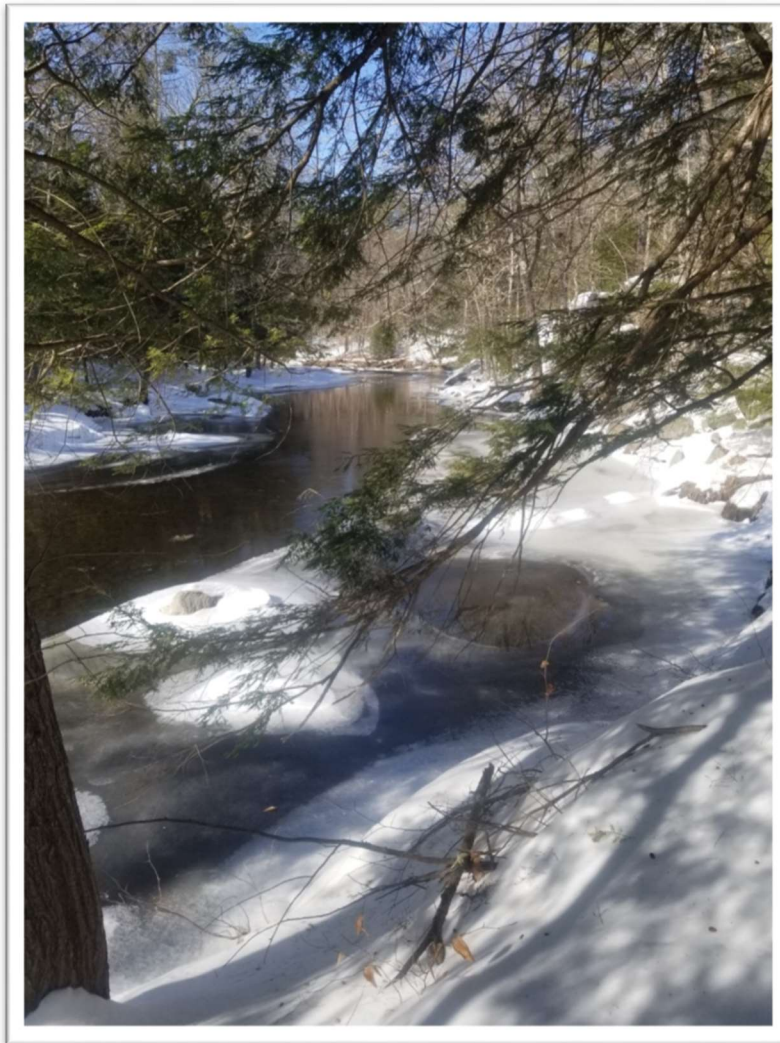


Warner River Corridor Management Plan

January 2021



Winter comes to the Warner River, near Morse Loop in Warner.

Photo Credit: Ken Milender of Warner

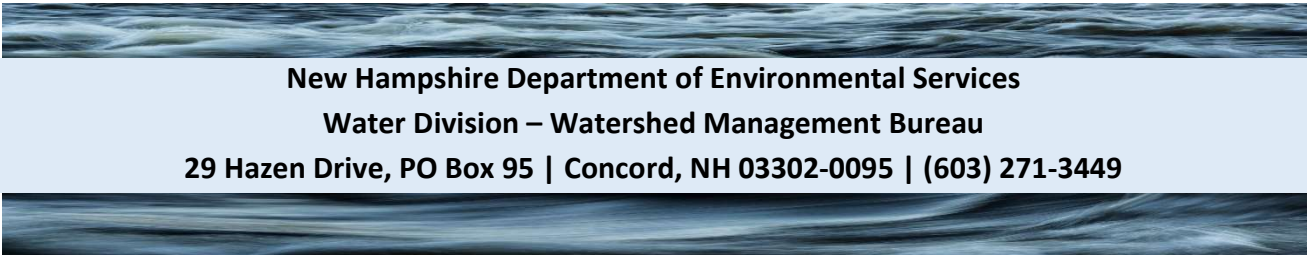
New Hampshire Rivers Management and Protection Program
Department of Environmental Services
Watershed Management Bureau



Warner River Corridor Management Plan

Prepared by

Warner River Local Advisory Committee (WRLAC)
with assistance from the Central New Hampshire Regional Planning Commission (CNHRPC)



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Acknowledgments

The Warner River Local Advisory Committee (WRLAC) prepared this Warner River Corridor Management Plan with assistance from the Central New Hampshire Regional Planning Commission and the New Hampshire Department of Environmental Services (NHDES) Rivers Management and Protection Program (RMPP). The draft of this Plan was completed in March 2020 and after revision, was adopted by WRLAC in January 2021. If you need accommodations for this document or it's appendices, please contact the Rivers Coordinator at riversprogram@des.nh.gov.

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- Laura Russell, Warner.
- Chris Spannweitz, Warner.
- Bruce Edwards, Bradford.
- Andy Jeffrey, Sutton.
- Ken Milender, Warner.

Mission Statement

The Warner River Local Advisory Committee (WRLAC) intends to carry out its responsibilities established by the New Hampshire Rivers Management and Protection Program (established under RSA 483), including the protection of the river's outstanding characteristics – recreational, fisheries, wildlife, cultural and ecological, and to support the protection and maintenance of the riparian lands within the Warner River corridor. This management plan represents the first step towards implementation of the WRLAC's responsibilities.

The Warner River Local Advisory Committee will focus its efforts on raising awareness of the need for conservation and thoughtful stewardship of the river's many resources, including supporting the protection of the riparian and aquatic habitats, advocating for maintaining the current high quality and available quantity, and supporting conservation efforts throughout the Warner River corridor. The WRLAC will work with riparian landowners, other interested residents, and local government agencies in the towns of Warner, Sutton, Webster, Bradford, and Hopkinton to promote these efforts and to work as partners in maintaining

the unique rural character of the Warner River. Neighboring communities and supporting agencies and organizations are welcome to participate and collaborate in the WRLAC activities.

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Chapter 1. Introduction

1.1 Background

A joint watershed study conducted in 2012 by New Hampshire Fish and Game Department and the [Basil W. Woods Jr. Chapter of Trout Unlimited](#) found that two-thirds of the streams within the Warner River watershed support healthy populations of wild brook trout, an indicator of exceptional water quality. This project was subsequently expanded to include identifying barriers, such as culverted stream crossings, to their natural movement in the streams. These inadequate road-stream crossings also can increase stream erosion and flood risk.

To better educate the public and to gain widespread appreciation of the study's results, the Warner Conservation Commission reached out to the [Central New Hampshire Regional Planning Commission \(CNHRPC\)](#) to explore the possibility of increasing the protections afforded to the river with a five-town effort to nominate the Warner River into the Rivers Management and Protection Program (RMPP), with help from residents of Bradford, Sutton, Warner, Webster, and Hopkinton.

From 2015 through 2017, the Warner River Nomination Committee formed and received a grant from the New England Grassroots Environmental Fund to write the nomination with assistance from CNHRPC. Over this time, the Committee met with the five Select Boards and convened six public information sessions to hear input from all interested parties. Based on public feedback, the nomination committee completed their nomination package. In a testament to the importance of the viewpoints of riparian landowners, the nomination committee adjusted the river classifications to accommodate the opinions of specific landowners.

During the entire nomination process, 34 letters of support were received, representing a wide variety of river interests, including municipal groups, landowners, the American Whitewater Association, New Hampshire Fish and Game Department, the Warner Village Water District, and many more. The WRLAC intends to continue to reach out to riparian landowners, residents, and local governments to share the goals and recommendations in this plan and to keep everyone apprised of the Committee's activities and initiatives.

Rivers Management and Protection Program

The [New Hampshire Rivers Management and Protection Program \(RMPP\)](#) was established in 1988 with the passage of RSA 483 to protect certain rivers in the state, called Designated Rivers, for their outstanding natural and cultural resources. Local communities, including municipal officials and residents, can develop a River Nomination to apply for designation. The New Hampshire General Court and Governor approve the nomination, looking for a level of local support and presence of important river values. NHDES administers and assists with the development and implementation of the corridor management plan but the RMPP is operated as a partnership between state government and local citizen volunteers.

In 2017, the Committee submitted the nomination package to the New Hampshire Department of Environmental Services for review, and the nomination was approved by the state's Rivers Management Advisory Committee (RMAC). A public hearing was held by NHDES, the nomination was submitted to the General Court, and the Governor signed the legislation to amend RSA 483 to include the Warner River in August 2018. An important characteristic of the RMPP is the partnership created between state government and local citizens through the formation of a Local River Management Advisory Committee for each designated river. A minimum of one resident from each of the five riverfront towns along the length of the river corridor is appointed to the committee by the RMAC. The Warner River Local Advisory Committee's members represent the five riverfront towns in the corridor, and they bring their broad range of interests, skills, and backgrounds into use in protecting and managing the Warner River and its resources.

The designated Warner River flows through the five riverfront communities of Bradford, Sutton, Warner, Webster, and Hopkinton.

1.2 Warner River Designation

The Warner River was designated as a protected river in 2018. The designation as a protected river recognizes the river's special resources and qualities, opening up opportunities for unique partnerships with riparian landowners, environmental groups, the five towns, and the state to better protect these resources. In addition, under the provisions of RSA 483, the river's designation to the Rivers Management and Protection Program (RMPP) increases protections and safeguards for the construction of new dams, channel alterations, and the siting of solid and hazardous waste facilities within the Warner River corridor, as well as providing guidance and funding to correct and restore water-quality impairments. The designation is contributing to those efforts to ensure there is a healthy future for the Warner River and all who rely on its high quality. Although development immediately adjacent to the river has occurred, there remains many undeveloped parcels within the corridor that would benefit from efforts to conserve and protect the habitats. Identifying and prioritizing areas that are important fish, plant and wildlife habitat and contribute to the health of the river are ways the designation and this management plan can help.

Examining the bigger picture from a regional level will provide broader context on issues such as conflicting and competing land uses, aquifer protection, wildlife corridors, flood management, and water quality. This watershed management will be especially important as the impacts of climate change become more locally felt. These impacts can include the increasing frequency of severe droughts and floods, the lack of high-quality aquifer and groundwater, wildlife habitat degradation, an increase in temperatures and irregular temperature fluctuations.

There are 19 designated rivers totaling 1,019 river miles within 125 communities participating in the Rivers Management and Protection Program.

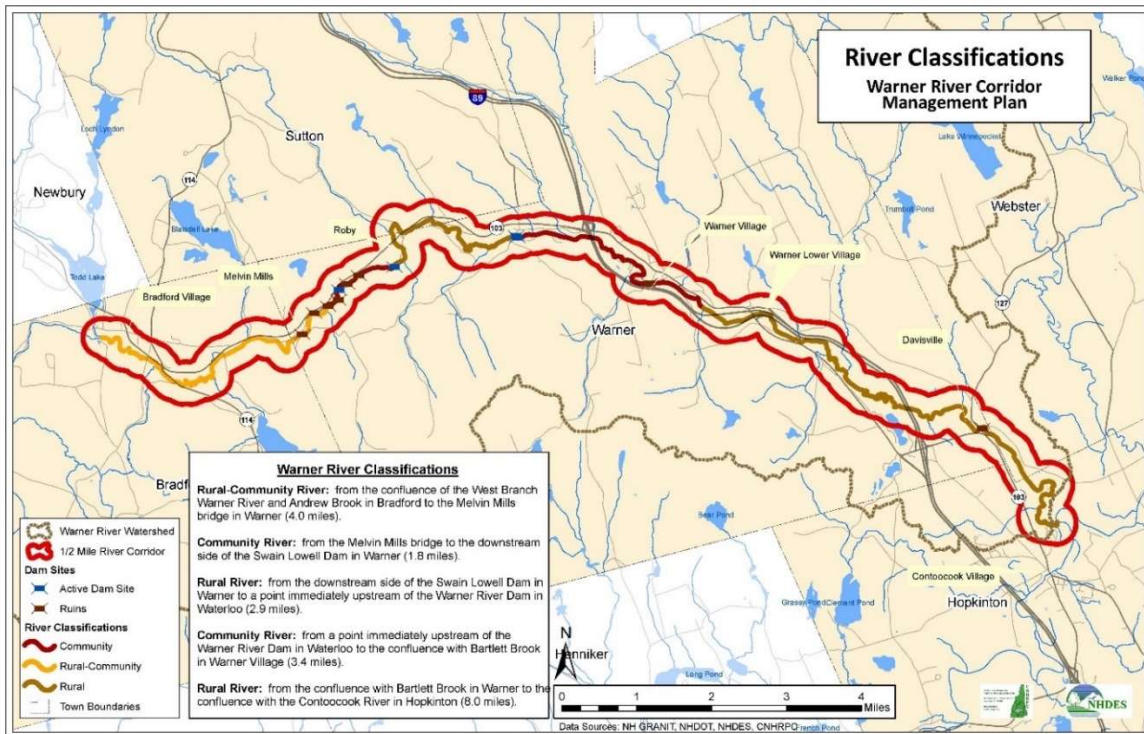
One important benefit of the river designation is that it allows for greater regional communication among the five towns sharing this natural resource. It can also open doors for funding sources for additional evaluations of the entire Warner River watershed. Designation helps to raise the public’s awareness of the river, water regulations, recreation opportunities, and the need for continuing environmental stewardship over this precious resource.

1.3 The Warner River Corridor

The designated Warner River, a fifth-order stream, flows for about 20 miles. It begins as the West Branch of the Warner River where it is joined by Andrew Brook in Bradford, meanders its way one mile to the confluence of the West Branch Warner River and Hoyt Brook to form the Warner River, and then flows 19 miles to its confluence with the Contoocook River in Hopkinton, downstream of Contoocook Village. With a watershed drainage basin of about 148 square miles across Merrimack and Sullivan Counties, the Warner River watershed is an integral part of central New Hampshire’s landscape. This river provides many valuable resources and helps define the character of the five riverfront towns through which it flows: Bradford, Sutton, Warner, Webster, and Hopkinton.

The corridor of the designated Warner River is a ½ mile wide zone – the area is measured ¼ mile outward from each bank of the designated river.

Figure 1.1 Warner River Classifications



Source: CNHRPC Mapping for the WRLAC

The Warner River corridor consists of the full length of the main stem of the Warner River and the lands within ¼ mile of each bank of the river (the corridor is a total of ½ mile wide). While Figure 1.1 illustrates the reach locations, see **Appendix A. River Classifications Map** for more detail. Table 1.2 details the length of the Warner River flowing through each community. Most of the river flows through Warner.

Table 1.2 Length of the Warner River in Each Corridor Town

Riverfront Town	River Mileage	Percentage of River Length
Bradford	3.7	19%
Sutton	0.8	4%
Warner	12.9	65%
Webster	0.8	4%
Hopkinton	1.6	8%

Source: CNHRPC Mapping for the WRLAC

Through the River Nomination, the designated river has been divided into a series of river reaches that have been assigned a classification based on the current land use and other specific characteristics of each reach. The state's Designated Rivers classification system is comprised of four categories: natural, rural, community, and rural-community river reaches. The categories provide different types and degrees of protection to the reaches. There are no natural categories along the river. The Warner River's five reaches are classified from upstream to downstream as:

- **Rural-Community River** – (20% of total river length): From the confluence of the West Branch of the Warner River and Andrew Brook in Bradford to the Melvin Mills bridge in Warner (4.0 miles).
- **Community River** – 9%: From Melvin Mills bridge to the downstream side of the Swain Lowell Dam (1.8 miles).
- **Rural River** – 14%: Downstream of the Swain Lowell Dam to the upstream side of the Warner River Dam in Waterloo Village (2.9 miles).
- **Community River** – 17%: Immediately upstream of the Warner River Dam at Waterloo to the confluence of the Warner River and Bartlett Brook below Warner Village (3.4 miles).
- **Rural River** – 40%: From Bartlett Brook in Warner to the confluence of the Warner and Contocook Rivers (8.0 miles).

The state's designated rivers classification system is composed of four categories – natural, rural, community, and rural-community, which provide different types and degrees of protection.

1.4 Warner River Corridor's Management Plan

The ecological health of the Warner River is directly connected to the quality of life felt by residents and to the economic prosperity of the corridor communities. Issues such as flooding potential, water pollution, erosion and sedimentation, influx of invasive species, and wildlife connectivity extend beyond municipal boundaries and concern many different stakeholders. All of these issues are expected to need more frequent attention in the face of anticipated local effects of climate change. By planning together, the riverfront towns can develop more coordinated strategies that will continue to protect and enhance the unique resource that connects us all – the Warner River! This Corridor Management Plan provides a consistent framework for input into planning decisions along the length of the Warner River, including natural resource protection, access to recreational opportunities, and economic development. This Plan builds on the individual regulatory mechanisms already established in the five riverfront towns by beginning development of a coherent structure for protecting and improving the Warner River corridor with strategies tailored to the unique opportunities and concerns of this river and the five towns in the corridor.

The intent of this Corridor Management Plan is to increase the information base about the Warner River's natural resources and better publicize that information to the public so that decision makers can be better informed in making their land use decisions. Working with local land use boards to better coordinate inter-town activities and regulations is also an important goal of this Plan. The information contained in the Plan will be critical in identifying areas where additional data and standardization is needed.

The Warner River Corridor Management Plan is intended to be a living document, a tool to guide response to the changing issues surrounding the protection and preservation of the designated Warner River and its ½ mile buffer corridor.

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Chapter 2. Resource Assessment

The outstanding natural and cultural features of the Warner River watershed are the basis for the river's incorporation into the New Hampshire Rivers Management and Protection Program as the state's 19th designated river. The river provides important water resources to its human residents, as well as being the basis for the habitats for the wildlife and plant communities that call the river home. The river and its valley have been an important avenue for transportation and development of natural resources since its initial settlement by Native Americans.

The Warner River Corridor Management Plan is striving for the balance that will be necessary for humans and nature to peacefully coexist while not over-utilizing the available resources.

The Warner River corridor contains a wide variety of natural resources that are essential to the quality of life of the human inhabitants, as well as fish, wildlife, and the natural communities they inhabit. The Warner River Corridor Management Plan strives for the balance that will be necessary for humans and nature to harmoniously coexist while not exploiting the available resources.

2.1. The Corridor and Its People

An overview of the human resources in the five riverfront communities over time, particularly the demographic and economic characteristics, will provide a snapshot of the region through which the Warner River flows.

2.1.1 Regional Profile

While economic conditions can fluctuate from time to time, New Hampshire continues to perform well in terms of maintaining a strong economy and remaining a desirable place to live, work and play. In the Warner River valley, the quality of life is highly valued for its strong sense of community, rural character, and ready access to its natural resources and recreational opportunities, both in the Warner River watershed and beyond. While sustaining and growing an economy relies on business recruitment as well as retention and expansion efforts, managing potential growth without compromising the region's rural character and high quality of life is a continuing challenge. Attracting and sustaining jobs with competitive salaries are key factors that need to be balanced with public services that enhance the quality of life but can also be an important consideration when attracting additional business activity. Transportation infrastructure, access to

amenities and services, and the availability of quality, affordable housing are also important considerations when looking at future economic development and population growth¹.

Over the past decade, the demographic trends for the Warner River corridor towns show a slowing growth of population and the continuing aging of its residents. New Hampshire’s growth is primarily driven by migration, not natural increase. For the first time, the most recent population estimates from the Census Bureau (2019) show deaths exceeding births. Most of this migration gain is the result of more people moving into New Hampshire from other states than leaving it. This domestic migration is very much a part of the state’s economic and demographic growth. According to Dr. Kenneth Johnson from the UNH Carsey School of Public Policy, “over the past three years, an annual average of 3,800 more people moved into New Hampshire from other U.S. destinations than left it.”

As far as estimates for the five-town region, the most recent available data is 2018, produced by the New Hampshire Office of Strategic Initiatives (NHOSI). The total regional estimate is 14,000, the result of marked jumps in population of all five towns during the period between 1960 and 1990. The slower rate of growth the area is now experiencing could be more evident (and have more of an impact) in the corridor’s smaller communities; some of the towns are expected to see small gains of population in the immediate future.

2.1.2 Town Demographics

The Warner River valley is home to numerous small villages within the five riverfront towns, including Bradford Village, Melvin Mills, Roby, Waterloo, Warner Village, and Davisville on the boundary of Warner, Webster, and Hopkinton.

The overall rural nature of the Warner River corridor is highlighted by the populations of the riverfront towns: all of the towns in the corridor have populations less than 6,000 people, with three of the towns’ populations having fewer than 2,000 residents. Table 2.1 details some basic demographics of the corridor communities as of 2018. Unemployment rate comparisons from 2018 and 2020 illustrate some of the economic effects of the coronavirus pandemic in 2020.

