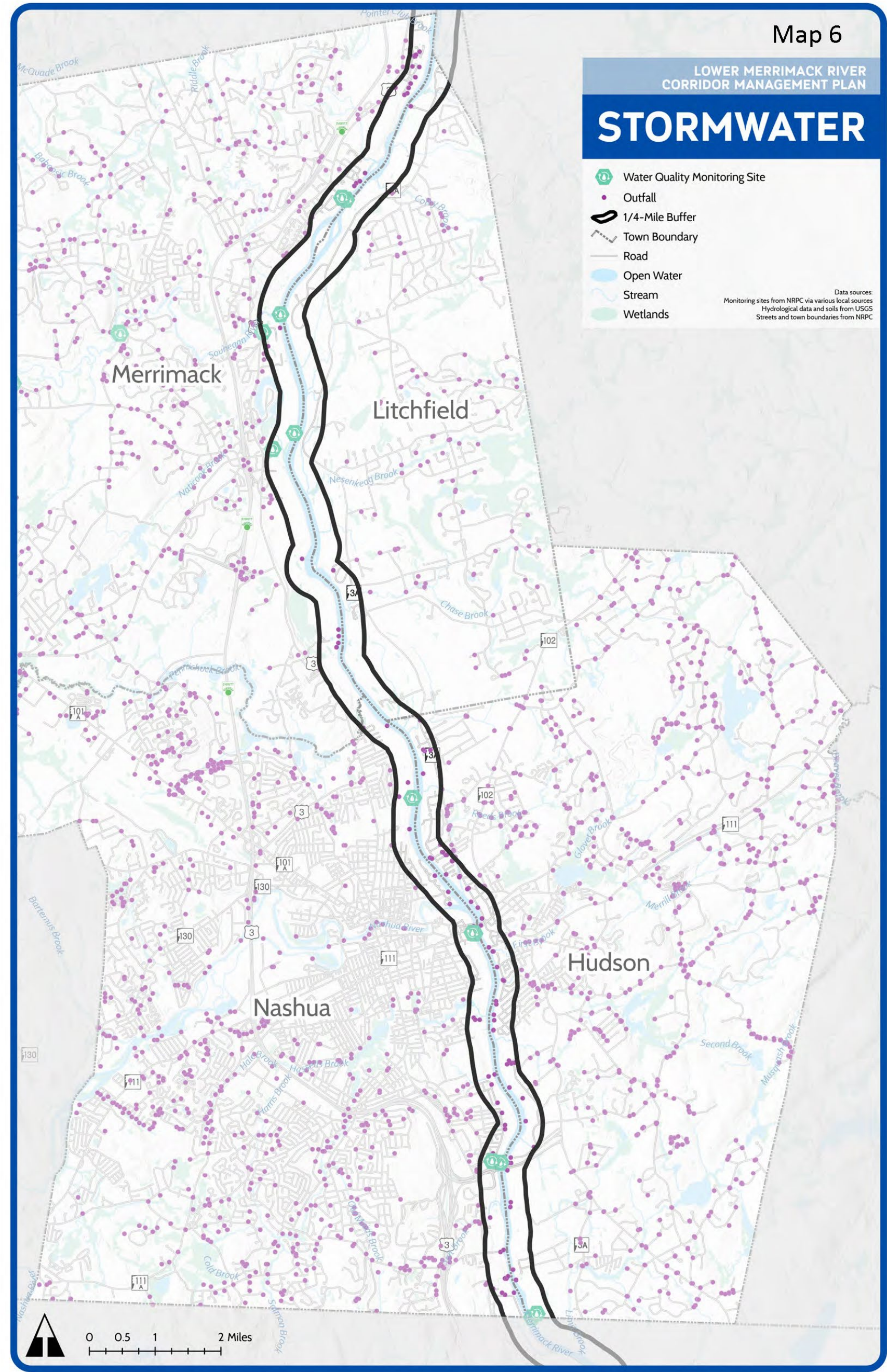
Road salt is a source of calcium and chloride contamination in surface and groundwater. High levels of sodium and chloride in the drinking water supply can pose serious health risks to pregnant women, infants, and people with heart, kidney, or liver diseases, hypertension, and other metabolic disorders. High salt concentrations can also harm animals and plants, kill trees, and corrode metals and concretes. Increased concern for water quality has led to reductions in salt applications particularly in areas impacting public surface and groundwater supplies, and areas containing large numbers or concentrations of individual wells. The Towns of Merrimack and Hudson actively limit their use of salt in these sensitive areas. All roads east of Route 3 in Merrimack are designated as no-salt routes as are roads near municipal wells or surface water supplies. In Hudson, the majority of the no-salt routes are located between the river and Route 3A. No-salt routes in Nashua are limited to the vicinity of the City's water source, Pennichuck Brook. At present, Litchfield has no road salt application policy. The State of New Hampshire is actively working to reduce the amount of chloride used on road surfaces. NH RSA §489-C:2 established a salt applicator certification. NHDES' Green SnowPro Program provides training and certification for private contractors in Best Management Practices for salt reduction and has plans to implement a municipal Green SnowPro program.

While only one waterbody in the corridor communities is currently impaired for chloride (the Nashua canal dike), chloride accumulates over time and is not easily removed. It is easier to prevent a chloride impairment by reducing road salt use than to remediate a water body.

Subsurface Waste Disposal

The entire river corridor in Nashua and the majority of Merrimack is served by public sewer. Approximately two-thirds of the Hudson portion of the corridor is sewered, from the Litchfield town line to Wason Road, including the Sagamore Industrial Park. There is no public sewer system in the Town of Litchfield. Areas that are not served by public sewer rely on private septic systems. Nutrient rich effluent from failed or failing septic systems can drain into the river creating optimal conditions for algal blooms and other aquatic plant growth and contaminating surface water and groundwater with bacteria. The rate of septic system failure should be examined in all areas without sewers.

Current State regulations require septic tanks and leach fields to be setback a minimum of 75 feet from surface waters, wetlands, and open drainage areas. Communities have the authority to adopt regulations that are stricter than State standards, including wider vegetated buffer widths to allow for greater filtration of effluents.



Map 6. Stormwater

Underground Storage Tanks

Leaks in Underground Storage Tanks (UST) are hard to detect and can go unnoticed for long periods of time while causing extensive contamination of water resources. Owners of USTs with a volume of 1,100 gallons or more are required to register and obtain a permit from the NHDES Oil Remediation and Compliance Bureau. Tanks with a volume less than 1,100 gallons, oil transmission and oil production facilities, residential fuel oil tanks for onsite consumption, and tanks for the storage of non-petroleum products are exempt from State regulations at this time. In addition, many tanks currently covered by Env-Or 400 *Underground Storage Tank Facilities* may still not be registered with the NHDES Oil Remediation and Compliance Bureau. There also may be a number of abandoned tanks along Routes 3 and 3A that pose potential threats to the area's surface and groundwater resources.

Table 5 provides an inventory of above-ground storage tanks and underground storage tanks in the corridor communities and identifies the number of underground storage tanks which are leaking and have entered into a remediation program with the NHDES. In addition to inventorying these storage tanks, abandoned storage tanks should be removed, and new storage tanks should be located away from sources of drinking water, including surface waters and underground aquifers.

Hazardous and Toxic Wastes

Several industrial operations exist in the corridor area that use, generate, transport, or store hazardous and toxic chemicals. Facilities that treat, store, or dispose of hazardous wastes are regulated by the Federal Resource Conservation and Recovery Act (RCRA). The RCRA program addresses proper management of hazardous wastes and requires all facilities to obtain an operating permit. The RCRA program operates on a "cradle to grave" practice where the waste is tracked from the facility where it is initially generated, to its storage location, and to its final disposal site. The Federal RCRA program regulates facilities that generate 1,000 kg or more of hazardous waste per month.

The State of New Hampshire *Hazardous Waste Rules* regulates all generators of hazardous waste in two classifications: small quantity generators (less than 100 kg per month) and large quantity generators (greater than 100 kg per month). Table 5 shows how many small and large quantity generators are located in the four corridor communities.

Table 5. Hazardous Waste Sites, Facilities and Releases in the Lower Merrimack River Corridor

Type of Facility or Event	Hudson	Litchfield	Merrimack	Nashua	Regional Total
Above-ground Storage Tanks (ASTs)	22	2	25	56	105
Underground Storage Tanks (USTs)	73	14	67	306	460
Leaking Underground Storage Tanks (LUSTs)	25	2	16	97	140
Oil Spill or Hazardous Release	18	1	12	42	73
Small Quantity Generators (SQGs)	49	4	36	126	215
Large Quantity Generators (LQGs)	11	1	8	25	45
Inactive Asbestos Disposal Sites	145	0	1	184	330
Superfund Sites (listed and proposed)	0	0	1	2	3

The manufacture, transport, and storage of hazardous waste within and nearby the river corridor puts groundwater and surface water at risk of contamination. These facilities should be carefully monitored to quickly detect and contain any spills, and new facilities should be located away from sources of drinking water, including surface waters and underground aquifers.

PFAS

Per- and Polyfluoroalkyl Substances (PFAS) are man-made chemicals that do not break down in the environment (also known as “forever” chemicals) and have been linked to harmful health effects in humans. They are used in consumer, commercial, and industrial products including non-stick cookware and waterproof clothing. These chemicals persist and accumulate in the environment and can be found in soil, water, and our bodies.

In 2016, PFAS were found in groundwater and drinking water wells in Merrimack near the Saint-Gobain Performance Plastics facility. Contamination has since been found in wells and surface waters in nearby towns, including Litchfield and Hudson. Another source of PFAS is foam used for firefighting at airports, such as the Manchester Boston Regional airport located just northeast of the corridor.

Water with PFAS is not safe to drink and must be treated to remove the PFAS – owners of private wells must install a PFAS treatment system or connect to a public water supplier. In July 2020, New Hampshire established Maximum Containment Levels for four types of PFAS, ranging from 11 parts per trillion to 18 parts per trillion. (NHDES no date “PFAS Response”) Regulation of PFAS is rapidly evolving as we learn more about the extent of their impacts. PFAS contamination of groundwater has highlighted the importance of protecting water from contamination in the first place as remediation may be impossible. The Merrimack River, which brings in water from outside the region, must be protected from contamination sources as PFAS contamination of groundwater is affecting the groundwater supply.

Erosion and Sedimentation

Erosion of soil is most common due to construction activities in the corridor. Eroding soil causes sedimentation, which can fill wetlands, reducing water storage capacity during peak flows. Municipal Separate Storm Sewer System (MS4) stormwater requirements have increased the attention paid to erosion control during construction and the management of stormwater during building design.

Within the shoreland area, waves created by large boats undercut banks, causing the soil above to slump and enter the river. Erosion is an issue along the river in the northern part of Nashua. Streambank erosion negatively effects water quality and fish habitats. Simply retaining as much riparian vegetation as possible can reduce erosion and sedimentation and creating living shorelines instead of artificially reinforcing with riprap or other means. Requirements for erosion and sedimentation are discussed in detail in Chapter 3.

Superfund Sites

A Superfund site is any land in the United States that has been contaminated by hazardous waste and identified by the Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment. Sites are proposed by municipalities, then EPA accepts public comments on the sites, responds to the comments, and places those sites that meet the requirements on the National Priorities List (NPL). Any site on the NPL is eligible for cleanup using

Superfund Trust money. Currently, there are two sites on the NPL in the corridor communities: the NH Plating Company site in Merrimack, and the Sylvester site in Nashua. A third site, the Mohawk Tannery (or Granite State Leathers) in Nashua has been proposed for listing on the NPL. These sites are described in Table 6.

Table 6. Existing and Proposed Superfund Sites in the Corridor Communities

Name	Location	Status	Description
NH Plating Company	Merrimack	Listed	Four natural lagoons located on-site were used for disposal of wastes and waste waters resulting from electroplating operations and are now contaminated with volatile organic compounds (VOCs) and heavy metals, Cadmium is present in groundwater throughout the site. Lagoon soils also contain elevated levels of heavy metals and cyanide.
Sylvester	Nashua	Listed	The site was operated as a sand pit for an undetermined number of years. During the late 1960s, the owner began an illegal waste disposal operation intending to fill the sand excavation. Household refuse, demolition materials, chemical sludge, and hazardous liquid chemicals were dumped at the site. The household refuse and demolition materials were usually buried, while the hazardous liquids were allowed to percolate into the ground adjacent to the old sand pit or were stored in steel drums that were placed on the ground.
Mohawk Tannery	Nashua	Proposed	The site is being proposed to the NPL on the basis that sludge discharged from the Mohawk Tannery facility contains elevated levels of arsenic, cadmium, chromium, lead, pentachlorophenol, chlorobenzene, and trichloroethylene, which is in direct contact with ground water, a drinking water source. Wastewater containing chromium also has been discharged directly into the Nashua River via an outfall pipe from a tank on the Mohawk Tannery property. The facility produced tanned hides for leather between 1924 and 1984 and is currently inactive. The former tannery produced both alkaline and acid waste-streams.

While not a superfund site, the Beazer East Inc site in Nashua, just north of the Greeley Park Boat Launch, was the site of a railroad tie manufacturer. This site is likely the source of the creosote impairment mentioned at the beginning of this chapter.

Water Supplies

The river and its tributaries are not free-flowing and are impounded in many locations. Of the Merrimack River tributaries, only Colby Brook and Reeds Brook are free-flowing. However, no dams currently exist in the river corridor. Dams have been constructed to moderate the discharge/flow rates of the river over time, providing storage and release of water during dry periods to temporarily augment flows. Water flow within the river corridor is influenced by the Amoskeag Dam upstream in Manchester

and the Pawtucket Dam downstream in Lowell. According to a US Fish and Wildlife Service special report on anadromous fish, the pool of the Pawtucket Dam extends upriver for 18 miles to a location between Thornton's Ferry and Reeds Ferry in Merrimack. The river has an average flow of 7,500 cubic feet per second (cfs) at the last gauging station in Lowell, MA. The average discharge at the Amoskeag Dam is 4,850 cfs and the Federal Energy Regulatory Commission (FERC) has ordered a minimum release of 833 cfs or whatever is entering the impoundment if less at the dam. The average flows of the major tributaries to the Merrimack River below the Amoskeag Dam are shown in Table 7.

Table 7. Average Flows for Tributaries into the Lower Merrimack River

Tributary	Cubic Feet per Second (cfs)	Million Gallons per Day (mgd)
Piscataquog River	305 cfs	
Souhegan River	281 cfs	
Nashua River	667 cfs	
Average flow within study corridor	5,892 cfs	3,818 mgd

River flow is measured at three gauging stations by the USGS at Franklin Junction and Goffs Falls in NH, and in Lowell, MA. The data from these stations is used to calculate various flow frequencies. The lowest 7-day sustained flow, occurring approximately once in ten years, is commonly abbreviated 7-Q-10. The 7-Q-10 flow is used as the minimum flow for waste assimilation in calculating waste loads. The 7-Q-10 flow at Goffs Falls, located below the Amoskeag Dam, is 667 cfs (432 mgd), while further downstream at the Lowell station, average flow is 930 cfs (602 mgd). The lowest flow at the mouth of the river, 199 cfs (128 mgd) was recorded on September 23, 1923.

When the river flow is high, there is plenty of water to meet drinking water needs and waste assimilation, as well as wildlife and recreational needs. During periods of drought, it may be a challenge to meet these competing needs. The New Hampshire Instream Flow Program (ISF) is designed to protect river flows so that human and wildlife needs can be met. The Instream Flow Program assesses how much water is needed to support wildlife in a particular river and creates Management Plans to reduce water withdrawals during times of drought. NHDES is methodically studying each designated river in the state; the Souhegan River was completed in 2013. Management Plans for many upstream tributaries must be completed before the lower Merrimack River can be assessed.

NH Drought Management Plan, most recently updated in 2016, provides statewide information to communities on how to deal with water shortages. The plan establishes the administrative framework for anticipating drought conditions and coordinating response. It includes monitoring hydrologic conditions, identifies water conservation options, and recommends appropriate response and the roles of participants for four different levels of drought conditions.

Drinking Water

Public Water Systems provide most of the drinking water to residents in the Corridor region, although many households have private wells. Pennichuck Water Works (PWW), operating primarily in Nashua, has 26,000 service connections. The Merrimack Village District has 7,500 service locations, Pennichuck East Utility (PEU), has 2,430 in Litchfield, and Hudson Water Supply has 6,500.

Pennichuck Corporation, parent company of PWW and PEU, sources water from the Pennichuck Brook watershed and from the Merrimack River itself. In the past, water was sourced from the river just during the summer months; in recent years, Pennichuck has built the infrastructure necessary to draw from the river year-round. In addition to Nashua, Pennichuck also provides water to the Town of Hudson, via a pipe near the Taylor Falls Bridge, and the Merrimack Village District to supplement water from their respective public wells. When PFAS were found in private household wells in Litchfield, residents were given the option to hook up to the public water supply from PEU via a pipe that runs under the bottom of the river from the Town of Merrimack to Litchfield.

These developments mean Pennichuck Corporation provides water to residents in all four corridor communities, as well as other communities in the region. Pennichuck relies on the river to provide drinking water for tens of thousands of residents, which makes the Merrimack River a vital source of drinking water. Maintaining and even improving the water quality is of upmost importance: continuing to reduce CSOs, monitor contaminants, and limit the storage and manufacturing of hazardous materials in the corridor to reduce the likelihood of spills. As flood and drought conditions become more common, judicious water use will become more important to ensure that there is enough water to drink.

2.3 Geology and Soils

Geology

The bedrock geology of the lower Merrimack Valley was formed hundreds of millions of years ago during the Ordovician and Silurian periods. The original sedimentary rocks, deposited by shallow seas that once inundated much of New Hampshire, were faulted, folded, and were exposed to high temperatures, and pressures, and eventually eroded. These processes transformed the sedimentary rock into metamorphic rock that exists today. Molten magma from the earth's core intruded into the overlying metamorphic rocks forming igneous intrusions. Granite is the most common form of intrusion in New Hampshire.

The Merrimack Group, underlying the river corridor from the Massachusetts border to approximately the Merrimack-Bedford town line, is the dominant geological formation in the corridor. This group is composed mostly of buff slate, buff quartzose slate and gray calcareous slate in the chlorite zone and purplish-brown biotite schist and gray quartz-mica schist in the higher metamorphic zones. The extreme northern portion of the corridor is underlain by granite, quartz, and granodiorite. In addition, a band of light gray to white medium grained binary granite and quartz monzonite cuts through the corridor just north of Nashua and Hudson.

About 100,000 years ago glaciers invaded and covered most of New Hampshire. This period of glaciation is the most significant factor in the development of the existing landscape. The enormous force of the ice scraped and molded the earth's surface creating the high peaks and outwash plains that exist today. Meltwater channels blocked by debris formed great shallow lakes. As the glaciers began to recede and melt, streams flowing from the ice sheets carried sediments which were deposited in the valleys. As the velocity of the meltwater slowed, the sediments dropped out forming stratified deposits of similar sized grains. These stratified drift deposits are prime locations for aquifers, as discussed in Section 2.1 and shown in Map 4.

Sand and Gravel

Aquifer sand and gravel deposits are also prime areas for sand and gravel excavations. Improper removal of these materials and poor site restoration can negatively impact groundwater quality. The soil above the groundwater acts as a filter by removing suspended contaminants as the water percolates down through the soil. If too much material is removed, the filtering capacity of the soil is reduced and contaminants can reach the groundwater in increased concentrations. RSA 155-E *Local Regulation of Excavation*, prohibits excavations “that would substantially damage a known aquifer, so that designated by the United States Geological Survey.” To protect a community’s aquifers, local excavation regulations can establish a minimum depth of soil that must remain above the seasonal high water table for excavations in the aquifer district. In addition, local aquifer protection regulations would also specify the types of land uses and activities permitted within the district, allowing the community to prohibit uses that have a negative impact on groundwater and to control to some degree the operation of allowed uses.

Topography

The relatively flat and low-lying Merrimack River valley rarely exceeds 200 feet above mean sea level (AMSL) in the four towns within the Corridor. The highest elevations in the study area are found in the northern section of Merrimack where elevations generally range between 150 and 200 feet aMSL. Corridor elevations for the majority of the Town, however, range between 100 and 150 feet aMSL; Litchfield has a similar profile. Elevations in Hudson and Nashua range between 100 to 200 feet aMSL with the majority of the area between 100 and 150. The river itself only drops about 20 feet as it travels the fifteen miles from the Manchester-Bedford line to the Massachusetts border.

The most significant steep slope areas in the study corridor are located along the river in south Hudson from the Massachusetts border to the area near St. Anthony’s Friary and in northern Merrimack from Reeds Ferry to the Bedford-Merrimack town line. Slopes along the river in these areas generally exceed 25 percent; they are very steep and highly susceptible to erosion. Most of the study corridor, however, is comprised of gentle to moderate slopes. The river is characterized by steeply sloping banks that level off to relatively flat areas. In some areas, a flat shelf that varies in width and length can be found just below the edge of the bank; it is about 10-15 feet below the top of the bank in many of the steeper sloped areas in Hudson, southern Nashua and northern Merrimack and Litchfield.

Areas with slopes greater than 25 percent are highly sensitive to development and should be protected to reduce the potential for erosion that could result in sedimentation and water quality problems in the river.

Soils

Soil type is a critical factor in determining the types of land uses and the development potential of a parcel of land. The Natural Resources Conservation Service (NRCS) has conducted extensive surveys and analyses of the soils of Hillsborough County. The general soil map defines broad areas that have a distinctive pattern of soils, relief, and drainage. The soils within the Merrimack River corridor fall into four soil associations: Occum-Pootatuk-Suncook, Hinckley-Windsor, Pipestone-Windsor-Deerfield, and Urban land-Windsor-Canton. Detailed descriptions can be found in Table 8 below.

Table 8. Major Soil Associations in the Lower Merrimack River Corridor

Soil Association	Characteristics
Occum-Pootatuck-Suncook	Composed of deep, nearly level, well-drained, moderately well-drained, and excessively drained, loamy and sandy soils on floodplains. Extends on both sides of the river from just below the junction of the Nashua and Merrimack Rivers north to just south of the Sawmill Brook in Litchfield. Suitable for farming and support a substantial amount of agriculture in the Town of Litchfield.
Hinckley-Windsor	Typified by deep, nearly level to steep, excessively drained, gravelly and sandy soils on terraces. Used for urban and suburban development for which they are well suited. Poor agricultural uses due to poor moisture holding capacity.
Pipestone-Windsor-Deerfield	Deep, nearly level to gently sloping, poorly drained, excessively drained, and moderately well drained, sandy soils mostly in depressions on stream terraces. Not suitable for most uses because of a high seasonal high-water table. Windsor soils, however, are well suited for development and are commonly a good source of sand for construction.
Urban land-Windsor-Canton	Deep, nearly level to sloping, excessively drained and well drained, sandy and loamy soils on terraces and uplands. Most of the land in this association has been developed along both sides of the river in Hudson and Nashua beginning at the Massachusetts border.

Fluvial Geomorphology

While the Merrimack Valley is already low-lying with little elevation change, the lower Merrimack River appears to be even more placid because it is primarily within the pool of the Pawtucket Dam in Lowell. Although there are no dams within this stretch, the water level is closely controlled by dams to the north and south. The river meanders a bit but is relatively straight, and has one oxbow pond, in Merrimack. A levee protects a heavily developed portion of Nashua where the Nashua River joins the Merrimack. The bottom of the river is sandy and there are large boulders present in some stretches. The east side of the river, along Litchfield and Hudson, has very steep banks while the banks on the west side are lower. Evidence of bank undercutting can be found on the west side, in Nashua, and high waterflows have damaged the public boat launch in Merrimack. The floodplain is widest along the stretch between Merrimack and Litchfield, which is where the Souhegan River and Baboosic Brook enter the river and the river has its biggest bend, shifting to take a more easterly path.

2.4 Wildlife, Fisheries and Vegetation

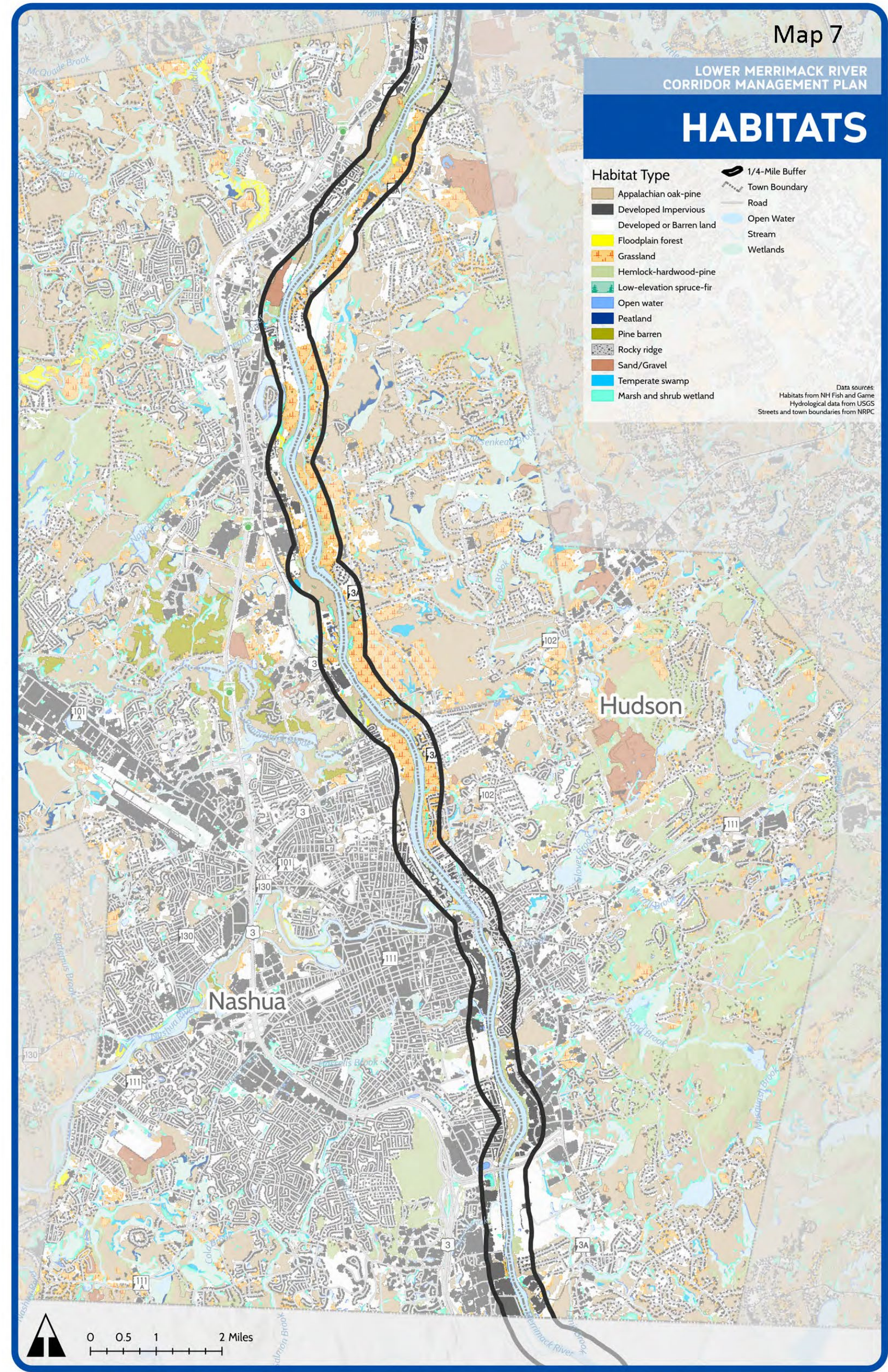
Wildlife

The Merrimack River corridor provides habitat for a diversity of fish and wildlife species including several state protected, endangered, or threatened species. This diversity provides many recreational opportunities for fishing and bird watching. Diverse habitats such as wetlands, forests, fields, rivers, and streams support a variety of species in quantities healthy enough to ensure continuation of the species.

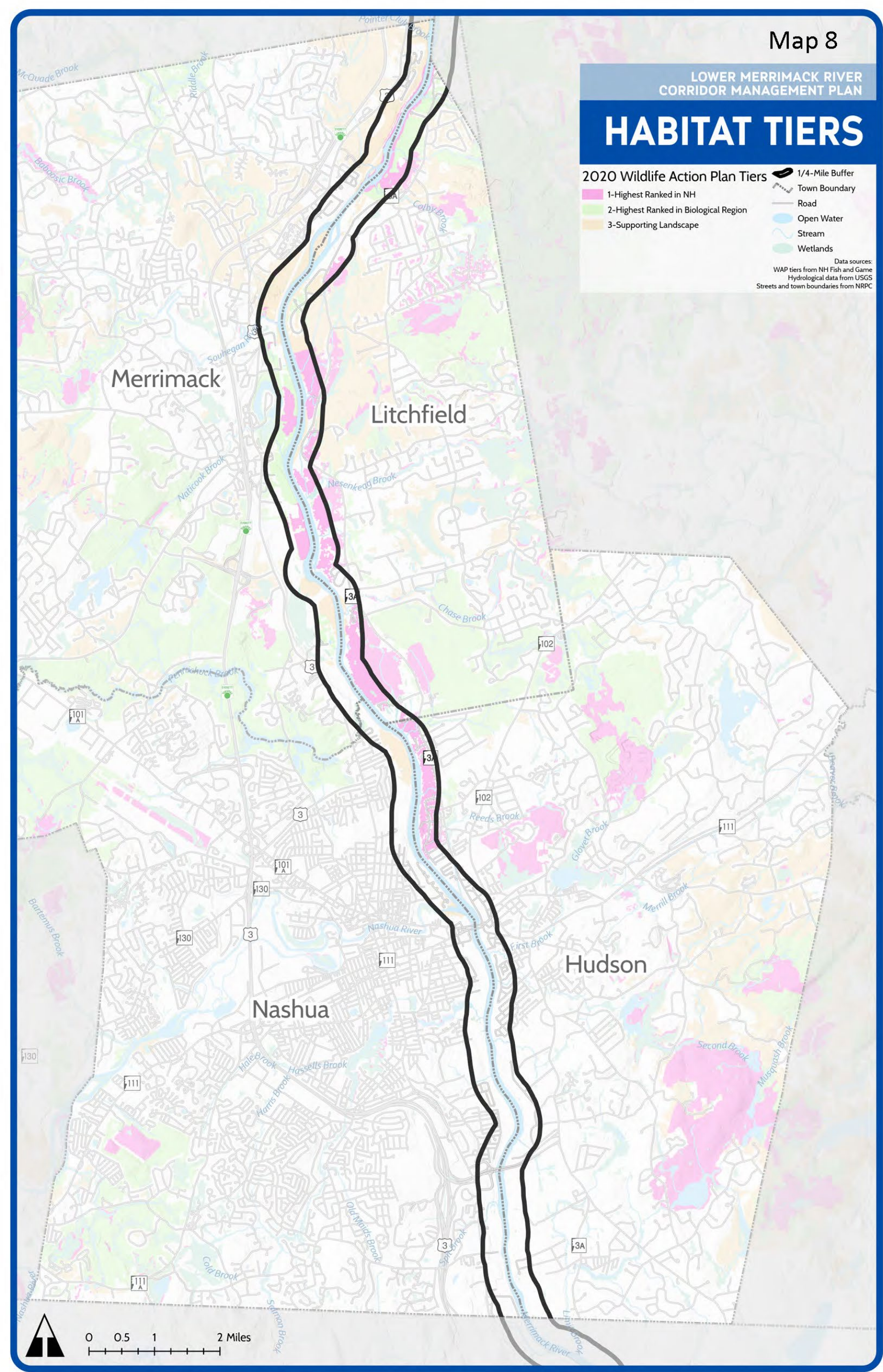
Maintenance of quality habitat is important to the survival of all species. Ensuring that the water quality is healthy provides good habitat for plants and animals and ensures that humans have safe water to drink. Wildlife habitats are shown in Map 7. The New Hampshire Wildlife Action Plan provides information on wildlife habitat and its relative condition as compared to other similar habitats in the state. Map 8 shows the quality of habitat in the corridor communities, as ranked in the Wildlife Action Plan.

State and federally listed threatened and endangered species present within the four corridor communities appear in Appendix 1. Only one federally threatened species is present within the lower Merrimack River corridor, the Bald Eagle. A legally protected species in New Hampshire, Bald Eagles inhabit the river corridor during the winter months. The corridor provides the necessary elements of eagle winter habitat, perch, and roost sites along open waters for fishing and it is second only to Great Bay in winter eagle activity. Perch sites, large open branched trees usually deciduous or pine, located on the riverbank or river islands, are used by the eagles during the day and provide good viewing areas for locating food. During the evening the eagles move inland to more sheltered areas, usually conifer stands that offer protection from wind and harsh temperatures. The presence of humans in wintering areas could have a negative effect on eagle populations within the state.

The Blanding's Turtle, Eastern Box Turtle, New England Cottontail, and Eastern Hognose Snake are all listed as endangered by the State and have been identified in multiple communities in the Corridor region. The endangered Karner blue butterfly has historically been found in the region.



Map 7. Wildlife Habitats



Fisheries & Aquatic Connectivity

Game species in the river include yellow perch, chain pickerel, brown bullhead, white perch, small mouth bass, large mouth bass, walleye, carp, and rock bass. Non-game species include pumpkin seed, white sucker, golden shiner, red-breasted sunfish, American eel, fall fish, and gold fish. It is possible to find some brook trout in the rocky fast waters.

Anadromous fish species such as blueback herring, alewife, and American shad are returning to the river because of the anadromous fish restoration program begun in 1969. The program is a cooperative effort between the Massachusetts and New Hampshire state fisheries agencies, the US Fish and Wildlife Service, and the National Marine Fisheries Service. The first decade of the program focused on describing and quantifying the habitat for Atlantic salmon and American shad. The results of the analysis projected that the habitat could support adult populations of 1,000,000 shad and 11,000 Atlantic salmon. It was also determined that six barriers on the main stem of the Merrimack River would require fish passage facilities for shad and salmon with two additional passage facilities required for salmon on the Pemigewasset.

As mentioned above, there are no dams on the lower Merrimack River itself. However, there are dams downstream, which may prevent fish from traveling north to this section of the river, as well as on many of the tributaries in the corridor, including multiple dams on the Nashua River, Salmon Brook, and Pennichuck Brook. Fish passage facilities are present at the Essex Dam in Lawrence, the Pawtucket Dam in Lowell, and the Jackson Mills and Mine Falls dams in Nashua. Existing dams can be seen in Map 9.

While Atlantic salmon counts were as high as 400 in 2011, in recent years less than a dozen of the species have been counted at the Essex Dam Fish Lift in Lawrence, MA. Efforts to bring salmon back to the Merrimack River have largely been abandoned.

The NHDES NH Aquatic Restoration Mapper (NHDES no date “Restoration Mapper”) is a way to access the data from the state’s stream crossing inventory initiative. The restoration mapper depicts where culverts or other infrastructure prevents fish, turtles, and other aquatic organisms from migrating or moving through the environment. In the four corridor communities, only 22% of the stream crossings allow for full passage by all organisms. The remaining allow for reduced or no passage or could not be evaluated. The percentages are shown in Figure 8 below. Figure 9 shows the locations of the crossings, and their status, within the corridor communities.

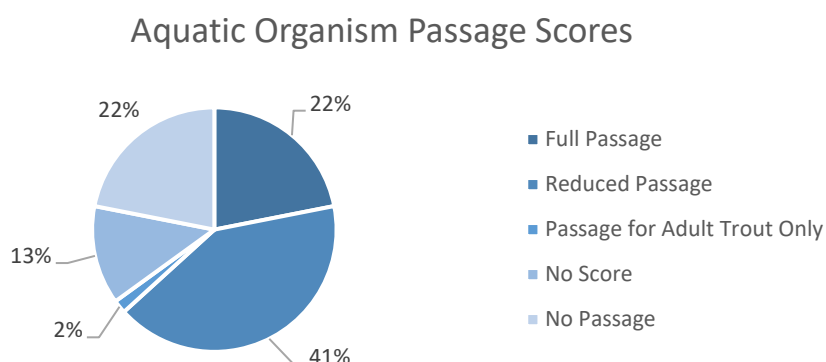


Figure 7. Percentage of aquatic organism passage facilities meeting standards.

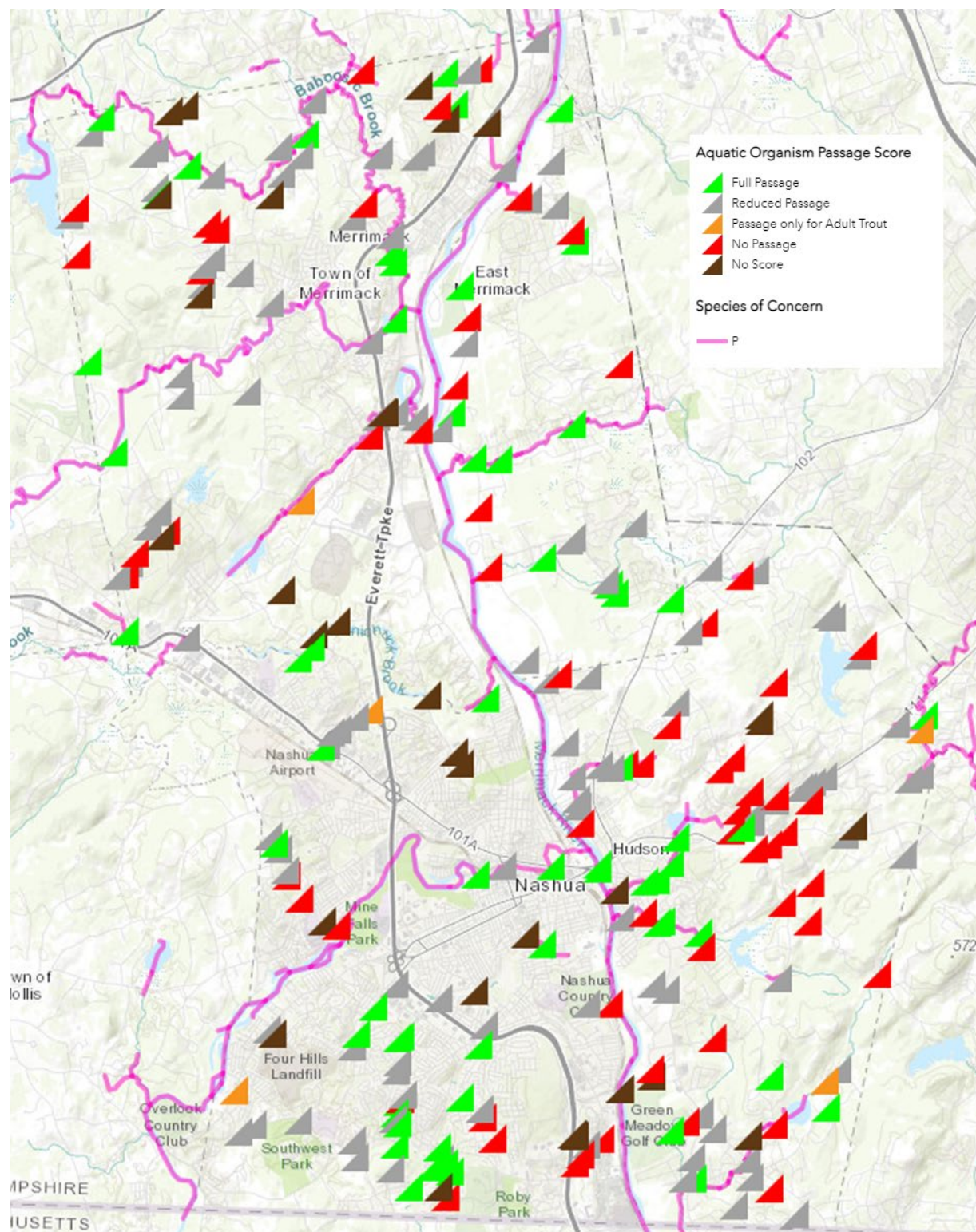
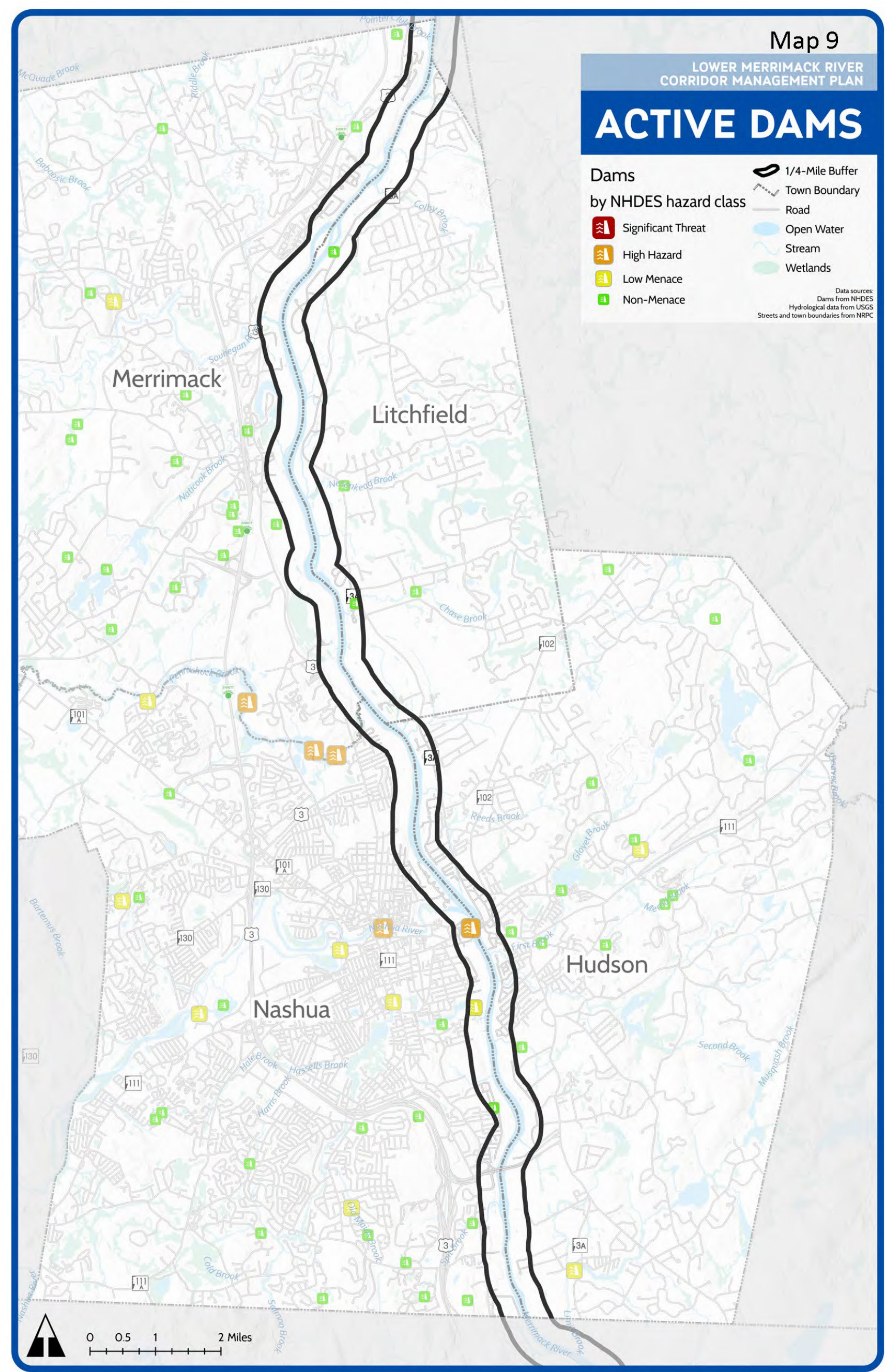


Figure 9. Aquatic Organism Passage in Lower Merrimack River Corridor Communities.



Map 9. Active Dams

Vegetation

Typical tree species found in the corridor include:

- Black locust
- Sycamore
- Silver maple
- Red maple
- Birch
- Aspen
- Red spruce
- Black spruce
- White pine

Most of the parcels along the river are too small to make commercial forest harvest viable, so their value as development property exceeds their value as forest land. A wide variety of grasses and shrubs can also be found in the corridor. Many plant species listed by the State as endangered are present in the four corridor communities. See Appendix 2 for full listings of endangered species.

The NH Natural Heritage Bureau has identified important natural communities present in the corridor communities. They include: Rich Appalachian oak rocky woods in Hudson and Merrimack, and Kettle hole bog system, sand plain basin marsh system, and three-way sedge – mannagrass mudflat marsh in Litchfield.

2.5 Scenic Views and Vistas

Scenic views, north and south, can be obtained when crossing the Taylors Falls and Sagamore Bridges in Nashua/Hudson. Greeley Park, in Nashua, Merrill Park, in Hudson, Sklar Waterfront Park in Merrimack and Moore's Falls in Litchfield also offer scenic views of the river and direct public access.

From the river itself, almost the entire riverbank is scenic. The banks of the river rise to a level where much of the development is blocked from view. Development can only be seen where buildings and parking areas are located directly at the top of the riverbank and are not screened by vegetation. Many species of birds and other wildlife can also be seen from the river.

Riverbank developments can be designed to fit into the natural landscape. Buildings, structures, and other site developments, for example, can be setback from the top of the bank and screened from the river by a vegetative buffer. The BAE Systems development in south Hudson provides a good example of effective use of setbacks and vegetative screens. The development can barely be seen from across the river. Height limitations for buildings and structures can also be used to conserve the visual integrity of an area. In addition, planting vegetative buffers around existing developed areas will screen the development from the river and help stabilize the soil. Clearcuts or extensive thinning of existing tree stands can have negative impacts on the visual quality of a view or vista as well as create situations ripe for erosion. On the other hand, selective cuts and thinning can open views that have been obstructed by vegetation growth. Proper site planning can ensure developments are designed and constructed to fit harmoniously into the landscape.

2.6 Agriculture and Conservation

Agricultural Lands

High quality or prime farmland is a very valuable but limited resource. The characteristics that make the land prime for agriculture also make it prime for development. Realizing the need for conserving the existing prime farmlands, the Natural Resource Conservation Service has developed a classification system based primarily on soil type to assist national, state, and local agencies in identifying prime farmland areas.

The SCS classification contains four farmland categories: prime, unique, state-wide important, and locally important. The specific characteristics of each farmland classification are listed in Table 9.

Table 9. Farmland Classification

Type of Farmland	Characteristics
Prime	• Land best suited for food, feed, forage, fiber, and oilseed crops. • Land with soil quality, growing season, and moisture supply to economically sustain high yields of crops when properly treated and managed. • Land that can be continuously farmed without degrading the environment. • Land which requires the least investment and the least amount of energy for maintaining productivity. • Croplands, pasture lands, forest, or other land, but not urban built lands.
Unique	• Land other than prime used for specific high value food and other crops. • Land with a combination of soil quality location, growing season, and moisture supply that will sustain a high quality / high yield of a specific crop (apple orchards, blueberry lands, vegetable truck gardens).
Statewide	• Land identified as important by state agencies. • Land that could not be considered prime because of soil characteristics of erodibility and droughtiness. • Land that requires greater input of fertilizers, soil amendments, and erosion control.
Local	• Land identified by local agencies. • Poorly drained land with drainage improvements established. • Fair to good crops when properly managed.

Prime farmland soils are most extensive in the Town of Litchfield, approximately 80 percent of the total area, while locally significant soils comprise another 10 percent. Prime farmland soils are especially rare in New Hampshire. Given this, the Trust for New Hampshire Lands has identified all the prime farmland soils in Litchfield as being of State significance for the purposes of protection through the Land

Conservation Investment Program. Land costs in southern New Hampshire, however, may prohibit the program from purchasing any parcels and make it difficult even to obtain easements.

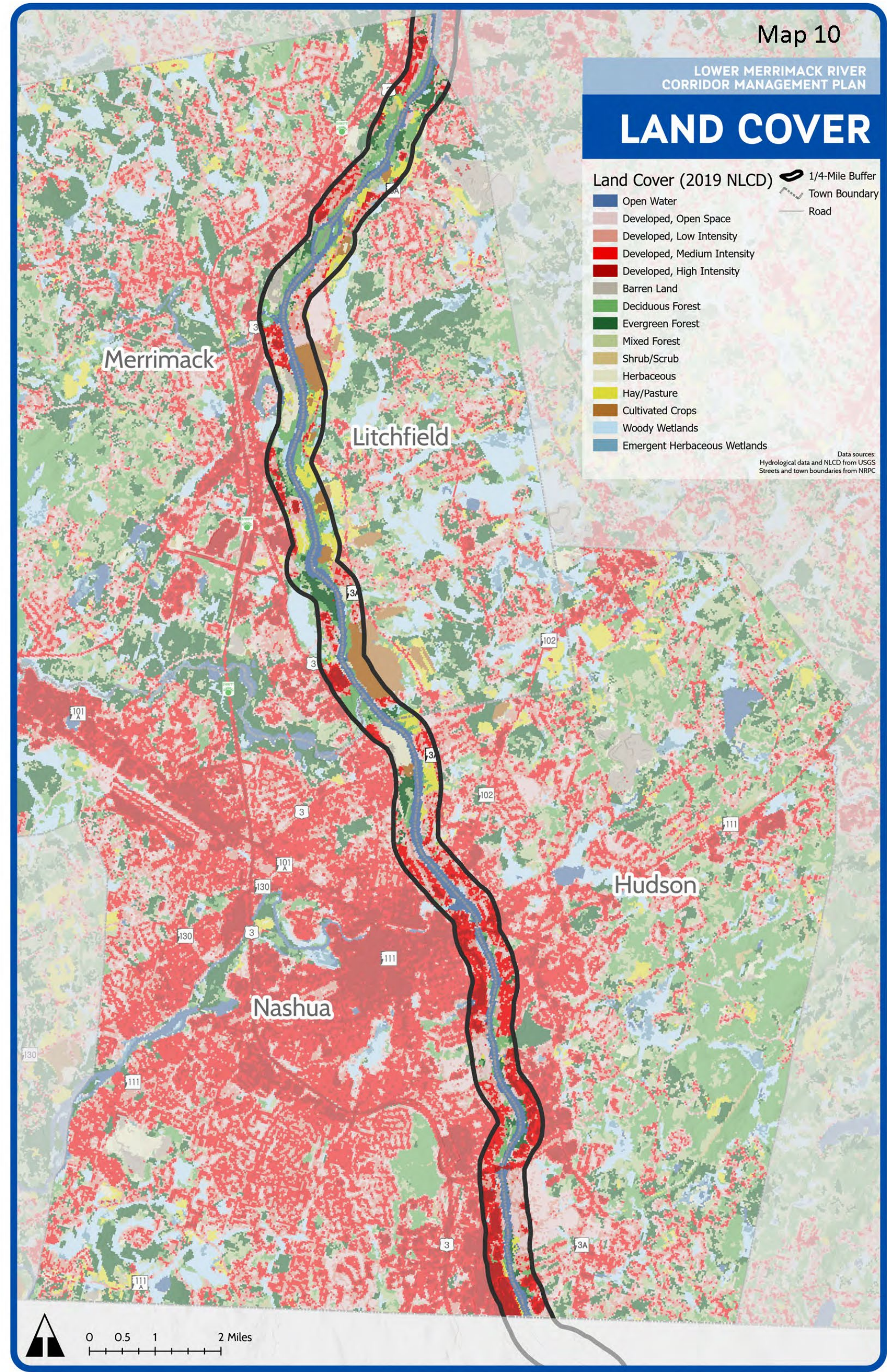
Much of the prime farmland in the corridor has been developed. Most of the prime farmland soils in Merrimack and Nashua are located adjacent to the railroad tracks. Other prime farmland areas are tied up in large parcels of industrial lands, such as those owned by Anheuser-Busch. Much of the remaining farmland soils have been developed for residential and commercial use, particularly along NH Routes 3 and 3A. Of the four communities, Litchfield contains the most undeveloped farmland in the river corridor. Increasing land values and development pressures, however, are rapidly changing this situation.



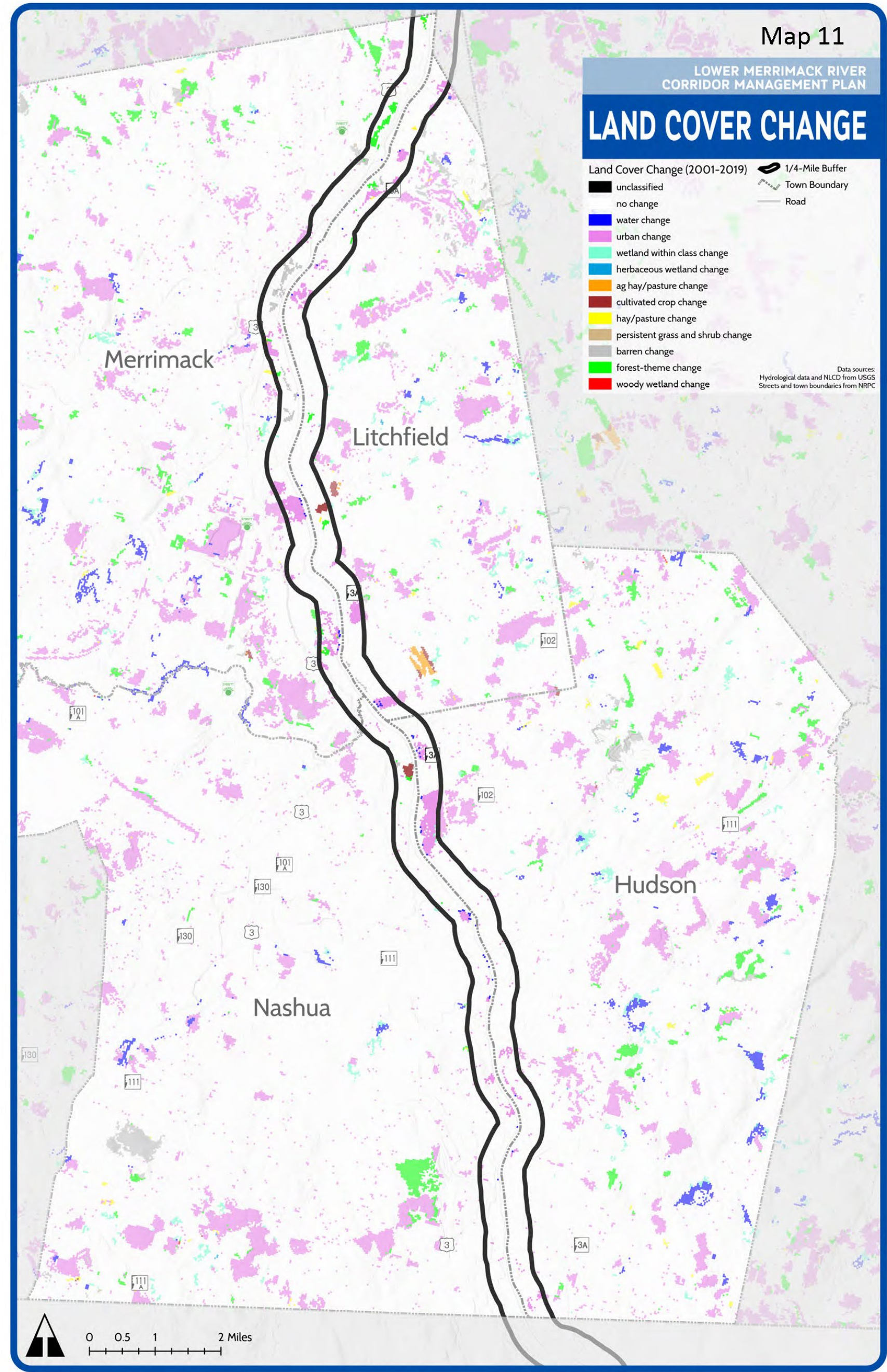
Figure 8. New development in Litchfield's Corridor

In addition to producing food and fiber, agricultural land use is an important form of open space in a community. Open fields and farm buildings provide diversity in the landscape and the pastoral setting is pleasing. Active agricultural operations in the Corridor are largely limited to the Litchfield section of the riverbank. While agriculture has been the dominant land use in the Litchfield portion of the Corridor, development is rapidly occurring. Land prices have risen dramatically, making it less profitable to keep land in agricultural use and more profitable to sell. Active agriculture should be conserved to ensure the continued local production of food and fiber, to maintain open space and diversity in the landscape, and to retain the cultural aspects associated with farming life. The ability to conserve productive farmland in parcels large enough to provide for efficient use of the land with generation of sufficient economic returns for the farmer is an issue with which the region will continue to struggle.

Map 10 and Map 11 show landcover and change in landcover from 2001 to 2019. While there are still large swaths of cultivated crops and hay/pasture in the Litchfield segment of the corridor, the change in landcover map shows that significant areas in Hudson, Litchfield and Merrimack have become urbanized in the last two decades. While agricultural uses can cause stormwater runoff containing fertilizer, pesticides, and animal waste, residential or industrial development increases the impervious surface area and may have even higher potential for problematic runoff. With increasing land costs and pressure to develop more housing, these agricultural areas are vulnerable to development.



Map 10. Land Cover

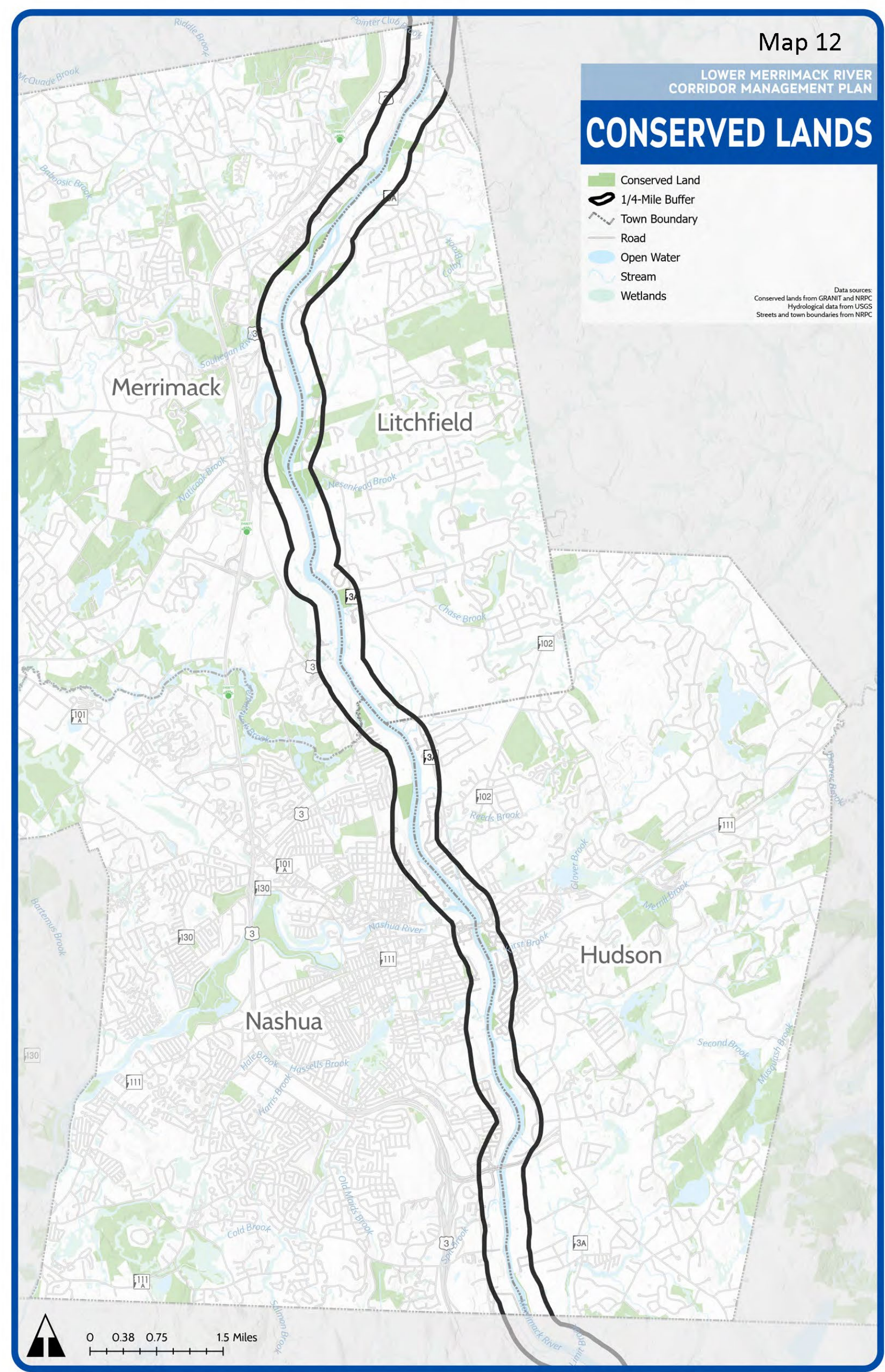


Conservation Lands

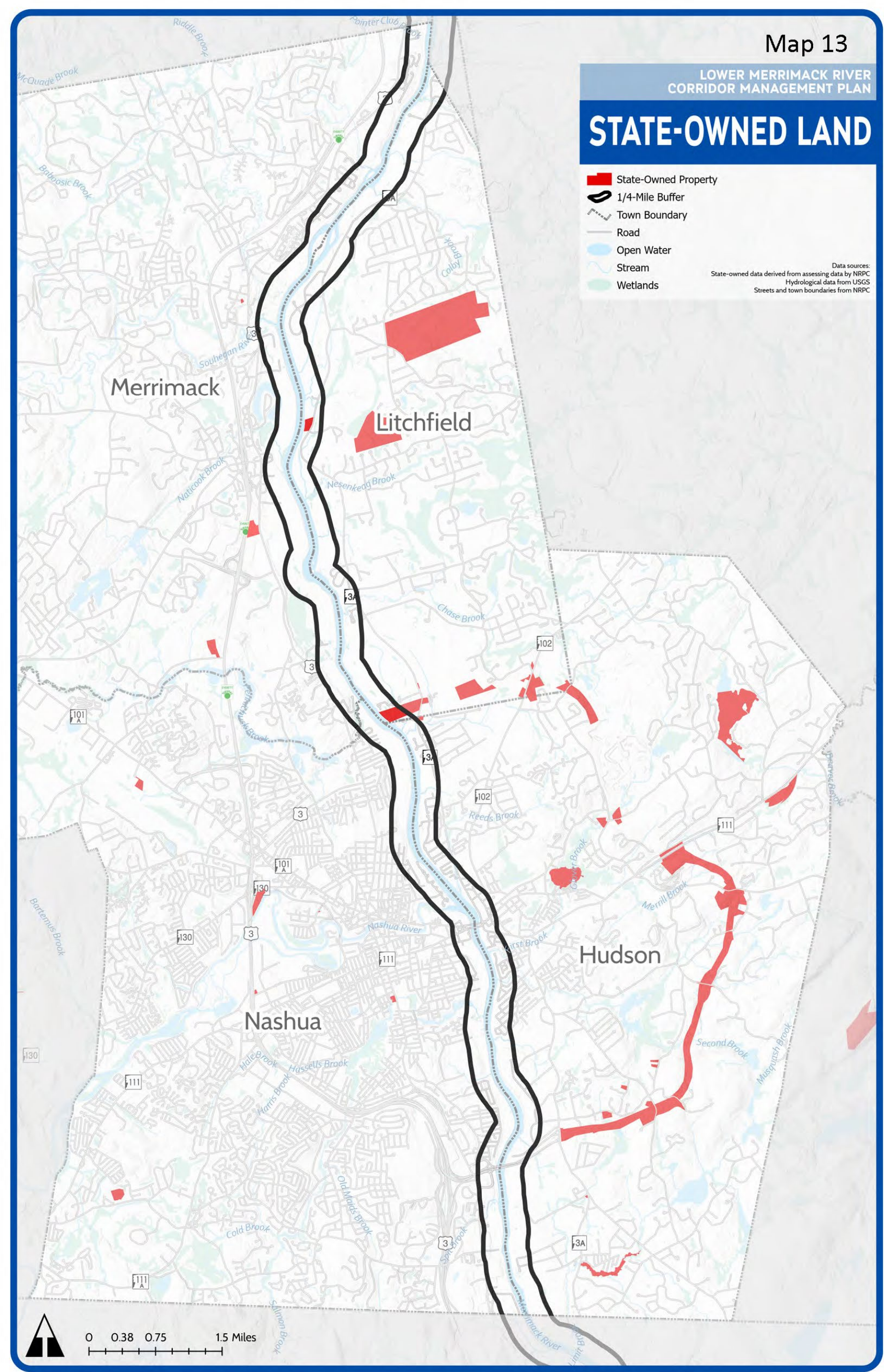
Of the total 5,087 acres within the lower Merrimack River corridor, approximately 193.3 acres (4%) have been set aside as permanently protected open space. Additionally, another 251 acres (5%) are secured in public recreational lands (ball fields, municipal parks, etc.) that provide an important contribution to public spaces, habitat areas, and scenic relief from development. While conservation commissions have made strides acquiring land in the last decade, including Sklar Waterfront Park in Merrimack, the majority of the land within the corridor is either developed or at risk of being developed. Map 12 depicts the locations of conservation lands within the corridor communities.