Table 2.1 Corridor Town Demographics

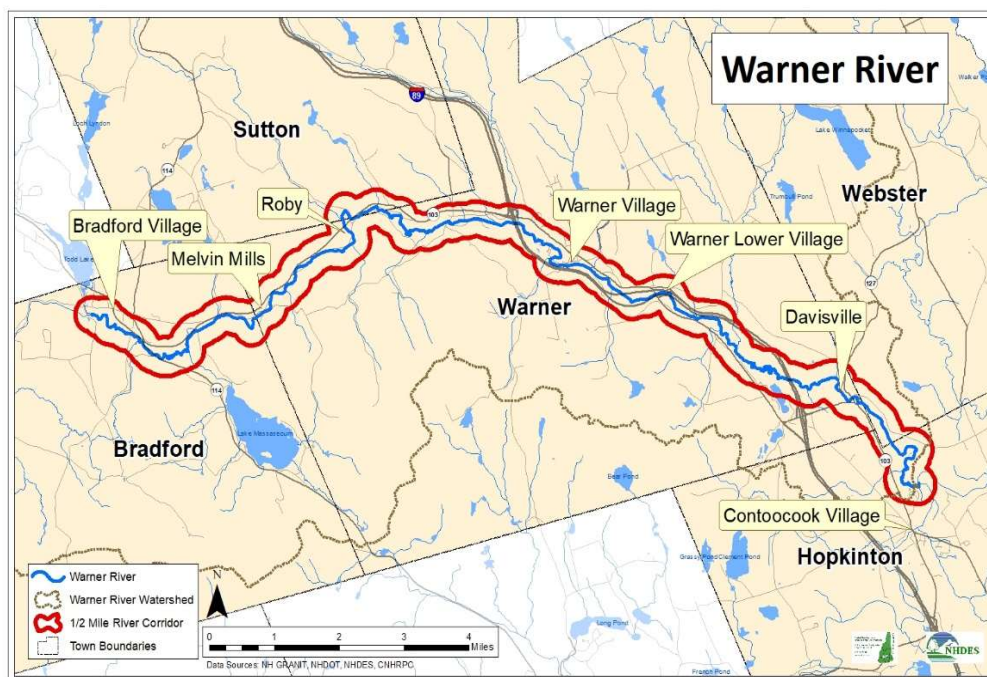
Town	2019 Population Estimates ¹	Median Household Income ²	Individuals Below Poverty Line ²	Civilian Labor Force ³	2018 Unemployment Rate ³	Nov 2020 Unemployment Rate ³
Bradford	1,690	\$64,167	5.4%	959	2.7%	3.5%
Hopkinton	5,712	\$97,014	4.5%	3,430	1.8%	2.0%
Sutton	1,881	\$92,688	3.4%	1,098	2.0%	2.0%
Warner	2,915	\$72,829	7.9%	1,570	2.3%	2.6%
Webster	1,902	\$83,385	4.6%	1,149	1.7%	3.7%
Totals	14,100	\$82,017 avg.	5.2% avg.	8,206	2.1% avg.	2.8% avg.

Sources: 1. NHOSI 2019 population estimates; 2. 2014-2018 ACS Data (newer data unavailable); 3. New Hampshire Economic and Labor Market Information (EMLI), 2018 data; [NH EMLI, 2020 data](#).

¹ Central New Hampshire Regional Planning Commission, 2016, Comprehensive Economic Development Strategy.

The total population of the riverfront towns is just over 14,000 people. The corridor's overall labor force was about 8,200 persons, with the working populations between 50% and 60% of each town's population. Mirroring regional, state, and national trends, the unemployment rate in the riverfront towns has declined over the past several years. The 2018 unemployment rates among the riverfront towns ranged between 1.7% and 2.7%.

Figure 2.2 Riverfront Towns and Villages of the Warner River



Source: Map developed by Central NH Regional Planning Commission (CNHRPC), 2020

Median household incomes in the corridor varied between \$64,167 and \$97,014. The median exceeds New Hampshire's state median household income of \$74,057 in three of the five riverfront towns, Bradford and Warner being the exceptions.

Another key economic indicator is the estimated number of residents living below the poverty rate. As shown in Table 2.1, of the five riverfront towns, Sutton had the lowest poverty rate (4.5%). By way of contrast, the remaining riverfront towns had poverty rates that ranged between 4.6% and 7.9%.

The riverfront towns with the largest populations have the highest number of employed workers in the corridor. About 42% of the working age residents of the five riverfront towns live in Hopkinton; 19% live in Warner. Figure 2.2 displays the locations of the riverfront towns and villages.

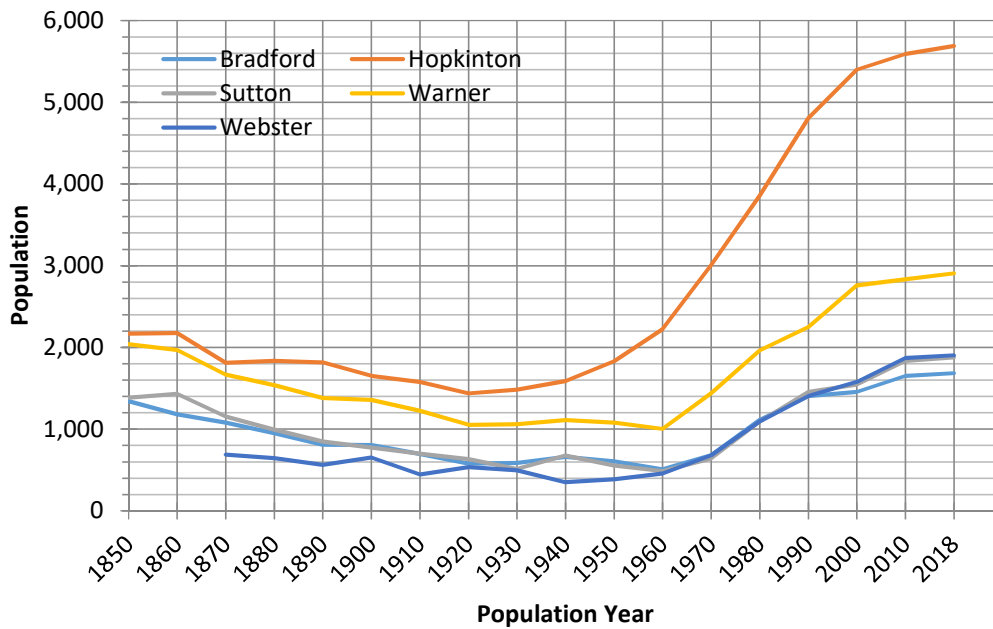
Overall, the watershed has experienced many changes to its housing stock over the past several decades. Building permits for new residential construction are on the rise again after a sharp regional decline after 2005. Data on new residential housing starts has generally averaged fewer than five new permits each year

since 2010 in each of the riverfront towns. Hopkinton, however, after averaging about five new starts annually, doubled to 10 per year in 2015 and the annual average new single-family residential permits has remained 10 per year through 2018.²

Similar to the recent trends in single-family residential construction, the median rental costs have continued to rise since the early 1990s, with the state’s highest median gross rent reported by New Hampshire Housing at \$1,241 in 2019.

The demographics data indicate that the Warner River valley continues to add to its human population, albeit at a slow rate as displayed in Figure 2.3 of population trends between 1850 and 2018 per town. The need for less expensive land that could be used for housing will continue to increase and could be a driver of future residential development as housing prices continue to rise outside the watershed. In higher demand will be places in proximity to employment centers like Concord and Lebanon/Hanover, New Hampshire.

Figure 2.3 Population of the Riverfront Towns, 1850-2018



Source: New Hampshire Office of Strategic Initiatives estimates data and US Census

New Hampshire, along with much of the United States, experienced a large increase in births due to the baby boom after World War II. Baby boomers now contribute to a larger adult population as they start to reach their 50’s and 60’s, which is causing a dramatic shift in the makeup of the population. The shift towards an older population with fewer younger adults has many potential impacts, including a high percentage of experienced workers in the peak years of their earning potential with considerable social, economic and

²State of New Hampshire, Office of Strategic Initiatives, 2019, Current Estimates and Trends in New Hampshire’s Housing Supply Update: 2010-2018, December.

intellectual capital. In the future, there will be a higher proportion of workers aged 65 and older and closing in on their retirement. By way of contrast, national trends indicate that young adults are moving to large metropolitan areas and spending less time commuting by car, and they are buying smaller houses later in life than their predecessors.

2.2 Geologic Conditions

Analysis of the terrain of the corridor and the underlying geologic formations gives important information about water availability and its natural quality. The terrain and the geologic units that form the landforms also help to define the suitability of the land and its role in constraining development in certain areas. This information can be helpful for towns in the corridor, whether for assessing site suitability or in drafting regulations that govern land uses and restrictions.

The Warner River flows through the eastern New England uplands physiographic province, an area of low mountains and deep valleys, with a well-developed drainage system. Bedrock in the Warner River valley chiefly consists of a mixture of metamorphic rock (mainly gneiss and schist) and igneous rock formations (granodiorite). The region is seismically inactive; the river does not cross any known, active faults. The shallow zones of the bedrock are extensively fractured. Fractures generally become less common with increasing depth.

In the upper reaches of the Warner River basin, the soils are primarily glacial till deposited by the last ice sheet, which melted back and away from the Warner River watershed approximately 15,000 years ago. Glacial till is an unsorted mixture of all grain sizes, from boulders to clay; in the watershed, glacial till was generally deposited as ground moraine, which forms a mantle several feet thick directly on the underlying bedrock.

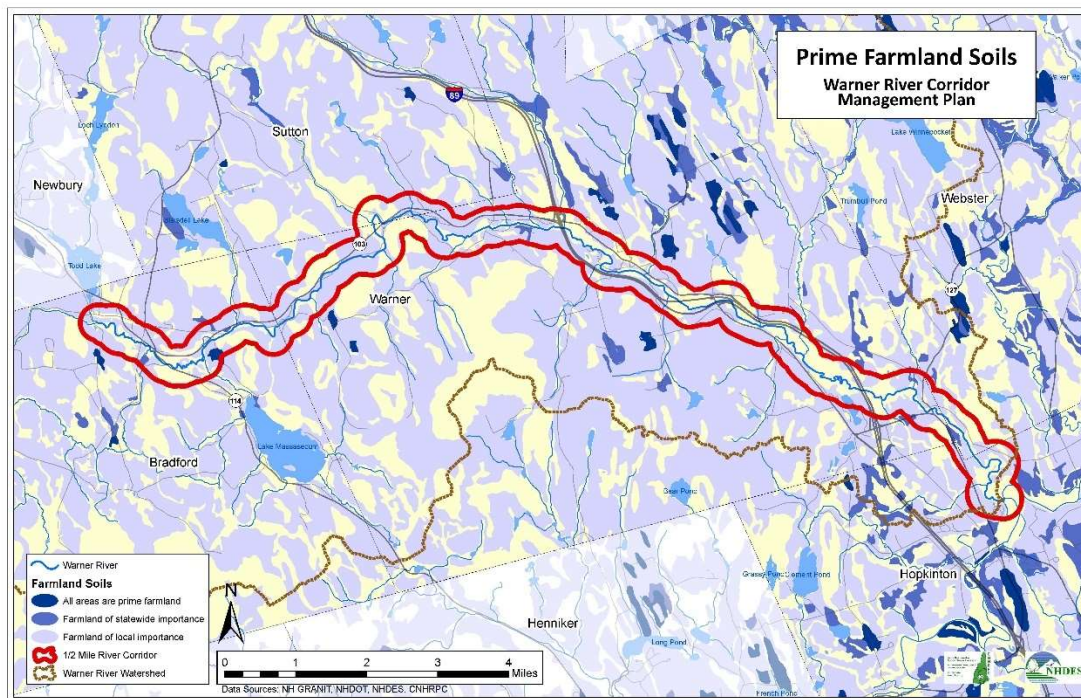
As the ice sheet retreated, the melting released large quantities of meltwater, which flowed into the lower elevations, carrying the sand, gravel, silt, and clay downstream. Where these meltwater rivers slowed, the bedload was deposited as stratified deposits of layers and lenses of sand and gravel called “stratified drift”. Significant stratified-drift deposits have been mapped in Bradford Village, Warner Village, and between Lower Warner and Davisville. Where saturated, stratified drift can supply large amounts of groundwater to wells. Where unsaturated, stratified-drift deposits are productive sand and gravel deposits. The ice sheets, and the melt water from the waning ice sheet, are responsible for forming stratified-drift deposits.

The finer grained silts and clays were carried farther downstream, until the current dropped enough in the quiet waters of glacial lakes that formed downstream in the Contoocook River valley, to allow their deposition. Other likely glacial lakes formed at higher points in the Warner River watershed, such as the flats of Bradford and between Lower Warner and Davisville. See **Appendix A. Water Resources Map** to view the stratified drift aquifers.

The corridor contains over 9,700 acres of land suitable for agriculture.

Large sections of land along the entirety of the Warner River have the potential to be used for farmland due to favorable soil quality. Regional scale soils mapping indicates that the primary soils within the corridor consist of the Monadnock Sandy Loam and the Tunbridge-Lyman-Becket Complex. The upper reaches of the corridor primarily contain farmland of local importance. Prime farmland in the downstream areas, for example, near the junction of the Contoocook River, tends to be set back slightly from the channel to avoid seasonal flooding, but still makes use of the fertile areas across the greater flood plain and remnant fluvial terraces to great agricultural effect. Productive soil types in this region include Adams Loamy and the Champlain-Woodstock Complex, which are predominantly fluvial in deposition. See the full-sized **Appendix A. Prime Farmland Soils Map** to view these soils in the corridor, also shown as Figure 2.4 below.

Figure 2.4 Prime Farmlands Map of the Warner River Corridor



Source: Map developed by Central NH Regional Planning Commission (CNHRPC), 2020

Overall, the corridor contains over 9,700 acres of land suitable for agriculture. Of this arable land, over 9,000 acres have been classified as farmland of significant local importance, and over 230 acres have been designated as farmland having statewide importance.

2.3 Water Resources

The water in the corridor is a finite resource. Sustainable water management depends on a full appreciation of the resource, its renewable nature, and the ease with which the resource can be misused or overused. Water is a shared resource with needs and interests including drinking water supply, recreational activities, dam operations, and the ability to support fish and wildlife habitat.

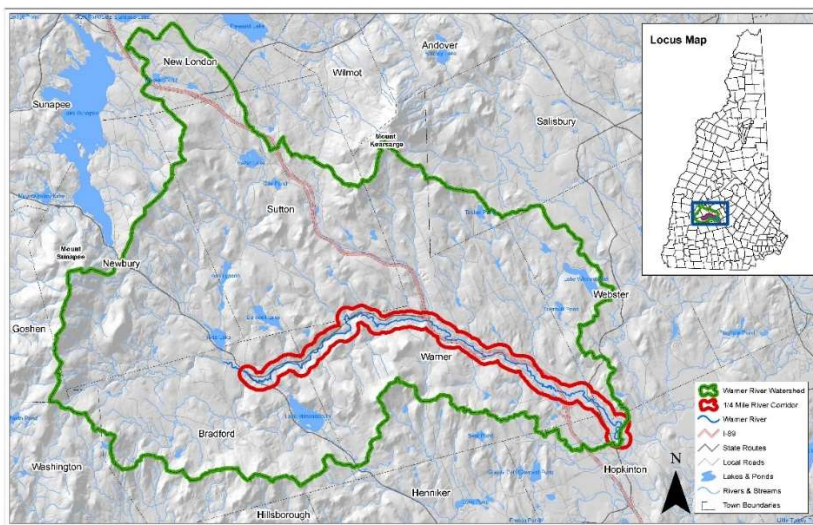
The watershed's health and function are subject to precipitation and land use, especially within the ½ mile river corridor. Water resources are vitally important to ensure an adequate supply of clean drinking water and to provide healthy habitats for wildlife. Water resource protection requires efforts to understand the interplay between the quantity and the quality of the groundwater and the surface water, the anticipated effects of changing weather patterns due to climate change, as well as the integrity of the river's channel.

Watersheds are land areas containing connecting water features, with the highest elevations guiding water downhill into collection waterbodies and underground into aquifers. The connectivity and collective contribution of small streams and wetlands are critical to the integrity of the downstream, higher order waters. Within the five riverfront towns in the Warner River watershed, water is found as both surface water and as groundwater.

2.3.1 Warner River Watershed

The Warner River watershed emerges through small drainage streams throughout the mountains of the Dartmouth-Lake Sunapee and Merrimack River Valley regions of New Hampshire. The small, high-altitude, named and unnamed first-, second-, and third-order streams collectively form the Warner River, originating from the heights of the watershed on the slopes of Mounts Sunapee and Kearsarge and from the lower altitude hills and ridges of the Mink Hills in Warner as shown in Figure 2.5.

Figure 2.5 Warner River Watershed and Water River Corridor Map



Source: Map developed by Central NH Regional Planning Commission (CNHRPC), 2020

The nation's watersheds have been divided into a series of Hydrologic Unit Codes (HUC), each with its own assigned HUC. These HUCs are a basic identification and locator system used by the United States Geological Survey to catalog the nation's surface-water watersheds. The Warner River watershed has a 10-digit HUC of 0107000304, signifying that the Warner River is part of the larger Merrimack River basin (HUC 010700) by way of the Contoocook River basin (HUC 01070003). The Warner River watershed has been divided into two individual subwatersheds, each with its own 12-digit HUC:

- Upper Warner River – 010700030402 (formerly 010700030302).
- Lower Warner River – 010700030404 (formerly 010700030304).

The division between the upper and lower Warner River subwatersheds is an artificial one, located at the confluence of the Warner River with the Lane River in Sutton. The HUCs were recently revised to those shown above, therefore some older maps and documents later in this section may list the two subwatersheds with their earlier identification codes.

Although the Warner River corridor consists chiefly of the Upper and Lower Warner River subwatersheds, two other HUC12 watersheds are important components of the drainage network that contribute significant flows to the main stem of the Warner River. The Lane River HUC12 subwatershed drains portions of Sutton and New London including Lyon Brook and Kezar Lake and joins the Warner River in Sutton. The Andrew Brook subwatershed concentrates flows from the higher elevations of the watershed in southern and eastern Newbury, such as Ring Brook, Shaw Brook, and Morse Brook, before flowing into Lake Todd.

The type of river flow varies depending on the reach location. In the west in Bradford and between Bagley Park and Davisville, the river is wider and slower, with a sandy streambed and meanders across the valley floor. In locations like the area between Melvin Mills and Waterloo, the river's reaches consist of kayak-favorable riffles and rapids with bedrock and boulders in the streambed.

2.3.2 Surface Waters

Appendix A. Water Resources Map displays the features of water resources in the riverfront towns, including the major brooks and tributaries in the Warner River watershed. Some notable built sites within the corridor include the Warner River Gage at Davisville, the Warner Wastewater Treatment Facility, Warner Village Water District wells, six active dams with numerous historical ruin dams, and about one dozen public water supply wells.

The River's Path

The Warner River begins at the confluence of Andrew Brook - the outlet of Lake Todd- outlet with the West Branch Warner in Bradford. Both Andrew Brook and the West Branch Warner River primarily drain portions of the easterly slopes of Mount Sunapee and other hills in Bradford and Newbury. Hoyt Brook is the first major tributary to enter the mainstem Warner River just downstream of the Bement Covered Bridge in

Bradford. As the Warner River passes through lower Bradford Village, it transitions from a faster-moving, moderate slope river in a defined channel with coarse streambed material and to a slow flowing, low slope river in a wider meandering channel winding its way through wetlands most of the way to the Warner town line. Once crossing into Warner, the channel becomes rock-lined and whitewater conditions develop.

The Warner River routinely expands into the floodplain during spring in this location. The outlet of Lake Massasecum (Melvin Brook) enters the Warner River shortly downstream of the intersection of NH Routes 103 and 114. This tributary, which drains the largest surface water body in the watershed, likely has a strong influence on physical and chemical water quality parameters as well as fish communities in the Warner River below this point. The outlet tributary of Blaisdell Lake also joins the Warner River in this reach just before the Bradford/Warner town line. As the Warner River enters the western side of Warner, there is a significant drop in topography creating a more defined channel with coarse streambed material and seasonal whitewater conditions.

Whitewater flows are predominately found within the western section Warner, which is also the section of river where dams were built to manipulate water flow and provide waterpower for the mills that once prospered along the river. Around Melvin Mills, the river flows over the remains of six inactive dams classified as ruins. The unnamed tributary outlet stream of Simmonds Pond enters the north side of the Warner River in this area. The first active dam is the privately-owned Warner River Hydro Dam located about 1.5 miles downstream from the Bradford/Warner town line. After this Dam, the river flows relatively unimpeded until reaching the Swain-Lowell Dam, forming an impoundment that is used as a local swimming hole in the summer.

Just downstream from the Swain-Lowell impoundment, the landscape transitions into a lowland interval and Slaughter Brook flows into the Warner River from the south. A sharp bend carries the Warner River to the north under NH Route 103 and briefly into the Town of Sutton. The Lane River flows into the Warner River shortly before the main stem flows through a wetland marsh and back under NH Route 103 into the Town of Warner. The 23.5 square mile Lane River subwatershed drains portions of Sutton and New London. An unnamed tributary paralleling Birch Hill Road in Sutton also enters the Warner River near the Sutton/Warner town line. Moving downstream, the slope of the landscape topography increases and the Warner River reverts to a rocky and shallow streambed, accelerating into a short reach of Class III rapids.

After passing under the closed bridge at the end of East Roby District Road, the slope of the Warner River declines and continues as a sluggish stream in a meandering channel until Waterloo Village except for a short reach of Class I rapids found only during high-water periods. This section of the river is noted for accumulations of fallen logs and branches, as the river does not normally flow fast enough to carry them downstream.