State-Owned Lands

The only state-owned lands within the corridor itself appear to be in Litchfield. There is a 37-acre parcel in southern Litchfield and a 6.8 acre parcel further north, across from Old Stage Road. There are no details available about the larger parcel but the smaller parcel appears to be owned by New Hampshire Fish and Game. Those parcels as well as other parcels owned by the state in the four corridor communities can be seen in Map 13.



Map 12. Conserved Lands



Map 13. State Owned Lands

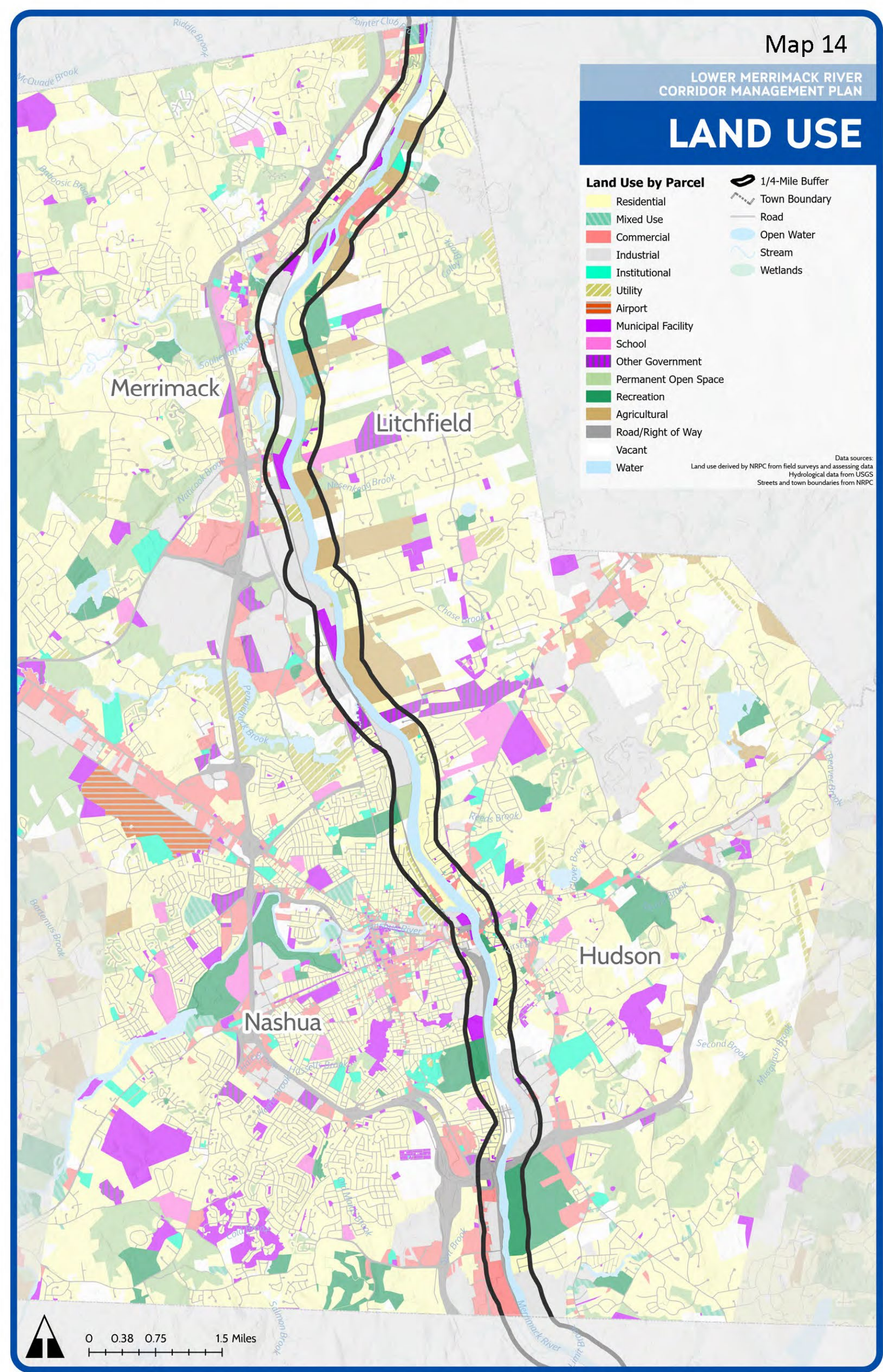
2.7 Existing Land Uses

Moving beyond land cover, land uses are often more intuitive ways of viewing development patterns than zoning, since most everyone can relate to residential, commercial, and industrial uses, whereas zoning is strictly codified and described differently between towns. General land uses within the quarter-mile river corridor for each of the towns is quantified in Table 10 and are illustrated in Map 14.

Table 10. Existing Land Use Types in the Lower Merrimack River Corridor

Land Use	Hudson		Litchfield		Merrimack		Nashua		Corridor Total	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Agricultural	16.4	1%	377.1	29%	0.0	0%	0.0	0%	393.5	8%
Commercial	14.6	1%	61.8	5%	41.2	3%	128.7	11%	246.3	5%
Group Quarters	0.0	0%	0.0	0%	1.1	0%	0.0	0%	1.1	0%
Industrial	215.8	19%	0.0	0%	381.8	27%	215.3	18%	812.9	16%
Institutional	1.9	0%	16.6	1%	0.2	0%	0.0	0%	18.7	0%
Mixed Use	2.0	0%	25.7	2%	17.3	1%	1.3	0%	46.3	1%
Municipal Facility	9.7	1%	23.6	2%	97.3	7%	47.5	4%	178.0	3%
Other Government	3.3	0%	21.4	2%	12.8	1%	16.5	1%	54.0	1%
Perm. Open Space	11.4	1%	72.2	5%	77.3	6%	32.4	3%	193.3	4%
Recreation	140.4	12%	39.7	3%	0.8	0%	70.4	6%	251.3	5%
Residential	382.6	33%	305.7	23%	121.1	9%	196.9	16%	1006.3	20%
Road	97.7	8%	40.9	3%	85.1	6%	97.2	8%	320.9	6%
Right-of-Way	0.3	0%	1.8	0%	36.3	3%	118.9	10%	157.3	3%
School	0.3	0%	8.0	1%	0.0	0%	4.4	0%	12.7	0%
Utility	0.0	0%	14.5	1%	30.2	2%	18.4	2%	63.1	1%
Vacant	33.8	3%	73.5	6%	240.5	17%	47.0	4%	394.8	8%
Water	230.2	20%	235.0	18%	262.2	19%	208.8	17%	936.1	18%
Total Corridor	1,160.4	100%	1,317.5	100%	1,405.2	100%	1,203.5	100%	5,086.7	100%

The character of each community may partially be captured by the land uses which have the highest percentages: Merrimack's land uses are predominated by industrial and vacant uses; Litchfield's are agriculture, closely followed by residential; Nashua has high percentages of industrial, residential, and commercial uses; and Hudson has high percentages of residential and industrial uses. For the region, residential uses make up the largest percent of land area, at 20 percent.



Map 14. Land Use

2.8 Public Access and Recreation

The Merrimack River provides many recreational opportunities: boating, canoeing, kayaking, rowing, fishing, and swimming on the river, and hiking, cross country skiing, picnicking, birdwatching, nature study, and enjoyment of the scenic views along its banks. State and federal studies have identified the need for increased recreation areas and facilities to serve an ever-growing and changing population.

Since the river corridor is in a heavily populated area, increased recreational opportunities could serve a large number of people within a range of economic and social sectors. Unfortunately, recreational activities on and around the Merrimack River are limited, partly due to an extremely limited number of public access points. Some progress has been made, as a new access point was established in 2018 for Litchfield Residents at the John Bryant River Access, and the Greeley Park Boat Ramp in Nashua was rebuilt in 2020. Still, existing trails along the Merrimack River are underutilized since they are not connected in a cohesive network, often do not have adequate parking or other facilities to provide a comfortable recreational experience, and as is the case in many urban settings, trail conflicts between user types are not uncommon.

Boating

Boating on the river includes both motorized and non-motorized including canoeing, kayaking, and crewing. Boating use is limited most directly by public access, with only four public boat launching facilities within the river corridor. The Greeley Park boat ramp is the only public launch that is capable of handling large watercraft and trailers. Large watercraft use is also impeded by the abundance of shallow or rocky waters, making the river more suitable for canoes, kayaks, and other small watercraft. Since shorelines are often shallow and contain submerged snags and other debris, the use of jet skis is also somewhat hazardous.



Figure 9. John Bryant River Access in Litchfield

The river is used by canoers and kayakers for both rapids and flat-water experiences. The stretch of the river from the Amoskeag Dam to Moores Falls contains quick water and rapids ranging from Class I to

Class III in difficulty. Below Moores Falls is a five-mile reach of flat-water and quickwater to Cromwells Falls, another short rapid with a varying degree of difficulty depending on the water's level. Below Cromwells Falls, the river is flat to the state line.

Members of the Independence Rowing Club also train competitively on the Merrimack River, with a seasonal dock on the river just south of the Taylors Falls Bridge. When water levels in the river are typical, four lanes of rowers can be safely accommodated, however, at low levels two lanes are safely accommodated.

An increase in the number and location of access points would enable a larger portion of the population to use the river for boating. In addition, the general population needs to be informed about the opportunities for boating on the river, the types of boating most appropriate, the location of access points, and the impacts of boating on natural communities and water quality.

Fishing

Small and large mouth bass are the most important game species in the Merrimack River, while other species include perch, pickerel, and walleye. Fishing on the river is done from both the shore and from small watercraft. Programs are currently in place to restore anadromous fish to the river. Established shad runs would increase the use of the river for angling, particularly from the shore; however, the success of the anadromous fish restoration effort depends upon the conservation of important habitats and continued efforts to allow fish to pass the existing dams.

Swimming

Swimming is not currently recommended within the study corridor if it has rained recently as bacteria from raw sewage may still be present from CSOs upstream. However, more than four days after a rain event, the water quality conditions are considered safe for swimming. Water quality has been improving steadily due to improvements in wastewater treatment and the reduction of CSO events.

Hiking

Participation in hiking, walking, and other trail activities takes place in the corridor area along the banks of the river where permitted by formal easement, as pictured in Figure 11. The Merrimack River was also selected as part of the New Hampshire Heritage Trail which when completed would extend the length of the state. The trail is envisioned to be an interconnected network of trails developed and constructed by individual communities rather than a statewide project, even though the Division of Parks and Recreation was designated as the agency responsible for overseeing the development of the trail and for selecting the locations.

Trail development and maintenance of the existing trails in the corridor is first determined by the types of uses allowed and expected on trail systems. However, even after trails are designed and constructed, issues such as requirements for upkeep and maintenance, trail security and law enforcement (especially in relation to vandalism) and issues of landowner liability need to be addressed. Fortunately, there are several models of successful trail development and maintenance projects to serve as examples. Additionally, RSA 212:34 and RSA 508:14 provide protection to landowners providing public uses on private properties.



Figure 10 Trail in Litchfield

Recreation and Public Access Survey

A survey of the general public was distributed between March 1, 2022 and April 28, 2022 to learn more about how and why people access the lower Merrimack River. The electronic survey was created using the MetroQuest platform and distributed via LMRAC members, conservation commissioners, social media, and monthly newsletters from the Nashua Regional Planning Commission and the Merrimack River Watershed Council. Eighty-four respondents answered questions.

Of the 84 respondents, 77 individuals (87%) were familiar with the Merrimack River, although 3 had not known the river's name. Sixty-one respondents (73%) reported that they spend time on or near the water.

Most of the respondents first found access to the river through their friends or family: 30% first found access to the river by word of mouth while an additional 19% grew up going to the river and 5% own property on the river. Only 11% found access to the river through an organized event or through a municipal website and 13% stumbled upon the river by chance.

When asked which outdoor activities they typically enjoy, the most common responses were hiking (61%), boating (60%), sightseeing (45%), birdwatching (38%), or fishing (32%).

Respondents thought that public access to the river could be improved with places to sit by the river (30%), more boat ramps (29%), and more hiking trails (23%). Nine percent of respondents thought boat rentals would improve access. Respondents also suggested improving the current public access points, creating a kayak launch, protecting the visual aesthetic, and not allowing land development on the waterfront.

Organizations

When asked “what organizations do you think of as promoting public access to the lower Merrimack River,” respondents most often listed the four local conservation commissions, the Merrimack River Watershed Council, Nashua Area Kayak Exploration Destinations group on Facebook, New Hampshire Fish and Game, the Society for Protection of NH Forests, the Independence Rowing Club, kayak rental companies, LMRLAC, and the Lowell Parks & Conservation Trust (which is outside the NH corridor).

Existing Public Access Points

Respondents were asked to indicate whether they used any of the eight public access points to visit the Merrimack River. Merrill Park in Hudson was selected by the greatest number of respondents, while the least number of respondents have visited Sklar Waterfront Park in Merrimack.

Location	# access
Merrill Park, Hudson	34
Greeley Park Trails, Nashua	27
Greeley Boat Ramp, Nashua	19
Reeds Ferry, Merrimack	17
Town Boat Ramp, Merrimack	13
John Bryant River Access, Litchfield	13
Moore's Falls, Litchfield	8
Sklar Waterfront Park, Merrimack	6

When asked where else they accessed the river, respondents noted the following locations: Heritage Trail, Bedford; Wason Park, Merrimack; Riverfront Park, Tyngsborough; Rourke Brothers Boat Ramp, Lowell; private backyards, and golf courses adjacent to the river.

Demographics

Eighty percent of respondents (67 people) were 35 or older; 4% were younger than 35, 1% preferred not to say and 15% did not answer the question. Thirty-six percent of respondents were female, 40% were male, 1% preferred not to say and 23% did not answer the question. Sixty-four percent of respondents were White/Caucasian, 11% preferred not to say, and 25% did not answer the question.

More of the respondents were from Hudson than anywhere else: 44% of people who took the survey were from Hudson, while 11% were from Nashua, 10% from Litchfield, 6% from Merrimack, 8% were from outside the four corridor towns, and 21% did not say.

Comments:

Respondents generally requested better and more recreational access to the Merrimack River and to limit building along the river. Some respondents left comments specific to an access location:

Merrill Park, Hudson

- Didn't even know there was access here, but because of safety issues from drugs and lack of care for this park I would not go here anyways.

- How do you get here? It looks wonderful.
- Needs some serious work. Very dangerous launch conditions.
- The Merrimack access showed in your cover photo needs some serious work. Very dangerous launch conditions.

John Bryant River Access, Litchfield

- Would love to but I am not a Litchfield resident.

Sklar Waterfront Park, Merrimack

- Didn't know about this.
- In early stages but needs resources.

Greeley Park Trails, Nashua

- Did not know about this.

Greeley Park Boat Ramp, Nashua

- We had difficulty finding this.
- Much too steep and needs a sandy area to the side of the ramp and not all those large stones.

A full list of general comments can be found in Appendix 2.

2.9 Hydropower and Water-dependent Uses

Water is used to generate electricity at dams throughout the Merrimack River Basin. Hydropower has a significant impact on the Corridor because of the generating facilities in Manchester at the Amoskeag Dam and in Lowell at the Pawtucket Dam. The Amoskeag Dam controls the amount of water released to the river corridor while the pool of the Pawtucket Dam extends for 18 miles behind the impoundment to the Town of Merrimack.

Moore's Falls is the only area within the river corridor where there is potential for additional hydro-development. The site was investigated by a company in the early 1980s, however, given the economic climate at the time the project was not constructed. Future changes in the economy as well as changes in the environment could at some point make the development of this site feasible.

Flow regulation can have both positive and negative impacts on the uses and users of the river. Impoundments are used to reduce flood damage on downstream areas and stored water can later be used to augment low flows. On the other hand, particularly where the water is used as an energy source, flows could be regulated in such a manner as to produce lower than normal flows.

State agency policies regarding the construction and reconstruction of new and existing hydropower facilities are mixed. Renewed interest in hydropower during the 1970s led to the 1981 amendments in RSA 481 in support of hydro-development, declaring "a special need for dams and reservoirs and other hydroelectric production facilities." RSA 482, while supporting hydro-development, provides for public participation in determining the public benefit of dams and requires the NHDES Dam Bureau to consider the effect of the impoundment on "scenic and recreational values and upon fish and wildlife and upon

the natural flow of the water in the stream below the dam and any hazards to navigation, fishing, bathing, and other public uses.”

The New Hampshire Fish and Game Commission’s policy, particularly regarding the Merrimack River, is “to protect and safeguard free-flowing streams and rivers because they are a limited habitat necessary for fishing.” To support this policy, the Commission discourages new dam construction, reconstruction of breached dams, significant diversions of water, or any other activity that would significantly alter fisheries habitats.

2.10 Archaeological and Historic Resources

Prehistoric and historic sites along the river include Native American sites, cellar holes, cemeteries, and remains of transportation and navigational systems. In addition to residential units, historic resources include mill buildings, trading posts, brickyards, meetinghouses, garrison houses, bridges, railroad structures, and cemeteries.

Archaeological Resources

The Merrimack Valley supported a resident prehistoric population from the Paleo-Indian until the initial period of Anglo-American settlement. The “Mouro-mak” trail (Price 1967) linked the people in northeastern Massachusetts with tribes in the Upper Merrimack Valley, supporting hundreds of camps and village sites located along its course on both sides of the river. Almost 200 archaeological sites have been recorded along the entire length of the Merrimack River in New Hampshire.

The river provided a major system of communication for prehistoric populations for thousands of years and many readily exploitable resources including fish, migratory birds, and diverse flora and fauna. The river was also an important route for trade and transport of raw materials.

Within the river corridor, at least 20 prehistoric sites and districts of significance have been documented within 1,000 feet of either side of the Merrimack River, such as the one in Figure 12. Although in many cases the record of the sites has been obliterated by historic residential and/or industrial development, many still contribute to our understanding of the region’s prehistory, and several survive with an outstanding level of integrity. Table 11 lists the prominent prehistoric sites located within the lower Merrimack River corridor.

Table 11. Prominent Prehistoric and Historic Resources in the Lower Merrimack River Corridor

ID	Location	Site Name	Type	Date	Significance
Litchfield					
1	East bank of Merrimack, south of Watts Brook	Three Flakes	Prehistoric	Archaic	Unique as single component site where lithic tools manufactured.
3	East bank of Merrimack, Moore’s Falls vicinity	Litchfield Site	Prehistoric	Middle Archaic to Late Woodland	Multi-purpose site, tool manufacturing and repair, burial ground.
4	East bank of Merrimack, Moore’s Falls vicinity	Naticook East Bank	Prehistoric	Late Archaic	Limited occupation during single time period. Tool manufacturing or repair, food processing.

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ID	Location	Site Name	Type	Date	Significance
5	East bank of Merrimack, Moore's Falls vicinity	Two Feather Site	Prehistoric	Late Archaic	Temporary occupation involving tool manufacture or repair, hunting and fire-related activity.
6	East bank of Merrimack, NE of Reed's Ferry	Moore's Falls Locks	Historic	1814	Three locks provided a bypass to the longest rapids on the Merrimack River system.
7	Colby Brook to the rear of the Colby Farm storehouse	Grist Mill	Historic	1830	Local grist mill on Colby Brook.
8	East bank of Merrimack overlooking Moore's Falls	Moore's Falls Site	Prehistoric	Late Archaic	Limited occupation, quartz industry, hunting, fishing, food processing.
9	East bank of Merrimack at Colby Brook	Colby Farm Site	Prehistoric	Late Archaic to Late Woodland	Temporary site, hunting, fishing, food preparation, and tool manufacture.
10	East bank of Merrimack opposite Souhegan confluence, Litchfield	Rodonis Field Site	Prehistoric	Middle Woodland	Evidence of short-term residence by small groups of people.
11	East bank of Merrimack across from Thornton's Ferry	Litchfield Island Site	Prehistoric	Unknown	Site was repeatedly occupied and a variety of activities practiced.
13	East bank of Merrimack near Chase Brook	Smolt Site	Prehistoric	Middle Archaic to Late Woodland	Site occupied during spring or early summer to collect plant foods.
14	East bank of Merrimack	Nesenkeag Site	Prehistoric	Late Archaic	Temporary task-specific site; tool manufacture or repair, hunting, or woodworking.
15	East bank of Merrimack near Cromwell's Falls vicinity	Campbell Site	Prehistoric	Middle Archaic and Woodland	Multi-component prehistoric site with evidence of tool maintenance and food procurement.
16	East bank of Merrimack between Cromwell's Falls and Chase Brook	Thebodeau Site	Prehistoric	Middle Archaic, Late Archaic, & Late Woodland	Multi-component habitation on site with flaked stone tools.
17	Chase Brook just east of Route 3A	Grist Mill Site	Historic	19 th Century	Remains of old grist mill.
18	East bank of Merrimack	Danforth Archaeological District	Prehistoric		
	18A	Riverbank Site	Prehistoric	Middle Archaic to historic	Tool manufacturing or maintenance
	18B	Danforth Field Site	Prehistoric	Middle Archaic	Short-term occupation, possibly for hunting or fishing.
	18C	Danforth Sand Bank Site	Prehistoric	Middle Archaic	Tool manufacturing or repair, hunting, butchering, or skinning may have been practiced.
34	East bank of Merrimack, Merrimack landing in N. Ferry Road vicinity	Thornton's Ferry	Site of early ferry crossing	1700s	Site of ferry operated in 1700s by Matthew Thornton, one of the signers of the Declaration of Independence.

ID	Location	Site Name	Type	Date	Significance
36	West side of Route 3A	Century Farm	House and Barn	1780	Fine example of the Georgian style; Litchfield's most substantial late 18 th century house.
37	East side of Route 3A	Litchfield Town Center	District of civil structures	1844-1924	Litchfield Town Hall (1851); Community Church (1844); Library (1924) and several fine older residences.
Merrimack					
2	Off Constance St.	Brickyard	Historic	1800	Bricks and brick fragments mostly submerged under a small pool.
12	West bank of Merrimack	Cromwell's Falls Lock	Historic archaeological	1814	Best preserved of eight remaining locks on Merrimack River system from Concord to Lowell. Originally 21 locks.
24	West and east sides of Route 3 at Greeley Street	The Signer's House & Matthew Thornton Cemetery	House and Cemetery	1770 and 1742	Late Georgian style structure with associations with Matthew Thornton. Oldest cemetery in Merrimack. Includes grave of Thornton and concentration of early gravestones.
35	West side of Merrimack at Depot Street	Reed's Ferry	Site of early ferry crossing		
38	West side of Merrimack at Cromwell's Falls or Thornton's Ferry	Cromwell's Trading Post	Site of Indian Trading Post	1656	One of the earliest trading posts on the Merrimack River. Burned in 1665.
Hudson					
19	East bank of Merrimack	Asparagus Field Site	Prehistoric	Unknown	Tool manufacturing or repair.
20	East bank of Merrimack	Merrimack Street Site	Prehistoric	Unknown	Thin scatter of flakes suggest tool manufacture or repair.
21	East bank of Merrimack	Kenyon Street Site	Prehistoric	Unknown	Thin scatter of flakes suggest tool manufacture or repair.
25	Derry Road	Hills House	House	1890	Excellent example of Shingle style summer dwelling designed by Boston architect Hubert Ripley.
26	Library Street	Hills Memorial Library	Library	1909	Constructed of native materials in Tudor Style.
27	Derry Street	G.O. Sanders House	House	1873	One of the best surviving examples of French Second Empire style in the State.
Nashua					
22	Confluence of Nashua & Merrimack Rivers	Nashua River Mouth Site	Prehistoric	Middle Archaic to Late Woodland	Prehistoric site on intact land surfaces. Variety of materials recovered: stone tools and cooking vessels.
23	West bank of Merrimack near Stateline	Pheasant Lane Mall Site	Prehistoric	Unknown	Site of prehistoric quartz workshop. No subsurface artifacts recovered.

ID	Location	Site Name	Type	Date	Significance
28	Center of Nashua, north of Nashua River and west of Merrimack River	Nashville Historic District	District	1800 – 1930	Broad representation of 19 th and early 20 th century styles including many high style. Historical associations with individuals important to commercial and industrial development of Nashua.
29	Temple Street	Hillsborough County Courthouse	Courthouse	1901	Typical early 20 th century institutional structure in Classical Revival style.
30	Main Street	Hunt Memorial Library	Library	1903	One of the early designs of internationally known Ralph Adams Cram. Important state example of Gothic style.
31	Abbot Square	Abbot-Spaulding House	House	1804	Important example of Federal and Colonial Revival periods of architecture in Nashua.
32	Concord Street	General George Stark House	House	1850	One of the finest dwellings in the Italian villa style in New Hampshire.
33	Factory & Pine Streets	Nashua Manufacturing Company Historic District	Mill District	1823-1948	Nashua's first and largest textile mill; good example of late 19 th century industrial design.

Historic Resources

Major historic Native American trails have been identified in and around the lower Merrimack River corridor. These include the Merrimack, Nasamok, Souhegan, Pawtucket, and Massabesic trails, which led to the development of trading posts situated in Litchfield and Merrimack.



Figure 11. Historic Site in Litchfield

The earliest residents in this section of the Merrimack Valley were the Naticook Indians. King Phillip's War in 1675-1678 forced the Indians out of the Merrimack Valley and the area they knew as "Naticook" which included portions of today's towns of Litchfield and Merrimack.

The town of Dunstable was chartered in 1673 as an outpost of the Massachusetts Bay Colony, consisting of 200 square miles on both sides of the Merrimack River. Beginning in 1730, the original Dunstable settlement began breaking away as separate entities:

- 1733: Hollis and Nottingham West are founded.
- 1734: Litchfield founded
- 1746: Merrimack and Hudson founded
- 1760: Amherst founded
- 1794: Milford founded
- 1836: Dunstable becomes Nashua

Until the damming of the Merrimack for industry, the river was filled with migratory fish that attracted Native Americans and European colonists. In its natural state, the Merrimack River had at least three rapids or waterfalls between Nashua and Lowell which were used by early colonists to great advantage. Taylor's Falls, located a mile below the junction of the Nashua and Merrimack Rivers, was a location where colonists found it easier to catch fish than in smaller streams. Prior to the construction of the Taylor's Falls Bridge across the Merrimack River from Nashua to Hudson in 1827, people crossed the river by ferry. The Cummings Farm Ferry, Hills Ferry and Little's Ferry all operated in the mid 1700s allowing passengers to cross between Nashua and Hudson. Ferries also linked Litchfield and Merrimack including Temple's Ferry, Thornton's Ferry, and Reed's Ferry.

In time, the Merrimack was also used for floating logs to sawmills downstream as well as operating as a critical transportation route linking New Hampshire to important commerce centers downstream. The region's lumber and timber trades were important industries, along with brick manufacturing in Litchfield and Merrimack. Communities on the river had a prosperous trade, evidenced by general merchandise stores and fleets of canal boats carrying produce and merchandise to Lowell and on to Boston through the Middlesex Canal. It was not until 1814 that the Merrimack River was navigable from present-day Lowell to Concord, New Hampshire, made possible by the completion of a series of 21 locks, dams, and canals.

In Nashua, the Nashua Manufacturing Company's early and successful development of a canal/power system was a widely respected engineering feat in the 1820s. To harness the power of the Nashua River, the company built a 30-foot dam at Mine Falls and a three-mile-long power canal to channel the water to the new mill site. An additional transportation canal was constructed to bring boats out to the Merrimack, from the Main Street bridge. The dam and locks of solid stone masonry measured 24 feet high. Each lift was ten feet wide and 82 feet long. Unable to withstand competition from the railroad, the last commercial boat passed through the Merrimack River canals in 1852, and the charter was extinguished by the courts in 1869. The canal beside Canal Street was filled in at about the time of the First World War prior to an expansion of the mills in the area. The part of the canal to the west of the bridge toward Mine Falls is still recognizable today.

In 1827 the original Taylor's Falls Bridge was constructed as a covered wooden toll bridge on the site of the present bridge of the same name. Construction of a concrete Taylor's Falls Bridge began in 1909, and was completed in 1912. After years of deterioration, the bridge was permanently closed to traffic in 1970 and removed in 1973 to make room for a new bridge that opened in 1974.

In Nashua, the textile industries and paper companies continued to flourish in the early 1900s. By the mid-1920s, these were joined by shoe factories. By this point, long exploited for its convenience as a conduit for wastes, the Merrimack River became one of the dirtiest and most heavily industrialized waterways in the United States.

Litchfield experienced quite a different pattern. Isolated on the east bank of the river from the railroad on the west side, Litchfield was denied easy access to markets afforded by the railroad, and since the area was already blessed with richer soils than many of its neighbors, Litchfield turned to agriculture.

By 1950 there was a shift in the textile industries from the northeast to more favorable southern climates. This potential economic disaster was offset by an influx of other industries including electronics firms. To a large degree, the loss of heavy industry in the region had a major positive impact on the health of the river. From 1950 to 1980 the Nashua region experienced rapid growth in technology-related industries which also had a major impact on nearby bedroom communities such as Litchfield and Merrimack. With the decline of the railroad, the construction of the F.E. Everett Turnpike began, ushering in passenger and freight transportation by automobile and truck. Passenger rail service was then discontinued in 1967.

Today, neither the industries, nor the means of transportation which depended on and defined the river during the 19th century remain in significant use in this part of the Merrimack Valley. Although the river is no longer valued for its power, the cities and towns along its banks are vital and growing. The river remains an important, yet largely overlooked, resource which contains relics and remnants of years past. The prominent historic resources contained from this recent era are described in Table 9, above. Protecting these pre-historic and historic resources brings positive attention to the river and encourages the public to value and preserve the river itself.

Chapter 3: Corridor Assessment

This chapter discusses regulations and other constraints that impact the lower Merrimack River corridor and their effects on the existing and potential uses and management of the corridor.

Regulations

Federal, state, and municipal regulations are the most conspicuous management tools available to a community. The following sections discuss some of the more prominent regulatory mechanisms that are in place to safeguard and regulate the lower Merrimack River.

New Hampshire Rivers Management and Protection Program

The Lower Merrimack River is designated under the Rivers Management and Protection Program as a Community River. RSA 483:9-b provides for the protection of rivers or river segments holding the community river designation, and includes the following protections:

- Construction of new dams for public water supply, flood control or hydroelectric energy production purposes may be allowed if such construction is consistent with management and protection of the resources for which the river or segment is designated.
- Construction, operation, and/or maintenance of new hydroelectric power facilities are allowed at existing or breached dams provided that:
 - (a) The operational mode of any proposed facility shall be run-of-the-river, with project outflow equal to project inflow on an instantaneous basis and the project does not significantly alter the natural flow characteristics of the river; and
 - (b) The proposed facility does not provide for diversion of the river or segment above or below the existing dam for a significant distance; and
 - (c) The height of the impoundment is constant and, for existing or breached dams, is not raised above the maximum historic level of impoundment at that site; and
 - (d) The proposed facility provides adequate fish passage as determined by the fish and game department.
- No interbasin transfers of water from a designated community river or segment shall be permitted.
- No new channel alteration activities shall be permitted which interfere with or alter the natural flow characteristics of the river or segment or which adversely affect the resources for which the river or segment is designated. However, the commissioner may approve such channel alterations as may be necessary for the construction, repair, or maintenance of a project including public water supply intake facilities in the river or river corridor.
- The use of native vegetation to stabilize the streambank of designated community rivers is encouraged.