As the Warner River approaches Waterloo Village, Davis Brook enters the main stem on the southern side of the river. Downstream of the covered bridge at Waterloo, the Warner River flows through a constriction created by the Class IV rapids of Waterloo Falls. Two active dams and the remains of multiple mill buildings indicate the historical importance of hydropower in this section of the river. Colby Brook and an unnamed

tributary, both draining portions of East Sutton, enter the northern side of the Warner River in this location. From Waterloo, the river crosses under both travel lanes of Interstate I-89 immediately before the confluence with Stevens Brook. The river slows, flowing through a series of short riffles along exposed sediment bars down to Warner Village. This is the location of a breached dam and the second to last human-built flow impediment on the river. Several tributaries enter the Warner River in the vicinity of Warner Village: Silver Brook, Bartlett Brook, and Ballard Brook enter the main stem after draining portions of the Mink Hills to the south, while Willow (Childs) Brook, Barclay Brook, and Schoodac Brook funnel drainage from sections of the foothills around Mount Kearsarge to the north. The Schoodac Brook watershed includes Lake Winnipocket and the significant wetlands of Knights Meadow Marsh.

From Warner Village, the river flows slowly beside I-89 and provides the backdrop to Riverside Park and Bagley Park. Above the Webster town line, the Warner River flows through one remaining stretch of whitewater and over the remains of the Davisville Dam. Two unnamed tributaries and the outlet stream of Tom Pond join the main stem in this reach. From Davisville, the river has a slow, meandering channel with some large dramatic bends before emptying into the Contoocook River downstream of Contoocook Village. Brown Brook is the most downstream tributary of the Warner River in Hopkinton. Smaller outlying ponds and regular tributaries line the Warner River and contribute to the active recharge of the flowing surface waters.

Channel Changes

As with every river, the Warner River's conditions and functions are dependent on the upland areas of the watershed. Ensuring the river and other watershed streams and ponds have limited exposure to human activities and environmental pollution will help maintain the natural habitats and clean water quality of the riverfront towns.

A stream channel is influenced by the complex relationships of water flow, runoff, groundwater recharge, topography, geology, land use practices, debris, bank erosion, drought and flooding, and more. Any changes to the channel can harm plants, animal, aquatic life, or nearby human development.

Geologically related sections of river, known as reaches, can experience bank erosion when water flow changes or when bank vegetation is lost. During flood conditions or high flow events, rivers and streams can erode their banks and migrate into their floodplains, degrading water quality as the water and debris flush over the land. Sediment from the streambed can be added to the flow and deposited in unwanted locations, impairing habitat for fish and aquatic macroinvertebrates. When a stream channel's unbalanced conditions continue, further water quality and habitat degradation can occur. Impaired reaches may lead to similar downstream problems, in turn impacting the entire watershed. As the climate changes over the next decades, more frequent and more severe floods are expected to occur. Managing streams, stream crossings and riverbank health are critical to mitigating these effects of climate change.

One of the purposes of this the Warner River Corridor Management Plan is to ensure the water resources and human activities are managed appropriately to reduce potential stream channel changes.

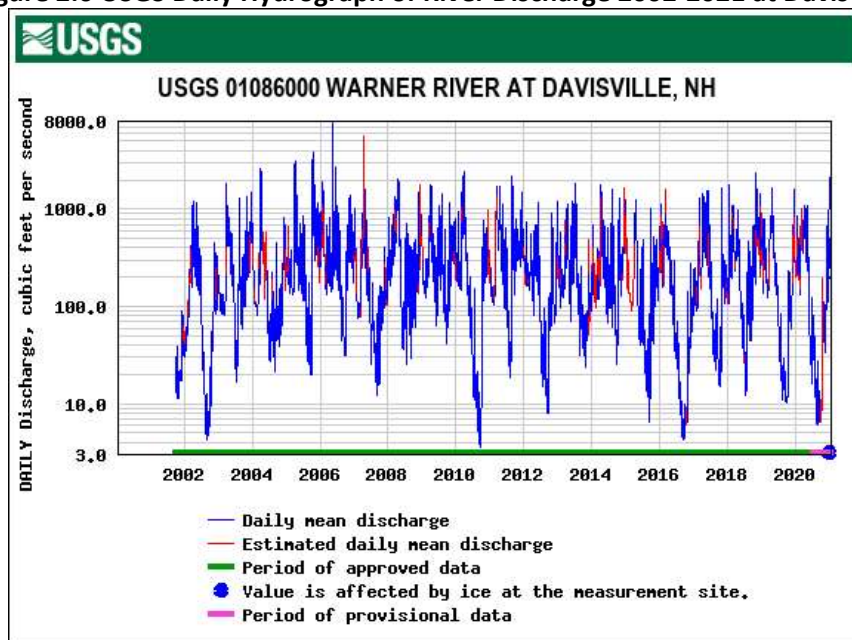
2.3.3 Stream Gages and Flooding

A basic illustration of the quantity of water in a river is the hydrograph, which depicts the instantaneous river flow at a gage station over time. A second useful source of information is the stage or height of the river surface at the gage station, tracked over a time period. The USGS maintains a full-service stream gage (gage #01086000 at Davisville in Warner), where the river’s flow and stage have been recorded, with some breaks in data, since about 1940. The Warner River watershed upstream of the Davisville gage is approximately 146 square miles, with about 2 square miles in the portions of the watershed downstream of the gage. This gage is a critical part of characterizing the quantities and other calculations of water flowing through the Warner River watershed. The records will be an essential part of the decision-making processes during planning for future water use.

Figures 2.6 and 2.8 represent daily and annual hydrographs of the river’s discharge of water in cubic feet, illustrating when the highest and lowest flows occurred daily between 2002-2021 and during the two-year period of Jan 2019-2021.

Figures 2.7 and 2.9 are hydrographs of the Warner River’s flow at the Davisville gage and a record of the river surface height (also referred to as the stage) for the same time period, from about 2008 to 2020 for discharge, and 2007 through February 2020 for stage). Benchmark comparisons are provided in Table 2.10.

Figure 2.6 USGS Daily Hydrograph of River Discharge 2002-2021 at Davisville



The [USGS National Water Interface System](#) provides both snapshot and selected data for the stream gage at Davisville. Figure 2.6 illustrates the annual hydrologic cycle and is based on the flow and elevation data at Davisville for twelve months, from January 2019 to January 2021. The Warner River flow is characteristic of medium-sized rivers in New England. The hydrographs show that the Warner River has, like most rivers that are not controlled by dams or other barriers, a distinct annual cycle of high flows and low flows. There is an annual peak flow during the spring (March or April), usually in the form of a spring freshet, when the melting snowpack combines with spring rainfall events to create a peak stream flow. The annual low-flow period occurs during late summer, when most of the rain that falls is taken up by plants (leaving little to run off into the streams). Groundwater discharging up through the riverbed provides the river's base flow during the summer and early fall months.

The highest river flows and river stage height occur as floods. The lowest flows and river stage height occur during droughts. Those extreme high and low flows are reflected in the long-term, period-of-record hydrograph data, from which the stage and discharge statistics can be determined as shown later in Table 2.10.

Figure 2.7 USGS Daily Hydrograph of River Stage Height 2008-2021 at Davisville

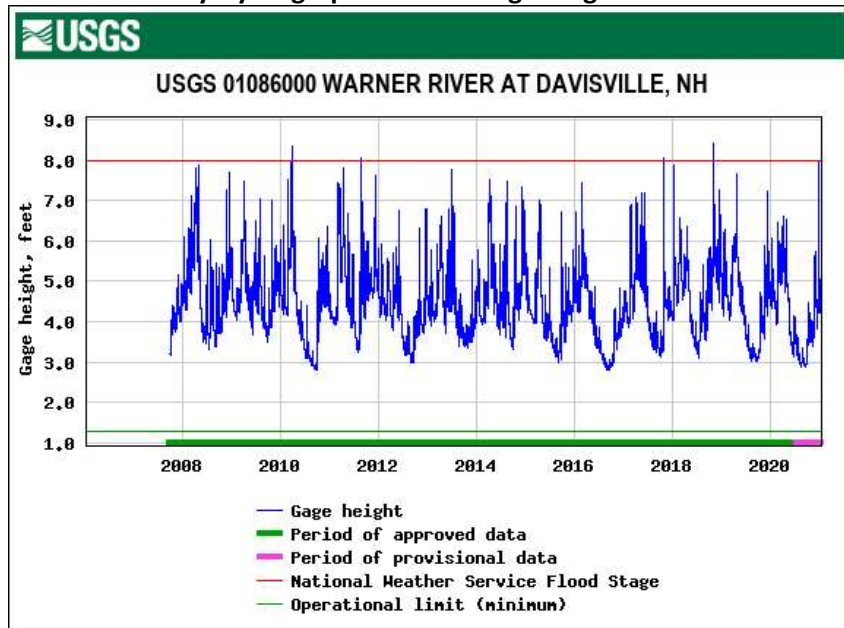
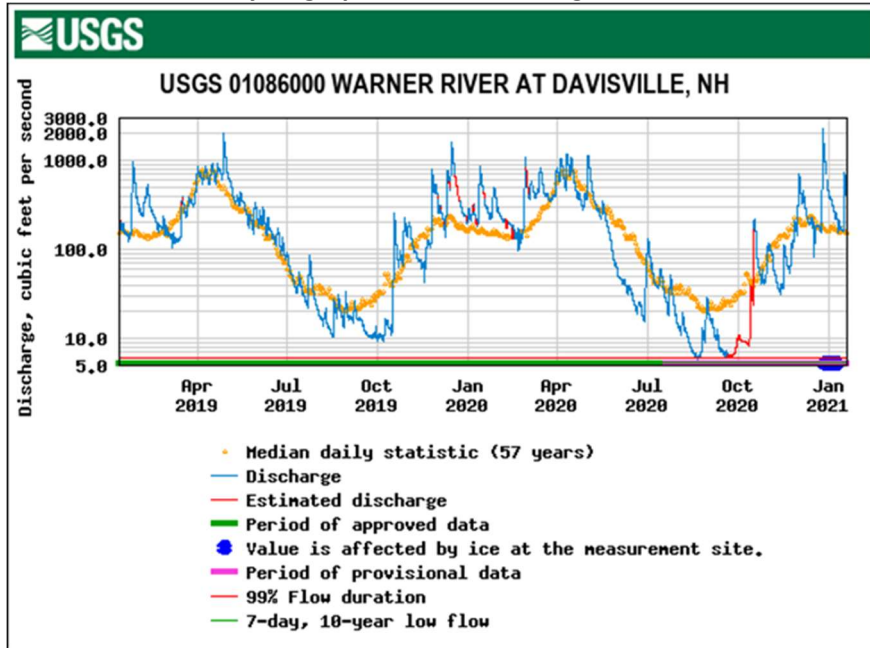
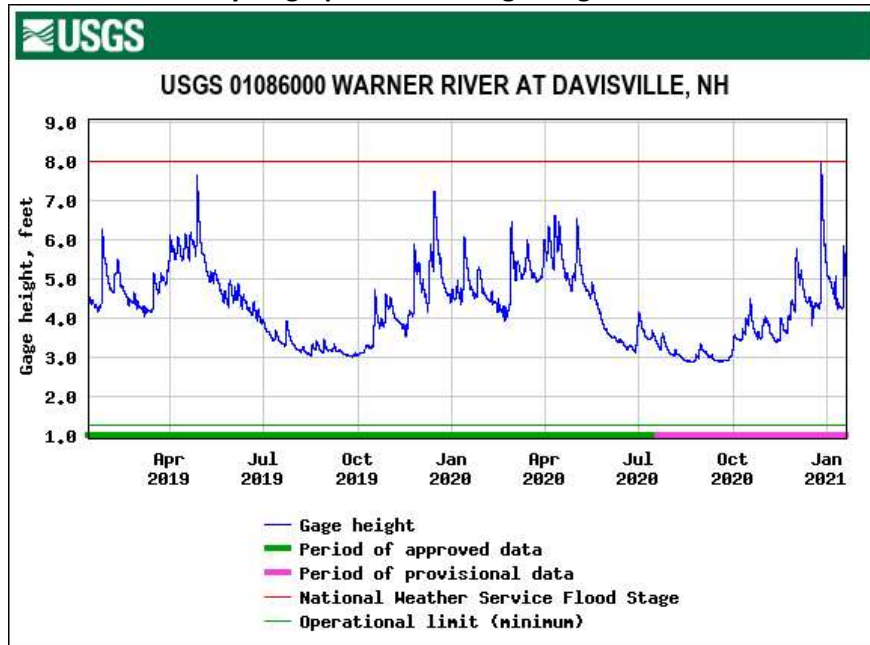


Figure 2.8 USGS Two-Year Hydrograph of River Discharge Jan 2019-Jan 2021 at Davisville



Both sets of values, the high flows and the low flows, are important in gauging the health of a river and its ability to supply enough water for human and wildlife needs. The hydrographs also clearly illustrate that the river flows vary considerably during any given year and reflect drought conditions as felt during the summers. The USGS reports the basic flow statistics describing river flows and discharges shown below in Table 2.10.

Figure 2.9 USGS Two-Year Hydrograph of River Stage Height Jan 2019-Jan 2021 at Davisville



Sources for Figures 2.6, 2.7, 2.8 and 2.9: USGS National Water Interface System for [Warner River at Davisville](#)

Table 2.10 Basic River Statistics from USGS Gage 01086000 1940-2019, Warner River at Davisville

Statistical Parameter	Water Year 2019		Water Years 1940 – 2019 (inclusive)	
	Value	Date	Value	Date
Annual Total Flow (cfs)	120,500			
Annual Mean Flow (cfs)	330.2		253.6	
Highest Annual Mean Flow (cfs)			534.6	2006
Lowest Annual Mean Flow (cfs)			82.0	1965
Highest Daily Mean Flow (cfs)	2,350	11/04/2019	7,740	05/15/2006
Lowest Daily Mean Flow (cfs)	10.1	09/25/2019	2.80	08/07/1965
Annual 7-day Minimum (7Q10, in cfs)	10.6	09/21/2019	3.34	08/14/1965
Max Peak Flow (cfs)	2,750	11/03/2019	8,270	05/15/2006
Max. Peak Stage (feet)	8.44	11/03/2019	12.16	05/15/2006
Annual Runoff (cfs)	2.26		1.74	
Annual Runoff (in.)	30.7		23.6	
10% Exceeds	753.0		620.0	
50% Exceeds	241.0		137.0	
90% Exceeds	16.8		20.0	

Source: USGS National Water Interface System for [Warner River at Davisville](#)

Seasonal flooding does occur, but the lower river channel appears to accommodate most reasonable variations in water level. Based on the Davisville records, when the river stage reaches a height of eight feet as measured on the gage, minor flooding occurs. When the river stage rises above eight feet of minor flooding, moderate flooding occurs at 10 feet; major flooding within the river basin occurs at gage heights of 12 feet and greater.

Flooding can also occur when obstructions block the channel, which leads to higher water levels upstream of the obstruction and high velocities and flows downstream. Anecdotes from the Bradford Conservation Commission indicate that when the Warner River rises rapidly and reaches a high stage in Bradford, water from the river can back up into Melvin Brook, the outlet stream of Lake Massasecum.

The Warner River (and its inhabitants) have been subjected to many floods. Flood levels prior to the installation of the Davisville gage in 1938 are not known with certainty. Historic flooding occurred in 1826 during the “Great Freshet,” which reportedly destroyed every bridge in Warner and damaged many of the mills. The worst recorded flood occurred during the New England Hurricane in 1938, when the river crested at a reported stage of 12.8 feet. More recently, the second highest flood event crested in 2006 as the result of Tropical Storm Tammy; the resulting flood reached a stage of 12.16 feet with a flood-level discharge of 8,270 cfs. The recurrence interval for the 2006 flood is 100 to 500 years. The following year the Warner River again reached its flood stage, with a crest at 11.87 feet and a discharge of 7,730 cfs.

2.3.4 Floodplains

Floodplains are areas of low-lying ground adjacent to a river or stream that are inundated when heavy precipitation occurs upstream within the watershed. Retaining a floodplain in its natural state is the most cost-effective way of reducing flood damage and has been found to be far less expensive and lack the impacts of dams, channelization, and other engineered systems. Undeveloped vegetated floodplains also trap sediments and pollution and reduce erosion, whereas development within the floodplain leads to higher peak flows and more rapid movement of stormwater runoff and pollutants into the stream channel, which degrades water quality. Floodplain forests occur throughout much of the Warner River basin, indicating that the annual flood conditions are generally consistent and contribute to some of the distinctive habitats in the corridor. Within the Warner River corridor, there are 1,482 acres of 500-year floodplain and 1,354 acres of 100-year floodplain.

There are 2,836 acres of floodplain within the Warner River corridor.

Preserving floodplains becomes increasingly important as the cumulative impacts of climate change and development continue, causing decreased capacity to store and slowly release floodwaters. All five riverfront towns in the corridor participate in the National Flood Insurance Program (NFIP) and enforce the minimum floodplain regulations required by FEMA for development within floodplain areas. Some of the towns have established more restrictive standards than required by FEMA by requiring a higher "freeboard" height above the base flood elevation, restrictions on certain land uses in the floodway and/or in the floodplain, including residential structures, or by prohibiting development that results in a net increase of the base flood elevation.

2.3.5 Wetlands

As defined by state and federal regulations, a wetland is an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions. Numerous types of wetlands, including forested wetlands, scrub-scrub wetlands, bogs, and marshes are located in the riverfront towns.

Many wetlands have water present because the soils are poorly drained or the water table is very high. There are 625 acres of wetlands along the Warner River corridor. Large wetland systems that provide significant water quality and wildlife benefits can be found throughout the corridor. Wetlands provide a multitude of functions that include flood control, fish and wildlife habitat, pollutant removal, carbon storage, and recreation. The primary impacts facing wetland function loss are associated with development within the or adjacent to these beneficial areas. See **Appendix A. Wetlands Map** which displays the location of wetlands in the watershed.

2.3.6 Stream Crossings and Geomorphic Compatibility, Aquatic Organism Passage and Vulnerability

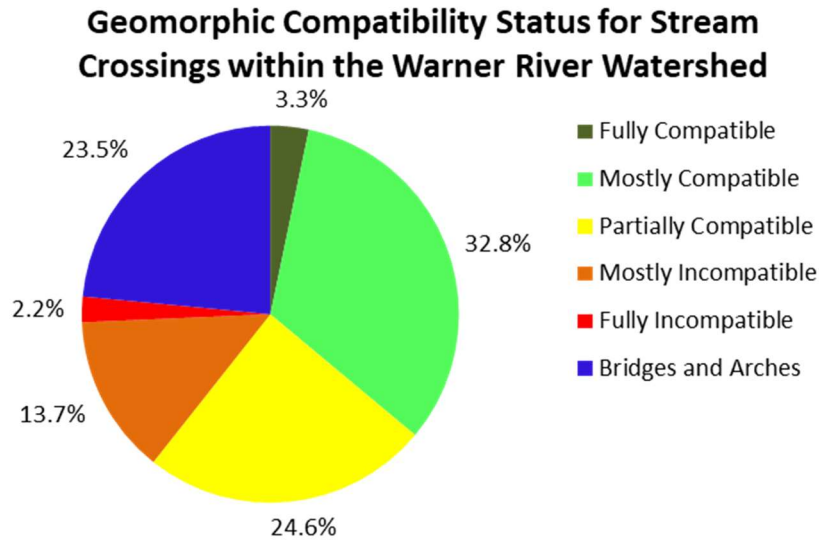
A stream crossings assessment of the Warner River watershed culverts was completed in 2019 by a collaboration of NHDES, NH Geological Survey (NHGS), NH Fish and Game Department (NHFG), volunteers within the watershed and the Basil W. Woods Jr. Chapter of Trout Unlimited. Throughout the entire watershed, over 200 stream crossings were evaluated to ascertain their geomorphic compatibility, aquatic organism passage (AOP) compatibility, and their storm vulnerability potential. *The Status of Stream Crossings in the Warner River Watershed, Revised February 2019* is available through NHFG. The local riverfront towns' *Hazard Mitigation Plans* will also describe the assessments in detail. See **Appendix A. Stream Crossing Aquatic Organism Passage Map** to view the stream crossings and their respective compatibilities.

Geomorphic compatibility rating describes the long-term compatibility of a stream crossing structure with natural river channel form and sediment transport.

In the assessment, stream crossings consisting of culverts, bridges and box culverts are rated on a scale system from Fully Compatible to Fully Incompatible. A score of Fully Compatible indicates the crossing structure does not change the stream channel's form or its streambed material movement and has a low risk of structure failure. A Fully Incompatible score suggests the crossing structure is significantly undersized for the stream channel and its natural streambed material movement. Fully Incompatible structures have the potential to increase the erosion of the streambed and the upstream channel while being at a high risk of structure failure. This information is particularly relevant as climate predictions indicate increased large precipitation and flood events, and this assessment can predict whether a stream crossing will flood.

Within the ½ mile Warner River corridor, there are approximately 27 stream crossings. In Bradford, the seven crossings are both geomorphically compatible and AOP compatible. Warner's upstream crossings are generally compatible while those downstream become more incompatible as the Warner River flows east. Figure 2.11 displays the stream crossing compatibility status for the entire watershed, over 200 culverts. Only 3% of culverts in the Warner River watershed are Fully Compatible while 33% are Mostly Compatible. About 2% of crossings are Fully Compatible and 14% are Mostly Compatible. Bridges and box culverts comprising nearly 24% of structures inventoried were not evaluated for geomorphic compatibility.

Figure 2.11 Geomorphic Compatibility Status for the Watershed’s Stream Crossings



Source: NHFG evaluation within the Status of Stream Crossings in the Warner River Watershed, Revised February 2019

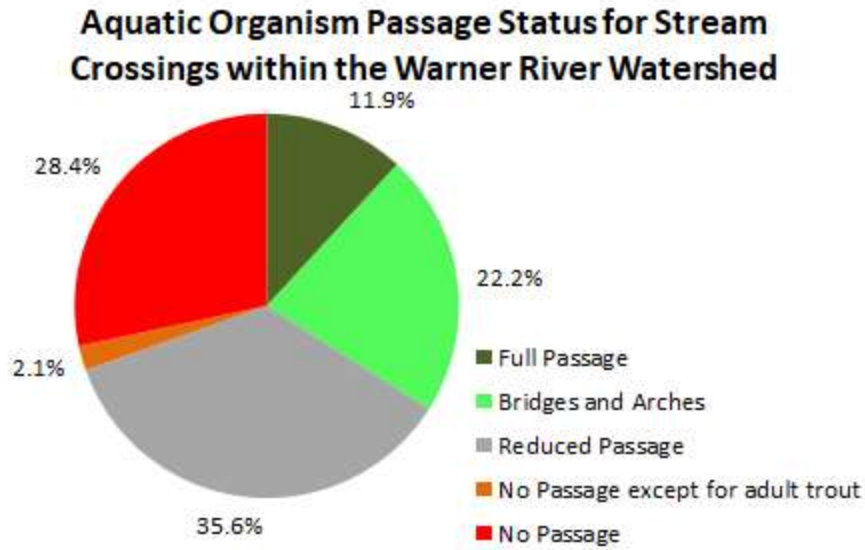
Aquatic Organism Passage (AOP)

The ability of aquatic organisms such as young wild brook trout and adult wild brook trout to pass unobstructed through the stream crossings is also rated in the assessment. The distribution and gathering of aquatic organisms are a measure of health of the watershed’s overall ecosystem. Several fish, amphibians, reptiles, and other wildlife species associated with aquatic ecosystems depend on seasonal migrations to reproduce or access suitable habitats. Open bottom bridges and culverts embedded in natural streambeds typically support full aquatic organism passage (AOP) at various flow levels.

AOP compatibility rating indicates the ability of the stream crossing structure to support the passage of fish and other wildlife through the stream channel to reach ideal habitats.

Undersized structures, rated as No Passage and Reduced Passage, create a constriction along a stream, particularly during high flow events. Over time, streamflow forced through an undersized crossing structure results in increased energy and velocity, creating a streambed scour effect with a waterfall feature, making fish passage upstream very challenging. Within the entire Warner River watershed, close to 2/3 of inventoried stream crossings are rated as having restricted AOP, Reduced Passage (36%), No Passage Except for Adult Trout (2%) or No Passage (28%). Bridges and other structures scored as supporting AOP, Full Passage (12%) or Reduced Passage (36%) as shown in Figure 2.12. Within the ½ mile corridor, crossings upstream in Bradford and Warner have more supporting AOP than the downstream crossings. See the **Appendix A. Stream Crossing and Aquatic Organism Passage Map** for further detail.

Figure 2.12 Aquatic Organism Passage Status in the Watershed’s Stream Crossings



Source: NHFG evaluation within the Status of Stream Crossings in the Warner River Watershed, Revised February 2019

Structure Vulnerability

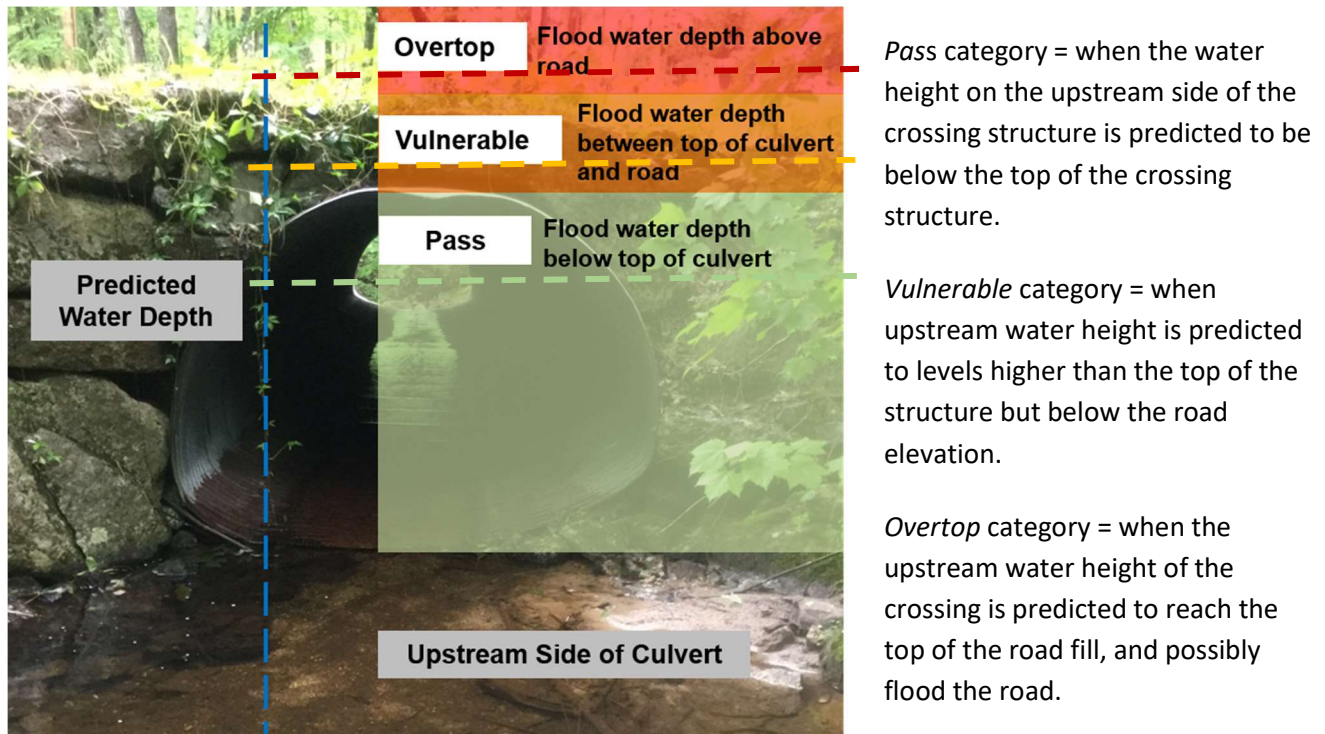
Being able to predict the performance of stream crossing structures during high stream flows is a valuable tool for communities. This information helps identify areas that can accommodate flood-level flows, but more importantly, helps identify the structures at risk of overtopping and failing at these high flow levels. The ability for crossing structures to have the hydraulic capacity to pass the stream flows of the 2-, 10-, 25-, 50-, and 100-year storm events was evaluated using the StreamWorks-TU Culvert Model (Version 2) software program. This model uses a combination of field measurements and mapped watershed characteristics to develop a ratio between the structure capacity and the height of water on the upstream side during these storm events. **Larger bridges with widths close to or greater than 20 feet were not included in the vulnerability analysis.** Figure 2.13 displays the data inputs required to predict the water depth categories as either Pass, Vulnerable, or Overtop.

Figure 2.13 Stream Works-TU Culvert Model Data Inputs

Field Measurements	Culvert Type Reference Number	Culvert Length	Culvert Inlet Elevation	Culvert Outlet Elevation
Roadway Elevation	Number of Barrels	Culvert Rise	Culvert Span	Culvert Wall Rise (Arch Only)
Culvert Embedded Depth	Mapped Watershed Features	Drainage Area	Curve Number	24-hour Precipitation, 2-year
24-hour Precipitation, 10-year	24-hour Precipitation, 25-year	24-hour Precipitation, 50-year	24-hour Precipitation, 100-year	Mean April Precipitation
	Representative Watershed Slope	Area of Wetlands and Ponds in Watershed	Watershed Length, Flow Path	

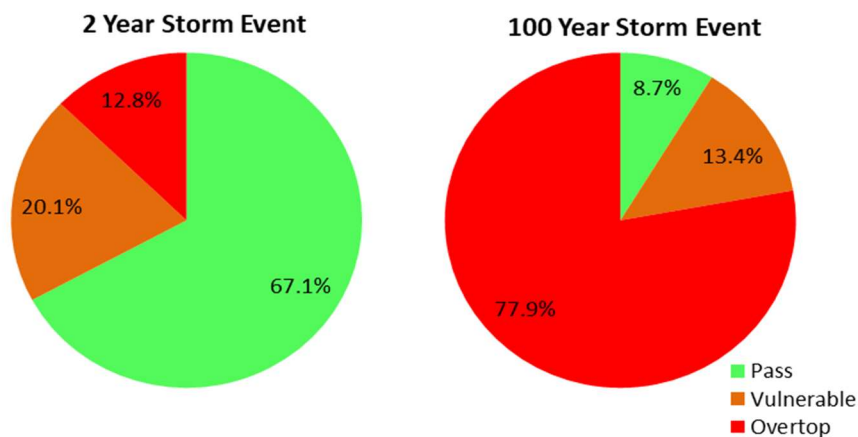
Figure 2.14 illustrates the predicted water depth visualization on the upstream side of a stream crossing. The software model classifies each stream crossing structure into one of three categories - *Pass*, *Vulnerable*, and *Overtop*- for each specified storm event, the 2-, 10-, 25-, 50-, and 100-year storms.

Figure 2.14 Predicted Upstream Water Depth Categories



The predicted ability for all scored stream crossing structures within the Warner River watershed to accommodate a 2-year storm and 100-year storm are displayed in Figure 2.15. During a 2-year storm event, 67% of stream crossings are predicted to Pass, while almost 9% will Pass during a 100-year storm.

Figure 2.15 Predicted Storm Performance of Warner River Watershed Storm Crossings



Source: NHFG evaluation within the Status of Stream Crossings in the Warner River Watershed, Revised February 2019

2.3.7 Fluvial Erosion Hazards

River channels are dynamic systems that adjust to changes in topography, stream flow, climate and streambed material. Stable river channels attempt to maintain a natural balance of erosion and subsequent sedimentation. Alterations within floodplains such as streambank armoring or vegetation removal and issues within the stream channel such as undersized stream crossing structures and channelization can also influence these natural processes. Upland development and increased densities of impervious surfaces can increase stormwater runoff rates, also resulting in imbalances to stream behavior. If the balance of sediment transport and deposition is altered, the channel will respond by making physical adjustments including channel cutting, channel widening, and lateral adjustment. These fluvial changes can increase the effects of flood hazards, like damage to public and private property, infrastructure, and impacts to aquatic ecosystems.

Fluvial erosion is the wearing away of a stream's bank, channel or floodway.

Traditional efforts to mitigate the impacts of fluvial erosion hazards have predominately focused on ensuring that flows are contained within the river channel. Rather than providing the ability for flood flows to expand laterally and dissipate the energy into floodplains, these approaches constrict flow, which amplifies the flow velocity and energy. Examples of these practices include stream channel straightening or excessive bank armoring. These efforts are often implemented immediately after a flooding event in an effort to prevent future problems. While channelization and shoreline armoring may help address impacts in an immediate area, these practices can create an unbalanced condition, and produce issues in downstream areas. While it is not feasible to remove all existing structures and utilities within flood prone areas, geomorphic assessments will help to identify potential erosion hazards. This may provide an opportunity for communities to protect these sensitive areas and avoid further flooding damage.

The effects of bank erosion can be seen in Warner Village upstream of Riverside Park and below the old North Village Road Bridge.

After the [extreme flooding disasters](#) of the 2000s, NHDES initiated a program within the [New Hampshire Geological Survey](#) to perform surveys of fluvial hazard areas along the state's flooded rivers to identify and catalog areas that could be prone to excessive erosion, beyond the "normal" bank and channel erosion, and with the potential for avulsions during extreme storm events. This [flood and geologic hazards program](#) is available during emergency situations.

2.3.8 Groundwater

In New Hampshire, useable amounts of groundwater can be obtained from two chief types of aquifers: fractured bedrock and stratified drift. Groundwater discharging to streams up through the riverbed provides much of a stream's flow throughout the year. During droughty periods, ground-water discharge provides all of the stream's base flow. The **Appendix A. Water Resources Map** displays the location and estimated transmissivity of stratified drift aquifers in the Warner River corridor.

Bedrock Aquifers

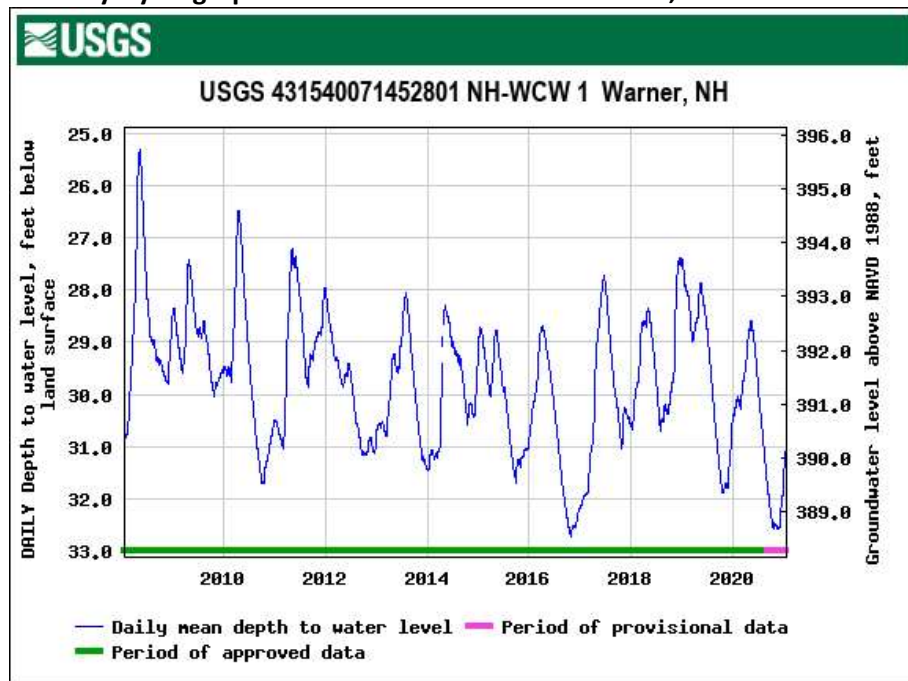
Bedrock aquifers consist of the fractured bedrock that underlies the land surface throughout the state. Interconnected fractures form fracture systems, which are highly variable in their occurrence, connectivity, and potential water yield. Groundwater is stored within the fractures themselves, and not generally within the pores within the rock mass itself. Wells drilled into large fractures or extensive fracture systems may yield high amounts of groundwater. However, wells that do not intersect a fractured zone are likely to yield little water. Bedrock water wells are typically capable of supplying only enough water for household-level needs. There are very few high-capacity bedrock wells supplying water to New Hampshire's public water systems; there are no known high-yielding bedrock aquifers along the Warner River. New Hampshire has a statutory definition of high-capacity wells as those capable of producing 57,600 gallons per day of groundwater (that equates to a continuous pumping rate of 40 gallons per minute).

Stratified-Drift Aquifers

Stratified-drift aquifers are deposits of sand and gravel that were deposited by the ice sheets as they retreated from the area. Stratified drift is capable of yielding large quantities of water because of the high porosity and permeability of the stratified layers of sand and gravel that comprise the deposits. Stratified-drift deposits are common in river valleys and form broad, flat plains above the level of the river. Stratified-drift aquifers underlie 3,717 acres for nearly 65% of the total land area within the corridor.

Hydrographs that depict groundwater levels are another helpful way to assess the amount of, and seasonal variations in, the available water. The Warner River basin has one groundwater monitoring well, USGS Station NH-WCW 1, equipped with automated recording equipment that measures depth to groundwater daily and has since approximately 2008. Monthly manual measurements of depth to the groundwater level were made between approximately 1994 and 2008. Figures 2.16 and 2.17 depict the groundwater-level data on a long-term basis from 2008-2021 and the year of 2019, respectively.

Figure 2.16 USGS Daily Hydrograph of Groundwater Level 2008-2021, Warner Observation Well WCW 1

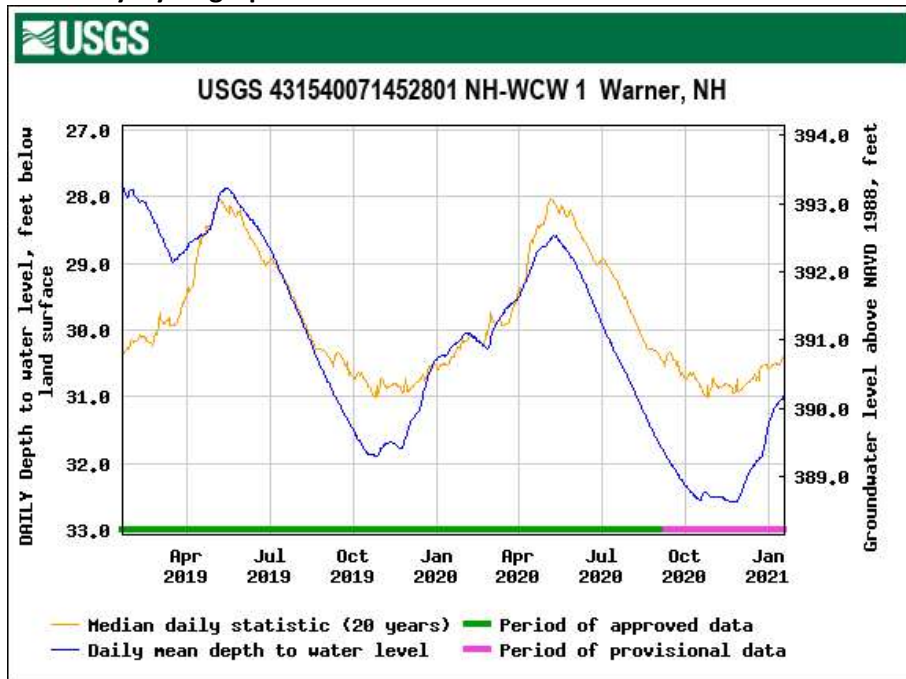


The hydrographs illustrate the annual cycle of groundwater rising and falling with the seasons as a result of the amounts of recharge to the groundwater. Figure 2.16 indicates that groundwater levels during fall 2016 were at record, or near-record, lows.

The Figure 2.17 hydrograph displays Warner groundwater levels differing from the median several times over the two-year period of January 2019-January 2021. These times included known droughts during fall 2019 and during summer to fall 2020, both of which were well below the 20-year median levels.

Regional-scale surficial geologic mapping indicates that the Warner River valley has stratified-drift deposits that could potentially produce moderate to high amounts of groundwater. Transmissivity of an aquifer is the measurement used to quantify the potential groundwater available to a well. In the Warner River corridor, transmissivity of the stratified-drift deposits has been estimated to range 2,000 to 8,000 square feet per day, which indicate that moderate amounts of water could potentially be obtained. The **Appendix A. Water Resources Map** illustrates the distribution and estimated transmissivity of stratified drift aquifers in the corridor.

Figure 2.17 USGS Daily Hydrograph of Groundwater Level Jan 2019-Jan 2021 at Warner Well WCW-1



Source for Figures 2.16 and 2.17: USGS National Water Interface System Groundwater Observation Well for [NH-WCW 1 Warner, New Hampshire](#)

The New Hampshire Geological Survey performed a regional screening of the overall water balance of the major drainage basins in New Hampshire in order to determine whether the basins were hydrologically stressed. Those basins that were determined to be “stressed” did not have a balance between withdrawals and consumption when compared to the summer low streamflow conditions. The “Water Balance Index” is a rough measurement of whether the known withdrawals of water remove more water than the basin can supply during low streamflow periods. Using their regional approach, the Warner River watershed is not a stressed basin, and known withdrawals can generally be met by the water available, even during the annual summer low flows.

2.3.9 Managed Water Resources

The Warner River contains a number of water-management facilities that can detract from, or augment, the river’s flow and quality. Water management facilities are those where water is withdrawn from within the corridor, wastewaters are discharged to the river, or dams in the channel that can impede or redirect the river’s flow. These features can also exert an influence on the river’s channel characteristics, and the ability of the river to support its fish and wildlife habitat needs. Facilities that are used to manage New Hampshire’s rivers are required to register with the NHDES in accordance with RSA 488 (Water Users) and RSA 482 (Dams).

In accordance with RSA 488, users of and dischargers to a water body are required to register with NHDES and report their monthly volumes of water use and/or monthly discharge if they have of a cumulative amount of more than 20,000 gallons of water (averaged over any 7-day period), or more than 600,000 gallons of water over any 30-day period. The Warner River watershed is home to only one registered water user and one discharge to surface water, both located in Warner, the Warner Village Water District.