- A protected instream flow level shall be established for each designated community river or segment and any upstream impoundment or diversion facility which may affect the natural flow characteristics of such river or segment pursuant to RSA 483-A:9-c.
- Water quality shall be restored or maintained at least at the Class B level. Significant adverse impacts on water quality or other instream public uses shall not be permitted.
- The department shall review and consider adopted local river corridor management plans prior to issuing any water discharge permit, terrain alteration permit, or wetlands permit (in accordance with RSA 485-A:13, RSA 485-A:17 or RSA 482-A).
- Any new solid waste storage or treatment facility shall be set back a minimum of 250 feet from the normal highwater mark of a designated community river or segment and shall be screened with a vegetative or other natural barrier to minimize visual impact, except:
 - (a) New solid waste landfills shall not be permitted within the 500 year floodplain of a designated community river and any new solid waste landfill located within the corridor shall be set back a minimum of 100 feet from the landward extent of the 500 year floodplain and screened from the river with a vegetative or other natural barrier to minimize visual impact
 - (b) Any land application within the river corridor of septage, sludge, or solid waste, and defined in RSA 149-M:4, XXII, shall be set back a minimum of 250 feet from the normal highwater mark and shall be immediately incorporated into the soil. The provisions of the subparagraph shall not apply to manure, lime, or wood wash when used for agricultural purposes and that follow established state or federal best management practices for the protection of water quality.
 - (c) An existing solid waste facility which is located within 250 feet of the normal highwater mark of a designated community river or segment may continue to operate under an existing permit provided it does not cause degradation to an area in excess of that area under permit at the time of designation; and
 - (d) The department may permit a resource recovery operation at an existing landfill located within 250 feet of the normal highwater mark of a designated community river or segment.
- Any motorized watercraft operating within 150 feet of the shoreline of a designated community river or segment shall travel at the slowest possible speed necessary to maintain steerage way, but at no time shall exceed six miles per hour.

Alteration of Terrain Permit:

Alteration-of-Terrain (AOT) permits are designed to protect New Hampshire surface waters by minimizing soil erosion and controlling stormwater runoff, as required by RSA 485-A:17. Generally an AOT permit is needed before initiating any ground-disturbing activities to a contiguous area 100,000 square feet (2.3 acres) or more in size or 50,000 square feet in size if the location is within 250 feet of a

lake, great pond, fourth-order stream, or designated river as defined in RSA 483-B, the Shoreland Water Quality Protection Act. Some general provisions for AOT permits apply:

- For a single family subdivision in which the lot development will not be carried out at the same time as roadway construction, (i.e., the roadway and other work within the right-of-way will be completed and stabilized prior to grading the lots), the only item considered in calculation of disturbed area is the roadway. For example, for a 50 foot right-of-way, 2,000 linear feet of roadway would create an area of disturbance of 100,000 square feet, thus requiring a Site Specific permit.
- For other types of developments and earth removal operations, a contiguous earth disturbance of 100,000 square feet including building area, parking, driveways, roadways, utility construction, landscaping and borrow areas would require a Site Specific permit.
- For earth removal operations in existence on the effective date of the regulations, May 4, 1981, the "footprint" of the area of disturbance at that time is considered to be grandfathered, but any contiguous disturbance of 100,000 square feet or more outside that footprint requires a Site Specific permit.
- In addition to the above, RSA 483-B, the "Shoreland Water Quality Protection Act," requires that any person intending to conduct an activity within the 250 feet of the protected shoreland resulting in a contiguous disturbed area exceeding 50,000 square feet to first obtain a permit.

Shoreland Water Quality Protection Act

Chapter 483-B of the New Hampshire Statutes contains the New Hampshire Shoreland Water Quality Protection Act (SWQPA), which is designed to protect the fragile and valuable resources adjacent to public surface waters. The SWQPA contains minimum standards necessary to protect these public surface waters and their environs and serves to:

- Maintain safe and healthful conditions.
- Provide for wise utilization of water and related land resources.
- Prevent and control water pollution.
- Protect fish spawning grounds, aquatic life, and bird and other wildlife habitats.
- Protect buildings and lands from the effects of flooding and erosion.
- Protect archaeological and historic resources.
- Protect commercial fishing and industry.
- Protect wetlands.
- Control building sites, placement of structures, and land uses.
- Conserve shoreline cover and points of access to inland and coastal waters.
- Preserve public waterbodies in their natural state.

- Promote wildlife habitat, scenic beauty, and scientific study.
- Protect public use of waters, including recreation.
- Conserve natural beauty and open spaces.
- Anticipate and respond to the impacts of development in shoreland areas.
- Provide for economic development in proximity to public waters.

Further details on the provisions, allowances, and prohibitions contained within the SWQPA can be found within the subparagraphs of Chapter 483-B.

Municipal Separate Storm Sewer System

Three of the corridor communities, Hudson, Merrimack, and Nashua, are subject to federal Municipal Separate Storm Sewer System (MS4) regulations. These communities must each develop a Stormwater Management Program that includes the following six focus areas:

- Public Education and Outreach
- Construction Site Erosion Control
- Public Participation and Involvement
- Post Construction Stormwater Management
- Illicit Discharge Detection and Elimination
- Pollution Prevention and Good Housekeeping

The MS4 permitting process as required by the federal government has brought a major focus to proper stormwater management; as a result, the affected corridor communities are more closely scrutinizing management practices on new developments and implementing more low impact development practices.

Ordinances

Table 12 below shows relevant municipal ordinances and zoning regulations related to corridor management in each of the adjacent towns. References to these natural resources may also appear in several other locations in the municipal ordinance; this table only references the primary sections on a resource's allowable uses.

Table 12. Municipal Ordinances Related to River Corridor Management Enacted within the Lower Merrimack River Corridor Communities

Management Category	Hudson	Litchfield	Merrimack	Nashua
Wetlands	CH 334, Article IX – <i>Wetland Conservation District</i>	Section 1200 – <i>Wetlands Conservation District</i>	2.02.7 – <i>Wetland Conservation District – Permitted Uses</i>	Chapter 190, Article XI – <i>Wetlands</i>
Floodplains	CH 218 – <i>Flood Damage Prevention</i>	Section 1100 – <i>Floodplain Conservation District</i>	2.02.8 – <i>Flood Hazard Conservation District – Permitted Uses</i>	Chapter 190, Article VII – <i>Floodplain Management</i>
Aquifers and Groundwater	n/a	Section 1250 – <i>Aquifer Protection District</i>	2.01.11 – <i>Aquifer Conservation District</i>	Chapter 190, Article IV, section 24.1 – <i>Four Hills Landfill Groundwater Management Zone</i>
Shoreland Protection	n/a	n/a	2.02.12 – <i>Shoreland Protection District</i>	n/a
Wastewater Treatment	CH 323 – <i>Wastewater Disposal</i>	n/a	Town Code CH 158 – <i>Sewer Use</i>	Chapter 255 – <i>Sewage Disposal</i>
Wellhead Protection	n/a	n/a	2.01.11.D.2 - <i>Prohibited Uses, Wellhead Protection Areas</i>	Chapter 190, Article IV, section 24 – <i>Water Supply Protection District</i>
Stormwater Management	CH 290 – <i>Stormwater Management</i>	n/a	Town Code CH 167 – <i>Stormwater Management Standards</i>	Chapter 190 Article XXXI – <i>Stormwater Management</i>
Watershed Protection	n/a	n/a	n/a	n/a

Subdivision / Site Plan Review Regulations

Subdivision and site plan review regulations are different in each community. Property owners and developers may find it useful to review the application and approval processes in their community.

Other Guidance

Lower Merrimack River Local Advisory Committee

As mentioned in Chapter 1, LMRLAC is the locally appointed river management advisory committee for the lower Merrimack River. Committee members are nominated by the local governing bodies of Hudson, Litchfield, Nashua, and Merrimack and appointed by the Rivers Management Advisory Committee to the local river management advisory committee. Each committee must be composed of at least three members who represent a broad range of interests in the vicinity of the designated river or segment. These interests shall include, but are not limited to, local government, business, conservation interests, recreation, agriculture, and riparian landowners. If an interest is not represented by the local governing bodies' nominations, the Rivers Management Advisory Committee may appoint a member

from the vicinity of the designated river or segment to the local river management advisory committee who will represent that interest. Each member serves a term of three years.

LMRLAC's duties include advising the Commissioner and municipalities on matters pertaining to the management of the lower Merrimack River. In turn, municipal officials, boards, and agencies shall inform LMRLAC of any actions which they are considering in managing and regulating activities within designated river corridors. LMRLAC also reviews federal, state, or local governmental plans to approve, license, fund or construct facilities that would alter the resource values and characteristics for which the river or segment is designated. LMRLAC has developed a Development Review Checklist to assist and guide the application review process, providing a standard template from which all applications are initially evaluated. LMRLAC reviews and comments on permit applications taking place within the lower Merrimack River corridor. Formal review of State permit applications is common, while other permits originate at the federal or municipal level. LMRLAC is also responsible for reporting annually to the Department of Environmental Services Commissioner on the status of compliance with federal and state laws and regulations, local ordinances, and plans relevant to the designated river or segment and corridor.

Guidelines for Naturalized River Channel Design and Bank Stabilization

These guidelines (NHDES and NHDOT 2007), produced jointly by the New Hampshire Department of Environmental Services and the New Hampshire Department of Transportation, provide a project classification system that can be used to determine whether a project is routine, moderate, or comprehensive which then can guide the selection of designs for bank stabilization methods. The guidelines also provide a description of the primary types of river channel distress to aid in accurate problem identification. Also provided is a project monitoring and evaluation tool which can be used in the monitoring phase of project work.

Buffer Options for the Bay

While the Buffer Options for the Bay initiative is focused on the Great Bay in the Seacoast region, the educational materials provide clear guidance on why buffers are important and factors to consider when sizing a buffer. More importantly, the guidance offers strategies for communicating with the public and working with municipalities to improve their regulations pertaining to buffers. More information is available on the [Buffer Options for the Bay website](#).

Innovative Land Use Planning Techniques: A Handbook for Sustainable Development

To address the need for guidance and technical assistance on Innovative Land Use Controls authorized by RSA 674:21, the New Hampshire Regional Environmental Planning Program (REPP) has produced a guide with model ordinances and regulations on several innovative land use techniques which consider the following topic areas:

- Lot Size Averaging
- Feature-based Density
- Village Plan Alternative Subdivision
- Growth Boundaries
- Wetlands
- Drinking Water

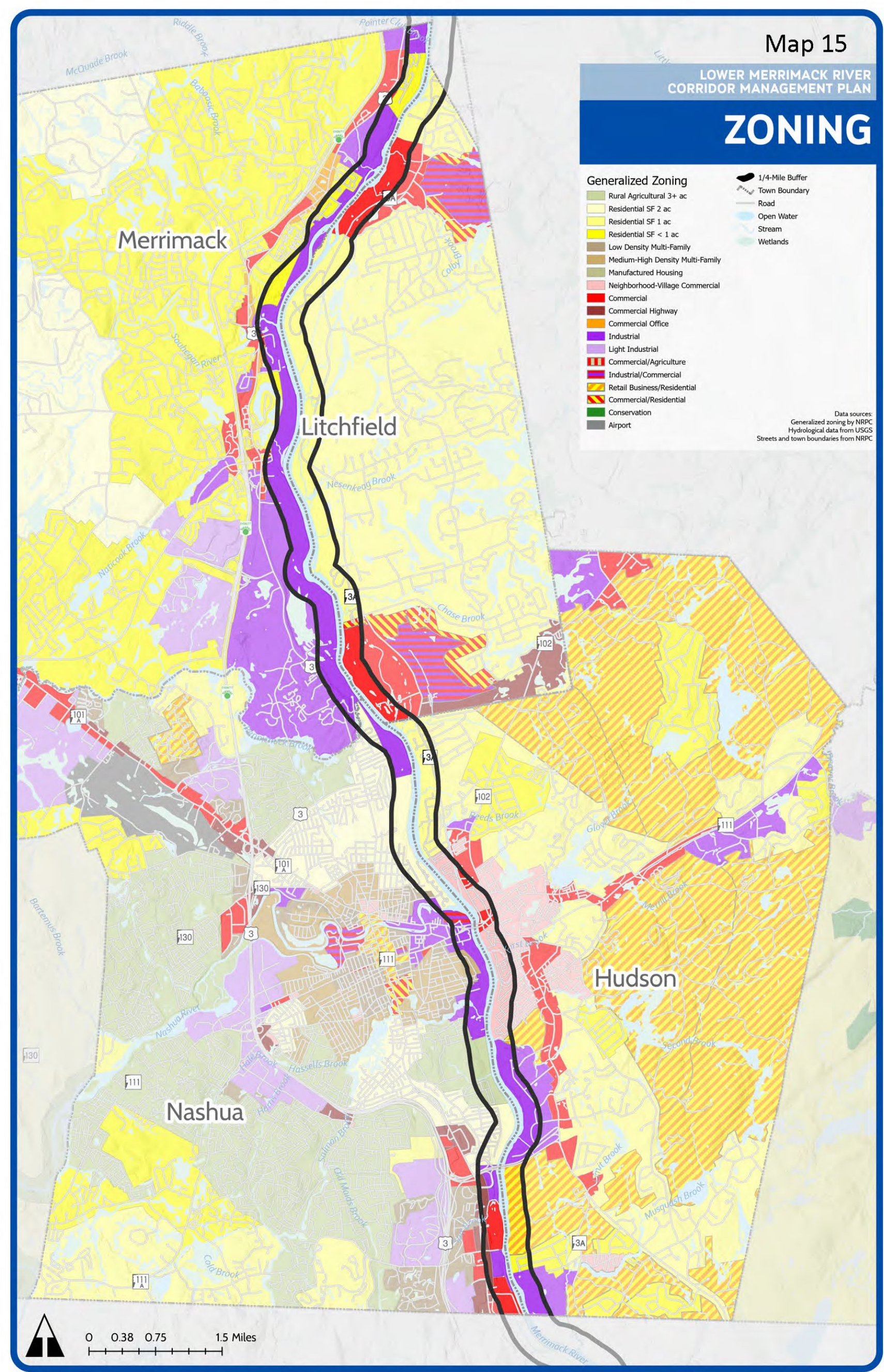
- Inclusionary Housing
- Stormwater Management
- Steep Slopes and Ridgeline Protection
- Wildlife Habitat Management
- Energy Efficient Development
- Transfer of Development Rights
- Conservation Subdivision
- Infill Development
- Shoreland and Riparian Areas
- Floodplains
- Erosion and Sediment Control
- Transit-oriented Development
- Livable/Walkable Design
- Access Management
- Dark Skies Lighting
- Landscaping Regulations

New Hampshire Wildlife Action Plan

The New Hampshire Fish and Game Department has created the state's *Wildlife Action Plan*. The plan provides New Hampshire decision-makers with tools for restoring and maintaining critical habitats and populations of the state's species of conservation and management concern. The plan incorporates statewide data such as species occurrence records into a Geographic Information System which contains wildlife species profiles, profiles of important habitats, and strategies for habitat conservation. Since river corridor areas often contain important wildlife habitat, the Wildlife Action Plan is a useful resource in evaluating critical management needs within the lower Merrimack River corridor. The 2020 Wildlife Action habitat tiers were shown in Map 8 in Chapter 2.

Zoning

Zoning can be a useful tool to predict future land uses and conditions based on current municipal regulations. While regulatory standards may fluctuate over time, zoning amendments are generally heavily scrutinized and publicly reviewed, and therefore slower to change. The corridor zoning requirements are illustrated in Map 15. For more detailed zoning maps with additional overlay zones, refer to the town's specific zoning maps, available at nashuarpc.org.



Watershed Audit Findings

A Watershed Audit can be used to establish the baseline of existing watershed protection strategies. In 2022, watershed audits were administered to knowledgeable municipal staff in Hudson, Litchfield, Merrimack, and Nashua. Each audit measures the extent to which eight watershed protection tools (watershed planning, land conservation, aquatic buffers, better site design, erosion and sediment control, stormwater management, non-stormwater discharges, and watershed stewardship programs) are enacted in the community. The results and themes of these audits, arranged by the watershed protection tools of interest, are detailed in Table 13 below. Copies of the actual audits are included at the end of the corridor plan in Appendix 3.

- **Tool 1: Watershed planning:** Watershed planning involves the creation of regulatory measures and planning methods that limit impervious cover and redirect development to the most appropriate and least sensitive areas.
- **Tool 2: Land conservation:** Land conservation includes programs to conserve underdeveloped, biologically sensitive, or areas of cultural or historic importance
- **Tool 3: Buffers:** Vegetative buffers help protect aquatic ecosystems by distancing development from shoreland areas, providing a natural shield from potentially hazardous activities or substances.
- **Tool 4: Better site design:** Better site design includes local ordinances and codes that can reduce impervious cover and redirect runoff through design decisions.
- **Tool 5: Erosion and sediment control:** Erosion and sediment controls include both physical mechanisms and regulatory practices to prevent erosion.
- **Tool 6: Stormwater management:** Stormwater management includes all structural practices that help mitigate the impacts of stormwater runoff into waterbodies.
- **Tool 7: Control of other discharges:** Controlling site-specific pollutant sources such as sanitary waste and deicing chemicals which can enter surface waters through runoff or direct discharges.
- **Tool 8: Watershed stewardship:** Watershed stewardship programs generally foster human behavior that prevents or reduces pollution over a range of land uses and activities.

Table 13. Watershed Audit Findings for Hudson, Litchfield, Merrimack, and Nashua

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Watershed Planning				
Master plan	Yes	Yes	Yes	Yes
Zoning tied to master plan	Yes	Yes	Don't know	Yes
How often is master plan updated?	As needed	Rolling	10 years	As needed
Plan addresses important water resource goals	Yes	Yes	Yes	Yes
Conservation easements	Yes	Yes	No	Yes
Land acquisition programs	No	Yes	No	Yes

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Transfer of Development Rights (TDR)	Yes	No	No	No
Limiting infrastructure extension	No	No	No	No
Infill/community redevelopment	No	No	Yes	Yes
Land Conservation				
NFIP	Yes	Yes	Yes	Yes
Historic district	No	No	No	Yes
Heritage commission	No	Yes	Yes	No
Preservation of cultural or historic resources	No	No	No	Yes, in district
Preservation of agriculture	No	Yes	No	No
Is there critical habitat for plant or animal species	Yes	Yes	No	Yes
Preservation of critical habitat	Encouraged	Encouraged	Neither	Encouraged
Steep slope restrictions	Greater than 25%	No	No	Yes, in conservation subdivisions
Conservation of forest areas	No	No	Yes, encouraged	Yes, encouraged
Restrictions on stream channel modification	Don't know	No	Don't know	Yes
Local shoreland protection overlay zone	No	No	Yes	No
Aquatic Buffers				
Stream buffers required	Yes	Yes	Yes	Yes
Stream buffer width	50 ft	75 ft for structures, 100 ft for leach fields	25 ft no cut, 40 ft for buildings	20 ft if >3,000 SF, 40 ft if >9,000 SF, 40 ft for Critical, 70 ft for Prime
Wetland buffers	50 ft	75 ft for structures, 100 ft for leach fields	25 ft no cut, 40 ft for buildings	20 ft if >3,000 SF, 40 ft if >9,000 SF, 40 ft for Critical, 70 ft for Prime
Reforestation requirements	Don't Know	No	No	Yes
Better Site Design				
Minimum pavement width <500 ADT	23-26 ft	23-36 ft	23-26 ft	greater than 26 ft
Parking lanes allowed to be traffic lanes	No	No	No	Not sure
Minimum ROW for residential street	greater than 45 ft	greater than 45 ft	greater than 45 ft	greater than 45 ft
Utilities to be placed under paved sections	Not specified	Yes	Yes	Yes
Minimum radius of cul-de-sac	greater than 45 ft	greater than 45 ft	36 ft to 45 ft	greater than 45 ft
Landscaped island allowed within cul-de-sac	Yes	Yes	Yes	Not specified
Hammerhead turn-arounds allowed	No	No	Not specified	Yes
Curb and gutters required for residential streets	Yes	No	No	Yes
Minimum parking ratio for office building	3.3/1000 SF	5/1000 SF	3.3/1000 SF	1/1000 SF min; 5/1000 GFA max

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Minimum parking ratio for shopping center	5/1000 SF	n/a	4/1000 SF	5/1000 SF min; 6.6/1000 SF max
Minimum parking ratio for single-family home	n/a	n/a	generally 2 cars	two/unit
Shared parking arrangement permitted?	Not specified	Not specified	Not specified	Yes
Parking ratios reduced for shared parking?	Not specified	Not specified	No	Yes
Minimum parking stall width	10 ft (9 ft by PB vote)	Not specified	9 ft	9 ft
Minimum parking stall length	20 ft (18 ft by PB vote)	Not specified	18 ft	20 ft
Percentage of spaces required for compact cars	No	No	No	No
Unpaved parking spaces allowed	No	Yes	No	Occasionally
Minimum percentage of parking lot landscaped	Yes	Yes	Yes	Yes
Open space/cluster developments allowed	By Right	By Right	By Right	By Right
Additional review for open space design	No	Yes	No	Yes
Flexible site design for open space options	Yes	Yes	Yes	Yes
Irregular lot shapes allowed	Not specified	No	Yes	No
Residential district lot size	TR: 10,000 SF	R: 43,560 SF	R-1: 100,000 SF	R40: 40,000
Residential district lot size	R-1: 30,000 SF sewer	n/a	R-2: 80,000 SF	R30: 30,000
Residential district lot size	R-1: 43,560 SF septic	n/a	R-3: 40,000 SF	R18: 18,000
Residential district lot size	R-2: 43,560 SF sewer	n/a	R-4: 40,000 SF	R9: 9,000
Residential district lot size	R-2: 60,000 SF septic	n/a	n/a	RA: 7,500
Residential district lot size	G: 43,560 SF	n/a	n/a	RB: 6,000
Residential district lot size	G-1: 87,120 SF	n/a	n/a	RC: 5,000
Overlay districts for increased density	No	Yes	Yes	Yes
Sidewalks required on at least one side	Yes	No	No	Yes
Minimum sidewalk width	Greater than 4 ft	n/a	Greater than 4 ft	Greater than 4 ft
Trails substitute for sidewalks	Not specified	Not specified	n/a	Yes
Minimum driveway width	Not specified	greater than 9 ft	Not specified	greater than 9 ft
Pervious materials for single-family driveways	Not specified	Not specified	Yes	Not specified
Two-track design for single-family driveways	Not specified	Not specified	Not specified	Not specified
Shared driveways permitted	Yes	Not specified	Yes	Not specified
Open space areas required to be consolidated	Yes	No	Yes	No
Minimum % of open space natural condition	Not specified	No	No	No

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Allowable uses for open space defined	Yes	Yes	Yes	Yes
Rooftop runoff can be discharged to yard areas	Not specified	Not specified	Yes	Yes
Erosion and Sediment Control				
Erosion & sediment control req'd during construction	All sites	All sites	All sites	All sites
Guidance for types of erosion and sediment control	Yes, own guidance	Yes, own guidance	Yes, own guidance	Yes, own guidance
Silt fence	Yes	No	Yes	Yes
Straw bales	Yes	No	Yes	Yes
Construction sequencing	Yes	No	Yes	No
Construction phasing	No	No	Yes	Yes
Preservation of natural vegetation	Yes	Yes	Yes	Yes
Preservation of stream or wetland buffers	Yes	Yes	Yes	Yes
Stair-step grading	No	No	Yes	No
Temporary seeding and mulching	Yes	No	Yes	Yes
Permanent seeding and mulching	Yes	No	Yes	Yes
Dust control	Yes	No	Yes	No
Erosion blankets and geotextiles	Yes	No	Yes	Yes
Fiber rolls	No	No	Yes	Yes
Temporary stream crossings	Yes	No	Yes	No
Stabilized construction entrance	Yes	No	Yes	Yes
Exit tire wash	No	No	Yes	No
Energy dissipation at pipe outlets	No	No	Yes	Yes
Check dams in natural or man-made channels	Yes	No	Yes	No
Sand/gravel bag barrier	Yes	No	Yes	No
Brush or rock filler	No	No	Yes	No
Storm drain inlet protection	Yes	No	Yes	Yes
Catch basin inlet filters	Yes	No	No	Yes
Sedimentation basins	Yes	No	Yes	No
Sediment traps	Yes	No	No	Yes
Filtration of dewatering operations	Yes	No	Yes	No
Secondary filtration	No	No	No	No
Dikes/berms as conveyance to ESC structures	Yes	No	No	Yes
Pipe slope drains to bypass erodible soils	Yes	No	Yes	No
Stockpile stabilization	Yes	No	Yes	Yes
Erosion & sediment control plan req'd in site plan review	Yes	Yes	No	Yes

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Construction sites inspected for compliance	Yes	Yes	Yes	Yes
Who conducts inspections	Municipal or 3rd party	3rd party	Municipal and 3rd party	Municipal
How frequently does inspector visit construction site	Weekly	No set schedule	Weekly	Varies
Sponsor erosion and sediment control training for	None of the above	None of the above	None of the above	n/a
Stormwater Management Practices				
Require stormwater management on new development	Yes	Yes	Yes	Yes
Require stormwater be managed on site	Yes	Yes	Yes	Yes
Control peak discharge rate	25 year storm	2-year, 24/hr	n/a	100 year storm
Treat stormwater runoff	25 year storm	n/a	25 year, 50 for detention basins	50, 10, 5
Control/reduce total volume of runoff	25 year storm	n/a	25 year, 50 for detention basins	50, 10, 5
Protect downstream channels	50 year storm	n/a	25 year, 50 for detention basins	Yes
Exemptions for these requirements	None	None	Very limited	Small projects encouraging filtration
Community provide guidance for types of BMP	Yes, refer to state doc	Yes, refer to state doc	Yes, own guidance	Yes, own guidance
Top three stormwater practices in community	Catch basins to infiltration/detention	On-site detention	Treatment swales	Vegetated swales
	Swale/level spreader	Vegetated swales	Detention basins	Wet retention ponds
	Dry wells	Drainage ditches	Infiltration	Stormceptors
Stormwater plan required during site plan review	Yes	Yes	Yes	Yes
Inspect stormwater practices during construction	Yes	Yes	Yes	
As-build drawing or stormwater practice required	Yes	n/a	Yes	Yes
Who is responsible for maintenance	Owner/sometimes DPW	Owner	Owner	Stormwater easement
Maintenance agreement	Yes	Don't Know	Yes	Yes
Privately maintained systems inspected	No	No	No	n/a
How frequently are privately owned practices inspected	Annually by HOAs	n/a	Annually	Annually
Penalties for not complying with maintenance	No	Yes	No	Yes. Bill owner for maintenance.
Non-Stormwater Discharges				

Mechanism and Activity	Hudson	Litchfield	Merrimack	Nashua
Description of stormwater management system	25% ditches, swales, basins;	100% ditches, swales, basins	50% ditches, swales, basins;	20% ditches, swales, basins,
	75% storm sewers		50% storm sewers	60% storm sewers; 20% treatment plant
Program for illicit connection detection	Yes	n/a	Yes	Yes
Illicit connection detection include removal	Yes	n/a	Yes	Yes
Regulations for septic system maintenance	Yes, within shoreland	No	Yes	No
Inspection of privately owned septic systems	Yes, on installation	No	No	No
Regulations for confined animal feeding lots	No	No	No	No
Spill response plan	Yes	Don't Know	Don't know	Yes
Regulate storage of hazardous materials	Yes, reporting to FD	Yes, FD requirements	Don't know	NFPA & EPA
Hazardous substances protection overlay district	No	No	No	Yes, landfill
Deicing compounds on public roads:	Sand, road salt, Magnesium Chloride, washed sand	Sand, road salt	Sand, road salt, Calcium Chloride, liquid calcium	Sand, road salt, Calcium Chloride brine
Storage of deicing compounds	Within structure	Within structure	Within structure	Within structure
Designated low- or no-salt routes	No	Yes	Yes	Yes
Watershed Stewardship Programs				
Education or outreach programs for:	residents, municipal employees	n/a	residents, commercial, industrial, municipal employees	residents, commercial sector, industrial, municipal employees, per MS4
Stream stewardship programs	No	Don't Know	Yes	Yes
Stream restoration programs	No	No	No	No
Restrictions on pet waste management	Yes	No	No	Yes
Sweep public streets	Yes	Don't Know	Yes	Yes
How often are streets swept	Annually	n/a	Annually	2x per year; downtown more
Fertilizers used on public lands	Yes	Don't know	Yes	Yes
Pesticides used on public lands	Yes	Don't know	No	Unknown

Issues Summary

Water Quality

The lower Merrimack River corridor has enjoyed over 30 years of continuous water quality field data; however, data is collected by multiple organizations and can be hard to track down. Protecting the

quality of the water is even more important today because the river provides water to Pennichuck Water Works, a major supplier of drinking water to the four corridor communities. While longstanding contaminants, such as *E. coli* from CSO events, are still present, new contaminants such as PFAS have been discovered locally. Recurring summer droughts followed by heavy rain events are also changing the dynamics of the river and the needs of residents. Regulatory frameworks lack the rigor needed to address a full spectrum of water quality issues ranging from road salt applications to aquifer protections to erosion control. Standards for regulating the cumulative effects of smaller developments are currently absent within the corridor community towns. In addition, water quality improvements may only be achievable when the full spectrum of upstream and downstream uses and impacts are considered at a variety of government levels, and additional partnering may be needed with entities having jurisdiction primarily outside of the corridor area.

Administration

Processes and administration of corridor-related issues and permits are handled differently in each corridor community, which can be problematic for issues that have trans-jurisdictional effects or implications since there is no oversight agency or group for day-to-day activities occurring within the river corridor. There is potential for increased coordination of violations tracking, enforcement, and permitting opportunities, perhaps through the local Conservation Commissions and the LMRAC. The Corridor Management Plan itself can serve as a unifying resource if incorporated into municipal Master Plans, giving each town a common basis for making recommendations and pursuing actions that promote wise use of the corridor. The NHDES One-Stop Database is a resource that tracks permit information. Visit the [NHDES One-Stop Database](#). It could also prove invaluable not only for understanding the cumulative effects of incremental developments but also for increasing public involvement in the management of corridor resources and concerns.

Citizens can always report potential violations through the NHDES Wetlands Bureau via [a complaint form on the NHDES website](#). Also, since each of the municipalities already has policy, personnel, and a regulatory framework that works well individually, there is strength to be built upon in the efforts of arranging collective management of the overall corridor, both in violations reporting and enforcement.

Conservation

Permanent conservation of land through purchase or conservation easements protects the river by reducing runoff into the river, preserving wildlife habitat, preventing loss from flooding, preserving scenic views, and providing spaces for recreation. While each of the communities has tools available to help in permanently protecting important land or resource areas, land in the river corridor continues to be developed for residential and industrial purposes. A recent trend is that already developed properties along the river are being redeveloped into more intensive uses. Communities should ensure that land in the river corridor is appropriately zoned.

Conservation commissions should closely evaluate which properties in the river corridor are good candidates for conservation. Land values continue to escalate which means that communities are finding it increasingly difficult to purchase large parcels of land outright and need to step-up partnering efforts. As such, there is also a need to implement conservation on a smaller scale, using innovative methods which right now are only encouraged in the corridor communities rather than required.

Conservation subdivisions, smaller or shared access, and innovations in stormwater controls are all methods which can incrementally preserve undeveloped land.