Water Withdrawals

There are no active water withdrawals directly from the Warner River, but the corridor does have a number of registered Public Water Systems (PWS) where the withdrawals and system operations are controlled through the registrations and permits issued by NHDES:

Bradford

Bradford has no municipal water system servicing a large portion of the town's residents. The town does, however, have several Public Water Systems in the corridor:

- Fisherfield Townhouses (64 West Main Street), NHDES PWS #0272010, operates a community water system that provides drinking water from one well source to the residents of the apartment building (registered as 40 users). The Wellhead Protection Area for the well is a 1,300-foot radius circle centered on the wellhead.
- Children's Center for Creative Learning (57 West Main Street), NHDES PWS #0275090, operates a non-transient, non-community PWS for the occupants of a childcare center. The Wellhead Protection Area for the well is a 1,300-foot radius circle centered on the wellhead.
- Kearsarge Regional Elementary School/Bradford (163 Old Warner Road), NHDES PWS #0275070, operates a non-transient, non-community PWS for the students and faculty at the school (registered as 231 users). The Wellhead Protection Area for the well is a 1,300-foot radius circle centered on the wellhead.
- NFI-North Transitional Housing (2552 Route 103), NHDES PWS #0275080, operates a non-transient, non-community PWS for the students and faculty at the school (registered as 50 users). NFI-North relies on two wells to provide water to the system. The Wellhead Protection Area for the two wells is a 1,300-foot radius circle centered on the two wellheads.

Warner

The Warner Village Water District operates the largest community public water system (NHDES PWS #2411010) in the corridor. The District withdraws groundwater from two gravel-packed wells in the stratified-drift aquifer in Warner Village. The river is so close to the well sites, water flow is likely influenced by induced infiltration from the river. The wellhead protection area has been delineated using data from the wells' withdrawals and geologic conditions to be an irregular area defined by a downgradient limit to the discharge, extending outward to a 4,000-foot radius circle in the upgradient areas. Monthly water-use data submitted to NHDES indicates that the average, seasonally adjusted daily demand has been approximately 25,000 gallons per day.

Hopkinton

Hopkinton has only one small community public water system within the corridor: Two well sources located off Deer Path Lane are used to supply drinking water to the 80 service connections (estimated service population of 200 residents) of the Deer Path Mobile Home Park (NHDES PWS #1193010). The Wellhead Protection Area for the two wells is a 1,500-foot radius circle centered on the two wellheads.

Registered Discharges

The Warner Village Water District operates the only Publicly Owned Treatment Works (POTW) or wastewater treatment facility (WWTF) with a registered discharge of pollutants to the river. The District operates its discharge of treated wastewater effluent (NHDES #20274-D01) under a National Pollutant Discharge Elimination System Permit (NPDES #NH0100498) as issued by NHDES and EPA. The POTW treats the wastewater through primary and secondary treatment trains, with chlorine disinfection, prior to its discharge through an outfall directly into the river. Examination of the monthly discharge data submitted to NHDES indicates that the average, seasonally adjusted daily discharge was approximately 47,000 gallons per day during 2019, the most recent year for which data were submitted.

Dams and Impoundments

There are no known dams within the Warner River corridor in the towns of Sutton, Webster, or Hopkinton. In Bradford's section of the corridor are two active dams, one Significant Hazard dam on the outlet of Lake Todd and one Non-Menace dam on the West Branch of the Warner River prior to its confluence with the Warner River. On the Warner River itself, four active dams and eight historical ruin dam sites are located in Warner. The riverfront communities have other dams outside the river corridor. Table 2.18 summarizes the basic information about the former and existing dams on the Warner River, listed in order from upstream to downstream. Dam locations are shown on the **Appendix A. Water Resources Map**.

All dams and dam sites on the Warner River are currently under private ownership.

Table 2.18 Registered Dams on the Warner River

Dam ID	Dam Name	Status*	Purpose	Length (feet)	Height (feet)	Impoundment Area (acres)
243.13	Bagley	Ruins	Recreation	115	9	0
243.12	Warner River	Ruins	Recreation	0	0	0
243.11	Jennison	Ruins	Mill	130	8	0
243.10	Pretty Penny Farm	Ruins	Farm Pond	120	9	0
243.29	Warner River Hydro	Exempt	Inactive	40	4	0.07
243.09	Excelsior	Ruins	Mill	90	10	0
243.08	Warner River (3 dams)	Ruins	Mill	0	0	0
243.07	Swain Lowell	Active, Non-Menace	Recreation	114	16	4.8
243.05	Warner River	Exempt	Recreation	38	5	1
243.06	Warner River	Exempt	Recreation	50	4	1
243.03	Warner River Box Factory	Ruins	Mill	0	12	0
243.01	Davisville	Ruins	Mill	180	14	98

Source: NHDES OneStop System, Dam Bureau, 2020 data. * Ruins = historical dam, some of which remain in the River

All the dams and dam sites on the Warner River are currently under private ownership. Most of the dam sites are just historical remnants and ruins in the channel and formerly serving the mills on the banks. Four of the dams are structurally adequate to actively impound water.

The Warner River currently has no hydroelectric generating facilities. Nevertheless, the river drops in elevation from approximately 650 feet in Bradford to 355 feet at the river's confluence with the Contoocook River. This is a significant drop in head that could, in the future, induce development of low-head hydroelectric power. The most feasible future hydroelectric generation sites in the corridor would be at locations where the drop in head is greatest over the shortest distance and would likely coincide with the historical waterpower sites.

One dam site is the subject of design and development for hydroelectric capacity: NHDES Dam ID 243.29 (the Warner River Hydro Dam) in Warner. The development is inactive at this time. Users of the Warner River will have to balance hydroelectric development with other water users, such as protection of wildlife habitat and continuation of recreational uses.

The river reaches that are classified as Community River on the **Appendix A. Rivers Classification Map** are based on maintaining the river and riparian land parcels available for potential future development of dams and hydroelectric power. At the falls in Davisville, however, landowners on both sides of the river indicated no interest in hydroelectric power generation in that area and this reach of the river was classified as Rural River; the classification as "rural" provides additional restrictions on dam permitting and development. Nevertheless, the potential for hydroelectric power generation at favorable locations should not be dismissed outright.

Instream Flow Protection Program

The [NHDES Instream Flow \(ISF\) Program](#) develops river-specific criteria for stream flow protection and water management plans to implement those criteria. The purpose of the ISF is to ensure rivers continue to flow freely despite human influences such as irrigation, drinking water, climate change impacts, or land use changes. The ISF applies to all designated rivers in New Hampshire.

In 2018, the Warner River was one of three rivers designated as the highest priority for an Instream Flow Study. The Warner River's Protected ISF Study and Management Plan project is expected to begin in 2021 and conclude in 2022. The study includes calculations of river flow conditions which protect aquatic organisms. The management plan describes how water users will operate to satisfy their water needs while maintaining the protected flow conditions.

2.3.10 Water Quality

The Warner River flows chiefly through undeveloped woodlands and low-density residential areas. The downtowns of Bradford and Warner and the Intervale section of Warner (at I-89 Interchange 9), are well-developed retail districts with medium- to high-density residential areas. As such, the corridor has a mix of known and potential sources of water-quality concern.

Statutory Designation

RSA 485A:8 established the state’s surface-water classification system and directed NHDES to classify all surface water quality in New Hampshire. The New Hampshire Surface Water Quality Regulations in Env-Wq 1700 have been promulgated to establish the numerical water-quality criteria, antidegradation provisions to protect and maintain the state’s surface-water quality, and the series of uses all fresh surface-water bodies must support:

- Aquatic life support.
- Fish consumption.
- Drinking-water supply.
- Recreation (primary and secondary contact).
- Wildlife habitat.

In accordance with the statute, the waters within the entire Warner River watershed are designated as Class B waters. The Class B designation indicates that these waters are considered to be acceptable for aquatic life, consumption of fish caught in the watershed, primary contact recreation (like swimming) and secondary contact recreation (boating, for example), drinking water (after adequate treatment), and wildlife habitat. Class B waters need, by state statute, to be maintained in a fishable, swimmable condition to allow unrestricted contact recreation, with a raw water quality suitable for potable supply with adequate treatment.

Actual Quality

The federal Clean Water Act requires each state to prepare an evaluation of its surface waters every two years which report on how they meet or fail to meet surface water quality standards and designated use criteria. These biennial reports are called the “305(b) reports” after Section 305(b) of the Clean Water Act. Section 303(d) of that Act requires each state to prepare and submit a list of surface-water bodies that do not comply with the state water quality standards, known as the “303(d) list” of impaired state waters. NHDES is required to prepare comprehensive water quality studies of the water bodies on the 303(d) List to guide restoration of the water quality.

The basic chemistry of the Warner River has been monitored since 2017 by the Warner River Volunteer River Assessment Program (VRAP). Some limited data was obtained during earlier monitoring efforts, which were largely sporadic and short term. VRAP monitoring program measures the basic water-quality parameters that describe the water chemistry and provide the data needed to evaluate compliance with the surface-water quality criteria; VRAP monitoring program does not provide a full suite of analytical testing (little laboratory testing has been performed to date). **Appendix D. VRAP Reports** provides this information.

Measurements of river water quality are conducted at a monthly frequency during the warm-weather months of June through October. Annual summaries of the monitoring stations and the data reports are

maintained at NHDES. NHDES retains a seasonal monitoring station at Melvin Mills along the Warner River to measure water quality parameters. Water quality data is included within NHDES's draft 2020 New Hampshire 305(b) Report and 303(d) List.

The Warner River VRAP data over the three years of monitoring are generally consistent and indicate that the water in the river is generally well oxygenated, clear, and cold. The water typically has an overall low electrical conductivity (likely due to only a low impact from deicing salts) and is slightly acidic with a low pH. The water-quality monitoring data indicates that the water quality is generally in compliance with the Class B standards throughout the river's length, with the following exceptions:

- pH levels are generally below 6.5, indicating that the river water is slightly acidic. The low pH conditions are most likely the result of slightly acidic precipitation, upland influences of wetlands and the poor acid-buffering capacity of the bedrock and unconsolidated deposits through which the water flows. Acidic pH conditions are common throughout New England's waters and result in many determinations of impairments throughout New Hampshire's surface waters.
- Mercury concentrations are high in fish, which has resulted in a statewide fish-consumption advisory because the mercury bioaccumulates in the river's food chain. The mercury is usually attributed to atmospheric transport and deposition from upwind coal-fired electricity generating stations and waste incinerators.

Some water quality impairments in the Warner River are noted as the result of several water bodies higher in the watershed that are upstream of, and discharge to, the river. The 2018 303(d) List and 305(b) Report available at <https://www.des.nh.gov/water/rivers-and-lakes/water-quality-assessment/swqa-publications> indicate the following surface water quality impairments within the Warner River watershed.

- Lake Massasecum (**Bradford**) is impaired for aquatic life due to a low pH and the presence of non-native invasive or exotic aquatic plants such as variable milfoil.
- Silver Lake Reservoir (**Warner**) is impaired for swimming due to presence of bacteria (*Escherichia coli*, abbreviated as *E. coli*).
- Tom Pond (**Warner**) is impaired for aquatic life from levels of Chlorophyll-a, low pH, and high total phosphorus, as well as impaired for swimming due to *E. coli*.
- The unnamed brook that connects Pleasant Pond to Tom Pond (**Warner**) has been impaired for swimming due to *E. coli*.

2.3.11 Anthropogenic Sources of Pollution

Water in the upper reaches of the Warner River, as well as its contributing lower order rivers and streams, flow chiefly through undeveloped woodlands and low-density residential areas, resulting in a naturally occurring high quality. However, much the lower reaches of the river are in a well-developed watershed, and the naturally high quality of the water can be affected by a mixture of known and potential sources of water-quality concern. Some are "point" sources of contaminants, others are the more diffuse and indirect "non-

point” sources of pollutants. There are many anthropogenic (human-made) sources of contaminants throughout the watershed that all have the potential to degrade natural water quality.

Potential Point Sources

The corridor is a significant transportation corridor as well, with State Route 103 connecting Contoocook Village with the small towns to the west in the Warner River valley and the Lake Sunapee region. Busy thoroughfares are also busy with services for the motoring public. And, as the villages are older and well-developed commercial centers with industrial pasts, other potential sources of contaminants to the surface and groundwaters (known, unknown, historical, and recent) exist that have the potential to discharge contaminants to the groundwater. These types of potential contamination sites are, typically, gasoline filling stations with their underground storage tanks, bulk heating oil storage facilities (and their underground and aboveground storage tanks), industrial facilities, and community septic systems.

Point source pollution is any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, or factory smokestack, into the environment as defined by the [USEPA](#).

NHDES identifies potential point sources of contamination and tracks the progress of remedial actions at sites where contaminants have been discovered in the soil and groundwater. The chief potential point sources of contamination in the corridor are:

- Aboveground storage tanks.
- Groundwater discharges.
- Hazardous waste generators.
- Remediation sites (includes non-domestic wastewater discharges and initial releases cleanups).
- Solid waste facilities.
- Underground storage tanks.

Even though the Warner River flows through a region of small towns with few industrial facilities, the corridor is home to many of each category of potential point contaminant sources. The corridor’s potential point sources are mainly along Route 103 and in the well-developed portions of the corridor at downtown Bradford, Warner Intervale, and downtown Warner.

Most of the regulated sites are underground storage tanks used for storing motor fuels, and tanks used to store heating oil for use within the facility. In addition to the known possible sources of contaminants, NHDES also tracks initial response actions at release sites; these commonly consist of releases of petroleum fuels from traffic accidents and overfills at residential heating oil tanks. These one-time events are typically included in the remediation sites category. These potential point source pollution sites are indicated in Table 2.19.

Table 2.19 Possible Point Source Pollution Locations

Point Pollution Source Type	Bradford	Warner	Hopkinton
ASTs (active) Facilities	1	1	0
Hazardous Waste Generators	4	10	2
Remediation Sites/Groundwater Permits	15	29	2
Solid Waste Facilities	3	1	0
USTs (active) Facilities	9	12	1

Source: NHDES OneStop System

The numbers of each category in Table 2.15 should be considered approximate. Some facilities are registered in several different categories, the NHDES database includes name changes for the same registered facility, and there may be some double counting. No point source pollution facilities were identified for Sutton or Webster within the corridor.

Solid waste facilities are commonly situated within sand and gravel deposits and along transportation routes like Route 103. Some are municipally owned and operated. For example, Naughton and Sons Recycling, Naughton Recycling Center, and the Bradford and Warner Transfer Stations are potential sources of contamination located within the Warner River corridor.

Potential Nonpoint Sources

Nonpoint sources of pollutants are ubiquitous throughout the watershed, to a greater or lesser degree. Warner and Bradford villages are the only developed village areas within the corridor with municipal stormwater drainage systems that convey stormwater from roadways to the river. The municipal systems are urban stormwater systems that convey runoff, with its sediment load, directly to the river. The well-developed intervalle in Warner also has its own stormwater management system that discharges the stormwater from the large parking lots and roofs to an underground stormwater infiltration system.

Nonpoint source pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into the groundwater, as defined by the [NHDES](#).

Much of the non-point impacts are sediment discharged to surface waters by stormwater runoff from many sources throughout the watershed. The most common in small, rural New England watersheds are:

- Roadway maintenance and winter deicing (sediment and deicing compounds).
- Stormwater (sediment).
- Subsurface septic systems (phosphorus, nitrogen).
- Agriculture (sediment and fertilizers).
- Timber harvesting (sediment).

- Sand and gravel mining (sediment).

2.4 Plant and Wildlife Resources

The Warner River forms a natural greenway corridor for wildlife and vegetation between multiple large protected open spaces like the Chandler Reservation in Warner, and Rollins State Park and Winslow State Park (both parks include portions of Mount Kearsarge). There are many other public and private protected conservation lands throughout the corridor which provide habitat, migration corridors, carbon storage, and public access to the river. The corridor and nearby protected areas provide a protected environment for the flora and fauna, and is critical to a healthy and diverse ecosystem, which is an overall benefit to the riverfront towns.

2.4.1 Forests and Woodlands

Forests have numerous roles in the community and in the region. These attributes include protecting the quality of surface water, storing large amounts of carbon dioxide, providing a source of renewable energy, and contributing to hospitable temperatures. Forests provide lumber and other manufactured forest products, wildlife habitat, outdoor recreational opportunities, and contribute to the overall rural character of the riverfront towns.

The Warner River watershed is a mixed temperate forest biome, generally populated by a mixture of deciduous, hardwood tree species (like oak, maple, beech, birch, larch) and coniferous, softwood trees (white pine, spruce, hemlock, fir). Small-scale localized conditions typically control which species thrive and dominate an area, and which species do not.

The Warner River watershed spans the border between the Vermont-New Hampshire Upland and the Lower New England ecological sections. The watershed has been further subdivided into two ecological subsections: the Hillsborough Inland Hills and Plains (westerly portion of the watershed) and the Gulf of Maine Coastal Plain (easterly portion).

Undeveloped upland areas of the Warner River watershed are chiefly hemlock-hardwood-pine forest with frequent areas of Appalachian oak-pine forest mixed in. Smaller blocks of farmland (grassland or hay pastures as well as cultivated fields) are common. Extensive naturally occurring grasslands are rare, except when associated with current and former agricultural use. Wetlands are generally floodplain forests with some marsh and shrub wetland areas distributed throughout the corridor³.

In addition to the forest types listed above, numerous plant species occupy the understory of the riverbanks, with sedges, grasses, willows, rushes, ferns, and wildflowers especially common. The river's channel has a variety of aquatic and weedy native and non-native plant species.

³ New Hampshire Fish & Game Department, Wildlife Action Plan, 2015.

Bradford Pines Natural Area is along the north bank of the Warner River in Bradford. This natural area (managed by the New Hampshire Division of Forests and Lands) is home to some of the oldest white pines in the state.

Protected Plant and Natural Community Species

The New Hampshire Natural Heritage Bureau within the Department of Natural and Cultural Resources and the NH Division of Forests and Lands tracks numerous plant and natural community species which are listed as Endangered, Threatened, or Species of Concern. If not listed, they may be granted status based on the local importance of the species. Although specific locations are not publicly released, Table 2.20 indicates reported observations within the riverfront towns. Further research or observation is needed to ascertain whether the species are located within the ½ mile river corridor.

Table 2.20 Protected Plant and Natural Community Species in the Riverfront Towns

Species	Location	NH Status
Palustrine Natural Community		
Drainage marsh - <i>shrub swamp system</i>	Bradford	Very High Importance
Inland Atlantic white cedar swamp	Bradford Sutton	Very High Importance Historical Record
Medium level fen system	Bradford Hopkinton	Very High Importance Very High Importance
Sandy pond shore system	Bradford	Very High Importance
Black gum - <i>red maple basin swamp</i>	Warner	Historical Record
Red maple floodplain forest	Webster	Historical Record
Temperate minor river floodplain system	Hopkinton	Historical Record
Terrestrial Natural Community		
Chestnut oak forest/woodland	Hopkinton	High Importance
Hemlock - beech - oak - pine forest	Hopkinton	Historical Record
Hemlock forest	Hopkinton	Historical Record
Plants		
American water-awwort - <i>Subularia aquatica ssp. americana</i>	Bradford	NH Endangered
Sclerolepis - <i>Sclerolepis uniflora</i>	Bradford	NH Endangered
American ginseng - <i>Panax quinquefolius</i>	Warner	NH Threatened
Small whorled pogonia - <i>Isotria medeoloides</i>	Warner	US/NH Threatened, Highest Importance
Dragon's-mouth - <i>Arethusa bulbosa</i>	Webster	NH Endangered
Flat-stem pondweed - <i>Potamogeton zosteriformis</i>	Webster	NH Endangered, Historical Record
Giant rhododendron - <i>Rhododendron maximum</i>	Hopkinton	NH Threatened, Historical Record
Wild lupine - <i>Lupinus perennis ssp. perennis</i>	Hopkinton	NH Threatened, Historical Record

Source: New Hampshire Natural Heritage Bureau, July 2020

2.4.2 Wildlife

According to the NH Fish and Game Department (NHFG), over 500 vertebrate animal species are located in the state. These include common animals such as squirrels, raccoons, skunk, deer, birds, and fish, all of which live in the Warner River corridor. NHFG maintains this listing at its website, <https://www.wildlife.state.nh.us/wildlife/profiles.html>.

Many rare, threatened, or endangered animal species have been documented in the corridor, including the American water-awlwort, Common Loon, and Wood Turtle. Significant areas of high-quality habitat can also be found along the river and has been identified in the NHFG [Wildlife Action Plan 2015](#).

Taking public outreach polls, holding events to count the species found, sponsoring a fishing event, leading birdwalks, hosting trail hikes, and other related activities will help to document the specific animals which live in the corridor and the watershed's watercourses. Reviewing the Wildlife Habitat Maps in conjunction with the Wildlife Action Plan can help identify the local vertebrate and invertebrate species.

Trout and Fish Species

The Warner River and several of its tributaries are stocked with brook trout, brown trout and rainbow trout by NHFG every year. Water temperature monitoring within the main channel of the Warner River suggests conditions exceed tolerable levels for cold-water fish species throughout the summer months. Although these fish depend on accessing cooler tributaries during hot weather, these large fish are thought to utilize portions of the main stem during the cooler months.

NHFG and project partners have documented several high-quality tributaries which support self-sustaining populations of wild brook trout, which is a species of greatest conservation need in the NHFG Wildlife Action Plan. While the tributaries of the Warner River offer suitable conditions for this species to mature and reproduce, impacts associated with poorly designed stream crossings, droughts, sedimentation, and riparian area loss still exist. Studies of other aquatic macroinvertebrate populations indicate *good to excellent* water quality within most tributaries. Burbot, another species of greatest conservation need noted in the Wildlife Action Plan, are documented throughout the Warner River and lower portions of several tributaries within the river corridor. NHFG and project partners will continue their evaluation of the health of the watershed using the Warner River and their tributaries as their laboratory.

The Warner and Contoocook Rivers flow into the Merrimack River. Dams and the ruins of dams restrict the passage of aquatic fish species, especially diadromous fish which migrate upstream to spawn. Prior to the installation of dams within these river watersheds, diadromous fish would freely migrate between fresh water and salt water to spawn. While juvenile American eels would migrate upstream in the Merrimack River watershed to develop and mature before returning to the sea to spawn, the adult alewives, American shad, Atlantic salmon, blueback herring and sea lamprey would return to the Merrimack River watershed to spawn after maturing in the Atlantic Ocean. Today, this passage is difficult.

Juvenile American eels, adapted to climbing dams, likely still navigate to the Warner River, yet at significantly reduced numbers. Downstream dams prevent the natural migratory spawning runs to the Warner River for the other diadromous fish species. Recovery efforts for these species have created fish passage facilities at several dams along the Merrimack River. For alewives and blueback herring -collectively referred to as river herring-, another recovery strategy involves trapping mature adults at lower dams in the Merrimack River and transporting them to upstream areas to spawn. Adult river herring spawn in lakes and ponds in late spring/early summer where the juveniles grow before making the journey to the sea. The most recent version of the [National Oceanic and Atmospheric Administration Fisheries Diadromous Species Recovery Plan](#), currently being update, identifies Lake Winnipocket in Webster as a potential stocking location for adult river herring. Outward migrating river herring will make their way through Schoodac Brook to the Warner River on their way downstream. An ongoing evaluation may identify other water bodies within the Warner River watershed that could be stocked with river herring.

Protected Wildlife Species

The New Hampshire Natural Heritage Bureau within the Department of Natural and Cultural Resources and the NHFG also tracks different vertebrate and invertebrate animal species which are listed as [Endangered Wildlife, Threatened Wildlife, or Species of Concern](#). If not listed below, they may be granted status within another Department’s listing or by anecdotal evidence. Although specific locations are not publicly released, Table 2.21 indicates reported observations within the riverfront towns. Further research or observation is needed to ascertain whether the species are located within the ½ mile river corridor.

Table 2.21 Protected Wildlife Species in the Riverfront Towns

Species	Location	NH Status
Vertebrates - Mammals		
Bat hibernaculum - <i>Bat Hibernaculum</i>	Warner	US Threatened /NH Endangered, Very High Importance
Northern Long-eared Bat - <i>Myotis septentrionalis</i>	Warner	US Threatened/ NH Endangered, Extremely High Importance
Vertebrates - Fish		
Wild Brook Trout – <i>Salvelinus fontinalis</i>	Bradford Hopkinton Warner Webster Sutton	NH Species of Greatest Conservation Need
American Eel - <i>Anguilla rostrata</i>	Hopkinton	NH Special Concern, Very High Importance
Burbot – <i>Lota lota</i>	Warner Sutton	NH Species of Greatest Conservation Need
Blueback Herring – <i>Alosa aestivalis</i>	Warner Webster Hopkinton	NH Special Concern, Regional Responsibility Species
Alewife – <i>Alosa pseudoharengus</i>	Warner Webster Hopkinton	NH Special Concern, Regional Responsibility Species

Species	Location	NH Status
Vertebrates – Reptiles and Amphibians		
Smooth Green Snake - <i>Ophedryx vernalis</i>	Bradford Webster Hopkinton	NH Special Concern, Very High Importance NH Special Concern, Historical Record NH Special Concern, Very High Importance
Wood Turtle - <i>Glyptemys insculpta</i>	Bradford Webster Sutton Warner Hopkinton	NH Special Concern, Extremely High Importance NH Special Concern, Extremely High Importance NH Special Concern, Extremely High Importance NH Special Concern, Extremely High Importance NH Special Concern, Extremely High Importance
Blanding's Turtle - <i>Emydoidea blandingii</i>	Webster Sutton Warner Hopkinton	NH Endangered, Very High Importance NH Endangered, Historical Record NH Endangered, Very High Importance NH Endangered, Very High Importance
Northern Black Racer - <i>Coluber constrictor constrictor</i>	Webster Warner Hopkinton	NH Threatened, Very High Importance NH Threatened, Very High Importance NH Threatened, Very High Importance
Spotted Turtle - <i>Clemmys guttata</i>	Webster Hopkinton	NH Threatened, Extremely High Importance NH Threatened, Very High Importance
Jefferson/Blue-spotted Salamander Complex - <i>Ambystoma</i>	Webster	Very High Importance
Invertebrates – Mollusks		
Brook Floater - <i>Alasmidonta varicose</i>	Webster Hopkinton	NH Endangered, Historical Record NH Endangered, Historical Record
Invertebrates – Moths and Butterflies, Dragonflies and Damselflies		
Frosted Elfin - <i>Callophrys irus</i>	Webster	NH Endangered, Historical Record
Karner Blue Butterfly - <i>Plebejus melissa samuelis</i>	Webster	US/NH Endangered, Historical Record
Phyllira Tiger Moth - <i>Grammia phyllira</i>	Webster	NH Special Concern, Historical Record
The Cora Moth - <i>Cerma cora</i>	Webster	NH Special Concern, Historical Record
Pygmy Snaketail - <i>Ophiogomphus howei</i>	Hopkinton	Extremely High Importance
Skilllet Clubtail - <i>Gomphus ventricosus</i>	Hopkinton	NH Special Concern, Extremely High Importance

Source: New Hampshire Natural Heritage Bureau, July 2020; NHFG

2.4.3 Wildlife Habitat

The New Hampshire Fish and Game Department’s Wildlife Action Plan, published in 2015, identified significant wildlife habitat areas in and near the Warner River corridor. The mapping associated with the Wildlife Action Plan was largely a geographic information system (GIS) mapping exercise in which habitat types were identified, cataloged, and mapped. In addition to the identification and mapping, the wildlife habitats were ranked with respect to their ecological integrity. Most of New Hampshire’s habitat ranked highly for biological diversity, the size and connectivity of blocks of similar habitats, and the impacts of human development and alterations to the terrain and the habitats.

Table 2.22 WAP Wildlife Habitat Rankings in the Warner River Corridor and Watershed

Wildlife Action Plan (2015) Habitat Ranking	Warner River Corridor	
	Acres	Percent of Corridor
Tier 1 (Top-ranked habitat in New Hampshire)	1,081	20%
Tier 2 (Top-ranked habitat in biological region)	327	6%
Tier 3 (Supporting Landscapes)	1,243	23%
Total Acres of All Tiers	2,651	48%

Source: Wildlife Action Plan (WAP) 2015

Wildlife Action Plan 2015

The NHFG worked with partners in the conservation community to create the state’s first Wildlife Action Plan (WAP) in 2005 and updated in 2015. The WAP identifies New Hampshire’s wildlife habitats and presents conservation strategies and tools for restoring and maintaining critical habitats and populations of the state’s species of concern. For purposes of prioritizing wildlife habitats for conservation across the state, a system was created to rank habitats. For each habitat type, the top-ranking habitats are combined and designated Highest Ranked Wildlife Habitat in New Hampshire. Recognizing that New Hampshire has a wide range of conditions, both natural and human altered, the state was divided into biological regions. Highest Ranked Habitat in a Biological Region includes the top 30% of all terrestrial and wetland habitats with the following exceptions: 100% of high elevation spruce-fir and floodplain habitats based on their ecological importance and rarity. Aquatic habitats are only ranked statewide and not ranked in this category.

Shown in Table 2.22, the Wildlife Action Plan has ranked 20% of the corridor as top ranked (Tier 1) wildlife habitat by ecological condition in the state. Another 6% of the corridor is ranked as wildlife habitats of highest relative rank in their biological region (Tier 2), and 23% of the corridor land is ranked as supporting habitats (Tier 3). Taken together, almost 26% of the Warner River corridor is classified as either Tier 1 or Tier 2 wildlife habitat. Based on the rankings in the Wildlife Action Plan, the corridor (and the surrounding watershed) is a region with a significant amount of interconnected, high-quality wildlife habitat. Please refer to the **Appendix A. Wildlife Habitat Ranking Map**.

Updated NHFG [Wildlife Action Plan 2020](#) maps are available for each community.

2.4.4 Birds

Birds are an integral part of the ecosystem and habitat changes can have critical, adverse impacts on bird species. As habitat loss occurs, the bird populations fluctuate and migrate. According to New Hampshire Audubon Society, fluctuations in short-term bird populations often occur due to seasonal variations in weather patterns, predators, and food supplies, but long-term declines usually indicate a potential threat to the continuation of the species.

Protected Bird Species

The New Hampshire Natural Heritage Bureau within the Department of Natural and Cultural Resources and the NHFG also tracks bird species which are listed as [Endangered, Threatened, or Species of Concern](#). If not listed, they may be granted status based on the local importance of the species. Although specific locations are not publicly released, Table 2.23 indicates reported observations within the riverfront towns. Further research or observation is needed to ascertain whether the species are located within the ½ mile river corridor.

Table 2.23 Protected Bird Species in the Riverfront Towns

Species	Location	NH Status
Vertebrates - Birds		
Bald Eagle - <i>Haliaeetus leucocephalus</i>	Bradford	US Threatened/ NH Special Concern, Very High Importance
	Hopkinton	US Threatened/ NH Special Concern, Very High Importance
Common Loon - <i>Gavia immer</i>	Bradford	NH Threatened, Very High Importance
	Webster	NH Threatened, Very High Importance
	Sutton	NH Threatened, Very High Importance
	Hopkinton	NH Threatened, Very High Importance
Pied-billed Grebe - <i>Podilymbus Podiceps</i>	Webster	NH Threatened, Historical Record
	Sutton	NH Threatened, High Importance
Least Bittern - <i>Ixobrychus exilis</i>	Sutton	NH Special Concern, Historical Record
Marsh Wren - <i>Cistothorus palustris</i>	Sutton	Very High Importance
	Hopkinton	Historical Record
Northern Harrier - <i>Circus hudsonius</i>	Sutton	NH Endangered, Historical Record
Vesper Sparrow - <i>Poocetes gramineus</i>	Warner	NH Special Concern, Historical Record
Eastern Meadowlark - <i>Sturnella magna</i>	Hopkinton	NH Threatened, Very High Importance
Purple Martin - <i>Progne subis</i>	Hopkinton	NH Threatened, Historical Record

Source: [New Hampshire Natural Heritage Bureau](#), July 2020

The Bald Eagle

After a 40-year absence in New Hampshire, Bald Eagles started to nest again in 1989. Bald eagles are present year-round in New Hampshire with pairs breeding and raising young in the spring/summer and many wintering in areas with open water such as Great Bay and the Merrimack River.

New Hampshire Audubon (NHA) staff has an active management program that constructs metal predator guards, maintains reduced-disturbance buffer zones, and works with New Hampshire Fish and Game Department (NHFG) to advise private landowners on how to best protect and manage Eagle breeding sites. Currently, there are over 20 breeding pairs of Bald Eagles in New Hampshire, and the numbers are rising. The Bald Eagle was removed from the federal Threatened and Endangered (T&E) Species List in 2007, and down listed from Endangered to Threatened on the New Hampshire T&E List in September 2008. Recovery of the Bald Eagle population along the Connecticut River watershed has been strong but areas along the Merrimack River have also been documented. NHA biologists and volunteers solicit public sightings, conduct field searches for new nests, determine breeding success and pinpoint critical habitat areas. This information is used by the New Hampshire Fish and Game Department and by conservation groups and land trusts to develop appropriate long-term conservation strategies. While there have not been any observation of Bald Eagles nesting in the Warner River corridor, there have been sightings within at least two riverfront towns. Residents can report sightings to NHFG at <https://www.wildlife.state.nh.us/nongame/index.html>. See also [New Hampshire Audubon](#) and [Cornell's ebird website](#) for more information.

There have been recent anecdotal sightings of bald eagles over the Warner River with one or two individuals showing interest in Lake Massasecum. The New Hampshire Audubon Society has been tracking these individuals.

2.4.5 Invasive Species

Exotic species are those not native to a certain geography and may be referred to as invasive or nuisance species which are harmful to ecosystems. For the purposes of this plan, they will be referred to as invasive species for simplicity. Like the rest of New Hampshire, the Warner River and some of its connections to the outside world have been overrun by non-native invasive plant and insect species. Invasive species are a continuing concern because the new arrivals can quickly colonize and out-compete native species, thereby changing the landscape and altering the food web which can significantly change the overall ecosystem. Some of the invasive species found in the corridor attack native hardwoods and softwoods, others are hydrophilic, choking riverbanks and channels.

The NHDES maintains a [statewide map of the invasive aquatic plant infestations](#) along with an accompanying [list of infested waterbodies](#). Other state Departments control different types of invasive species, such as the [NH Department of Agriculture, Markets and Foods Division of Plant Industry](#) (NHDAMF) regulating invasive upland plant and invertebrate pest species and [NHFG](#) regulating invasive aquatic invertebrates. Table 2.24 displays known invasive species in the riverfront towns, but not specifically within the Warner River corridor. Some of the more common and insidious invasive plant and insect species are pictured in Figure 2.25.

Table 2.24 Invasive Species in the Riverfront Towns

Species	Location	Year Listed
Invasive Upland Plants		
Japanese Knotweed	NH 103 from Bradford to Warner (7 miles)	2015 (NHDAMF)
Invasive Aquatic Plants		
Variable Milfoil	Lake Massasecum (Bradford)	1997-2017+ (NHDES)
Invasive Invertebrates		
Emerald Ash Borer	Five Riverfront Towns, Merrimack County, most of New Hampshire	2013 (NHDAMF)
Hemlock Woolly Adelgid	Five Riverfront Towns and southern Merrimack County, southern New Hampshire	2017-2020 (NHDAMF)

Sources: [NHDAMF Division of Plant Industry](#); [NHDES Invasive Aquatic Species](#)

While there may be more invasive species within the five riverfront towns, there is no central informational source for invasive species. Types could include upland plants, aquatic plants, invertebrates, aquatic invertebrates, fungi, natural communities, mammals, birds, amphibians, reptiles, and more. Until a single repository is available for reference, residents should be encouraged by WRLAC to familiarize themselves with nonnative plants and insects and to report any spotted invasive species to the respective state departments.

Emerald Ash Borer

The Emerald Ash Borer was first confirmed in Hopkinton in 2014. This non-native insect has no natural predators to keep the population in check. Infected ash trees typically die in three to five years. Strategies have been implemented to reduce the spread of the emerald ash borer, including a quarantine of all hardwood firewood and all ash nursery stock in Belknap, Hillsborough, Merrimack, and Rockingham counties.

Hemlock Woolly Adelgid

This small, wingless insect (originally from Asia) feeds on small hemlock twigs. Alone, if left untreated, it can kill a tree in four to ten years. The Hemlock Woolly Adelgid (HWA) weakens trees and will leave them susceptible to damage from pests like elongate hemlock scale and hemlock borers. First discovered in New Hampshire in Portsmouth in 2000, its presence was noted in Warner and Hopkinton in 2014 as well as in neighboring Hillsborough and Henniker. The New Hampshire Division of Forests and Lands has released an action plan to deal with the continuing spread of Hemlock Woolly Adelgid. Steps to counter the spread include cultural control like removing infested trees and burning them on-site, insecticides, or a combination. Biological controls can also be employed that utilize predatory beetles to reduce the Adelgid population. This is only a viable option in healthy forests with only a moderate infestation that can sustain a population of beetles.

Elongate Hemlock Scale

Native to Japan, Elongate Hemlock Scale was first observed in Queens, New York in 1908. Presence of this Scale was confirmed in Hopkinton in 2014. Like the Hemlock Woolly Adelgid (HWA), this species feeds on the underside of the hemlock needle by draining the tree’s fluids. Tree death can occur ten years after the initial infestation. Elongate Hemlock Scale infection typically follows infestations of HWA, drought, and other stressors that weaken the hemlocks. Quarantines are currently the most effective means of mitigating the spread of Elongate Hemlock Scale.

Variable Milfoil

As a common and aggressive aquatic invasive species, Variable Milfoil has been found in over 75 New Hampshire waterbodies as of late 2019, plus six waterbodies were found to host Eurasian water milfoil. Recent surveys have not found Milfoil in the Warner River; however, it has been documented in Lake Massasecum which flows into the Warner River as well as in the Contoocook River downstream of its confluence with the Warner River.

Oriental Bittersweet & Japanese Knotweed

Oriental bittersweet and Japanese knotweed have been observed in large quantities along the Warner River. Oriental bittersweet is a leafy deciduous, climbing vine that can smother trees, shrubs and other vegetation with its aggressive growth. Japanese Knotweed grows well in disturbed soils, making roadsides prime habitat for this invasive species. Given the proximity of Route 103 to the Warner River, the corridor is well acquainted with this invasive. In 2015, New Hampshire Department of Agriculture’s Statewide Invasive Species Treatment Project, a cooperative venture with the NH Department of Transportation, treated a 7-mile long, 1.5-acre swath of Japanese Knotweed infestation along Route 103 between Warner and Bradford.

Figure 2.25 Invasive Insects and Plants in New Hampshire



Emerald Ash Borer



Hemlock Woolly Adelgid



Elongate Hemlock Scale



Japanese Knotweed



Oriental Bittersweet

Source: Wildlife Action Plan 2015

2.5 Historical and Cultural Resources

The Warner River valley has a cultural and historical heritage rich enough to match the features of the natural environment. There are many local assets in the watershed and in the vicinity that contribute to the highly regarded quality of life enjoyed by residents and visitors. The amenities and opportunities for leisure, entertainment and relaxation, as well as the support services that these activities generate, lie in abundance of outdoor recreation possibilities, as supported by historic downtowns, scenic agricultural and working forest lands, and ease of access (to those with automobiles). These all contribute value to the local economy. Going into the future, the riverfront towns will need to focus their attention to maintaining and enhancing the strong quality of life characteristics to better attract people to work, play, and live.⁴

The quality of life in the riverfront towns is usually regarded as the most important factor in attracting and maintaining resident populations and local and commuting work forces. Keeping in mind, of course, that the factors that make the Warner River corridor and its surrounding watershed attractive areas to live and enjoy, does carry with it the potential for misuse; for example, developing housing to accommodate an increasing population will exert stresses and strains on the natural environment. The riverfront towns will need the tools, resources, and training to provide proper planning and stewardship for protection and management of the Warner River to prevent overuse.

2.5.1 Native Americans

The Warner River flows easterly as part of the larger Merrimack River watershed. The Central NH area was first settled by humans approximately 10,000 years ago as the glaciers retreated. Native American peoples eventually became the “Algonquian language family” of the northeastern US, comprised of more than 20 different languages and corresponding tribal associations.

The tribe residing within the Warner River watershed were known as the Pennacook tribe, which means “by the falling bank,” a powerful people and the primary power in the region when Europeans arrived beginning in 1600s. The [Pennacook tribe](#) held year-round settlements on the Merrimack River and along many other watercourses of its watershed, unlike many other northeastern Native American tribes which migrated seasonally as resources changed. The sedentary, hardy Pennacooks exerted influence over southern New Hampshire tribes such as the nearby Abenaki. Stories of interactions between the tribes and Europeans are recorded in the history of the region.

Native American artifacts have been found along the Warner River, indicating a historical use of the river corridor for travel, hunting and harvesting. The Pennacook and Abenaki people fled after Queen Anne’s War in 1713 and now live on reservations in Canada. The [Mount Kearsarge Indian Museum](#) in Warner preserves cultural traditions and artifacts and holds educational workshops. Today, there is an active presence of Pennacook-Abenaki people as represented by the local 2020 initiation of the [Abenaki Trails Project](#), which aims to create public and educational trails following historical Pennacook-Abenaki uses and cultivation of

⁴ Central New Hampshire Regional Planning Commission, 2016, Comprehensive Economic Development Strategy.

this area. However, they are unable to be federally recognized as a tribe since most of the population officially lives in Canada. Local Historical Societies are sponsoring and supporting the trails project.

2.5.2 Historic Villages and Industry

After the Penacook people migrated north out of the Warner River watershed, the European settlements along the river developed into small villages within the five towns. From upstream to downstream, historic industrial centers included Bradford Village in Bradford, Melvin Mills, Roby Village, Waterloo Village, Warner Village, and Warner Lower Village in Warner, and Davisville on the border of Warner, Webster, and Hopkinton.

Each village, in its earliest years, was somewhat self-sufficient and full of water-powered industries afforded by the Warner River. Warner Village was the largest of the villages in Warner. The river has been essentially unoccupied below Davisville to its confluence with the Contoocook River. The local manufacturing industries depended on the river and its flows to produce finished goods or foodstuffs.

During the 18th and 19th centuries, the Warner River valley was the picture of small, local industrial development. Within Warner's many villages, the Warner River was harnessed to power a wide variety of industries: sawmills, grist mills, paper mills, as well as mills for the production, at various times, of scythe snaths, strawboard, woolen cloth, shingles, clapboards, shoe pegs, excelsior, wagon-wheel hubs, wooden crates and boxes, baseball bats, crutches, toys, leather goods, and clothespins. Industries based on the use of water for power were concentrated around the river's falls at Warner Village, Davisville, and Waterloo.

The river's power is mainly concentrated in Warner, where the river flows over many reaches with rapids and waterfalls. The other four riverfront towns have little frontage on the Warner River that is advantageous for waterpower. Of the other four riverfront towns, only Bradford has a significant amount of river frontage. Bradford, lacking the river's power, had a much more limited industrial direction than their neighbors in Warner. Bradford did host, for example, a woolen mill; a mill for sashes, blinds, and doors; sawmills, a gristmill, and a clothing mill.