Corridor Management

Management of the Merrimack River is mainly controlled by the existing regulatory framework contained within the corridor communities, consisting of regulations, ordinances, and permitting approvals. It is apparent that each of the corridor communities has made strides toward better protection of the corridor resource; however, critical pieces of regulatory oversight are sometimes still lacking, or when in place, there is a lack of enforcement or long-term evaluation of protective measures. None of the four corridor communities have adopted watershed protection measures within their zoning ordinances, making it difficult to regulate activities or disturbances that occur to already developed properties within the corridor. In addition, only Merrimack has adopted a zoning ordinance which regulates development within the shoreland area.

The watershed audits also reveal that the protective measures afforded to the river throughout the corridor vary widely between communities, which may have the unintended consequence of encouraging developments to occur in places which have the least control or influence over it.

Public Access and Awareness

Public access to and public awareness of the river continues to be limited. Increasing public access allows for both increased appreciation and potential degradation of the river corridor, so recreational uses of the river environment need to be carefully managed and directed. While there are some new and/or improved public access points, access points are still limited and not well publicized or known, and some contain structural deficiencies in terms of facilities, parking, and maintenance. However, the Merrimack River itself is a much beloved resource that is still a “diamond in the rough.” Creating more attractive and well-managed facilities will help to promote even greater appreciation of the river corridor by a wider, environmentally conscious audience. Public education and stewardship events and outreach could also help residents new to the region discover the river and learn about its value.

Protect and Remediate

Each of the corridor communities have made increasing efforts towards effectively regulating new developments with riparian resource considerations in mind, but it is somewhat more difficult to regulate existing uses and even more difficult to achieve rehabilitation or restoration of existing structures that do not violate any existing standards but do represent outdated or no longer permitted designs. Outfalls and streambank stabilization structures along the Merrimack River corridor range in design and condition and many are problematic in the degree to which they accommodate riparian interests either in terms of materials, velocity of discharge, height, landscaping, or aesthetic concerns. Communities will need to use a variety of voluntary and involuntary approaches to achieving restoration of outdated, unsafe, or incompatible structures.

Scenic Quality

Scenic quality is an important resource that remains largely ignored, in that structural heights and screening standards are the same for either upland or riparian properties. Viewsheds from the river are

not currently protected, and viewsheds to the river from individual homes are often in violation of the Shoreland Water Quality Protection Act but are not enforced.

Historic Resources

All four communities in the river corridor actively protect historic resources, though information on the lower Merrimack River corridor as a collective resource has not yet been officially recognized. There is room, and need, for more active protection of historic resources along the Merrimack River which may have the combined effect of contributing to overall recreation and conservation goals at the same time.

Chapter 4: Goals and Objectives

The goals and objectives of the plan were first drafted in 1989 by representatives from the four corridor communities. This list was revised by LMRLAC to reflect current conditions: while always important, water quality is even more vital today because the river is now a source of drinking water for residents of all four corridor communities; LMRLAC can be the most effective at when it is a strong organization with solid relationships; and time is running out to conserve land in the river corridor. Based on the 2022 public access survey, the river is a hidden gem that is difficult to access. The public needs to know and value the river if they are going to protect it.

Below is the list of goals and objectives. Chapter 5 contains a separate list of recommended actions to implement the Plan.

Goal 1 **Water Quality**
To protect water quality in the river.

- Objective:**
- 1.1 Compile and assess current data on physical, chemical, and biological indicators of water quality in the river corridor as collected by Pennichuck Water Works, the Souhegan Watershed Association, the Merrimack River Watershed Council, and NHDES.
 - 1.2 Implement local ordinances and performance standards that further the protection of water quality through regulation of land uses within the river corridor.
 - 1.3 Participate in state processes which directly or indirectly benefit the protection of river resources within the State.

Goal 2 **Administration**
Coordinate the implementation of LMRLAC goals, objectives, and actions with corridor towns.

- Objectives:**
- 2.1 Strengthen relationships with local or regional entities involved in protection or management of the river or its tributaries by coordinating at least one joint activity or meeting with these groups, yearly.
 - 2.2 Internally improve LMRLAC as an organization by evaluating membership, duties, and public awareness of the organization on a yearly basis.
 - 2.3 Contribute to enforcement activities: partner with state and local authorities by proactively testifying at relevant hearings and submitting formal comments before decisions are made.

Goal 3 **Conservation**
To retain open space along the river corridor.

- Objectives:
- 3.1 Preserve the natural character of undeveloped/underdeveloped properties along the river by partnering with municipalities and local non-profits in conservation efforts.
 - 3.2 Conserve prime and active farmland within the river corridor through purchase of easements and/or development rights and adoption of local regulations which protect farmlands.
 - 3.3 Retain the existing character of the river shoreline by planning a “greenbelt” system along the shoreline.

Goal 4 **Corridor Management**
To promote the conservation, protection, and sound management of the river corridor.

- Objectives:
- 4.1 Emphasize Low Impact Development (LID) techniques and strategies in regulatory approaches to achieve more efficient developments in the river corridor.
 - 4.2 Proactively encourage developers to consult LMRLAC early in development planning.
 - 4.3 Publicize the state regulations that address setback, buffer, and shoreland protection issues within the river corridor.
 - 4.4 Implement mitigation requirements that counteract development impacts to corridor resources and values.

Goal 5 **Public Access and Awareness**
To increase public access to and use of the lower Merrimack River.

- Objective:
- 5.1 Increase the recreational use of the corridor by at least 20% as measured in numbers and types of recreational users over the next 10 years by increasing the quality and quantity of recreational resource.
 - 5.2 Increase the knowledge of local citizenry of the river corridor resources by conducting at least yearly information dissemination efforts.

Goal 6 **Protect and Remediate**
To restore river conditions to those ecologically endemic to the natural state of the river.

- Objective:
- 6.1 Restore and enhance the streambank to more natural conditions by supporting and encouraging riparian owners to plan and obtain funding for such improvements.
 - 6.2 Ensure that shoreline developments fully comply with the requirements of the Shoreland Water Quality Protection Act (SWQPA) as detailed by NHDES regulations.

Goal 7 **Scenic Quality**
To promote the appreciation and protection of special scenic vistas associated with the river and its corridor.

- Objectives:
- 7.1 Protect the significant views from the river by adopting local regulations that protect views from river user vantages.
 - 7.2 Protect the significant scenic views of the river, especially along nearby trails.

Goal 8 **Historic Resources**
To promote, preserve, enhance, and protect the historic sites, buildings, character, and settings of the river corridor.

- Objectives:
- 8.1 Identify and protect the historic resources of the river corridor.
 - 8.2 Increase public interest in and knowledge of river corridor historic resources and historic preservation tools by contributing material to municipal and regional outreach efforts.

Chapter 5: Recommended Actions

Previous chapters identified several issues associated with protecting the river and its corridor. This section contains specific recommended actions aimed at maintaining or improving the river's resources. While the recommendations in this chapter are specifically made for the river corridor, many can also be applied to activities throughout the watershed as well. The recommendations are arranged according to the goals and objectives of the corridor plan, given in Chapter 4 of this document.

List of Recommended Actions

Action Class 1: Water Quality

Rank	Action
1	Facilitate active participation in and support local water quality monitoring programs, including sampling for contaminants. The results obtained can provide valuable information regarding the health of the State's rivers and streams.
2	Monitor all proposals for intakes, discharges and water transfers, and provide comment during the NHDES 401 Water Quality Certificate review process. The impacts of the discharges on other water uses and users should be specifically described in any proposal documents.
3	Conduct an inventory of all in-use and abandoned underground storage tanks in each community, paying particular attention to those tanks located in the river corridor or near a tributary. The inventory can be conducted by the conservation commissions. This will supplement information available from the NHDES Oil Remediation and Compliance Bureau (ORCB) for registered facilities with underground storage capacities of 1,100 gallons or greater. In addition, owners of abandoned tanks should be provided with information and assistance on proper closure. Any faulty tanks detected in the inventory should be reported to the ORCB.
4	Encourage the development of a comprehensive study that quantifies the surface and groundwater resources that comprise the drinking water supply of the lower Merrimack River watershed, so that resource use can be better understood and managed.
5	Develop and adopt aquifer protection regulations in Hudson, Litchfield and Nashua to protect groundwater resources. Model regulations and assistance in drafting regulations are available from NRPC. Since the river flows through an aquifer, these regulations will also protect the water quality of the river.
6	Encourage NHDES to continue to jointly protect the water quality and quantity of the Merrimack River in both New Hampshire and Massachusetts.
7	Utilize volunteers to conduct useful research into such things as outfall locations and periodic monitoring of effluent reports generated by NPDES facilities.

Action Class 1: Water Quality

- | | |
|---|--|
| 8 | Encourage the four communities to participate in the NHDES Green Snow Pro certification programs. |
| 9 | At least yearly, discuss discharger compliance with NHDES in regards to NPDES permits, violations, and ongoing enforcement actions to monitor permit activity in the lower Merrimack River Corridor. |

Action Class 2: Administration

- | Rank | Action |
|------|---|
| 1 | Encourage NHDES to increase enforcement of existing environmental regulations such as Alteration of Terrain and dredge and fill of wetlands and NPDES violations. |
| 2 | Inform and educate citizens and enforcement officials on the applicable federal, state and local regulations to ensure proper understanding of the regulation and the rationale behind them. |
| 3 | Report any violations of federal, state or local regulations. To facilitate citizen reports, LMRLAC should partner with the Conservation Commissions, code enforcement officers, and police departments of the four communities to work jointly on developing a process by which citizens and municipalities can follow in reporting wetland, stormwater, shoreland protection, and pollutant discharge violations. |
| 4 | The communities and other organizations should use the power of the press to its fullest in promoting the issues and activities surrounding the river. Publicize all public meetings, clean-up days, public access dedications, recreation events and volunteer activities. |
| 5 | Utilize the assistance of the Nashua Regional Planning Commission to conduct a series of meetings in each corridor community to discuss the information contained in the Merrimack River Corridor Management Plan and its recommendations. |
| 6 | Facilitate a process by which projects within the river corridor being reviewed by local Conservation Commissions are simultaneously reviewed by the LMRLAC. |
| 7 | Seek training for the Local Advisory Committees from NHDES so that LACs are better able to assist in notification and enforcement of violations. |
| 8 | Actively recruit new membership into the LMRLAC. |

Action Class 3: Conservation

- | Rank | Action |
|------|---|
| 1 | Partner with local Conservation Commissions to sponsor regularly scheduled informational meetings on topics related to river conservation that are of interest to community residents. The discussions should focus on the impacts of individual actions and the benefits derived from the river. |

Action Class 3: Conservation

Rank	Action
2	Develop asset inventory logs for all undeveloped / underdeveloped properties within the lower Merrimack River corridor.
3	Partner with the local Conservation Commissions to support requests for funding the purchase of conservation easements and land in their annual budget request. Provide Conservation Commissions with support documentation on priority properties deserving protection.
4	Partner with local Conservation Commissions in each community to develop outreach materials on river conservation issues.
5	Request that the corridor community municipal officials include funds for the purchase of conservation easements and lands in the capital improvements program on an annual basis. LMRAC should encourage the Conservation Commissions to submit conservation funding requests.
6	Adopt a watershed conservation district which creates standards for development within areas adjacent to riparian habitats in all four corridor communities.

Action Class 4: Corridor Management

Rank	Action
1	Adopt impervious surface limitations that restrict development to less than 10% allowable impervious surface within the river corridor.
2	Support local communities in the development and adoption of local river protection regulations which identify permitted uses and their requirements, as well as give development standards for the allowable locations of public and private boating docks.
3	Protect steep slopes and other environmentally sensitive areas through adoption of land use regulations that prohibit or limit development in these river corridor areas.
4	Adopt regulations that limit alterations to natural stream channels and banks and require restoration for already degraded streambank segments and mitigation of unavoidable impacts to stream and river banks.
5	Adopt local shoreland protection regulations in all four corridor communities that are designed to protect the lower Merrimack River according to specific local needs and conditions.
6	Determine a tiered set of required buffer distances for use in regulating land uses adjacent to the Merrimack River based upon the hydrology and topographic features surrounding this unique riparian resource, acknowledging that a one-size-fits-all setback may not be the most appropriate or equitable means of managing this surface water.

Action Class 4: Corridor Management

- 7 Encourage the adoption of mitigation requirements when the natural appearance and function of shoreland elements are degraded, both in new construction and for existing developments.
- 8 Amend or adopt floodplain regulations in corridor communities to restrict the construction or enlargement of buildings and structures within the 100-year floodplain.
- 9 Partner with the corridor communities' Conservation Commissions to amend the wetland regulations to include the following:
 - 75-foot minimum setback for buildings, structures, and parking areas
 - 50-foot required vegetated buffer for wetlands
 - 125-foot minimum setback for septic systems and leachfields located in somewhat poorly drained soils or soils with a rapid or very rapid permeability.

Action Class 5: Public Access and Awareness

- | Rank | Action |
|------|--|
| 1 | Partner with other river-oriented organizations to offer recreational opportunities for the general public that are designed to provide positive recreational experiences to users in order to facilitate greater appreciation for river resources. |
| 2 | Increase public awareness of the Merrimack River as an asset to the four communities and to the region as a whole through development of outreach materials, recreational opportunities, and partnerships with other entities having high media profiles. |
| 3 | Encourage corridor communities to acquire public access easements along the shoreline to be used for a continuous recreational trail within the river corridor. |
| 4 | Establish a trained team of volunteers to facilitate education and recreation programs that emphasize the wise use of the river through recreational programs and uses. Educational messages should focus on conservation and recreational uses, but should also be flexible enough to provide landowners with answers to questions regarding liability and law enforcement. Where possible, volunteer programs should be incorporated into schools. |
| 5 | Partner with the local Conservation Commissions and historical societies in each community to develop and install signage at public access points, including interpretive signs to highlight important natural and historic areas. |
| 6 | Develop additional boat launching facilities along both sides of the lower Merrimack River corridor. |
| 7 | Develop a clearinghouse for useful information related to landowner liability, responsibility, and opportunity concerning use of public recreational facilities which cross private property. |

Action Class 5: Public Access and Awareness

- | | |
|----|--|
| 8 | Work with NRPC to create a list of lower Merrimack River corridor property owners, updated at least once a year, to assist municipalities, conservation commissions, and the LMRLAC in communicating with landowners on important corridor issues and opportunities. |
| 9 | Investigate the possibility of developing shared parking programs between municipal buildings and/or private firms to provide additional evening and weekend parking for trail and river users wherever possible. |
| 10 | Work with NRPC to develop maps in each community showing the location and the conditions of use for each public access point on the river. |

Action Class 6: Protect and Remediate

- | Rank | Action |
|------|---|
| 1 | Clean up river habitats and shoreland areas that are already polluted with debris, contaminants, and garbage to improve site-specific water quality. |
| 2 | Encourage and educate Conservation Commissions, developers, and the general public about alternatives to rip-rap streambank stabilization methods, such as living shorelines. |
| 3 | Encourage active restoration of degraded streambank through the development and implementation of regulatory requirements or incentive-based performance standards. |

Action Class 7: Scenic Quality

- | Rank | Action |
|------|---|
| 1 | Adopt height restrictions, in conjunction with shoreland protection regulations, to limit the height of new buildings in the shoreland zone to a maximum of two stories to effectively screen development from the river and maintain the visual integrity of the corridor. |
| 2 | Adopt landscaping regulations, in conjunction with shoreline protection regulations, to screen developments from the river and public recreation areas, including trails. |

Action Class 8: Historic Resources

Rank	Action
1	Support volunteer efforts to conduct historic resource surveys of the river corridor in each community. The NRPC can aid the organizations interested in conducting historic surveys.
2	Obtain assistance in preparing National Register applications for eligible sites.
3	Partner with corridor community historic preservation offices to publicize updates to historic resource inventories.

Recommended Participants

Lower Merrimack River Local Advisory Committee (LMRLAC)

One of the main tasks charged to the Local Advisory Committee is to “develop or assist in the development and adoption of local river corridor management plans under RSA 483:10.” LMRLAC plays a unique, citizen-based, multidisciplinary role as stewards over activities in the river corridor and should be a primary participant in these action items.

Municipal Governing Bodies

Municipal government recommendations concerning the river corridor deal with amendments to the zoning regulations or financial commitments. All four communities are managed differently, through Town Council, Board of Alderman, Board of Selectmen, and Town Meetings. Every municipality needs to be aware of the need to protect the river and be committed to conserving the river corridor. Public education is particularly important in Litchfield, Merrimack, and Hudson because of the influence of Town Meeting. The success of any effort to protect the river corridor has a direct relationship to the support and commitment of the municipal governing bodies.

Planning Boards

As the municipal board responsible for drafting new zoning ordinances, amending existing regulations and administering the municipality’s land use regulations, the Planning Boards play a major role in protecting the Merrimack River and its watershed. While the board recommends changes to the zoning regulations, they must ultimately be approved by the community’s governing body. Changes to the site plan and subdivision review regulations, however, can be made by a majority vote of the Planning Board without the approval of the municipal governing body. The Planning Board can also use non-regulatory actions to protect the river such as recommending changes to the proposed design and negotiating with developers for conservation easements. Planning Board support is key to the success of protecting the Merrimack River corridor, and these entities must be encouraged to use their regulatory and non-regulatory powers to pursue the objectives of this plan.

Budget Committees

The municipal budget is generally prepared by the Budget Committee. It is important that the Budget Committee be informed of the need for conserving the river corridor, particularly with regard to funding for conservation efforts. Though the Budget Committee does not make the final decisions, their support of a program is important.

Conservation Commissions

Conservation Commission responsibilities include: conducting an inventory of the municipality's natural resources; coordinating the activity of unofficial bodies organized for similar purposes; and maintaining an index of the municipality's natural and scenic resources. Conservation Commissions may also do the following: recommend to the governing body a project for the protection, development, and sound utilization of all the areas in the index; acquire in the name of the municipality by gift or purchase conservation lands and be responsible for their management and control; carry over funds from year to year for purchasing conservation areas; and provide public information on conservation issues.

Regional Planning Commissions

The Nashua Regional Planning Commission (NRPC) serves as a forum for inter-municipal issues and regional policy. NRPC also provides technical assistance to the individual member communities such as master plan and capital improvement program updates, revisions to zoning, subdivision and site plan review regulations, drafting water resource management and protection plans, and professional planning services through the circuit rider program.

NRPC is committed to assisting the communities in protecting the Merrimack River corridor. As a regional agency, the NRPC has a great deal of information about the communities within its region which can be used to develop consistent regulations and methods for achieving the goal of protecting the river corridor. NRPC staff can also assist communities with applications for funding and with making landowner contacts.

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) can provide communities with valuable information on soil and soil potentials. The NRCS can assist communities in developing setback and buffer requirements based on soil types; in evaluating wetlands and wetland impacts; in evaluating erosion problems; and in providing general information on erosion and sedimentation control.

Merrimack River Watershed Council

The Merrimack River Watershed Council (MRWC) is a local non-profit that focuses on making the Merrimack River cleaner, healthier, and more accessible. The MRWC is actively involved in conservation, restoration, science, education, recreation, and advocacy efforts in both New Hampshire and Massachusetts. The MRWC can provide New Hampshire communities with assistance in a number of areas including assistance with implementing restoration activities and conservation easements, organizing outreach and educational events, and developing local and regional partnerships.

Conservation Organizations

Assistance is available from conservation organizations including: the Society for the Protection of New Hampshire Forests, the New Hampshire Audubon Society, the Nature Conservancy, the Trust for Public Lands, and the New Hampshire Rivers Council. These organizations can provide valuable information on wildlife, forest management and land conservation techniques.

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**APPENDIX 1: State and Federally Listed Threatened
and Endangered Species Present Within the Lower
Merrimack River Corridor Community**



New Hampshire Natural Heritage Bureau

DNCR - Division of Forests & Lands
172 Pembroke Road, Concord, NH 03301
(603) 271-2215

Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns



July 2020



NH Natural Heritage is a bureau in the Division of Forests & Lands. Our mission is to find, track, and facilitate the protection of New Hampshire's rare plants and exemplary natural communities. We currently study 686 plant and animal species, 197 natural communities, and 45 natural community systems. Our database contains information on more than 7,300 species, natural community, and system occurrences throughout the state.

Plants, Animals, and Natural Communities Tracked by the NH Natural Heritage Bureau

The following lists note the rare plants, rare animals, and exemplary natural communities and systems that the NH Natural Heritage Bureau has on record in each town. This document may not be used as a substitute for NH Natural Heritage Bureau reviews that are required by the Department of Environmental Services, Federal Energy Regulatory Commission, or any other local, state, or federal government agency. *A few species that are highly vulnerable to collection are not included in the town lists.* In addition, the list is dynamic: as new populations and natural communities are reported to our office, the list grows. Planners and interested residents should therefore contact the NH Natural Heritage Bureau directly if they need up-to-date information or have questions.

Rare Plant Species

The NH Natural Heritage Bureau tracks the state's rarest and most imperiled plant species. We have identified these species in cooperation with researchers, conservation organizations such as The Nature Conservancy, and knowledgeable amateur botanists. Population locations for these species are obtained from a variety of sources including herbarium specimens (some dating from the late 1800s), personal contacts, scientific literature, and extensive field research. The NH Natural Heritage Bureau undertakes surveys on private property only with landowner permission.

Rare Animal Species

The NH Natural Heritage Bureau tracks rare animal species in cooperation with the Nongame & Endangered Wildlife Program of the NH Fish & Game Department. The Nongame Program has identified these species in cooperation with researchers, conservation organizations such as the Audubon Society of New Hampshire, knowledgeable amateur biologists, and the NH Natural Heritage Bureau. Wildlife locations were obtained from sources including museum specimens, personal contacts, the scientific literature, and through extensive field research.

Exemplary Natural Communities

Natural communities are defined as assemblages of plants and animals that recur in predictable patterns across the landscape under similar physical conditions. Basically they are different types of habitats or ecosystems such as forests, wetlands, grasslands, etc. Most of the New Hampshire landscape is covered by relatively common natural community types. Scattered throughout the state, however, and usually in predictable areas, are distinctive communities found in few other places.

Particular sets of natural communities tend to co-occur in the landscape and are linked by a common set of driving forces (such as landforms, flooding, soils, and nutrient regime). These groups of communities are referred to as *natural community systems* (sometimes just referred to as *systems*). Systems are often at an appropriate scale for many applications, including mapping and predictive modeling, identifying wildlife and wildlife habitats, and conservation planning.



The NH Natural Heritage Bureau tracks "exemplary" natural community and system occurrences. To qualify as exemplary, a natural community or system in a given place must be of a rare type, such as a calcareous riverside seep, or must be a relatively undisturbed occurrence of a common community in good condition, such as an old-growth spruce - fir forest. Exemplary natural communities and systems represent the best remaining examples of New Hampshire's biological diversity.

For each plant, animal, exemplary natural community, and system within a town, we have provided the following information:

Name

Plants: Readers should remember that common names vary across the range of the plant. For example, "wild lupine" (*Lupinus perennis*) in New Hampshire is called "wild blue lupine" in New York and "sundial lupine" in other parts of its range; the name also commonly leads to confusion with garden lupine (*Lupinus polyphyllus*) which is not native to New Hampshire but grows wild in some areas. Scientific names are more standardized. The primary reference used for New Hampshire plants as of 2011 is:

Haines, Arthur. 2011. New England Wild Flower Society's Flora Novae Angliae A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press. New Haven and London.

Wildlife: Common names are provided for all species that have them. Many insect species, particularly moths, do not have common names, so general terms such as "A Noctuid Moth" are used or no name is given ("--"). Scientific names are standardized with the scientific names used by other Natural Heritage programs.

Natural Communities: The names of natural communities reflect the plants that help define them, such as a **beech forest**, or the environmental processes that influence them, such as a **boulder - cobble river channel**.

Listing

Plants: Most of New Hampshire's rare plants are listed as "threatened" or "endangered" under the NH Native Plant Protection Act of 1987 (NH RSA 217-A). A subset of species are also listed under the federal Endangered Species Act of 1973 (42 USCA §§ 4321-4370c). Listing represents a political recognition of rarity, so some species that are biologically rare (and therefore included in the list) may not be listed as "threatened" or "endangered." Under the NH Native Plant Protection Act, "endangered" species are those in danger of being extirpated from the state, while "threatened" species face the possibility of becoming "endangered."

The presence of a rare plant or natural community does not limit a landowner's ability to use their land – this is stated explicitly in the NH Native Plant Protection Act. Landowners applying for state wetland permits are required by the NH Department of Environmental Services to review options for achieving their land-use objectives while protecting a rare plant or natural community, but projects will not be denied solely on the basis of a rare plant occurrence. In our experience, rare plants are typically destroyed because landowners are not aware of them; minor changes to their projects usually could have saved the rarities. Our goal is to help landowners protect rarities on their properties *voluntarily*.



Wildlife: A portion of New Hampshire's rare animals are listed as "threatened" or "endangered" under the NH Endangered Species Conservation Act of 1979 (NH RSA 212-A). "Endangered" species are those in danger of being extirpated from the state, while "threatened" species face the possibility of becoming "endangered." A subset of these species are also listed under the federal Endangered Species Act of 1973. In New Hampshire, an additional "special concern" list contains (a) species that could become "threatened" in the foreseeable future if conservation actions are not taken or that were recently recovered enough to be removed from the endangered and threatened category and (b) species for which a large portion of their global or regional range (or population) occurs in New Hampshire and where actions to protect these species habitat will benefit the species' global population. Species that do not meet the criteria for "endangered", "threatened", or "special concern", but that are still biologically rare, as indicated by the State and Global Ranks, are also listed as rare in New Hampshire.

Rare wildlife in New Hampshire are under the jurisdiction of the Nongame and Endangered Wildlife Program in the NH Fish & Game Department.

Known Locations We have noted the number of known occurrences of a given plant, animal, or natural community within each town. There has not been a comprehensive search of the state for rare species or natural communities, so we are frequently finding or learning about previously unknown populations and adding them to the list. Further, many rare plant and animal populations have not been checked since they were originally found, sometimes more than 50 years ago, so we do not know the current status of these populations. We have listed populations that have not been reported to us in the last 20 years as "historical only"; these populations may still be present, but field surveys are necessary to confirm their survival.

We have also included the number of known occurrences of each plant, animal, natural community, and system within the entire state. If no locations are indicated (- -), the species or natural community is known to have once occurred in the state, but specific sites are not in our database.

Flags

When considering rarity, it is important to consider the status of a species or natural community both in New Hampshire and across its entire range. Some species, such as Robbins' cinquefoil (*Potentilla robbinsiana*), are critically imperiled throughout their global range. Other species, such as green-dragon (*Arisaema dracontium*), are very rare in New Hampshire but quite common in other parts of their range.

A plant species is "globally rare" if it has fewer than 20 populations anywhere in the world, or if it has more populations but few reproducing individuals. "State rare" species are those that have few populations or total individuals in New Hampshire.

The rankings for wildlife are based more on the degree of imperilment than on the number of occurrences in the state, although abundance certainly plays a role in assessing a species' long-term viability in New Hampshire. Some species, such as the fish crow (*Corvus ossifragus*) have only a few occurrences in New Hampshire but, since they are expanding northward into the state, they are considered to be vulnerable but not imperiled. Blanding's turtles (*Emydoidea blandingii*), on the other hand, are distributed



fairly broadly across the state, but populations are small and vulnerable to habitat loss, so they are considered at risk.

The relative quality of a given rare species population, natural community, or system is also important when assessing its conservation importance. We consider all populations to be of high conservation value, but an "excellent" population (say with several hundred plants) of a globally rare species is particularly important when compared to a "marginal" population (say with only five plants).

To help planners assess the relative importance of rare species and exemplary natural communities or systems in their town, we have attached "flags" to occurrences that have been recorded in the last 20 years. The flags are as follows:

- | | | |
|------|-----------------------|---|
| **** | Highest | An excellent example of a globally rare species, natural community, or system |
| *** | Extremely High | A good example of a global rarity or an excellent example of a state rarity |
| ** | Very High | A marginal example of a global rarity or a good example of a state rarity |
| * | High | A marginal example of a state rarity |

Readers should remember that there are many different ways to assess the value of a rare species population, natural community, or system. We therefore recommend that towns contact the NH Natural Heritage Bureau at (603) 271-2215 to discuss why occurrences in their towns were flagged at each level.

If you have any questions or need additional information, please do not hesitate to contact us. Thank you!

Address: NH Natural Heritage/DNCR
172 Pembroke Road
Concord, NH 03301

Telephone: (603) 271-2215

Web page: <http://www.nhdf.org/about-forests-and-lands/bureaus/natural-heritage-bureau>



A Quick Overview of the NH Natural Heritage Bureau's Purpose and Policies

The Natural Heritage Bureau is mandated by the Native Plant Protection Act of 1987 (NH RSA 217-A) to determine protective measures and requirements necessary for the survival of native plant species in the state, to investigate the condition and degree of rarity of plant species, and to distribute information regarding the condition and protection of these species and their habitats.

The Natural Heritage Bureau provides information to facilitate informed land-use decision-making. We are not a regulatory agency; instead, we work with landowners and land managers to help them protect the State's natural heritage and meet their land-use needs.

The Natural Heritage Bureau has three facets:

Inventory involves identifying new occurrences of sensitive species and classifying New Hampshire's biodiversity. We currently study more than 680 plant and animal species and 240 natural communities. Surveys for rarities on private lands are conducted only with landowner permission.

Tracking is the management of occurrence data. Our database currently contains information about more than 7,300 plant, animal, and natural community occurrences in New Hampshire.

Interpretation is the communication of Natural Heritage Bureau information. Our goal is to cooperate with public and private land managers to help them *protect* rare species populations and exemplary natural communities.



Town	Flag	Species or Community Name	Listed? US	NH	~ reports last 20 yrs Town	State
Hudson						
Natural Communities - Terrestrial						
~		- Dry Appalachian oak forest	--	--	Historical	15
~		- Hemlock forest	--	--	Historical	4
***		- Rich Appalachian oak rocky woods	--	--	1	17
Plants						
**		anemone meadow-rue - <i>Thalictrum thalictroides</i>	--	E	2	8
~		arrow-head rattlebox - <i>Crotalaria sagittalis</i>	--	E	Historical	1
~		bird-foot violet - <i>Viola pedata</i> var. <i>pedata</i>	--	T	Historical	17
~		clasping milkweed - <i>Asclepias amplexicaulis</i>	--	T	Historical	15
~		clustered sedge - <i>Carex cumulata</i>	--	T	Historical	20
~		common prickly-ash - <i>Zanthoxylum americanum</i>	--	E	Historical	1
**		common star-grass - <i>Hypoxis hirsuta</i>	--	T	1	20
~		dragon's-mouth - <i>Arethusa bulbosa</i>	--	E	Historical	24
~		dwarf huckleberry - <i>Gaylussacia bigeloviana</i>	--	T	Historical	12
**		four-leaved milkweed - <i>Asclepias quadrifolia</i>	--	E	1	10
~		hairy bedstraw - <i>Galium pilosum</i> var. <i>pilosum</i>	--	E	Historical	6
~		Kalm's brome - <i>Bromus kalmii</i>	--	E	Historical	3
~		late purple American-aster - <i>Symphyotrichum patens</i> var. <i>patens</i>	--	T	Historical	12
**		narrow-leaved pinweed - <i>Lechea tenuifolia</i>	--	E	1	4
**		Nuttall's reed grass - <i>Calamagrostis coarctata</i>	--	E	1	8
~		palmate violet - <i>Viola palmata</i> var. <i>palmata</i>	--	E	Historical	6
**		red threeawn - <i>Aristida longespica</i> var. <i>geniculata</i>	--	T	1	18
~		river birch - <i>Betula nigra</i>	--	T	Historical	10
~		round-leaved trailing tick-trefoil - <i>Desmodium rotundifolium</i>	--	T	Historical	14
**		sicklepod rockcress - <i>Boechera canadensis</i>	--	T	1	9
**		slender bush-clover - <i>Lespedeza virginica</i>	--	E	1	8
~		smooth forked whitlow-wort - <i>Paronychia canadensis</i>	--	E	Historical	9
~		walking spleenwort - <i>Asplenium rhizophyllum</i>	--	E	Historical	7
**		wild lupine - <i>Lupinus perennis</i> ssp. <i>perennis</i>	--	T	1	30
Vertebrates - Mammals						
***		New England Cottontail - <i>Sylvilagus transitionalis</i>	--	E	1	24
Vertebrates - Reptiles						
**		Blanding's Turtle - <i>Emydoidea blandingii</i>	--	E	14	1098
**		Eastern Box Turtle - <i>Terrapene carolina</i>	--	E	1	19
**		Spotted Turtle - <i>Clemmys guttata</i>	--	T	1	165
***		Wood Turtle - <i>Glyptemys insculpta</i>	--	SC	1	281
Vertebrates - Amphibians						
**		Jefferson/Blue-spotted Salamander Complex - <i>Ambystoma</i> pop. 3	--	--	1	19
Vertebrates - Fish						
~		American Eel - <i>Anguilla rostrata</i>	--	SC	Historical	177
**		Banded Sunfish - <i>Enneacanthus obesus</i>	--	SC	1	32
**		Redfin Pickerel - <i>Esox americanus americanus</i>	--	SC	2	32

Listed? E = Endangered T = Threatened SC = Special concern

Flags

**** = Highest importance
 *** = Extremely high importance
 ** = Very high importance
 * = High importance
 ~ = Historical Record

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact the Natural Heritage Bureau at (603) 271-2215 to learn more about approaches to setting priorities.