Warner's business community was diverse and based on proximity to the water and waterpower of the river. Near the river in Warner Village were a creamery, an evaporating company, a wood-alcohol plant, a dye plant, blacksmith shops, a cooperage, a broom factory, a bulk fuel oil distributor, and a grain store.

The Concord & Claremont Railroad was built through the Warner River valley between 1848 and 1850; the route largely hugs the banks of the river and had many bridges across the river. The railroad was opened between Concord and Bradford in 1850. The second half, from Bradford to Claremont, was not completed until 1871. Warner itself had seven stops: Dimond's (near Davisville), Bagley, Lower Warner, the Warner Village, Waterloo, Roby, and Melvin Mills. Dimond's, Bagley and Lower Warner were just flag stops. After being abandoned and the rails removed around 1961, the railroad bed lay dormant and overgrown with vegetation. This is the railroad bed currently being developed into the Concord-Lake Sunapee Rail Trail.

2.5.3 National Register of Historic Places

The state of New Hampshire and the federal government have listings of developed sites of cultural and/or historical importance. The corridor has a number of recognized historic sites listed in the National Register of Historic Places in Table 2.26 below and are depicted on the **Appendix A. Cultural and Recreational Resources Map**. The riverfront towns have several more National Register listings located outside the corridor itself.

Three bridges, two individual buildings, and an entire village district, all within the corridor, are listed at the National Register of Historic Places:

- The Dalton, Waterloo, and Bement Covered Bridges illustrate the importance of the region’s covered bridges and the cultural ties to those who have constructed, financed, and used these river crossings.
- The Waterloo Historic District consists of 24 houses, the cemetery, a schoolhouse, the railroad depot, and mill buildings. Residents are proud of their ties to their local history.
- Two town-owned buildings further underscore the importance of historical influences on local culture.

Table 2.26 National Register of Historic Places in the Corridor

National Register Entry	Location	Town
Dalton Covered Bridge	Joppa Road	Warner
Waterloo Historic District	Waterloo Street/Newmarket Road	Warner
Waterloo Covered Bridge	Newmarket Road	Warner
Lower Warner Meetinghouse	State Route 103	Warner
Bement Covered Bridge	Center Road	Bradford
Bradford Town Hall	West Main Street	Bradford

Source: [National Register of Historic Places](#)

2.6 Recreational Resources and Public Access

A wide variety of recreational activities are available to community residents and visitors to the Warner River. Seasonally variable flow conditions offer whitewater opportunities unique to this part of the state, including numerous Class IV rapids and a three-foot dam sluice in Warner. American Whitewater has identified the Warner River as a highly popular destination due to its large watershed, long whitewater season, and “incredible” in-stream features. Several dams along the river impound sizeable swimming holes that can be enjoyed during the summer months. Many access points exist as the river parallels Route 103 for a significant length, encouraging frequent use and enjoyment of the river.

2.6.1 Water-Based Recreation

New Hampshire Fish and Game’s fish-stocking program, in conjunction with the river’s naturally variable aquatic habitat, provide anglers with several excellent fishing spots. The NHFG Freshwater Fishing Guide claims the Warner River to be an excellent location for brook trout and rainbow trout. The Warner River corridor is a popular spot for wildlife observation due to the proximity of large blocks of conserved open space and the adjacent, heavily wooded Mink Hills offer respectable hunting. A rail trail is being developed along the old railroad bed that parallels the Warner River and links Bagley Field to Riverside Park in Warner Village and the Warner Intervale (I-89 Interchange 9 retail area).

The Warner River is an excellent seasonal cold-water fishery with varied habitat that offers anglers ready access to the river. As NH Route 103 parallels the Warner River, there are many access points, official and unofficial, which are commonly used for fishing which follow in a later table in this section.

The opportunity for motorized boating on the Warner River is limited due to its size and depth. However, the river offers canoeing and kayaking for thrill seekers as well as the less adventurous. American Whitewater rates the Warner River from Melvin Mills to Warner Village as Class IV rapids during normal river flows. This rafting section is 3.7 miles long and is considered a unique paddling experience for New England. Due to the size of the watershed, the paddling season is longer than normal and the local wetlands also help add to an extended season. The river provides easy flatwater paddling between the whitewater reaches. The upper two thirds of the Warner run are mostly Class III rapids with some Class II rapids intermixed. Pinball Rapid is rated Class IV with a three-foot sluice dam. The Warner Gorge is considered the main event on the river, with a series of tight drops in an intense quarter mile. A typical run of the gorge takes about an hour and a half with two additional take-outs farther downstream, which adds thirty minutes each. At medium or high levels, the lower sections of the river are well worth the extra flat-water paddling.

There is a ramp for canoe and kayak access at a public access point near the Bohanan Farm on the Contoocook River in Hopkinton, downstream of the confluence of the Warner River. The water there is calm, and canoes and kayaks can be paddled upstream and into the Warner River. There is a second access point in Contoocook upstream of the Warner River where canoes and kayaks can also be launched to access the Warner River.

The Warner River corridor offers a wide variety of recreational opportunities. From the Bradford Pines Natural Area used for wildlife observing and walking trails to the Town of Warner’s Riverside Park used for its recreational fields and courts, opportunities are available for many interests.

Public access for fishing, kayaking, canoeing, and swimming can be found almost anywhere along the Warner River where there is not an existing private residence. The Route 103 right-of-way extends to the river’s edge along many portions of the river. There are several informal pull offs along the river which provide potential fishing, boating, and other recreation. Known public access sites are displayed in Table 2.27.

Table 2.27 Public Access Sites on the Warner River

Public Access Site	Location	Type	Activities
Swain Lowell Dam	West Roby District Road	Foot Access	Swimming, Whitewater
Melvin Mills	Melvin Rd	Cartop	Whitewater
Paddlers Gage	Lane Bridge	Cartop	Whitewater
Upper Take-Out	Below Gorge	Cartop	Whitewater
Middle Take-Out	East Roby District Road	Cartop	Whitewater
Waterloo Take-Out	Covered Bridge	Cartop	Whitewater
Bottom Take-Out	0.3 mi east of Covered Bridge	Cartop	Whitewater
Bagley Fields	NH 103, Warner	Parking lot	Soccer fields, Swimming

Source: [New Hampshire GRANIT](#); WRLAC Nomination Committee Input

2.6.2 Land-Based Recreation

Table 2.28 lists other recreational sites and opportunities in the corridor. These resource locations are displayed on the **Appendix A. Cultural and Recreational Resources Map**.

Table 2.28 Other Recreational Areas in the Warner River Corridor

Recreational Site	Location	Activities
Bradford Pines Natural Area	Bradford	Walking, picnicking, wildlife observation
Kearsarge Elementary School	Bradford	Field sports
Concord – Lake Sunapee Rail Trail (additional segments under development)	Warner and Hopkinton	Biking, walking, scenic views, rail trail is accessible at Waterloo, Bagley Fields, Warner village, and south of I-89 Interchange 7 which runs into Hopkinton
Chandler Reservation	Warner	Hiking trails, wildlife observation
Snowmobile Trail # 345	Warner - Crosses Dalton Covered Bridge, Joppa Rd.	Snowmobiling
Riverside Park	Warner	Tennis courts, basketball courts, baseball, Softball, Football fields, Skate park, Bathrooms, Snack bar
Bagley Fields	Warner	Soccer fields, seasonal ice-skating rink, bathrooms, rail trail access.

Recreational Site	Location	Activities
Class VI Roads	Warner - North Road along Stevens Brook, Couchtown Road, others	Equestrian trails, walking, biking
Tom Pond	Warner	Swimming, fishing, winter motorcycle races

Source: [New Hampshire GRANIT](#); WRLAC Nomination Committee Input

That segment of State Route 127 from Contocook Village to Davisville (and continuing north and south, outside the corridor) has been as a designated recreational drive that connects “iconic New England villages, rural towns, and sweeping vistas [that] evoke the nostalgia” of an earlier era, known as the “Currier & Ives Scenic Byway” (the above quote is from the Currier & Ives Scenic Byway Council website). In 2017, the Council added a spur of the Byway along State Route 103 from Davisville to Warner Village, and north to the Mount Kearsarge Auto Road at Rollins State Park. The Council’s purpose is to encourage tourism and visitors to patronize the local attractions and scenic viewpoints. Much of the Scenic Byway is within the Warner River corridor, further helping to highlight the Corridor’s scenic views and resources.

The Warner River corridor also has ready access to the regional hiking trails in the Sunapee-Ragged-Kearsarge Greenway. The corridor is also within the Quabbin-to-Cardigan Partnership and, as such, strategically placed to potentially contribute to that effort.

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Chapter 3. Land Use Assessment

Land resources and how they are developed can have a direct/indirect impact on the ability to respond to climate events. As an example, land use decisions based on regulations that allow sprawling development patterns result in more paved surfaces, less forest cover and open space, and reliance on automobiles to access needed services, leading to more generated heat, runoff and erosion, as well as energy consumption and emissions.

3.1 Land Use in the Corridor

Based on examination of the state data, over half of the Warner River corridor is currently forested and undeveloped woodlands. About 16% of the corridor is wetlands. Together, almost $\frac{3}{4}$'s of the land in the corridor is woodlands and wetlands. Developed lands are only approximately 13% of the corridor's land, but this 13% is mostly right along the river, in Bradford Village, Warner Village, and along Route 103 (Park Avenue) near Contoocook Village. The highest population density areas in the corridor are Warner Village and downstream between Davisville, Webster, and Contoocook Village. Using a LandSat landcover satellite classification, Table 3.1 displays the existing land cover and acreages within the corridor. Roads will fall into the Developed Land categories.

Table 3.1 Land Cover by Type in the Warner River Corridor

Land Use	Acres	Percent of Corridor
Forest Land	3,116	57
Wetlands	850	16
Lightly Developed Land	542	10
Agricultural Land	313	6
Scrub/Shrub Transition Land	221	4
Developed Open Space	170	3
Moderately Developed Land	160	3
Barren/Idle Land	55	1
Open Water	29	< 1
Highly Developed Land	17	< 1
Total	5,473	100%

Source: GIS land cover classification (generalized by CNHRPC) from NOAA Coastal Change Analysis Program, based on LandSat satellite imagery from 2010

3.1.1 Villages

The Warner River flows chiefly through Bradford and Warner, with approximately 84% of the river mileage in these two towns. The Town of Warner is composed of a series of villages, with the largest being Warner Village. Warner Village is a high-density developed area between Exit 9 and Exit 8 of Route I-89. Low-density residential areas connect the villages along the river. There are multiple distinct villages with a mix of land uses, surrounded by residential and rural development:

- Bradford Village.
- Melvin Mills.
- Roby.
- Waterloo.
- Warner Village.
- Warner Lower Village.
- Davisville.

Downstream from Davisville, the river continues to its confluence with the Contoocook River approximately ½ mile downstream from Contoocook Village in the town of Hopkinton.

3.1.2 Commercial and Industrial Areas

Two primary commercial areas exist within the Warner River corridor: the commercial retail area around Exit 9 on I-89 (the Warner Intervale) and downtown Warner Village.

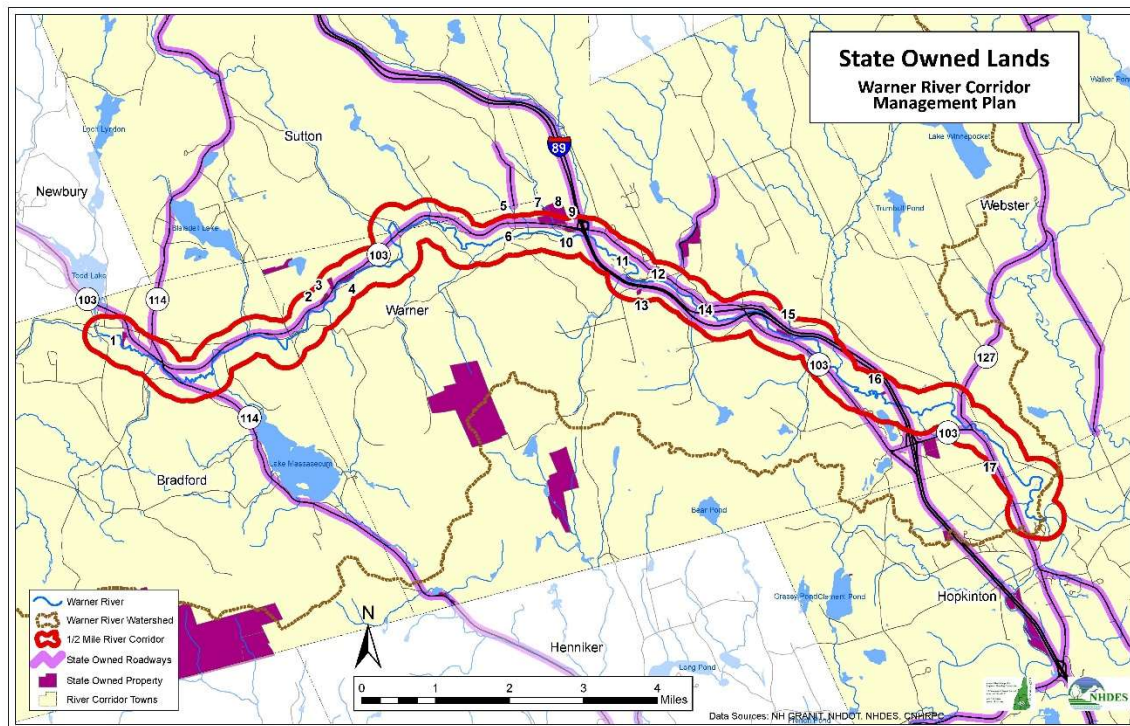
There are several small commercial or industrial areas within the corridor:

- O&E Repair - a large truck repair shop on Breezy Hill Road in Bradford situated on the river.
- Rymes propane storage and distribution facility on Chemical Road in Warner.
- Warner Power, Inc. electrical power systems manufacturing on Depot Street in Warner.
- H.R. Clough, Inc. heating oil storage and distribution facility on Depot Street in Warner.
- R.R. Charlebois, Inc. truck sales and servicing on Route 103E in the Davisville section of Warner, formerly the Southworth-Milton facility.
- Naughton Recycling Center, LLC on Jones Road in Bradford.

3.1.3 State Lands

The State of New Hampshire owns several parcels of land within the river corridor, not including the state roads and highways. Small parcels are situated in Bradford and a few are located in Warner, with at least one larger parcel in Warner. Although there are state owned lands in the watershed, no other riverfront community has state owned parcels within the corridor as displayed in Figure 3.2 below. See **Appendix A. State Owned Lands Map** for a larger depiction.

Figure 3.2 State Owned Lands



Source: Central NH Regional Planning Commission (CNHRPC)

The state lands are numbered on Figure 3.2, and these key to the data listing of parcels in Table 3.3. The total estimated acres within the corridor is 91 acres, although because the two largest parcels totaling 57 acres are only partially within the buffer, that figure could vary significantly. Sutton and Webster do not have any state-owned parcels within the corridor.

Table 3.3 State Owned Lands Within the ¼ Mile Buffer

Key	Town	Location or Address	Map/Lot	Acres	Description	Within ¼ Mile Buffer
1	Bradford	NH103	2-106	2.2	Bradford Pines Natural Area	Completely
2	Warner	NH103	16-074	4.3	Vacant Lot	Completely
3	Warner	NH103	16-076	5.4	Vacant Lot	Completely
4	Warner	NH103	16-024	6.3	Vacant Lot	Completely
5	Warner	NH103	17-007	0.3	Vacant Lot	Completely
6	Warner	NH103	37-015	0.1	Vacant Lot	Completely
7	Warner	NH103	17-001	18.7	DOT Highway Garage	Partial
8	Warner	NH103	14-12	38	Land Adjacent to Highway Garage	Partial
9	Warner	NH103	14-011	0.2	Land Adjacent to Highway Garage	Completely
10	Warner	Waterloo St	36-002	3.5	Former DOT Highway Garage	Completely
11	Warner	Chemical Ln	32-008	2.3	Vacant Lot	Completely
12	Warner	Chemical Ln	32-007	0.4	Vacant Lot	Completely
13	Warner	North Village Rd	10-034	2.4	Vacant Lot	Completely
14	Warner	W Joppa Rd/I-89	10-042	0.1	Vacant Lot	Completely
15	Warner	I-89 and Warner River	07-001	5	Vacant Lot	Completely
16	Warner	I-89 and Warner River	57-051	1.4	Vacant Lot	Completely
17	Hopkinton	Park Ave	23-18	0.5	Vacant Lot	Completely

Source: CNHRPC analysis of parcel data, November 2020

Most of the state-owned lots are vacant right-of-way parcels. In Bradford, the Bradford Natural Pines Area is a small park while in Warner, several parcels accommodate the NHDOT Highway Garage and its surroundings. Those state-owned parcels along the Warner River could be pursued in the future as potential conservation lands or public trail lands.

3.2 Future Development

Route 103 is the primary transportation route along the Warner River and its corridor. Route 103 runs along the north side of the river through Bradford and runs along the north bank of the river for much of its length to Waterloo. The river is separated from Route 103, except for a crossing, for the rest of its course to the Contoocook River. Route 103 crosses over the Warner River three times. The interstate crosses the river at Exits 8 and 9 before continuing north and away from the river. The length of the Warner River between Exits 7 and 9 is about 6.5 miles. Local town roads cross the river on 21 bridges as listed in Table 3.4.

Table 3.4 Warner River Crossings

Town	Number	Crossing Location
Bradford	4	Breezy Hill Road
		Henniker Road (Route 114)
		Center Road (Bement Bridge)
		Water Street (over the West Branch Warner River)
Hopkinton	0	N/A
Sutton	0	N/A
Warner	17	Melvin Road (Melvin Mills)
		Laing Bridge Road
		Route 103 (Roby U/S)
		Route 103 (Roby D/S)
		Newmarket Road (Waterloo Bridge)
		I-89 (Southbound)
		I-89 (Northbound)
Chemical Lane		
		North Village Road
		West Joppa Road (Dalton Bridge)
		I-89 (Northbound)
		Route 103
		I-89 (Southbound)
		I-89 (Southbound on-ramp)
		I-89 (Southbound)
		I-89 (Northbound)
Route 127		
Webster	0	N/A

Source: NH Department of Transportation bridge database

3.3 Open Space and Protected Lands

Open space is a very important part of the Warner River corridor and essential to the quality of life residents enjoy in the riverfront towns. Protecting open space and ensuring public access along the corridor, as well as providing information on its recreation opportunities, are important goals as they connect people to the outdoors and build an appreciation for the resources. In its simplest definition, open space is land that has not been developed or converted to other uses, and consists of forests, fields, rivers, and wetlands. All provide valuable wildlife habitat.

Preserving open space, and specifically wildlife corridors, has been identified as a key part of reducing the risks of climate change. As habitats change, species will need to be able to migrate to other suitable habitats. If that migration path is interrupted by human development, both plant and animal species are much less likely to complete their migration. Tracts of land under conservation easement can be permanently protected from future development as part of a parcel’s deed restrictions or they can be under temporary conservation for a limited duration.

The Warner River corridor has several land parcels either protected by conservation easements or by municipal ownership and held for conservation. See **Appendix A. Conservation Lands Map**. These protected open spaces and conservation lands within the corridor are displayed in Table 3.5.

Table 3.5 Protected Open Spaces in the Warner River Corridor

Parcel Name	Location	Primary Protection Type*	Primary Agency*	Acres in Corridor	Total Acres
Bagley/Stillman Clark	Warner	Fee Ownership	Town of Warner	36	36
Bohanan Farm	Hopkinton	Conservation Easement	Five Rivers	45	279
Chandler Reservation	Warner	Fee ownership	Town of Warner	22	1,414
Flanders Wellsite	Warner	Fee Ownership	Town of Warner	2	2
Gilmore State Forest	Warner	Fee Ownership	New Hampshire	11	36
Hill Tract #1	Warner	Fee Ownership	Town of Warner	82	84
Hill Tract #2	Warner	Fee Ownership	Town of Warner	8	8
Hill Tract #3	Warner	Fee Ownership	Town of Warner	1	1
Hill Tract #4	Warner	Fee Ownership	Town of Warner	1	1
Jelleme Forest	Warner	Fee Ownership	SPNHF	25	49
Bradford Pines	Bradford	Fee Ownership	State of NH	2.2	2.2
Kumin	Warner	Conservation Easement	SPNHF	1	107
Ordway Woods	Warner	Fee Ownership	Town of Warner	4	4
Royce Well Site	Warner	Fee Ownership	Town of Warner	8	8
School Street Park	Warner	Fee Ownership	Town of Warner	6	13
Scott/Ballou	Warner	Deed Restriction	SPNHF	24	42
Warner River Parcel	Warner	Fee Ownership	Town of Warner	5	5
Aranosian	Warner	Conservation Easement	Ausbon Sargent	42	42
Whitman Park	Bradford	Fee Ownership	Town of Bradford	1.8	1.8
Totals				327	2,135

**Note: Only the primary protecting agency and protection type are listed here. Parcels may have additional protection in the form of a deed restriction or conservation easement held by another entity.
Source: New Hampshire GRANIT Conservation/Public Lands Layer with updates from WRLAC*

The corridor serves as an undeveloped connector between significant blocks of protected lands that surround the corridor. Some of the protected parcels in Table 3.5 are small acreage like the 1-acre Kumin parcel to the larger parcels, like the 1,400+ acre Chandler Reservation. Taken together, all the protected lands are critical for wildlife habitat and migration, as well as for outdoor recreation.