Town	Species or Community Name	Listed?		~ reports last 20 yrs	
Flag		US	NH	Town	State
Litchfield					
Natural Communities - Palustrine					
**	- Kettle hole bog system	--	--	1	20
~	- Medium level fen system	--	--	Historical	51
***	- Sand plain basin marsh system	--	--	4	17
**	- Three-way sedge - mannagrass mudflat marsh	--	--	1	1
Plants					
~	bird-foot violet - <i>Viola pedata</i> var. <i>pedata</i>	--	T	Historical	17
~	clasping milkweed - <i>Asclepias amplexicaulis</i>	--	T	Historical	15
~	coastal plain grass-leaved-goldenrod - <i>Euthamia caroliniana</i>	--	T	Historical	13
~	common star-grass - <i>Hypoxis hirsuta</i>	--	T	Historical	20
~	dry land sedge - <i>Carex siccata</i>	--	E	Historical	7
~	dwarf huckleberry - <i>Gaylussacia bigeloviana</i>	--	T	Historical	12
~	late purple American-aster - <i>Symphotrichum patens</i> var. <i>patens</i>	--	T	Historical	12
~	long-leaved bluet - <i>Houstonia longifolia</i>	--	E	Historical	3
~	Macoun's bluejoint - <i>Calamagrostis canadensis</i> var. <i>macouniana</i>	--	E	Historical	1
~	meadow garlic - <i>Allium canadense</i> var. <i>canadense</i>	--	E	Historical	5
**	netted nutsedge - <i>Scleria reticularis</i>	--	E	1	1
~	northern wild senna - <i>Senna hebecarpa</i>	--	E	Historical	10
~	Philadelphia panicgrass - <i>Panicum philadelphicum</i> ssp. <i>philadelphicum</i>	--	E	Historical	8
~	red-footed spikesedge - <i>Eleocharis erythropoda</i>	--	E	Historical	4
**	sharp-flowered manna grass - <i>Glyceria acutiflora</i>	--	E	1	9
~	smooth beggar-ticks - <i>Bidens laevis</i>	--	E	Historical	2
~	stiff tick-trefoil - <i>Desmodium obtusum</i>	--	E	Historical	2
~	unpretentious yellow-seeded false pimpernel - <i>Lindernia dubia</i> var. <i>anagallidea</i>	--	E	Historical	5
~	upright false bindweed - <i>Calystegia spithamea</i> ssp. <i>spithamea</i>	--	E	Historical	9
~	Virginia mountain-mint - <i>Pycnanthemum virginianum</i>	--	E	Historical	3
~	wild chives - <i>Allium schoenoprasum</i>	--	E	Historical	7
~	wild goat's-rue - <i>Tephrosia virginiana</i>	--	E	Historical	7
~	wild lupine - <i>Lupinus perennis</i> ssp. <i>perennis</i>	--	T	Historical	30
~	Wright's spikesedge - <i>Eleocharis diandra</i>	--	E	Historical	12
Vertebrates - Mammals					
***	New England Cottontail - <i>Sylvilagus transitionalis</i>	--	E	2	24
Vertebrates - Birds					
**	Grasshopper Sparrow - <i>Ammodramus savannarum</i>	--	T	1	15
**	Vesper Sparrow - <i>Pooecetes gramineus</i>	--	SC	1	20
Vertebrates - Reptiles					
**	Blanding's Turtle - <i>Emydoidea blandingii</i>	--	E	27	1098
**	Eastern Hognose Snake - <i>Heterodon platirhinos</i>	--	E	2	45
~	Northern Black Racer - <i>Coluber constrictor constrictor</i>	--	T	Historical	70
**	Smooth Green Snake - <i>Opheodrys vernalis</i>	--	SC	1	85
**	Spotted Turtle - <i>Clemmys guttata</i>	--	T	4	165
***	Wood Turtle - <i>Glyptemys insculpta</i>	--	SC	3	281
Vertebrates - Amphibians					
**	Northern Leopard Frog - <i>Lithobates pipiens</i>	--	SC	1	18

Listed? E = Endangered T = Threatened SC = Special concern

Flags **** = Highest importance
 *** = Extremely high importance
 ** = Very high importance
 * = High importance
 ~ = Historical Record

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact the Natural Heritage Bureau at (603) 271-2215 to learn more about approaches to setting priorities.



Town		Listed?		~ reports	last 20 yrs
Flag	Species or Community Name	US	NH	Town	State
Merrimack					
Natural Communities - Terrestrial					
**	- Rich Appalachian oak rocky woods	--	--	1	17
Natural Communities - Palustrine					
**	- High-gradient rocky riverbank system	--	--	1	10
**	- Kettle hole bog system	--	--	1	20
**	- Sand plain basin marsh system	--	--	1	17
**	- Silver maple - false nettle - sensitive fern floodplain forest	--	--	1	19
**	- Swamp white oak basin swamp	--	--	1	6
Plants					
**	bashful clubsedge - <i>Trichophorum planifolium</i>	--	E	1	4
**	bird-foot violet - <i>Viola pedata</i> var. <i>pedata</i>	--	T	1	17
**	blunt-lobed cliff fern - <i>Woodsia obtusa</i> ssp. <i>obtusa</i>	--	E	2	11
~	butterfly milkweed - <i>Asclepias tuberosa</i> ssp. <i>tuberosa</i>	--	E	Historical	9
~	clasping milkweed - <i>Asclepias amplexicaulis</i>	--	T	Historical	15
**	common star-grass - <i>Hypoxis hirsuta</i>	--	T	1	20
**	downy false foxglove - <i>Aureolaria virginica</i>	--	E	2	16
**	dry land sedge - <i>Carex siccata</i>	--	E	1	7
**	early crowfoot - <i>Ranunculus fascicularis</i>	--	E	1	4
**	hairy bedstraw - <i>Galium pilosum</i> var. <i>pilosum</i>	--	E	1	6
**	hoary mountain-mint - <i>Pycnanthemum incanum</i> var. <i>incanum</i>	--	E	1	6
**	late purple American-aster - <i>Symphyotrichum patens</i> var. <i>patens</i>	--	T	2	12
*	licorice goldenrod - <i>Solidago odora</i> ssp. <i>odora</i>	--	T	1	26
~	long-spined sandbur - <i>Cenchrus longispinus</i>	--	E	Historical	11
~	Macoun's bluejoint - <i>Calamagrostis canadensis</i> var. <i>macouniana</i>	--	E	Historical	1
~	meadow garlic - <i>Allium canadense</i> var. <i>canadense</i>	--	E	Historical	5
~	northern wild senna - <i>Senna hebecarpa</i>	--	E	Historical	10
~	Philadelphia panicgrass - <i>Panicum philadelphicum</i> ssp. <i>philadelphicum</i>	--	E	Historical	8
~	red-footed spikesedge - <i>Eleocharis erythropoda</i>	--	E	Historical	4
**	reflexed sedge - <i>Carex retroflexa</i>	--	E	1	6
**	rock muhly - <i>Muhlenbergia sobolifera</i>	--	E	1	6
**	round-leaved trailing tick-trefoil - <i>Desmodium rotundifolium</i>	--	T	2	14
**	sicklepod rockcress - <i>Boechera canadensis</i>	--	T	1	9
***	smooth beggar-ticks - <i>Bidens laevis</i>	--	E	1	2
**	smooth forked whitlow-wort - <i>Paronychia canadensis</i>	--	E	1	9
~	smooth small-leaved tick-trefoil - <i>Desmodium marilandicum</i>	--	E	Historical	4
~	stiff tick-trefoil - <i>Desmodium obtusum</i>	--	E	Historical	2
**	tall cottonsedge - <i>Eriophorum angustifolium</i> ssp. <i>angustifolium</i>	--	E	1	4
~	upright false bindweed - <i>Calystegia spithamea</i> ssp. <i>spithamea</i>	--	E	Historical	9
~	Virginia mountain-mint - <i>Pycnanthemum virginianum</i>	--	E	Historical	3
*	waxy-leaved meadow-rue - <i>Thalictrum revolutum</i>	--	E	1	2
~	wild chives - <i>Allium schoenoprasum</i>	--	E	Historical	7
~	wild goat's-rue - <i>Tephrosia virginiana</i>	--	E	Historical	7
**	wild lupine - <i>Lupinus perennis</i> ssp. <i>perennis</i>	--	T	2	30
***	Wright's spikesedge - <i>Eleocharis diandra</i>	--	E	1	12

Listed? E = Endangered T = Threatened SC = Special concern

Flags **** = Highest importance
 *** = Extremely high importance
 ** = Very high importance
 * = High importance
 ~ = Historical Record

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact the Natural Heritage Bureau at (603) 271-2215 to learn more about approaches to setting priorities.



Town		Listed?		~ reports last 20 yrs	
Flag	Species or Community Name	US	NH	Town	State
Nashua					
Natural Communities - Terrestrial					
~	- Hemlock forest	--	--	Historical	4
~	- Pitch pine - scrub oak woodland	--	--	Historical	15
Natural Communities - Palustrine					
~	- Medium level fen system	--	--	Historical	51
~	- Poor level fen/bog system	--	--	Historical	29
~	- Sand plain basin marsh system	--	--	Historical	17
Plants					
~	arrow-head rattlebox - <i>Crotalaria sagittalis</i>	--	E	Historical	1
***	bird-foot violet - <i>Viola pedata</i> var. <i>pedata</i>	--	T	3	17
~	branched bur-reed - <i>Sparganium angrocladum</i>	--	E	Historical	2
**	clasping milkweed - <i>Asclepias amplexicaulis</i>	--	T	2	15
~	common prickly-ash - <i>Zanthoxylum americanum</i>	--	E	Historical	1
*	common star-grass - <i>Hypoxis hirsuta</i>	--	T	1	20
**	flat-stem pondweed - <i>Potamogeton zosteriformis</i>	--	E	1	12
**	greater fringed-gentian - <i>Gentianopsis crinita</i>	--	T	1	30
*	licorice goldenrod - <i>Solidago odora</i> ssp. <i>odora</i>	--	T	1	26
~	long-spined sandbur - <i>Cenchrus longispinus</i>	--	E	Historical	11
~	meadow garlic - <i>Allium canadense</i> var. <i>canadense</i>	--	E	Historical	5
~	narrow-leaved white-topped-aster - <i>Sericocarpus linifolius</i>	--	E	Historical	5
***	northern blazing star - <i>Liatris novae-angliae</i> var. <i>novae-angliae</i>	--	E	1	16
~	northern wild senna - <i>Senna hebecarpa</i>	--	E	Historical	10
~	Philadelphia panicgrass - <i>Panicum philadelphicum</i> ssp. <i>philadelphicum</i>	--	E	Historical	8
~	ram's-head lady's-slipper - <i>Cypripedium arietinum</i>	--	E	Historical	13
~	sicklepod rockcress - <i>Boechera canadensis</i>	--	T	Historical	9
***	smooth beggar-ticks - <i>Bidens laevis</i>	--	E	1	2
~	wild chives - <i>Allium schoenoprasum</i>	--	E	Historical	7
**	wild goat's-rue - <i>Tephrosia virginiana</i>	--	E	3	7
**	wild lupine - <i>Lupinus perennis</i> ssp. <i>perennis</i>	--	T	3	30
Vertebrates - Birds					
**	Bald Eagle - <i>Haliaeetus leucocephalus</i>	T	SC	3	140
**	Eastern Meadowlark - <i>Sturnella magna</i>	--	T	2	28
**	Horned Lark - <i>Eremophila alpestris</i>	--	SC	1	8
**	Peregrine Falcon - <i>Falco peregrinus anatum</i>	--	T	1	25
**	Sora - <i>Porzana carolina</i>	--	SC	1	16
Vertebrates - Reptiles					
**	Blanding's Turtle - <i>Emydoidea blandingii</i>	--	E	13	1098
**	Eastern Box Turtle - <i>Terrapene carolina</i>	--	E	1	19
**	Eastern Hognose Snake - <i>Heterodon platirhinos</i>	--	E	4	45
**	Northern Black Racer - <i>Coluber constrictor constrictor</i>	--	T	1	70
**	Spotted Turtle - <i>Clemmys guttata</i>	--	T	1	165
**	Wood Turtle - <i>Glyptemys insculpta</i>	--	SC	1	281
Vertebrates - Fish					
**	Banded Sunfish - <i>Enneacanthus obesus</i>	--	SC	1	32

Listed? E = Endangered T = Threatened SC = Special concern

Flags **** = Highest importance
 *** = Extremely high importance
 ** = Very high importance
 * = High importance
 ~ = Historical Record

These flags are based on a combination of (1) how rare the species or community is and (2) how large or healthy its examples are in that town. Please contact the Natural Heritage Bureau at (603) 271-2215 to learn more about approaches to setting priorities.

APPENDIX 2: Public Access Survey Comments

Public Survey Comments:

What organizations do you think of as promoting public access to the Merrimack River?

- School project
- The adjacent towns and their conservation and recreation commissions.
- Conservation and recreation commissions
- Nashua area kayak Facebook group
- Lowell Boulevard
- None but some should
- The Vandenburg Esplanade in Lowell is where I go
- Don't know
- SPNHF (forest society), Merrimack Conservation Commission
- no idea
- Lived in area
- Hudson Conservation Commission
- don't know
- None
- MRWC, SWA, LMRAC, Rowing Club,
- Town groups or organizations
- Can't think of any.
- No idea
- Town of Hudson, conservation commission
- Conservation Commission
- Don't know of any organizations.
- New Hampshire Fish and Game
- Don't know
- paddling clubs
- The Merrimack River Watershed Council
- None
- Recreation Departments
- I don't know of any
- "Merrimack River Watershed
- Friends of the Merrimack River
- Lowell Parks"
- None
- Conservation and bike groups
- I am not sure.
- Municipal
- "Nashua Area Kayak Exploration Destinations group on Facebook, we recommend it often.
- Paddling.com shows the launch sites."

- Facebook groups and civic organizations.
- Fish & Game, NHDES
- Merrimack watershed
- Litchfield conservation commission
- Conservation groups
- none that I know
- kayak rental companies
- The City of Nashua
- Litchfield What's Up Page
- Nashua area kayak exploration destination also us app called GoPaddling
- None
- Not sure
- "NH State Public Waters Access Advisory Board
- Lower Merrimack River Local Advisory Committee and Corridor Master Plan
- Nashua City Master Plan
- Nashua City Waterfront Development Plan
- Hudson Conservation Commission
- MRWC
- MRWC

Is there anything else you would like us to know about access to the Lower Merrimack River in New Hampshire?

- Don't ALLOW AMAZON TO BUILD THE WAREHOUSE!
- It would be great if there was an upstream place to put in and a downstream place to take out. Litchfield to Hudson?
- No building on riverfront. Maintain resources and green space.
- Sklar Waterfront Park in Merrimack in early stages but needs resources.
- It would be great to have a kayak launch available. Also, more hiking trails near the river would be awesome!
- a public location (i.e. website) that lists access to the river
- no
- No
- Visual aesthetic needs to be protected
- Trails for hiking like Mine Falls in Nashua
- Establish a rowing club
- Park space would be nice
- Needs to be an access for kayaking in Hudson
- There are a few areas to access the river, the town park by the old bridge supports, off Winnhaven (Saint Mary's Bank) road.
- Most land along the river seems to be privately owned.
- An excursion boat - parking areas - easily accessible scenic overlooks.

- Shore fishing access
- Respect private property.
- Improved access like Nashua did recently
- I would love for there to be a park with a bandshell, picnic area, docks, and a watershed education area that includes a walking / biking path and is near restaurants.
- Hudson, NH needs access for dropping in kayaks or other boats and places to wade or swim.
- I love to walk along the river by the boat club in Ma. I wish we had an area we could walk along the river and enjoy it's beauty.
- Why did the group, Friends of the Merrimack River support Massive industrial development along the River in Hudson?
- Please continue to keep it a beautiful place to go.
- Keeping it pristine enough to support wildlife and native plants. Also, being sure to keep out invasive species.
- "The Merrimack access showed in your cover photo needs some serious work. Very dangerous launch conditions.
- The Nashua access although brand new is much too steep and needs a nice sandy area to the side of the ramp and not all those large stones."
- I would like to see more access for roof top to explore more of the river. Having no motor and few place to put in limits how much we can explore.
- River status for kayaking, temps, etc
- For boating & paddling, easily accessible ramps with parking and clear signage visible from the water to indicate where they are.
- A map or something like it would be helpful to know about all the different points of access in the towns. Perhaps it already exists.... don' t know.
- kayak friendly ramps
- Less access on east side of river. Need more on east side
- Maps of good places to access the river
- They should stock trout in the Merrimack make it a more valuable asset
- I've often thought of paddling there, but am not aware of access points.
- Riverside hiking/viewing trails needed; town should require easements when riverfront land developed
- If the water is not clean, there is no sense in attracting people to it. The sewage and waste in the river is disgusting and i would not recommend anyone to go in its current condition. The river has so much potential for recreation and wildlife. Sadly iys full of trash and smells like sewage. Full of trash and smells disgusting. it breaks my heart to see it in this condition. Its truly is a treasure that needs a lot of work, but it is treated as a dumping ground.

APPENDIX 3: Corridor Community Watershed Audits

WATERSHED PROTECTION AUDIT

Background Information

Your Name: Brian Groth

Municipality: Town of Hudson

Department: Planning Department

Address: 12 School Street
Hudson, NH 03051

Phone: 603-886-6008 Fax: 603-594-1142

Email: bgroth@hudsonnh.gov

Municipality Population: 25,458 (2018)

Municipality Area (square miles): 29.2

Questions may be directed to:

Emma Rearick
Regional Planner II
Nashua Regional Planning Commission
emmar@nashuarpc.org
603-417-6578

Tool 1. Watershed Planning

Definition: The application of regulatory measures and/or planning techniques that are designed to maintain or limit future impervious cover, redirect development where appropriate, and protect sensitive areas.

Department: Planning

1.1 Does your community have a **master plan**?

- ☒ Yes
- ☐ No
- ☐ Don't Know

1.2 Is the master plan based on political jurisdictions or watersheds?

- ☒ Political jurisdictions
- ☐ Watersheds
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

1.3 Is your zoning tied to the master plan?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

1.4 How often do you typically update your master plan?

- ☐ Every 5 years
- ☐ Every 10 years
- ☐ On a Rolling Basis
- ☐ We don't
- ☒ Other, please explain _____
- ☐ Not Applicable

Currently updating, previous adopted version is from 2006. Moving forward I am recommending the Town consider an update every 5 years.

1.5 Does your plan evaluate and take into account impacts of future land use on water resources?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.6 Does your plan identify and address important water resource goals for your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.7 Does your community permit or encourage any of the following techniques to manage land use and impervious cover?

- ☒ **Conservation easements** (*voluntary agreement to legal transfer of development and land use rights to a piece of property to a conservation trust; easements may be temporary or permanent*)
☐ Land acquisition programs
☒ **Transfer of development rights (TDRs)** (*transfers potential development from a designated "sending area" to a designated "receiving area"*)
☐ Limiting infrastructure extension (*a conscious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas*)
☐ Infill / community redevelopment (*encourage new development and redevelopment within existing developed areas*)

Tool 2. Land Conservation

Definition: Programs or efforts to conserve undeveloped, sensitive areas or areas of particular historical or cultural value.

Department: Planning

2.1 Does your community participate in the National Flood Insurance Program (NFIP)?

- ☐ Yes
☒ No
☐ Don't Know

2.2 If yes, what type of **floodplain** regulations do you have?

- ☐ NFIP minimum standards
☐ Other, please describe key components below
☐ Don't Know
☐ Not Applicable

2.3 Does your community have a local historic district?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe _____

2.4 Does your community have a heritage commission?

- ☐ Yes
☐ No
☐ Don't Know
☒ Other, please describe There is a historic society but nothing municipal

2.5 Is the preservation of cultural or historic resources required under local ordinances or regulations?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe

2.6 Do your local land use regulations encourage the preservation of agriculture?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe _____

2.7 Are you aware of any critical habitat areas for plant and animal species in your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

2.8 Other than what is required by state and federal laws, is the preservation of critical habitat areas for plant and animal species:

- ☐ Required
☒ Encouraged
☐ Neither
☐ Don't Know
☐ Other, please describe _____

2.9 Does your community have regulations or requirements, other than what is required by state and federal laws, governing the preservation of wetlands during development?

- ☐ Yes
☐ No
☐ Don't Know
☐ Other, please describe _____

2.10 Are there development restrictions pertaining to steep slopes?

- ☒ Yes
☐ No
☐ Don't Know

If yes, please describe key components of restrictions:

Steep slopes greater than 25% not part of buildable area for lot requireme



2.11 Do your local land use regulations encourage the conservation of forested areas?

- ☐ Yes, required
☐ Yes, encouraged
☒ No
☐ Don't Know
☐ Other (please describe)

If the conservation of forested areas is required or encouraged, please provide key components of your methods:

2.12 Are there development restrictions pertaining to stream channel modification?

- ☐ Yes
☐ No
☒ Don't Know

If yes, please describe key components of restrictions:

2.13 Does your community have a local shoreland protection overlay zone or district?

- ☐ Yes
☒ No
☐ Don't Know

Tool 3. Aquatic Buffers

Definition: The protection, restoration, creation, or reforestation of stream, wetland, and urban lake buffers.

Department:

Planning

3.1 Are stream buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.2 What are your stream buffer width requirements? 50-feet

3.3 Are wetland buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.4 What are your wetland buffer width requirements? 50-feet

3.5 Are there reforestation, restoration, or riparian cover requirements or programs for buffers?

- ☐ Yes
☐ No
☒ Don't Know
☐ Not Applicable

If yes, please describe key components of the requirements.

Tool 4. Better Site Design

Definition: Local ordinances and codes incorporate techniques to reduce impervious cover and/or redirect runoff onto pervious surfaces in the design of new development and redevelopment projects.

Department: Planning

Street Width

- 4.1 What is the minimum pavement width allowed for streets in low-density residential developments that have less than 500 average daily trips (ADT)?
- ☐ 18 - 22 feet
☒ 23 - 26 feet
☐ Greater than 26 feet
- 4.2 In higher density development are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?
- ☐ Yes
☒ No
☐ Not Sure
☐ Not Applicable

Right-of-Way (ROW) Width

- 4.3 What is the minimum right-of-way (**ROW**) width for a residential street?
- ☐ Less than 45 feet
☒ Greater than 45 feet
- 4.4 Does the code allow utilities to be placed under the paved section of the ROW?
- ☐ Yes
☐ No
☒ Not specified in codes

Cul-de-Sacs

- 4.5 What is the minimum radius allowed for **cul-de-sacs**?
- ☐ Less than 35 feet
☐ 36 feet to 45 feet
☒ Greater than 45 feet

4.6 Can a landscaped island be created within the cul-de-sac?

- ☒ Yes
☐ No
☐ Not specified in codes

4.7 Are alternative turn-arounds such as "**hammerheads**" allowed on short streets in low-density residential developments?

- ☐ Yes
☒ No
☐ Not specified in codes

Vegetated Open Channels

4.8 Are curb and gutters required for most residential street sections?

- ☒ Yes
☐ No

Parking Ratios

4.9 What is the minimum parking ratio for a professional office building (per 1000 ft² of gross floor area)?

3.33 (one per 300 sf)

4.10 What is the minimum required parking ratio for shopping centers (per 1,000 ft² gross floor area)?

5 (one per 200 sf)

4.11 What is the minimum required parking ratio for single-family homes (per home)?

n/a

Parking Codes

4.12 Is the use of shared parking arrangements permitted?

- ☐ Yes
☐ No
☒ Not specified in codes

4.13 Are parking ratios reduced if shared parking arrangements are in place?

- ☐ Yes
☐ No
☒ Not specified in codes
☐ Not applicable

Parking Lots

4.14 What is the minimum stall width for a standard parking space?

10-feet (9-feet allowed by PB vote)

4.15 What is the minimum stall length for a standard parking space?

20-feet (18-feet allowed by PB vote)

4.16 Is a percentage of the spaces at commercial parking lots required to have smaller dimensions for compact cars?

- ☐ Yes, please specify percentage: _____
☒ No

4.17 Are unpaved parking spaces allowed?

- ☐ Yes
☒ No
☐ Other, please describe: _____

Parking Lot Runoff

4.18 Is a minimum percentage of a parking lot required to be landscaped?

- ☒ Yes
☐ No

Open Space Design

4.19 Are open space or cluster development designs allowed in the community?

- ☒ Yes, by right
☐ Yes, with a conditional use permit
☐ Yes, by special exception
☐ No
☐ Not specified in codes

Comments: needs improvement. lacks good standards for open space.

4.20 Are there additional submittal or review requirements for open space design, beyond those for conventional development?

- ☐ Yes
☒ No
☐ Not applicable

Comments: _____

4.21 Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes)?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Setbacks and Frontages

4.22 Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

- ☐ Yes
☐ No
☒ Not specified in codes

Watershed Protection Audit

- 4.23 Please provide the following lot size and setback requirements for the principle zoning districts that allow residential development in your community:

	Name of District	Minimum Lot Size	Frontage	Setbacks		
				Front	Rear	Side
1	Town Residential	10,000 sf	90	30	15	15
2	Residential One	30,000sf/43,560sf	120/150	30/50	15	15
3	Residential Two	43,560sf/60,000sf	120/150	30/50	15	15
4	General//General-1	43,560sf//87,120sf	150//200	30/50	15	15

- 4.24 Does your community have any overlay districts that allow for increased residential density?

☐ Yes
☒ No

If yes, please list: repealed age-restricted bonuses in 2022.

Sidewalks

- 4.25 Are sidewalks always required on at least one side of residential streets?

☒ Yes
☐ No

- 4.26 What is the minimum sidewalk width required in the community?

☐ Not less than 4 feet
☒ Greater than 4 feet
☐ Not specified in codes
☐ Not Applicable

- 4.27 Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

☐ Yes
☐ No
☒ Not specified in codes
☐ Not applicable

Driveways

- 4.28 What is the minimum driveway width specified in the community?
- ☐ 9 feet or less
☐ Greater than 9 feet
☒ Not specified in codes
- 4.29 Can pervious materials be used for single-family home driveways (e.g., grass, gravel, porous pavers, etc)?
- ☐ Yes
☐ No
☒ Not specified in codes
- 4.30 Can a “two-track” design be used at single-family driveways (*a driveway with two strips of paving corresponding to wheel tracks with a vegetated area in between*)?
- ☐ Yes
☐ No
☒ Not specified in codes
- 4.31 Are shared driveways permitted in residential developments?
- ☒ Yes
☐ No
☐ Not specified in codes

Open Space Management

Skip to question 4.39 if open space, cluster, or conservation developments are not allowed in your community.

- 4.32 Are open space areas within subdivisions required to be consolidated into larger units?
- ☒ Yes
☐ No
☐ Not specified in codes
- 4.33 Does a minimum percentage of open space in a residential subdivision have to be managed in a natural condition?
- ☐ Yes
☐ No
☒ Not specified in codes

4.34 Are allowable and unallowable uses for open space in residential developments defined?

☒ Yes

☐ No

Rooftop Runoff

4.35 Can rooftop runoff be discharged to yard areas?

☐ Yes

☐ No

☒ Not specified in codes

Tool 5. Erosion and Sediment Control

Definition: *The use of erosion control, sediment control, and dewatering practices at all new development and redevelopment sites.*

Department: Engineering

5.1 During construction, is **erosion and sediment control** required for:

- ☒ All sites
- ☐ Sites greater than 1 acre
- ☐ Sites greater than 2 acres
- ☐ Sites greater than 5 acres
- ☐ No sites
- ☐ Don't know

5.2 Does your community provide guidance or set forth requirements on the types of erosion and sediment control practices that may be used?

- ☐ Yes, we refer the development community to a state document
- ☒ Yes, we have developed our own guidance and/or requirements
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

5.3 Check all erosion and sediment control practices that your community has required to be implemented in the past three years (list continues on next page):

- | | |
|---|--|
| ☒ Silt fence | ☒ Permanent seeding and mulching |
| ☒ Straw bales | ☒ Dust control |
| ☒ Construction sequencing | ☒ Erosion blankets and geotextiles |
| ☐ Construction phasing | ☐ Fiber rolls |
| ☒ Preservation and non-disturbance of natural vegetation | ☒ Temporary stream crossings |
| ☒ Preservation and non-disturbance of stream or wetland buffers | ☒ Stabilized construction entrance |
| ☐ Stair-step grading | ☐ Exit tire wash |
| ☒ Temporary seeding and mulching | ☐ Energy dissipation at pipe outlets |

Watershed Protection Audit

- | | |
|---|--|
| ☒ Check dams in natural or man-made channels | ☐ Secondary filtration (mechanical or sand filtration devices to filter fine sediments from runoff) |
| ☒ Sand / gravel bag barrier | |
| ☐ Brush or rock filter | |
| ☒ Storm drain inlet protection | ☒ Dikes / berms as conveyance to ESC structures |
| ☒ Catch basin inlet filters | ☒ Pipe slope drains to bypass erodible soils |
| ☒ Sedimentation basins | ☒ Stockpile stabilization |
| ☒ Sediment traps | |
| ☒ Filtration of dewatering operations | |

5.4 Is an erosion and sediment control plan required during the site plan review process?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.5 Are construction sites inspected for compliance with erosion and sediment control requirements?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.6 Who conducts inspections of construction sites for compliance with erosion and sediment control requirements?

- ☐ Municipal inspector
☐ Third-party inspector (e.g. private engineer)
☒ Other, please describe Municipal & sometimes 3rd party
☐ Not Applicable

5.7 How frequently does an erosion and sediment control inspector visit a construction site?

- ☐ Daily
☒ Weekly
☐ Monthly
☐ Annually
☐ Other, please describe _____
☐ Not Applicable

5.8 Does your community sponsor erosion and sediment control training for:

- ☐ Developers
- ☐ Contractors
- ☐ Engineers
- ☐ Inspectors
- ☒ None of the above
- ☐ Not Applicable

Tool 6. Stormwater Management Practices

Definition: The incorporation of structural practices into new development, redevelopment, or the existing landscape to help mitigate the impacts of urbanization and stormwater runoff on receiving waters.

Department: Engineering

6.1 Does your community require stormwater management on new development sites?

- ☒ Yes
☐ No
☐ Don't Know

6.2 Does your community require the stormwater be managed on site?

- ☒ Yes
☐ No
☐ Don't Know

6.4 If management is required, what are the design criteria for stormwater practices?

☒ Control **peak discharge rate** (flood control)

Design storm(s): 25 year

☒ Treat **stormwater runoff** for water quality

Design storm(s): 25 year

☒ Control / reduce total volume of runoff (by means of infiltration practices, etc.)

Design storm(s): 25 year

☒ Protect downstream channels

Design storm(s): 50 year

☐ Other: _____

☐ Not Applicable

6.3 What type of exemptions do you have for these requirements?

None

6.5 Does your community provide guidance or set forth requirements on the types of stormwater practices that may be constructed?

- ☒ Yes, we refer the development community to a state document
☐ Yes, we have developed our own guidance and/or requirements
☐ No
☐ Don't Know
☐ Not Applicable

- 6.6 What are the top three stormwater practices typically installed in your community?
catch basins to infiltration or detention basins; swale/level spreader; dry wells
- 6.7 Is a stormwater plan or other documentation required during the site plan review process?
- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.8 Does your community inspect stormwater practices during construction?
- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.9 Is an as-built or record drawing of the stormwater practice required after construction?
- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.10 Who is typically responsible for maintenance of stormwater practices over the life of the stormwater practice?
- ☐ Private owner
☐ Builder
☐ Homeowner's association
☐ Permitting agency
☒ Other, please explain Private Owner, sometimes DPW
☐ Don't Know
☐ Not Applicable

Watershed Protection Audit

6.11 Is there a maintenance agreement or covenant between the municipality and the private owner, builder, or homeowner's association in charge of maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.12 Are privately maintained stormwater management systems inspected by the municipality for maintenance upkeep or structural integrity over the life of the facility?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

6.13 How frequently are privately owned stormwater practices inspected?

- ☐ More than once a year
- ☐ Once a year
- ☐ Every two years
- ☐ In response to complaints
- ☐ Never
- ☒ Other, please describe once a year by home owner associations
- ☐ Don't Know
- ☐ Not Applicable

6.14 Are there penalties for not complying with the maintenance agreement or other applicable regulations applying to maintenance?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please describe penalties.

Tool 7. Non-Stormwater Discharges

Definition: *Locating, quantifying, and controlling non-stormwater pollutant sources in the watershed. Operation and maintenance practices that prevent or reduce pollutants entering the municipal or natural drainage system.*

Department: Engineering

Sanitary and Stormwater Sewer System

7.1 The best description of my community's stormwater management system is:

- ☐ Storm sewers (usually pipes leading to a receiving stream)
- ☐ Drainage ditches, swales, detention basins
- ☒ Combination, please provide relative percentage of each 25% swales to basins; 75% engineered drainage to streams
- ☐ Other, please describe _____
- ☐ Don't Know

7.2 Is there a program for illicit connection detection?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

7.3 If so, does your illicit connection detection program include provisions for removal of illicit discharges?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

Watershed Protection Audit

7.4 Does your community have regulations pertaining to septic system maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please explain.

within shoreland protection boundaries

7.5 Does your community conduct inspections of privately owned septic systems?

- ☒ Yes, on installation
- ☐ Yes, ongoing
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

Confined Animal Feeding Lots

7.6 Are there regulations regarding stormwater runoff from confined animal feeding lots?

- ☐ Yes
- ☒ No
- ☐ Don't Know

Spill Response, Prevention and Cleanup

7.7 Does your community have a spill response plan?

- ☒ Yes
- ☐ No
- ☐ Don't Know

7.8 Does your community regulate the storage of hazardous materials?

- ☒ Yes, please describe: Tier II reporting to Fire Dept
- ☐ No
- ☐ Don't Know

7.9 Does your community have a Hazardous Substances Protection Overlay District?

- ☐ Yes, please describe: _____
- ☒ No
- ☐ Don't Know

Snow Management

7.10 What deicing compounds are applied to public roads?

- ☒ Sand
- ☒ Road salt (Sodium Chloride, NaCl)
- ☐ Calcium Chloride (CaCl₂)
- ☒ Magnesium Chloride (MgCl₂)
- ☒ Other, please describe Washed Sand

7.11 How are the deicing compounds stored?

- ☒ Within structure
- ☐ Covered, but not in structure
- ☐ Not covered
- ☐ Other, please explain _____

7.12 Does your community have designated low- or no-salt routes or areas?

- ☐ Yes
- ☒ No
- ☐ Don't Know

Tool 8. Watershed Stewardship Programs

Definition: Stormwater and watershed education or outreach programs targeted towards fostering human behavior that prevents or reduces pollution over a range of land uses and activities.

Department: Engineering

8.1 Does your community administer or support education or outreach programs targeted towards:

- ☒ Residents
- ☐ Commercial sector
- ☐ Industrial sector
- ☒ Municipal employees
- ☐ Other, please describe _____
- ☐ None of the above

8.2 Are there any stream stewardship or volunteer monitoring programs within your community?

- ☐ Yes. Please List: _____
- ☒ No
- ☐ Don't Know

8.3 Are there any stream restoration programs or projects within your community?

- ☐ Yes. Please List: _____
- ☒ No
- ☐ Don't Know

Pet Waste Management

8.4 Does your community have any restrictions on pet waste management?

- ☒ Yes
- ☐ No
- ☐ Don't Know

If yes, please describe regulations or restrictions.

Pet waste must be removed from public or private property immediately unless the pet owner is disabled.

Street Sweeping

8.5 Does your community sweep public streets?

- ☒ Yes
☐ No
☐ Don't Know

8.6 How often does street sweeping occur?

- ☐ Weekly
☐ Monthly
☒ Annually
☐ Other, please explain _____
☐ Not Applicable

8.7 Does street sweeping vary seasonally (e.g., streets are not swept in winter)?

- ☒ Yes, please explain weather dependent _____
☐ No
☐ Don't Know
☐ Not Applicable

Lawn Care

8.8 Are fertilizers used on public lands?

- ☒ Yes
☐ No
☐ Don't Know

8.9 Are pesticides (insecticides, herbicides) used on public lands?

- ☒ Yes
☐ No
☐ Don't Know

Additional Notes

WATERSHED PROTECTION AUDIT

Background Information

Your Name: Jay Minkarah

Municipality: Litchfield

Department: Planning

Address: 30 Temple Street, Suite 310

Nashua, NH, 03060

Phone: 603-417-6570 Fax: _____

Email: jaym@nashuarpc.org

Municipality Population: 8,478

Municipality Area (square miles): 15.31 mi²

Questions may be directed to:

Emma Rearick
Regional Planner II
Nashua Regional Planning Commission
emmar@nashuarpc.org
603-417-6578

Tool 1. Watershed Planning

Definition: The application of regulatory measures and/or planning techniques that are designed to maintain or limit future impervious cover, redirect development where appropriate, and protect sensitive areas.

Department: Planning

1.1 Does your community have a **master plan**?

- ☒ Yes
- ☐ No
- ☐ Don't Know

1.2 Is the master plan based on political jurisdictions or watersheds?

- ☒ Political jurisdictions
- ☐ Watersheds
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

1.3 Is your zoning tied to the master plan?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

1.4 How often do you typically update your master plan?

- ☐ Every 5 years
- ☐ Every 10 years
- ☒ On a Rolling Basis
- ☐ We don't
- ☐ Other, please explain _____
- ☐ Not Applicable

1.5 Does your plan evaluate and take into account impacts of future land use on water resources?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.6 Does your plan identify and address important water resource goals for your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.7 Does your community permit or encourage any of the following techniques to manage land use and impervious cover?

- ☒ **Conservation easements** *(voluntary agreement to legal transfer of development and land use rights to a piece of property to a conservation trust; easements may be temporary or permanent)*
☒ Land acquisition programs
☐ **Transfer of development rights (TDRs)** *(transfers potential development from a designated "sending area" to a designated "receiving area")*
☐ Limiting infrastructure extension *(a conscious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas)*
☐ Infill / community redevelopment *(encourage new development and redevelopment within existing developed areas)*

Tool 2. Land Conservation

Definition: Programs or efforts to conserve undeveloped, sensitive areas or areas of particular historical or cultural value.

Department: Planning

2.1 Does your community participate in the National Flood Insurance Program (NFIP)?

- ☒ Yes
- ☐ No
- ☐ Don't Know

2.2 If yes, what type of **floodplain** regulations do you have?

- ☐ NFIP minimum standards
- ☐ Other, please describe key components below
- ☒ Don't Know
- ☐ Not Applicable

2.3 Does your community have a local historic district?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Other, please describe _____

2.4 Does your community have a heritage commission?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Other, please describe _____

2.5 Is the preservation of cultural or historic resources required under local ordinances or regulations?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe

2.6 Do your local land use regulations encourage the preservation of agriculture?

- ☒ Yes
☐ No
☐ Don't Know
☐ Other, please describe _____

2.7 Are you aware of any critical habitat areas for plant and animal species in your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

2.8 Other than what is required by state and federal laws, is the preservation of critical habitat areas for plant and animal species:

- ☐ Required
☒ Encouraged
☐ Neither
☐ Don't Know
☐ Other, please describe _____

2.9 Does your community have regulations or requirements, other than what is required by state and federal laws, governing the preservation of wetlands during development?

- ☐ Yes
☐ No
☐ Don't Know
☐ Other, please describe _____

2.10 Are there development restrictions pertaining to steep slopes?

- ☐ Yes
☒ No
☐ Don't Know

If yes, please describe key components of restrictions:

2.11 Do your local land use regulations encourage the conservation of forested areas?

- ☐ Yes, required
☐ Yes, encouraged
☒ No
☐ Don't Know
☐ Other (please describe)

If the conservation of forested areas is required or encouraged, please provide key components of your methods:

2.12 Are there development restrictions pertaining to stream channel modification?

- ☐ Yes
☒ No
☐ Don't Know

If yes, please describe key components of restrictions:

2.13 Does your community have a local shoreland protection overlay zone or district?

- ☐ Yes
☒ No
☐ Don't Know

Tool 3. Aquatic Buffers

Definition: The protection, restoration, creation, or reforestation of stream, wetland, and urban lake buffers.

Department:

Planning

3.1 Are stream buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.2 What are your stream buffer width requirements? Structures-75', Leachfields-100'

3.3 Are wetland buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.4 What are your wetland buffer width requirements? Structures-75', Leachfields-100'

3.5 Are there reforestation, restoration, or riparian cover requirements or programs for buffers?

- ☐ Yes
☒ No
☐ Don't Know
☐ Not Applicable

If yes, please describe key components of the requirements.

Tool 4. Better Site Design

Definition: Local ordinances and codes incorporate techniques to reduce impervious cover and/or redirect runoff onto pervious surfaces in the design of new development and redevelopment projects.

Department: Planning

Street Width

- 4.1 What is the minimum pavement width allowed for streets in low-density residential developments that have less than 500 average daily trips (ADT)?
- ☐ 18 - 22 feet
☒ 23 - 26 feet
☐ Greater than 26 feet
- 4.2 In higher density development are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?
- ☐ Yes
☒ No
☐ Not Sure
☐ Not Applicable

Right-of-Way (ROW) Width

- 4.3 What is the minimum right-of-way (**ROW**) width for a residential street?
- ☐ Less than 45 feet
☒ Greater than 45 feet
- 4.4 Does the code allow utilities to be placed under the paved section of the ROW?
- ☒ Yes
☐ No
☐ Not specified in codes

Cul-de-Sacs

- 4.5 What is the minimum radius allowed for **cul-de-sacs**?
- ☐ Less than 35 feet
☐ 36 feet to 45 feet
☒ Greater than 45 feet

4.6 Can a landscaped island be created within the cul-de-sac?

- ☒ Yes
☐ No
☐ Not specified in codes

4.7 Are alternative turn-arounds such as "**hammerheads**" allowed on short streets in low-density residential developments?

- ☐ Yes
☒ No
☐ Not specified in codes

Vegetated Open Channels

4.8 Are curb and gutters required for most residential street sections?

- ☐ Yes
☒ No

Parking Ratios

4.9 What is the minimum parking ratio for a professional office building (per 1000 ft² of gross floor area)?

5

4.10 What is the minimum required parking ratio for shopping centers (per 1,000 ft² gross floor area)?

NA

4.11 What is the minimum required parking ratio for single-family homes (per home)?

NA

Parking Codes

4.12 Is the use of shared parking arrangements permitted?

- ☐ Yes
☐ No
☐ Not specified in codes

4.13 Are parking ratios reduced if shared parking arrangements are in place?

- ☐ Yes
☐ No
☒ Not specified in codes
☐ Not applicable

Parking Lots

4.14 What is the minimum stall width for a standard parking space?

Not specified _____

4.15 What is the minimum stall length for a standard parking space?

Not specified _____

4.16 Is a percentage of the spaces at commercial parking lots required to have smaller dimensions for compact cars?

- ☐ Yes, please specify percentage: _____
☒ No

4.17 Are unpaved parking spaces allowed?

- ☒ Yes
☐ No
☐ Other, please describe: _____

Parking Lot Runoff

4.18 Is a minimum percentage of a parking lot required to be landscaped?

- ☒ Yes
☐ No

Open Space Design

4.19 Are open space or cluster development designs allowed in the community?

- ☒ Yes, by right
☐ Yes, with a conditional use permit
☐ Yes, by special exception
☐ No
☐ Not specified in codes

Comments: Required for parcels 20-acres or larger

4.20 Are there additional submittal or review requirements for open space design, beyond those for conventional development?

- ☒ Yes
☐ No
☐ Not applicable

Comments: _____

4.21 Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes)?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Setbacks and Frontages

4.22 Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

- ☐ Yes
☒ No
☐ Not specified in codes

Watershed Protection Audit

- 4.23 Please provide the following lot size and setback requirements for the principle zoning districts that allow residential development in your community:

	Name of District	Minimum Lot Size	Frontage	Setbacks		
				Front	Rear	Side
1	Residential	1 acre	150"	50"	20"	20"
2						
3						
4						

- 4.24 Does your community have any overlay districts that allow for increased residential density?

☒ Yes
☐ No

If yes, please list: Multi-family Overlay District

Sidewalks

- 4.25 Are sidewalks always required on at least one side of residential streets?

☐ Yes
☒ No

- 4.26 What is the minimum sidewalk width required in the community?

☐ Not less than 4 feet
☐ Greater than 4 feet
☐ Not specified in codes
☒ Not Applicable

- 4.27 Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

☐ Yes
☐ No
☒ Not specified in codes
☐ Not applicable

Driveways

4.28 What is the minimum driveway width specified in the community?

- ☐ 9 feet or less
- ☒ Greater than 9 feet
- ☐ Not specified in codes

4.29 Can pervious materials be used for single-family home driveways (e.g., grass, gravel, porous pavers, etc)?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

4.30 Can a “two-track” design be used at single-family driveways (*a driveway with two strips of paving corresponding to wheel tracks with a vegetated area in between*)?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

4.31 Are shared driveways permitted in residential developments?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

Open Space Management

Skip to question 4.39 if open space, cluster, or conservation developments are not allowed in your community.

4.32 Are open space areas within subdivisions required to be consolidated into larger units?

- ☐ Yes
- ☒ No
- ☐ Not specified in codes

4.33 Does a minimum percentage of open space in a residential subdivision have to be managed in a natural condition?

- ☐ Yes
- ☒ No
- ☐ Not specified in codes

4.34 Are allowable and unallowable uses for open space in residential developments defined?

☒ Yes

☐ No

Rooftop Runoff

4.35 Can rooftop runoff be discharged to yard areas?

☐ Yes

☐ No

☒ Not specified in codes

Tool 5. Erosion and Sediment Control

Definition: *The use of erosion control, sediment control, and dewatering practices at all new development and redevelopment sites.*

Department: Planning

5.1 During construction, is **erosion and sediment control** required for:

- ☒ All sites
- ☐ Sites greater than 1 acre
- ☐ Sites greater than 2 acres
- ☐ Sites greater than 5 acres
- ☐ No sites
- ☐ Don't know

5.2 Does your community provide guidance or set forth requirements on the types of erosion and sediment control practices that may be used?

- ☐ Yes, we refer the development community to a state document
- ☒ Yes, we have developed our own guidance and/or requirements
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

5.3 Check all erosion and sediment control practices that your community has required to be implemented in the past three years (list continues on next page):

- | | |
|---|---|
| ☐ Silt fence | ☐ Permanent seeding and mulching |
| ☐ Straw bales | ☐ Dust control |
| ☐ Construction sequencing | ☐ Erosion blankets and geotextiles |
| ☐ Construction phasing | ☐ Fiber rolls |
| ☒ Preservation and non-disturbance of natural vegetation | ☐ Temporary stream crossings |
| ☒ Preservation and non-disturbance of stream or wetland buffers | ☐ Stabilized construction entrance |
| ☐ Stair-step grading | ☐ Exit tire wash |
| ☐ Temporary seeding and mulching | ☐ Energy dissipation at pipe outlets |

Watershed Protection Audit

- | | |
|--|--|
| ☐ Check dams in natural or man-made channels | ☐ Secondary filtration (mechanical or sand filtration devices to filter fine sediments from runoff) |
| ☐ Sand / gravel bag barrier | ☐ Dikes / berms as conveyance to ESC structures |
| ☐ Brush or rock filter | ☐ Pipe slope drains to bypass erodible soils |
| ☐ Storm drain inlet protection | ☐ Stockpile stabilization |
| ☐ Catch basin inlet filters | |
| ☐ Sedimentation basins | |
| ☐ Sediment traps | |
| ☐ Filtration of dewatering operations | |

5.4 Is an erosion and sediment control plan required during the site plan review process?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.5 Are construction sites inspected for compliance with erosion and sediment control requirements?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.6 Who conducts inspections of construction sites for compliance with erosion and sediment control requirements?

- ☐ Municipal inspector
☒ Third-party inspector (e.g. private engineer)
☐ Other, please describe _____
☐ Not Applicable

5.7 How frequently does an erosion and sediment control inspector visit a construction site?

- ☐ Daily
☐ Weekly
☐ Monthly
☐ Annually
☒ Other, please describe No set schedule
☐ Not Applicable

5.8 Does your community sponsor erosion and sediment control training for:

- ☐ Developers
- ☐ Contractors
- ☐ Engineers
- ☐ Inspectors
- ☒ None of the above
- ☐ Not Applicable

Tool 6. Stormwater Management Practices

Definition: The incorporation of structural practices into new development, redevelopment, or the existing landscape to help mitigate the impacts of urbanization and stormwater runoff on receiving waters.

Department: Planning

6.1 Does your community require stormwater management on new development sites?

- ☒ Yes
☐ No
☐ Don't Know

6.2 Does your community require the stormwater be managed on site?

- ☒ Yes
☐ No
☐ Don't Know

6.4 If management is required, what are the design criteria for stormwater practices?

- ☐ Control **peak discharge rate** (flood control)
Design storm(s): 2-year, 24-hour storm event
- ☐ Treat **stormwater runoff** for water quality
Design storm(s): _____
- ☐ Control / reduce total volume of runoff (by means of infiltration practices, etc.)
Design storm(s): _____
- ☐ Protect downstream channels
Design storm(s): _____
- ☐ Other: _____
- ☐ Not Applicable

6.3 What type of exemptions do you have for these requirements?

6.5 Does your community provide guidance or set forth requirements on the types of stormwater practices that may be constructed?

- ☒ Yes, we refer the development community to a state document
☐ Yes, we have developed our own guidance and/or requirements
☐ No
☐ Don't Know
☐ Not Applicable

6.6 What are the top three stormwater practices typically installed in your community?

On-site detention basins, vegetated swales, drainage ditches.

6.7 Is a stormwater plan or other documentation required during the site plan review process?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.8 Does your community inspect stormwater practices during construction?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.9 Is an as-built or record drawing of the stormwater practice required after construction?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☒ Not Applicable

6.10 Who is typically responsible for maintenance of stormwater practices over the life of the stormwater practice?

- ☒ Private owner
- ☐ Builder
- ☐ Homeowner's association
- ☐ Permitting agency
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

Watershed Protection Audit

6.11 Is there a maintenance agreement or covenant between the municipality and the private owner, builder, or homeowner's association in charge of maintenance?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.12 Are privately maintained stormwater management systems inspected by the municipality for maintenance upkeep or structural integrity over the life of the facility?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

6.13 How frequently are privately owned stormwater practices inspected?

- ☐ More than once a year
- ☐ Once a year
- ☐ Every two years
- ☐ In response to complaints
- ☐ Never
- ☐ Other, please describe _____
- ☐ Don't Know
- ☒ Not Applicable

6.14 Are there penalties for not complying with the maintenance agreement or other applicable regulations applying to maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please describe penalties.

Standard Land-use enforcement tools

Tool 7. Non-Stormwater Discharges

Definition: *Locating, quantifying, and controlling non-stormwater pollutant sources in the watershed. Operation and maintenance practices that prevent or reduce pollutants entering the municipal or natural drainage system.*

Department: Planning-DPW

Sanitary and Stormwater Sewer System

7.1 The best description of my community's stormwater management system is:

- ☐ Storm sewers (usually pipes leading to a receiving stream)
- ☒ Drainage ditches, swales, detention basins
- ☐ Combination, please provide relative percentage of each _____
- ☐ Other, please describe _____
- ☐ Don't Know

7.2 Is there a program for illicit connection detection?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☒ Not Applicable

7.3 If so, does your illicit connection detection program include provisions for removal of illicit discharges?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☒ Not Applicable

Watershed Protection Audit

7.4 Does your community have regulations pertaining to septic system maintenance?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please explain.

7.5 Does your community conduct inspections of privately owned septic systems?

- ☐ Yes, on installation
- ☐ Yes, ongoing
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

Confined Animal Feeding Lots

7.6 Are there regulations regarding stormwater runoff from confined animal feeding lots?

- ☐ Yes
- ☒ No
- ☐ Don't Know

Spill Response, Prevention and Cleanup

7.7 Does your community have a spill response plan?

- ☐ Yes
- ☐ No
- ☒ Don't Know

7.8 Does your community regulate the storage of hazardous materials?

- ☒ Yes, please describe: Fire Dept requirements
- ☐ No
- ☐ Don't Know

7.9 Does your community have a Hazardous Substances Protection Overlay District?

- ☐ Yes, please describe: _____
- ☒ No
- ☐ Don't Know

Snow Management

7.10 What deicing compounds are applied to public roads?

- ☒ Sand
- ☒ Road salt (Sodium Chloride, NaCl)
- ☐ Calcium Chloride (CaCl₂)
- ☐ Magnesium Chloride (MgCl₂)
- ☐ Other, please describe _____

7.11 How are the deicing compounds stored?

- ☒ Within structure
- ☐ Covered, but not in structure
- ☐ Not covered
- ☐ Other, please explain _____

7.12 Does your community have designated low- or no-salt routes or areas?

- ☒ Yes
- ☐ No
- ☐ Don't Know

Tool 8. Watershed Stewardship Programs

Definition: Stormwater and watershed education or outreach programs targeted towards fostering human behavior that prevents or reduces pollution over a range of land uses and activities.

Department: Planning

8.1 Does your community administer or support education or outreach programs targeted towards:

- ☐ Residents
- ☐ Commercial sector
- ☐ Industrial sector
- ☐ Municipal employees
- ☐ Other, please describe _____
- ☒ None of the above

8.2 Are there any stream stewardship or volunteer monitoring programs within your community?

- ☐ Yes. Please List: _____
- ☐ No
- ☒ Don't Know

8.3 Are there any stream restoration programs or projects within your community?

- ☐ Yes. Please List: _____
- ☒ No
- ☐ Don't Know

Pet Waste Management

8.4 Does your community have any restrictions on pet waste management?

- ☐ Yes
- ☒ No
- ☐ Don't Know

If yes, please describe regulations or restrictions.

Street Sweeping

8.5 Does your community sweep public streets?

- ☐ Yes
☐ No
☒ Don't Know

8.6 How often does street sweeping occur?

- ☐ Weekly
☐ Monthly
☐ Annually
☐ Other, please explain _____
☒ Not Applicable

8.7 Does street sweeping vary seasonally (e.g., streets are not swept in winter)?

- ☐ Yes, please explain _____
☐ No
☒ Don't Know
☐ Not Applicable

Lawn Care

8.8 Are fertilizers used on public lands?

- ☐ Yes
☐ No
☒ Don't Know

8.9 Are pesticides (insecticides, herbicides) used on public lands?

- ☐ Yes
☐ No
☒ Don't Know

Additional Notes

WATERSHED PROTECTION AUDIT

Background Information

Your Name: Casey Wolfe

Municipality: Town of Merrimack

Department: Community Development

Address: 6 Baboosic Lake Road
Merrimack, NH 03054

Phone: 603-424-3531 Fax: _____

Email: cwolfe@merrimacknh.gov

Municipality Population: 26,632

Municipality Area (square miles): 33.4

Questions may be directed to:

Emma Rearick
Regional Planner II
Nashua Regional Planning Commission
emmar@nashuarpc.org
603-417-6578

Tool 1. Watershed Planning

Definition: The application of regulatory measures and/or planning techniques that are designed to maintain or limit future impervious cover, redirect development where appropriate, and protect sensitive areas.

Department: Community Development

1.1 Does your community have a **master plan**?

- ☒ Yes
- ☐ No
- ☐ Don't Know

1.2 Is the master plan based on political jurisdictions or watersheds?

- ☒ Political jurisdictions
- ☐ Watersheds
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

1.3 Is your zoning tied to the master plan?

- ☐ Yes
- ☐ No
- ☒ Don't Know
- ☐ Not Applicable

1.4 How often do you typically update your master plan?

- ☐ Every 5 years
- ☒ Every 10 years
- ☐ On a Rolling Basis
- ☐ We don't
- ☐ Other, please explain _____
- ☐ Not Applicable

1.5 Does your plan evaluate and take into account impacts of future land use on water resources?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.6 Does your plan identify and address important water resource goals for your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.7 Does your community permit or encourage any of the following techniques to manage land use and impervious cover?

- ☐ **Conservation easements** (*voluntary agreement to legal transfer of development and land use rights to a piece of property to a conservation trust; easements may be temporary or permanent*)
☐ Land acquisition programs
☐ **Transfer of development rights (TDRs)** (*transfers potential development from a designated "sending area" to a designated "receiving area"*)
☐ Limiting infrastructure extension (*a conscious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas*)
☒ Infill / community redevelopment (*encourage new development and redevelopment within existing developed areas*)

Tool 2. Land Conservation

Definition: Programs or efforts to conserve undeveloped, sensitive areas or areas of particular historical or cultural value.

Department: Community Development

2.1 Does your community participate in the National Flood Insurance Program (NFIP)?

- ☒ Yes
- ☐ No
- ☐ Don't Know

2.2 If yes, what type of **floodplain** regulations do you have?

- ☒ NFIP minimum standards
- ☐ Other, please describe key components below
- ☐ Don't Know
- ☐ Not Applicable

2.3 Does your community have a local historic district?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Other, please describe_____

2.4 Does your community have a heritage commission?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Other, please describe_____

2.5 Is the preservation of cultural or historic resources required under local ordinances or regulations?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe

2.6 Do your local land use regulations encourage the preservation of agriculture?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe _____

2.7 Are you aware of any critical habitat areas for plant and animal species in your community?

- ☐ Yes
☒ No
☐ Don't Know
☐ Not Applicable

2.8 Other than what is required by state and federal laws, is the preservation of critical habitat areas for plant and animal species:

- ☐ Required
☐ Encouraged
☒ Neither
☐ Don't Know
☐ Other, please describe _____

2.9 Does your community have regulations or requirements, other than what is required by state and federal laws, governing the preservation of wetlands during development?

- ☐ Yes
☐ No
☐ Don't Know
☐ Other, please describe _____

2.10 Are there development restrictions pertaining to steep slopes?

- ☐ Yes
☒ No
☐ Don't Know

If yes, please describe key components of restrictions:

2.11 Do your local land use regulations encourage the conservation of forested areas?

- ☐ Yes, required
☒ Yes, encouraged
☐ No
☐ Don't Know
☐ Other (please describe)

If the conservation of forested areas is required or encouraged, please provide key components of your methods:

Cluster Residential Developments

2.12 Are there development restrictions pertaining to stream channel modification?

- ☐ Yes
☐ No
☒ Don't Know

If yes, please describe key components of restrictions:

2.13 Does your community have a local shoreland protection overlay zone or district?

- ☐ Yes
☒ No
☐ Don't Know

Tool 3. Aquatic Buffers

Definition: The protection, restoration, creation, or reforestation of stream, wetland, and urban lake buffers.

Department:

Community Development

3.1 Are stream buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.2 What are your stream buffer width requirements? 25 feet

3.3 Are wetland buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.4 What are your wetland buffer width requirements? 25 feet

3.5 Are there reforestation, restoration, or riparian cover requirements or programs for buffers?

- ☐ Yes
☒ No
☐ Don't Know
☐ Not Applicable

If yes, please describe key components of the requirements.

Tool 4. Better Site Design

Definition: Local ordinances and codes incorporate techniques to reduce impervious cover and/or redirect runoff onto pervious surfaces in the design of new development and redevelopment projects.

Department: Community Development

Street Width

- 4.1 What is the minimum pavement width allowed for streets in low-density residential developments that have less than 500 average daily trips (ADT)?
- ☐ 18 - 22 feet
☒ 23 - 26 feet
☐ Greater than 26 feet
- 4.2 In higher density development are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?
- ☐ Yes
☒ No
☐ Not Sure
☐ Not Applicable

Right-of-Way (ROW) Width

- 4.3 What is the minimum right-of-way (**ROW**) width for a residential street?
- ☐ Less than 45 feet
☒ Greater than 45 feet
- 4.4 Does the code allow utilities to be placed under the paved section of the ROW?
- ☒ Yes
☐ No
☐ Not specified in codes

Cul-de-Sacs

- 4.5 What is the minimum radius allowed for **cul-de-sacs**?
- ☐ Less than 35 feet
☒ 36 feet to 45 feet
☐ Greater than 45 feet

4.6 Can a landscaped island be created within the cul-de-sac?

- ☒ Yes
☐ No
☐ Not specified in codes

4.7 Are alternative turn-arounds such as "**hammerheads**" allowed on short streets in low-density residential developments?

- ☐ Yes
☐ No
☒ Not specified in codes

Vegetated Open Channels

4.8 Are curb and gutters required for most residential street sections?

- ☐ Yes
☒ No

Parking Ratios

4.9 What is the minimum parking ratio for a professional office building (per 1000 ft² of gross floor area)?

1 space per 300 s.f. (office up to 50,000 s.f.)

4.10 What is the minimum required parking ratio for shopping centers (per 1,000 ft² gross floor area)?

1 space per 250 s.f. (retails stores up to 75,000 s.f.)

4.11 What is the minimum required parking ratio for single-family homes (per home)?

no ratio, we generally look for enough for two cars

Parking Codes

4.12 Is the use of shared parking arrangements permitted?

- ☐ Yes
☐ No
☒ Not specified in codes

4.13 Are parking ratios reduced if shared parking arrangements are in place?

- ☐ Yes
☒ No
☐ Not specified in codes
☐ Not applicable

Parking Lots

4.14 What is the minimum stall width for a standard parking space?

9 feet

4.15 What is the minimum stall length for a standard parking space?

18 feet

4.16 Is a percentage of the spaces at commercial parking lots required to have smaller dimensions for compact cars?

- ☐ Yes, please specify percentage: _____
☒ No

4.17 Are unpaved parking spaces allowed?

- ☐ Yes
☒ No
☐ Other, please describe: _____

Parking Lot Runoff

4.18 Is a minimum percentage of a parking lot required to be landscaped?

- ☒ Yes
☐ No

Open Space Design

4.19 Are open space or cluster development designs allowed in the community?

- ☒ Yes, by right
☐ Yes, with a conditional use permit
☐ Yes, by special exception
☐ No
☐ Not specified in codes

Comments: Still need to meet minimum requirements in ordinance.

4.20 Are there additional submittal or review requirements for open space design, beyond those for conventional development?

- ☐ Yes
☒ No
☐ Not applicable

Comments: _____

4.21 Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes)?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Setbacks and Frontages

4.22 Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

- ☒ Yes
☐ No
☐ Not specified in codes

Watershed Protection Audit

- 4.23 Please provide the following lot size and setback requirements for the principle zoning districts that allow residential development in your community:

	Name of District	Minimum Lot Size	Frontage	Setbacks		
				Front	Rear	Side
1	R-1 Residential	100,000 s.f.	250	50	60	30
2	R-2 Residential	80,000 s.f.	200	50	60	30
3	R-3 Residential	40,000 s.f.	150	30	60	20
4	R-4 Residential	40,000 s.f.	150	30	60	20

- 4.24 Does your community have any overlay districts that allow for increased residential density?

☒ Yes
☐ No

If yes, please list: Planned Residential Development Overlay

Sidewalks

- 4.25 Are sidewalks always required on at least one side of residential streets?

☐ Yes
☒ No

- 4.26 What is the minimum sidewalk width required in the community?

☐ Not less than 4 feet
☒ Greater than 4 feet
☐ Not specified in codes
☐ Not Applicable

- 4.27 Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

☐ Yes
☐ No
☐ Not specified in codes
☒ Not applicable

Driveways

4.28 What is the minimum driveway width specified in the community?

- ☐ 9 feet or less
- ☐ Greater than 9 feet
- ☒ Not specified in codes

4.29 Can pervious materials be used for single-family home driveways (e.g., grass, gravel, porous pavers, etc)?

- ☒ Yes
- ☐ No
- ☐ Not specified in codes

4.30 Can a “two-track” design be used at single-family driveways (*a driveway with two strips of paving corresponding to wheel tracks with a vegetated area in between*)?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

4.31 Are shared driveways permitted in residential developments?

- ☒ Yes
- ☐ No
- ☐ Not specified in codes

Open Space Management

Skip to question 4.39 if open space, cluster, or conservation developments are not allowed in your community.

4.32 Are open space areas within subdivisions required to be consolidated into larger units?

- ☒ Yes
- ☐ No
- ☐ Not specified in codes

4.33 Does a minimum percentage of open space in a residential subdivision have to be managed in a natural condition?

- ☐ Yes
- ☒ No
- ☐ Not specified in codes

4.34 Are allowable and unallowable uses for open space in residential developments defined?

☒ Yes

☐ No

Rooftop Runoff

4.35 Can rooftop runoff be discharged to yard areas?

☒ Yes

☐ No

☐ Not specified in codes

Tool 5. Erosion and Sediment Control

Definition: *The use of erosion control, sediment control, and dewatering practices at all new development and redevelopment sites.*

Department: Community Development/Public Works

5.1 During construction, is **erosion and sediment control** required for:

- ☒ All sites
- ☐ Sites greater than 1 acre
- ☐ Sites greater than 2 acres
- ☐ Sites greater than 5 acres
- ☐ No sites
- ☐ Don't know

5.2 Does your community provide guidance or set forth requirements on the types of erosion and sediment control practices that may be used?

- ☐ Yes, we refer the development community to a state document
- ☒ Yes, we have developed our own guidance and/or requirements
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

5.3 Check all erosion and sediment control practices that your community has required to be implemented in the past three years (list continues on next page):

- | | |
|---|--|
| ☒ Silt fence | ☒ Permanent seeding and mulching |
| ☒ Straw bales | ☒ Dust control |
| ☒ Construction sequencing | ☒ Erosion blankets and geotextiles |
| ☒ Construction phasing | ☒ Fiber rolls |
| ☒ Preservation and non-disturbance of natural vegetation | ☒ Temporary stream crossings |
| ☒ Preservation and non-disturbance of stream or wetland buffers | ☒ Stabilized construction entrance |
| ☒ Stair-step grading | ☒ Exit tire wash |
| ☒ Temporary seeding and mulching | ☒ Energy dissipation at pipe outlets |

Watershed Protection Audit

- | | |
|---|--|
| ☒ Check dams in natural or man-made channels | ☐ Secondary filtration (mechanical or sand filtration devices to filter fine sediments from runoff) |
| ☒ Sand / gravel bag barrier | ☐ Dikes / berms as conveyance to ESC structures |
| ☒ Brush or rock filter | ☒ Pipe slope drains to bypass erodible soils |
| ☒ Storm drain inlet protection | ☒ Stockpile stabilization |
| ☐ Catch basin inlet filters | |
| ☒ Sedimentation basins | |
| ☐ Sediment traps | |
| ☒ Filtration of dewatering operations | |

5.4 Is an erosion and sediment control plan required during the site plan review process?

- ☐ Yes
☒ No
☐ Don't Know
☐ Not Applicable

5.5 Are construction sites inspected for compliance with erosion and sediment control requirements?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.6 Who conducts inspections of construction sites for compliance with erosion and sediment control requirements?

- ☒ Municipal inspector
☐ Third-party inspector (e.g. private engineer)
☐ Other, please describe both municipal and third party
☐ Not Applicable

5.7 How frequently does an erosion and sediment control inspector visit a construction site?

- ☐ Daily
☒ Weekly
☐ Monthly
☐ Annually
☐ Other, please describe _____
☐ Not Applicable

5.8 Does your community sponsor erosion and sediment control training for:

- ☐ Developers
- ☐ Contractors
- ☐ Engineers
- ☐ Inspectors
- ☒ None of the above
- ☐ Not Applicable

Tool 6. Stormwater Management Practices

Definition: The incorporation of structural practices into new development, redevelopment, or the existing landscape to help mitigate the impacts of urbanization and stormwater runoff on receiving waters.

Department: Public Works

6.1 Does your community require stormwater management on new development sites?

- ☒ Yes
☐ No
☐ Don't Know

6.2 Does your community require the stormwater be managed on site?

- ☒ Yes
☐ No
☐ Don't Know

6.4 If management is required, what are the design criteria for stormwater practices?

- ☐ Control **peak discharge rate** (flood control)
Design storm(s): _____
- ☒ Treat **stormwater runoff** for water quality
Design storm(s): 25 year, and 50 year for detention basins
- ☒ Control / reduce total volume of runoff (by means of infiltration practices, etc.)
Design storm(s): 25 year, and 50 year for detention basins
- ☒ Protect downstream channels
Design storm(s): 25 year, and 50 year for detention basins
- ☐ Other: _____
- ☐ Not Applicable

6.3 What type of exemptions do you have for these requirements?

Very limited, exceptions come in if it is an existing property.

6.5 Does your community provide guidance or set forth requirements on the types of stormwater practices that may be constructed?

- ☐ Yes, we refer the development community to a state document
☒ Yes, we have developed our own guidance and/or requirements
☐ No
☐ Don't Know
☐ Not Applicable

6.6 What are the top three stormwater practices typically installed in your community?

treatment swales, detention basins, and infiltration.

6.7 Is a stormwater plan or other documentation required during the site plan review process?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.8 Does your community inspect stormwater practices during construction?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.9 Is an as-built or record drawing of the stormwater practice required after construction?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.10 Who is typically responsible for maintenance of stormwater practices over the life of the stormwater practice?

- ☒ Private owner
- ☐ Builder
- ☐ Homeowner's association
- ☐ Permitting agency
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

Watershed Protection Audit

6.11 Is there a maintenance agreement or covenant between the municipality and the private owner, builder, or homeowner's association in charge of maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.12 Are privately maintained stormwater management systems inspected by the municipality for maintenance upkeep or structural integrity over the life of the facility?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

6.13 How frequently are privately owned stormwater practices inspected?

- ☐ More than once a year
- ☒ Once a year
- ☐ Every two years
- ☐ In response to complaints
- ☐ Never
- ☐ Other, please describe _____
- ☐ Don't Know
- ☐ Not Applicable

6.14 Are there penalties for not complying with the maintenance agreement or other applicable regulations applying to maintenance?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please describe penalties.

Tool 7. Non-Stormwater Discharges

Definition: *Locating, quantifying, and controlling non-stormwater pollutant sources in the watershed. Operation and maintenance practices that prevent or reduce pollutants entering the municipal or natural drainage system.*

Department: Public Works

Sanitary and Stormwater Sewer System

7.1 The best description of my community's stormwater management system is:

- ☐ Storm sewers (usually pipes leading to a receiving stream)
- ☐ Drainage ditches, swales, detention basins
- ☒ Combination, please provide relative percentage of each 50/50
- ☐ Other, please describe _____
- ☐ Don't Know

7.2 Is there a program for illicit connection detection?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

7.3 If so, does your illicit connection detection program include provisions for removal of illicit discharges?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

Watershed Protection Audit

7.4 Does your community have regulations pertaining to septic system maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please explain.

Part of MS4, we have pamphlets for septic owners.

7.5 Does your community conduct inspections of privately owned septic systems?

- ☐ Yes, on installation
- ☐ Yes, ongoing
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

Confined Animal Feeding Lots

7.6 Are there regulations regarding stormwater runoff from confined animal feeding lots?

- ☐ Yes
- ☒ No
- ☐ Don't Know

Spill Response, Prevention and Cleanup

7.7 Does your community have a spill response plan?

- ☐ Yes
- ☐ No
- ☒ Don't Know

7.8 Does your community regulate the storage of hazardous materials?

- ☐ Yes, please describe: _____
- ☐ No
- ☒ Don't Know

7.9 Does your community have a Hazardous Substances Protection Overlay District?

- ☐ Yes, please describe: _____
- ☒ No
- ☐ Don't Know

Snow Management

7.10 What deicing compounds are applied to public roads?

- ☒ Sand
- ☒ Road salt (Sodium Chloride, NaCl)
- ☒ Calcium Chloride (CaCl₂)
- ☐ Magnesium Chloride (MgCl₂)
- ☒ Other, please describe liquid calcium _____

7.11 How are the deicing compounds stored?

- ☒ Within structure
- ☐ Covered, but not in structure
- ☐ Not covered
- ☐ Other, please explain _____

7.12 Does your community have designated low- or no-salt routes or areas?

- ☒ Yes
- ☐ No
- ☐ Don't Know

Tool 8. Watershed Stewardship Programs

Definition: Stormwater and watershed education or outreach programs targeted towards fostering human behavior that prevents or reduces pollution over a range of land uses and activities.

Department: Public Works

8.1 Does your community administer or support education or outreach programs targeted towards:

- ☒ Residents
- ☒ Commercial sector
- ☒ Industrial sector
- ☒ Municipal employees
- ☐ Other, please describe _____
- ☐ None of the above

8.2 Are there any stream stewardship or volunteer monitoring programs within your community?

- ☒ Yes. Please List: _____
- ☐ No
- ☐ Don't Know

8.3 Are there any stream restoration programs or projects within your community?

- ☐ Yes. Please List: _____
- ☒ No
- ☐ Don't Know

Pet Waste Management

8.4 Does your community have any restrictions on pet waste management?

- ☐ Yes
- ☒ No
- ☐ Don't Know

If yes, please describe regulations or restrictions.

No restrictions, but there are informational pamphlets that get mailed to dog owners every spring.

Street Sweeping

8.5 Does your community sweep public streets?

- ☒ Yes
☐ No
☐ Don't Know

8.6 How often does street sweeping occur?

- ☐ Weekly
☐ Monthly
☒ Annually
☐ Other, please explain _____
☐ Not Applicable

8.7 Does street sweeping vary seasonally (e.g., streets are not swept in winter)?

- ☒ Yes, please explain Streets are typically only swept in the spring.
☐ No
☐ Don't Know
☐ Not Applicable

Lawn Care

8.8 Are fertilizers used on public lands?

- ☒ Yes
☐ No
☐ Don't Know

8.9 Are pesticides (insecticides, herbicides) used on public lands?

- ☐ Yes
☒ No
☐ Don't Know

Additional Notes

WATERSHED PROTECTION AUDIT

Background Information

Your Name: Deb Chisholm/Matt Sullivan/Scott McPhie/Dan Hudson/Amy Gill

Municipality: City of Nashua

Department: Community Development Division

Address: 229 Main Street

Nashua, NH 03060

Phone: 603-589-3092 Fax: _____

Email: chisholmd@nashuanh.gov

Municipality Population: 91,322

Municipality Area (square miles): 30.83

Questions may be directed to:

Emma Rearick
Regional Planner II
Nashua Regional Planning Commission
emmar@nashuarpc.org
603-417-6578

Tool 1. Watershed Planning

Definition: The application of regulatory measures and/or planning techniques that are designed to maintain or limit future impervious cover, redirect development where appropriate, and protect sensitive areas.

Department: Sustainability Department

1.1 Does your community have a **master plan**?

- ☒ Yes
- ☐ No
- ☐ Don't Know

1.2 Is the master plan based on political jurisdictions or watersheds?

- ☒ Political jurisdictions
- ☐ Watersheds
- ☐ Other, please explain _____
- ☐ Don't Know
- ☐ Not Applicable

1.3 Is your zoning tied to the master plan?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

1.4 How often do you typically update your master plan?

- ☐ Every 5 years
- ☐ Every 10 years
- ☐ On a Rolling Basis
- ☐ We don't
- ☒ Other, please explain Update as needed.
- ☐ Not Applicable

1.5 Does your plan evaluate and take into account impacts of future land use on water resources?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.6 Does your plan identify and address important water resource goals for your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

1.7 Does your community permit or encourage any of the following techniques to manage land use and impervious cover?

- ☒ **Conservation easements** (*voluntary agreement to legal transfer of development and land use rights to a piece of property to a conservation trust; easements may be temporary or permanent*)
☒ Land acquisition programs
☐ **Transfer of development rights (TDRs)** (*transfers potential development from a designated "sending area" to a designated "receiving area"*)
☐ Limiting infrastructure extension (*a conscious decision is made to limit or deny extending infrastructure, such as public sewer, water, or roads, to designated areas to avoid increased development in these areas*)
☒ Infill / community redevelopment (*encourage new development and redevelopment within existing developed areas*)

Tool 2. Land Conservation

Definition: Programs or efforts to conserve undeveloped, sensitive areas or areas of particular historical or cultural value.

Department: Planning and Zoning Department

2.1 Does your community participate in the National Flood Insurance Program (NFIP)?

- ☒ Yes
☐ No
☐ Don't Know

2.2 If yes, what type of **floodplain** regulations do you have?

- ☐ NFIP minimum standards
☒ Other, please describe key components below
☐ Don't Know
☐ Not Applicable

City Land Use Code Article VII Floodplain Development Ordinance - regulations apply to all lands designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its "Flood Insurance Study for the County of Hillsborough, N.H." dated September 25, 2009, together with the associated Flood Insurance Rate Maps dated September 25, 2009, including the

2.3 Does your community have a local historic district?

- ☒ Yes
☐ No
☐ Don't Know
☐ Other, please describe_____

2.4 Does your community have a heritage commission?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe_____

2.5 Is the preservation of cultural or historic resources required under local ordinances or regulations?

- ☐ Yes
☐ No
☐ Don't Know
☒ Other, please describe **Yes, only within Historic District area.**

2.6 Do your local land use regulations encourage the preservation of agriculture?

- ☐ Yes
☒ No
☐ Don't Know
☐ Other, please describe _____

2.7 Are you aware of any critical habitat areas for plant and animal species in your community?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

2.8 Other than what is required by state and federal laws, is the preservation of critical habitat areas for plant and animal species:

- ☐ Required
☒ Encouraged
☐ Neither
☐ Don't Know
☐ Other, please describe **Note wetlands responses below.** _____

2.9 Does your community have regulations or requirements, other than what is required by state and federal laws, governing the preservation of wetlands during development?

- ☐ Yes
☐ No
☐ Don't Know
☐ Other, please describe _____

2.10 Are there development restrictions pertaining to steep slopes?

- ☒ Yes
☐ No
☐ Don't Know

If yes, please describe key components of restrictions:

Please note that restrictions only exist within Conservation Subdivisions a:



2.11 Do your local land use regulations encourage the conservation of forested areas?

- ☐ Yes, required
☒ Yes, encouraged
☐ No
☐ Don't Know
☐ Other (please describe)

If the conservation of forested areas is required or encouraged, please provide key components of your methods:

Conservation Subdivision design is encouraged for all subdivision develop



2.12 Are there development restrictions pertaining to stream channel modification?

- ☒ Yes
☐ No
☐ Don't Know

If yes, please describe key components of restrictions:

If the stream channel is a wetland, modification would need approval by Zo



2.13 Does your community have a local shoreland protection overlay zone or district?

- ☐ Yes
☒ No
☐ Don't Know

Tool 3. Aquatic Buffers

Definition: The protection, restoration, creation, or reforestation of stream, wetland, and urban lake buffers.

Department:

Planning and Zoning

3.1 Are stream buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.2 What are your stream buffer width requirements? See Article XI - Wetlands

3.3 Are wetland buffers required in your community?

- ☒ Yes
☐ No
☐ Don't Know

3.4 What are your wetland buffer width requirements?

See Article XI - Wetlands Prime=70', Critical=40', other >9,000sq ft=40', other >3,000=20'

3.5 Are there reforestation, restoration, or riparian cover requirements or programs for buffers?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

If yes, please describe key components of the requirements.

Ordinance 190-117 Trees cut unlawfully in wetland buffer replaced in ki



Tool 4. Better Site Design

Definition: Local ordinances and codes incorporate techniques to reduce impervious cover and/or redirect runoff onto pervious surfaces in the design of new development and redevelopment projects.

Department: Planning and Zoning/Engineering

Street Width

- 4.1 What is the minimum pavement width allowed for streets in low-density residential developments that have less than 500 average daily trips (ADT)?
- ☐ 18 - 22 feet
☐ 23 - 26 feet
☒ Greater than 26 feet
- 4.2 In higher density development are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?
- ☐ Yes
☐ No
☐ Not Sure
☐ Not Applicable

Right-of-Way (ROW) Width

- 4.3 What is the minimum right-of-way (**ROW**) width for a residential street?
- ☐ Less than 45 feet
☒ Greater than 45 feet
- 4.4 Does the code allow utilities to be placed under the paved section of the ROW?
- ☒ Yes
☐ No
☐ Not specified in codes

Cul-de-Sacs

- 4.5 What is the minimum radius allowed for **cul-de-sacs**?
- ☐ Less than 35 feet
☐ 36 feet to 45 feet
☒ Greater than 45 feet

4.6 Can a landscaped island be created within the cul-de-sac?

- ☐ Yes
☐ No
☒ Not specified in codes

4.7 Are alternative turn-arounds such as “**hammerheads**” allowed on short streets in low-density residential developments?

- ☒ Yes
☐ No
☐ Not specified in codes

Vegetated Open Channels

4.8 Are curb and gutters required for most residential street sections?

- ☒ Yes
☐ No

Parking Ratios

4.9 What is the minimum parking ratio for a professional office building (per 1000 ft² of gross floor area)?

1 per 1000 square feet minimum/ 1 per 200 GFA max. (table 198-1)

4.10 What is the minimum required parking ratio for shopping centers (per 1,000 ft² gross floor area)?

1 per. 200 SF min. / 1 per. 150 SF. max.

4.11 What is the minimum required parking ratio for single-family homes (per home)?

2 per. unit

Parking Codes

4.12 Is the use of shared parking arrangements permitted?

- ☒ Yes
☐ No
☐ Not specified in codes

4.13 Are parking ratios reduced if shared parking arrangements are in place?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Parking Lots

4.14 What is the minimum stall width for a standard parking space?

9- feet

4.15 What is the minimum stall length for a standard parking space?

20- feet

4.16 Is a percentage of the spaces at commercial parking lots required to have smaller dimensions for compact cars?

- ☐ Yes, please specify percentage: _____
☒ No

4.17 Are unpaved parking spaces allowed?

- ☐ Yes
☐ No
☒ Other, please describe: Occasionally gravel is allowed

Parking Lot Runoff

4.18 Is a minimum percentage of a parking lot required to be landscaped?

- ☒ Yes
☐ No

Open Space Design

4.19 Are open space or cluster development designs allowed in the community?

- ☒ Yes, by right
☐ Yes, with a conditional use permit
☐ Yes, by special exception
☐ No
☐ Not specified in codes

Comments: Conservation Subdivisions /Cluster have specific criteria

4.20 Are there additional submittal or review requirements for open space design, beyond those for conventional development?

- ☒ Yes
☐ No
☐ Not applicable

Comments: See Conservation Subdivision requirements 190-40

4.21 Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes)?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Setbacks and Frontages

4.22 Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

- ☐ Yes
☒ No
☐ Not specified in codes

Watershed Protection Audit

4.23 Please provide the following lot size and setback requirements for the principle zoning districts that allow residential development in your community:

	Name of District	Minimum Lot Size	Frontage	Setbacks		
				Front	Rear	Side
1	R40,R30	40,000,30,000	120,105	40,30	50,40	25,20
2	R18,R9	18,000,9,000	100,75	20,20	40,30	20,10
3	RA,RB	7,500,6,000	60,50	25,10	25,20	10,7
4	RC	5,000	50	10	20	7

4.24 Does your community have any overlay districts that allow for increased residential density?

- ☒ Yes
☐ No

If yes, please list: <https://ecode360.com/8730805>

Sidewalks

4.25 Are sidewalks always required on at least one side of residential streets?

- ☒ Yes
☐ No

4.26 What is the minimum sidewalk width required in the community?

- ☐ Not less than 4 feet
☒ Greater than 4 feet
☐ Not specified in codes
☐ Not Applicable

4.27 Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

- ☒ Yes
☐ No
☐ Not specified in codes
☐ Not applicable

Driveways

4.28 What is the minimum driveway width specified in the community?

- ☐ 9 feet or less
- ☒ Greater than 9 feet
- ☐ Not specified in codes

4.29 Can pervious materials be used for single-family home driveways (e.g., grass, gravel, porous pavers, etc)?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

4.30 Can a “two-track” design be used at single-family driveways (*a driveway with two strips of paving corresponding to wheel tracks with a vegetated area in between*)?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

4.31 Are shared driveways permitted in residential developments?

- ☐ Yes
- ☐ No
- ☒ Not specified in codes

Open Space Management

Skip to question 4.39 if open space, cluster, or conservation developments are not allowed in your community.

4.32 Are open space areas within subdivisions required to be consolidated into larger units?

- ☐ Yes
- ☒ No
- ☐ Not specified in codes

4.33 Does a minimum percentage of open space in a residential subdivision have to be managed in a natural condition?

- ☐ Yes
- ☒ No
- ☐ Not specified in codes

4.34 Are allowable and unallowable uses for open space in residential developments defined?

☒ Yes

☐ No

Rooftop Runoff

4.35 Can rooftop runoff be discharged to yard areas?

☒ Yes

☐ No

☐ Not specified in codes

Tool 5. Erosion and Sediment Control

Definition: The use of erosion control, sediment control, and dewatering practices at all new development and redevelopment sites.

Department: Planning and Zoning/Engineering

5.1 During construction, is **erosion and sediment control** required for:

- ☒ All sites
- ☐ Sites greater than 1 acre
- ☐ Sites greater than 2 acres
- ☐ Sites greater than 5 acres
- ☐ No sites
- ☐ Don't know

5.2 Does your community provide guidance or set forth requirements on the types of erosion and sediment control practices that may be used?

- ☐ Yes, we refer the development community to a state document
- ☒ Yes, we have developed our own guidance and/or requirements
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

5.3 Check all erosion and sediment control practices that your community has required to be implemented in the past three years (list continues on next page):

- | | |
|---|--|
| ☒ Silt fence | ☒ Permanent seeding and mulching |
| ☒ Straw bales | ☐ Dust control |
| ☐ Construction sequencing | ☒ Erosion blankets and geotextiles |
| ☒ Construction phasing | ☒ Fiber rolls |
| ☒ Preservation and non-disturbance of natural vegetation | ☐ Temporary stream crossings |
| ☒ Preservation and non-disturbance of stream or wetland buffers | ☒ Stabilized construction entrance |
| ☐ Stair-step grading | ☐ Exit tire wash |
| ☒ Temporary seeding and mulching | ☒ Energy dissipation at pipe outlets |

Watershed Protection Audit

- | | |
|--|--|
| ☐ Check dams in natural or man-made channels | ☐ Secondary filtration (mechanical or sand filtration devices to filter fine sediments from runoff) |
| ☐ Sand / gravel bag barrier | |
| ☐ Brush or rock filter | |
| ☒ Storm drain inlet protection | ☒ Dikes / berms as conveyance to ESC structures |
| ☒ Catch basin inlet filters | ☐ Pipe slope drains to bypass erodible soils |
| ☐ Sedimentation basins | ☒ Stockpile stabilization |
| ☒ Sediment traps | |
| ☐ Filtration of dewatering operations | |

5.4 Is an erosion and sediment control plan required during the site plan review process?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.5 Are construction sites inspected for compliance with erosion and sediment control requirements?

- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable

5.6 Who conducts inspections of construction sites for compliance with erosion and sediment control requirements?

- ☐ Municipal inspector
☐ Third-party inspector (e.g. private engineer)
☒ Other, please describe Public Works & Planning
☐ Not Applicable

5.7 How frequently does an erosion and sediment control inspector visit a construction site?

- ☐ Daily
☐ Weekly
☐ Monthly
☐ Annually
☒ Other, please describe It varies depending on weather conditions and quality of installation
☐ Not Applicable

5.8 Does your community sponsor erosion and sediment control training for:

- ☐ Developers
- ☐ Contractors
- ☐ Engineers
- ☐ Inspectors
- ☐ None of the above
- ☒ Not Applicable

Tool 6. Stormwater Management Practices

Definition: The incorporation of structural practices into new development, redevelopment, or the existing landscape to help mitigate the impacts of urbanization and stormwater runoff on receiving waters.

Department: Engineering Department

6.1 Does your community require stormwater management on new development sites?

- ☒ Yes
☐ No
☐ Don't Know

6.2 Does your community require the stormwater be managed on site?

- ☒ Yes
☐ No
☐ Don't Know

6.4 If management is required, what are the design criteria for stormwater practices?

☒ Control **peak discharge rate** (flood control)

Design storm(s): 100 year

☒ Treat **stormwater runoff** for water quality

Design storm(s): 50 10 5

☒ Control / reduce total volume of runoff (by means of infiltration practices, etc.)

Design storm(s): 50 10 5

☒ Protect downstream channels

Design storm(s): _____

☐ Other: _____

☐ Not Applicable

6.3 What type of exemptions do you have for these requirements?

Exemptions include small projects that are reducing impervious areas and encouraging onsite infiltration.

6.5 Does your community provide guidance or set forth requirements on the types of stormwater practices that may be constructed?

- ☐ Yes, we refer the development community to a state document
☒ Yes, we have developed our own guidance and/or requirements
☐ No
☐ Don't Know
☐ Not Applicable

- 6.6 What are the top three stormwater practices typically installed in your community?
1. Vegetated swales/Dry swales
 2. Wet retention ponds with swales
 3. Stormcentors
- 6.7 Is a stormwater plan or other documentation required during the site plan review process?
- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.8 Does your community inspect stormwater practices during construction?
- ☐ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.9 Is an as-built or record drawing of the stormwater practice required after construction?
- ☒ Yes
☐ No
☐ Don't Know
☐ Not Applicable
- 6.10 Who is typically responsible for maintenance of stormwater practices over the life of the stormwater practice?
- ☐ Private owner
☐ Builder
☐ Homeowner's association
☐ Permitting agency
☒ Other, please explain Nashua requires a stormwater easement for all properties seeking sub & site review
☐ Don't Know
☐ Not Applicable

Watershed Protection Audit

6.11 Is there a maintenance agreement or covenant between the municipality and the private owner, builder, or homeowner's association in charge of maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

6.12 Are privately maintained stormwater management systems inspected by the municipality for maintenance upkeep or structural integrity over the life of the facility?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☒ Not Applicable

6.13 How frequently are privately owned stormwater practices inspected?

- ☐ More than once a year
- ☐ Once a year
- ☐ Every two years
- ☐ In response to complaints
- ☐ Never
- ☒ Other, please describe We require a once a year inspection report as of this year and going forward .
- ☐ Don't Know
- ☐ Not Applicable

6.14 Are there penalties for not complying with the maintenance agreement or other applicable regulations applying to maintenance?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please describe penalties.

If the City drainage is impacted or a private drainage area is clogged that has a stormwater easement in place the City can go in and clean the issue up and bill the owner for lack of maintenance.

Tool 7. Non-Stormwater Discharges

Definition: *Locating, quantifying, and controlling non-stormwater pollutant sources in the watershed. Operation and maintenance practices that prevent or reduce pollutants entering the municipal or natural drainage system.*

Department: Public Works & Environmental Health Department

Sanitary and Stormwater Sewer System

7.1 The best description of my community's stormwater management system is:

- ☐ Storm sewers (usually pipes leading to a receiving stream)
- ☐ Drainage ditches, swales, detention basins
- ☒ Combination, please provide relative percentage of each Combined sewers - 20% to Wastewater Treatment Plant. +
- ☐ Other, please describe _____
- ☐ Don't Know

7.2 Is there a program for illicit connection detection?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

7.3 If so, does your illicit connection detection program include provisions for removal of illicit discharges?

- ☒ Yes
- ☐ No
- ☐ Don't Know
- ☐ Not Applicable

Watershed Protection Audit

7.4 Does your community have regulations pertaining to septic system maintenance?

- ☐ Yes
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

If yes, please explain.

7.5 Does your community conduct inspections of privately owned septic systems?

- ☐ Yes, on installation
- ☐ Yes, ongoing
- ☒ No
- ☐ Don't Know
- ☐ Not Applicable

Confined Animal Feeding Lots

7.6 Are there regulations regarding stormwater runoff from confined animal feeding lots?

- ☐ Yes
- ☒ No
- ☐ Don't Know

Spill Response, Prevention and Cleanup

7.7 Does your community have a spill response plan?

- ☒ Yes
- ☐ No
- ☐ Don't Know

7.8 Does your community regulate the storage of hazardous materials?

- ☒ Yes, please describe: In accordance with NFPA and EPA.
- ☐ No
- ☐ Don't Know

7.9 Does your community have a Hazardous Substances Protection Overlay District?

- ☒ Yes, please describe: 190-24.1 Four Hills Landfill Groundwater man. zone
☐ No
☐ Don't Know

Snow Management

7.10 What deicing compounds are applied to public roads?

- ☐ Sand
☐ Road salt (Sodium Chloride, NaCl)
☐ Calcium Chloride (CaCl₂)
☐ Magnesium Chloride (MgCl₂)
☐ Other, please describe _____

7.11 How are the deicing compounds stored?

- ☐ Within structure
☐ Covered, but not in structure
☐ Not covered
☐ Other, please explain _____

7.12 Does your community have designated low- or no-salt routes or areas?

- ☐ Yes
☐ No
☐ Don't Know

Tool 8. Watershed Stewardship Programs

Definition: *Stormwater and watershed education or outreach programs targeted towards fostering human behavior that prevents or reduces pollution over a range of land uses and activities.*

Department: Sustainability Department

8.1 Does your community administer or support education or outreach programs targeted towards:

- ☒ Residents
- ☒ Commercial sector
- ☒ Industrial sector
- ☒ Municipal employees
- ☒ Other, please describe Per MS-4 Requirements
- ☐ None of the above

8.2 Are there any stream stewardship or volunteer monitoring programs within your community?

- ☒ Yes. Please List: Merrimack & Nashua River Watershed Associations
- ☐ No
- ☐ Don't Know

8.3 Are there any stream restoration programs or projects within your community?

- ☐ Yes. Please List: _____
- ☒ No
- ☐ Don't Know

Pet Waste Management

8.4 Does your community have any restrictions on pet waste management?

- ☒ Yes
- ☐ No
- ☐ Don't Know

If yes, please describe regulations or restrictions.

§ 93-8. Duty to dispose. It shall be the duty of each person who owns, possesses or controls a dog to immediately remove and dispose of any feces left by his/her dog on any sidewalk, street or other public area.

Street Sweeping

8.5 Does your community sweep public streets?

- ☒ Yes
☐ No
☐ Don't Know

8.6 How often does street sweeping occur?

- ☐ Weekly
☐ Monthly
☐ Annually
☐ Other, please explain _____
☐ Not Applicable

8.7 Does street sweeping vary seasonally (e.g., streets are not swept in winter)?

- ☐ Yes, please explain _____
☐ No
☐ Don't Know
☐ Not Applicable

Lawn Care

8.8 Are fertilizers used on public lands?

- ☒ Yes
☐ No
☐ Don't Know

8.9 Are pesticides (insecticides, herbicides) used on public lands?

- ☐ Yes
☐ No
☐ Don't Know

Additional Notes

None.