3.3.1 Bohanan Farm

One of the most significant conservation properties in the Warner River corridor is Bohanan Farm in Hopkinton. Protected by a conservation easement since 2008, 45 acres of the 410-acre parcel are within the Warner River corridor. Its preservation is the result of hard work and collaboration among the Five Rivers Conservation Trust, the Town of Hopkinton, the state, and the US Department of Agriculture. A working dairy farm since the 1930s, today the farm is home to the Contoocook Creamery which produces milk that can be purchased at stores across the state. Currently, the farm has 400 cows and sustainably produces 50% of their feed on their conserved acreage bordering the Warner River. Bohanan Farm serves an important recreational role for the Town of Hopkinton as the property hosts seven miles of public walking trails.

3.3.2 Chandler Reservation

The Chandler Reservation is the largest tract of conserved land that abuts the Warner River corridor with its 1,400+ acres of protected land in the Mink Hills of Warner. Starting as an 800-acre gift to the Town of Warner in 1919 by the son of U.S. Senator William E. Chandler, it has been expanded over the years to reach its current size. In the 1930s, under President Franklin Roosevelt's *New Deal*, the Civilian Conservation Corps constructed several plantations and trails on the property, many of which are still used today. At many points throughout its history the Chandler Reservation has been used for commercial timber production, and in 1992, it became just the third Town Forest in Merrimack County to be recognized as a Tree Farm. The Reservation is a popular public destination with many foot access trails and is used for year-round recreation.

The Quabbin-to-Cardigan Partnership launched in 2003 is a collaborative effort to conserve the Monadnock Highlands of north-central Massachusetts and western New Hampshire. Spanning one hundred miles, bounded by the Connecticut and Merrimack Rivers and by the Quabbin Reservoir and White Mountain National Forest, the Q2C Partnership encompasses approximately two million acres. This region is one of the largest remaining areas of intact, interconnected, ecologically significant forest in central New England, and is a key headwater of the Merrimack and Connecticut Rivers. In the upper third of this region lies Bradford and Warner. There are only two major corridors in the area connecting southern portions to the White Mountain National Forest in the north; one is Lake Sunapee and the other is the Warner River. The Warner River serves as a corridor between the Chandler Reservation, the Warner Town Forest, and Mount Kearsarge State Forest

Park. When taking a regional view of conserving habitat, preserving wildlife corridors, and mitigating climate change, the important role of the Warner River corridor becomes even more evident.

3.4 Local Planning and Zoning

The five riverfront towns are aware of the importance of water resource protection and the controls that land uses exert on water quality. Bradford, Warner, Sutton, Webster, and Hopkinton all have relatively current master plans; some are actively working on revisions. Highlighted below is the most current information on the corridor communities' master plans and land-use regulations.

3.4.1 Master Plans

Per RSA 674:2, municipal Master Plans are the foundation for local land-use controls such as zoning ordinances, subdivision regulations, and site plan review regulations. The New Hampshire Office of Strategic Initiatives recommends that master plans be updated every five to 10 years to ensure that the most current data is available and that a town's plan reflects current town priorities and addresses current and future land use issues.

Master Plans for the corridor communities contain water resources provisions such as controlling stormwater, protecting riparian lands, regulating open spaces and subdivisions, river access for recreational use, wetlands protection, and agricultural land management. These recommendations are important first steps in achieving water-quality protections through implementing regulations, policies, and other initiatives.

3.4.2 Zoning Ordinances

Zoning ordinances reflect the priorities of a community and regulate land use in accordance with state law RSA 673. Water resources and their role in providing recreational opportunities and protecting ecosystems are recognized as important by the Warner River corridor communities. Ordinances such as controlling development on steep slopes, open space requirements in subdivision regulations, floodplain management, shoreland and wetland protection and stormwater management are all techniques used by the Warner River corridor communities to address water resource and wildlife habitat protection through land-use management.

3.4.3 Zoning Districts

Zoning districts provide restrictions for certain geographical areas of a community. The zoning districts in the corridor for each of the five riverfront towns communities are detailed in the following Table. Those districts across the five-town region that directly or indirectly protect water resources include variations of Open Space, Agricultural, Rural, Residential, and Commercial by having impervious surface limitations. Overlay districts such as Wetland Conservation and Warner Intervale provide more constraints or requirements to

development in addition to the requirements of the underlying district. See Table 3.6 below for a summary of the zoning districts of the five communities within the Warner River corridor.

Table 3.6 Zoning District Summary within the Warner River Corridor

Community	Zoning District(s)	Corridor Acres	Percent of Corridor
Bradford	Residential Rural	618	10.7%
	Residential Business	487	8.4%
Hopkinton	Residential /Agricultural	208	3.6%
	Low Density Residential	30	0.5%
	Medium Density Residential	114	2.0%
	Medium Density Residential	102	1.8%
Sutton	Rural Agricultural	227	3.9%
Warner	Village Residential	274	4.7%
	Medium Density Residential	1,459	25.3%
	Commercial District	260	4.5%
	Open Conservation	959	16.6%
	Open Recreation	22	0.4%
	Business District	26	0.5%
	Low Density Residential	759	13.2%
Webster	Residential/Agricultural	224	3.9%

Source: Compiled by CNHRPC from Towns’ Zoning Ordinances and Zoning District GIS Data

3.4.4 Subdivision and Site Plan Review Regulations

Subdivision and site plan review regulations focus on the requirements for new or expanded residential developments. These requirements typically include protections for surface water and wetlands, erosion and sediment control, and stormwater management.

3.4.5 Zoning/Regulations by Town

Bradford, Warner, Sutton, Webster, and Hopkinton utilize land use regulations that are periodically amended to reflect changing trends, technologies, or priorities. The following sections provide a summary of the key regulations that affect the designated Warner River.

3.4.6 State and Local Setback and Buffer Requirements

For the Warner River corridor communities, the local requirements for wetland setbacks or river buffers vary from town to town and are a mix of local regulations and the New Hampshire Shoreland Water Quality Protection Act (SWQPA, formerly the Comprehensive Shoreland Protection Act or CSPAs). The state adopted the SWQPA to provide a minimum-level of protection to New Hampshire’s rivers and lakes by controlling and

restricting land use within a 250' buffer zone as measured landward from the ordinary high-water reference line of the surface-water resource. The SWQPA established:

- Requirements for a 0'-50' naturally vegetated waterfront buffer as the primary protection against disturbance to riparian vegetation and habitat.
- Requirements for a 50'-150' naturally vegetated woodland buffer, which also serves as the primary protection against disturbance to riparian vegetation and habitat.
- Limitations on the amount of impervious surface coverage within the 250' shoreland buffer.
- Restrictions on the use of pesticides and fertilizers within 25 feet of the ordinary high-water line.
- Only low phosphorus, slow-release nitrogen fertilizer is permitted within the 250' buffer.

Vernal Pools

Vernal pools are wetland depressions characterized by their small size, subject to seasonal filling and drying and may be physically isolated from other wetlands. Because they typically dry each year, no fish can survive. Some unique wildlife species are dependent on vernal pools especially for breeding. These include fairy shrimp, wood frog, and "mole salamanders" such as the blue-spotted salamander and yellow spotted salamander.

Vernal pools are vulnerable to being overlooked during certain seasons or drier years due to the seasonal nature of filling and drying cycles. Because of this, locations of vernal pools can be challenging to identify. The Town of Sutton is the one town in the Warner River corridor that has a vernal pool setback. There are no known inventories or maps of vernal pools in the Warner River corridor. While this detail is outside the scope of the Corridor Management Plan, vernal pool mapping and identification could be a future project.

Some towns employ more stringent requirements and controls than specified by the state statute. For example, Sutton regulates an outstanding 75' setback from vernal pools. Although some of the riverfront towns utilize wetlands and riparian buffers as noted in the next section, they are generally not more restrictive than those the state statutes.

3.4.7 Riparian Buffers within the Corridor

Riparian areas and buffers are the vegetated uplands adjacent to surface waters and wetlands that help reduce the adverse effects of human activities on these resources. The primary function of a buffer is to physically protect and separate sensitive areas like rivers and wetlands from future disturbance. RSA 482-A declares that protection and preservation of wetlands ecosystems and surface waters from unregulated alteration and despoliation are for the public good and welfare. Riparian areas and buffers provide valuable functions:

- Absorbing and filtering runoff to protect water quality.
- Providing flood storage.
- Maintaining ecological integrity.
- Slowing runoff to prevent erosion.
- Providing habitat and migration routes for wetland species and upland species.
- Enriching landscape and scenic qualities.
- Sustaining recreational uses.
- Utilizing the fallen trees into rivers and streams to enhance habitat and support the floodplain.

Determination of wetlands functionality requires evaluating a wetland's interaction with adjacent uplands and with other aquatic or wetland systems. Functions of wetlands have effects that can extend far beyond the wetland boundary. For example, flood storage in wetlands reduces the downstream peak flood flow in downstream river reaches.

To protect the functions of wetlands, impacts from development must be minimized. Preserving some portion of the adjacent upland area as a naturally vegetated buffer, as measured from the edge of the wetland into the surrounding non-wetland areas, can help reduce wetland impacts.

The ecological health of lakes, ponds, rivers and streams is also protected by buffers. Because water bodies can be edged with wetlands, buffers on surface waters are also frequently mandated in local wetlands ordinances. Local zoning ordinances with buffer requirements can prohibit disturbance within the buffer or allow only limited alterations or uses. The restrictions and prohibitions are included in comprehensive wetlands protection regulations enforced at the local municipal level.

The effectiveness of wetlands and surface water buffers is largely controlled by the width of the buffer or riparian area. The width of the buffer can vary depending on one or more factors, including the functions of the wetland or surface water, the sensitivity of the wetland to disturbances, the characteristics of the buffer area (such as the vegetation and slope), the intensity of adjacent land uses, watershed characteristics, and anticipated future changes to the area. A single width buffer could be used to protect all functions deemed

important. Adopting and sizing wetlands buffers should be supported by validated scientific techniques for effective protection and legal endorsement.

Sutton, Hopkinton, and Bradford have separate wetlands protection ordinances. Warner and Webster do not currently have separate wetlands ordinances. The width of the buffers mandated by the local ordinances vary between the towns and the features of the proposed development. Table 3.7 summarizes the local riparian buffer requirements within the five riverfront communities.

Table 3.7 Local Regulatory Requirements for Riparian Buffers

Municipality	Ordinance	Wetlands/Riparian Buffer
Bradford	Wetlands Protection Ordinance	No building within 100' of wetland 20,000 square feet or more 50' for wetlands >1,000 square feet but <20,000. No structures or alterations of the surface by dredging or filling. Can rebuild on existing footprint. No septic or leach field within 75'
	Zoning	Minimum distance from high water mark to any building is 75'
Hopkinton	Wetlands Conservation Overlay District	Buffer 75' from any wetlands - no septic, leach field, structures or alteration of natural surface configuration. Applies to wetlands ≥ one acre or any size if adjacent to surface waters. No excavation within 75' of navigable river. No solid-waste or construction and demolition debris disposal within 300' of the reference line.
	Zoning	
Sutton	Wetlands Overlay District	Buffer ranges from 15' for sheds, pools, agricultural buildings, 50 feet for wetlands 10,000 square feet or less, 75' to 125' for wetlands >10,000 or along rivers, streams and lakes depending on structure type and wetland size/type. Vernal pool setback of 75' - a no disturbance buffer. Agricultural application of sludge must maintain a 100' buffer from all surface waters. Building setback 75' from reference line of rivers, perennial streams, and lakes or ponds greater than 10,000 square feet.
	Zoning	
Warner	No separate ordinance	75' from Warner River, ponds greater than 10 acres, and other perennial streams, for buildings and storage tanks. Lots on the Warner River must have a minimum frontage of 100'.
Webster	No separate ordinance	50' from rivers, brooks, streams, lakes and ponds, includes accessory and primary structures. Fifty percent of native vegetation must remain undisturbed.

Source: CNHRPC research of town regulations

Bradford

The corridor in Bradford is currently zoned to allow rural residential development with a residential-business zoning district along Route 103 and the river, and south along Route 114. Refer to **Appendix A. Zoning Districts Map** for details. Routes 103 and 114 constitute Bradford’s primary population center, with developed commercial areas stretching out from Bradford Village along those roadways. Based on Bradford’s zoning, future growth and development will probably occur along these roadways.

Bradford’s Zoning Ordinance 2017 includes:

- Septic systems in wetland and buffer areas must follow NHDES requirements.
- Erosion and sediment control requirements.
- SWQPA (RSA 483-B) applies by reference.
- Wetlands Overlay District Ordinance.
- Floodplain Development Overlay Zone regulations, NFIP minimum standards.
- Cluster development allowed in Rural Residential and Conservation Districts.
- Lot size calculations cannot use steep slopes, wetlands or floodplains.

Subdivision and site plan review regulations have stormwater management requirements – a plan must be submitted if the project is greater than 20,000 square feet or disturbing critical areas such as steep slopes, wetlands and floodplain. Proposed developments must demonstrate that there will be no net increase of runoff from the pre-development state. The water quality land use controls are summarized in Table 3.8.

Table 3.8 Bradford’s Zoning Districts and Requirements

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space/Cluster Regulations
Residential Business District - Applies to most of the Center of town	One dwelling or business per two buildable acres. 250' of road frontage	50' from right of way or 75' from center of public road / 30' / 30'	n/a / 35'	No
Conservation District - Applies to areas over 1,200' in elevation.	Minimum of five acres (ten acres for a cluster development). 400' of road frontage	50' from right of way or 75' from center of public road / 30' / 30'	n/a / 35'	Yes, minimum of ten acres
Residential Rural District - All areas outside of downtown lower than 1,200' elevation.	One dwelling or business per two buildable acres. 250' of road frontage.	50' from right of way of 75' from center or public road / 30' / 30'	n/a / 35'	Yes, minimum of ten acres

Source: Town of Bradford Zoning Ordinance 2017 regulations

Bradford has small, localized areas of stratified drift (Refer to Water Resources Map). The largest of which is situated below the river between the Bement Bridge and Breezy Hill Road. This area of potential highly productive stratified-drift aquifer is not currently used for a community public water supply. Bradford has not prepared a Water Resources Plan, nor has the town established a groundwater protection zoning district to better protect this possible future resource.

Warner

Warner’s zoning districts reflect the well-developed downtown of Warner Village, with lower residential density areas leading away from downtown, and the large tracts of undeveloped woodlands in the Mink Hills and forested foothills of Mount Kearsarge. For most of its route through Warner, the river is flanked by a medium-density residential zoning district. Between the Warner Intervale at Exit 9 and the Route 103 crossing over the river at Warner Lower Village, the zoning districts allow for denser residential and commercial development in the Village Residential, Commercial, and Business zoning districts. The area around Interstate Route I-89 Exit 9 is zoned for commercial land uses with the Intervale Overlay District regulations also in effect. Warner’s downtown is zoned as the Business District. Warner’s water quality land use controls are summarized in Table 3.9.

Warner’s Zoning Ordinance 2019 includes:

- Septic system regulations that follow NHDES regulations.
- Floodplain protection provisions that go beyond the minimum requirement - do not allow alteration/repair/additions to non-conforming structures in flood hazard areas that exceed 25% of replacement value.
- Open Space Development Ordinance applies to major subdivision in R-2, R-3, OC-1 and OR-1. See Table 3.9 for more detail.
- Buildable lot calculations cannot include 100-year floodplains, slopes > 25%, wetlands, waterways and poorly drained soils.

Table 3.9 Warner’s Zoning Districts and Requirements

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Village Residential District R-1	20,000 square feet, 100' of frontage. Unless not served by a municipal sewer system in which case - 40,000 square feet and 150' of frontage	30' / 15' / 15'	n/a / 35'	n/a
Medium Residential District R-2	Two acres, 200' of frontage. Unless served by municipal sewer, in which case - 40,000 square feet, 120' of frontage	40' / 25' / 25'	n/a / 35'	Yes, subdivisions larger than 12 acres
Low Density Residential District R-3	Three acres, 250' of frontage. If bordering shoreline of public lake or pond - 100' of frontage.	50' / 40' / 40'	n/a / 35'	Yes, not applicable to subdivided lots of 12 acres or greater.
Open Conservation District OC-1	Five acres, 300' of frontage. If bordering shoreline of public lake or pond - 200' of frontage.	50' / 50' / 50'	n/a / 35'	Not applicable to subdivided lots of 15 acres or greater.
Open Recreation District OR-1	Five acres, 500' of frontage. If bordering shoreline of public lake or pond - 200' of frontage.		n/a / 35'	Not applicable to subdivided lots of 20 acres or greater.

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Business District B-1	10,000 square feet, 100' of frontage.	30' / 15' / 15'	4,000 square feet, 45' high	n/a
Commercial District C-1	40,000 square feet, 200' of frontage.	40' / 25' / 25'	40,000 square feet. No more than 70% of lot may be covered by impermeable surfaces. Special exceptions apply. 45' high.	Where abutting a parcel of residential or open space zoning, a natural vegetative buffer of 25' is required. Additional provisions exist.
Warner Intervale Overlay District INT	The overlay district encompasses a portion of the commercial district and serves as a framework for development to reflect the historic character of the town and serve as a social hub for the community. Provisions are identical to those of the C-1 district with additional permitted use provisions.			

Source: Town of Warner Zoning Ordinance 2019 regulations

One of the purposes of Warner’s subdivision regulations is to require innovative land use controls when supported by the master plan. Subdivision and site plan review regulations have a general requirement that due regard must be given to protection of habitat areas of ecological significance and natural and cultural features to the maximum extent possible. Other requirements include the submission of information, including the existence of any environmentally sensitive, significant or unique area within or abutting the parcel and any historical or cultural features. A full Environmental Impact Assessment is triggered if any unique areas are identified. Erosion and sediment control plans and stormwater management are also required and must show no increased runoff from a proposed project.

Warner’s 2010 Master Plan identified the Warner River corridor as one of six natural resource areas where conservation efforts should be focused. In an opinion survey performed in 2008 in support of the Master Plan, 56% of respondents indicated the preservation of open space in Warner is ‘most important’ In regards to future conservation efforts by the town, 69% (of respondents) indicated a willingness to “continue spending town money to protect natural resources and open space.” A goal of protecting “meaningful blocks of high-quality conservation land and distinctive natural features in at least . . . 20% of the Warner River corridor” was articulated. Currently, of the 5,473 acres that make up the ¼-mile corridor within Warner, 282 acres (about 5%) are currently under some type of conservation protection, well below the goal of 20%.

Warner has several localized areas of stratified drift that have the potential to be developed into community public water supply sources. Warner Village Water District’s wellfield currently withdraws water from the stratified-drift aquifer below the river near Warner Village. Additional potential stratified-drift aquifers are downstream of the Warner Intervale, downstream of Warner Village (in the area around the Dalton Bridge) and farther downstream between Bartlett and Schoodac Brooks and Tom Pond. See **Appendix A. Water Resources Map**. Warner has not prepared a Water Resources Plan, nor has the town established a groundwater protection zoning district to better protect these possible future resources.

Sutton

Sutton has little land within the corridor. The Sutton properties area all zoned Rural-Agricultural with low-density residential areas along Route 103 and up Roby Road. See **Appendix A. Zoning Districts Map**. Water quality land use controls are summarized in Table 3.10.

Sutton’s Zoning Ordinance 2019 includes:

- Septic setbacks of 50’ for poorly drained soils or 75’ for very poorly drained soils.
- Stream/river and surface water setbacks from 75’-125’, depending on soil conditions.
- Floodplain Development Ordinance.
- Steep Slope Overlay District, elevation change of 20’ or more and the slope is 20% or greater.
- Open Space requirements.
- Erosion and sediment control provisions.
- Wildlife habitat protection as part of the Wetlands Overlay District.
- Lot size calculation excludes wetlands.

Table 3.10 Sutton’s Zoning Districts and Requirements

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Regulations
Residential District	Two acres, 250' of road frontage. If bordering shoreline - 150' of frontage	46.5' from centerline of any road 2 rods wide, 55' from centerline of any road 3 rods wide, 63' from centerline of any road 4 rods wide / 15' / 15'	n/a / 35', Special Exceptions exist.	Applicable to cluster developments 10 acres or greater.
Rural - Agriculture	Two acres, 200' of road frontage. If bordering shoreline - 150' of frontage	66.5' from centerline of any road 2 rods wide, 75' from centerline of any road 3 rods wide, 83' from centerline of any road 4 rods wide / 25' / 25'	n/a / 35', Special Exceptions exist.	Applicable to cluster developments 10 acres or greater.

Source: Town of Sutton Zoning Ordinance 2019 regulations

Subdivision and site plan review regulations for Sutton include general guidance that due regard shall be given to brooks, streams, water bodies and other natural resources. Other important requirements include steep slope provisions, Environmental Impact Study for information on wetlands, floodplains, cultural resources and wildlife habitat, stormwater and erosion and sedimentation plans.

Webster

Webster has little land within the corridor. The Webster properties are all zoned Residential/Agricultural with low-density residential development along Dustin Road. See **Appendix A. Zoning Districts Map**. Webster’s water quality land use controls are summarized in Table 3.11.

Webster’s Zoning Ordinance 2017 includes:

- Septic system requirements that follow NHDES requirements.
- Waterbody setback (50’ for accessory and primary structures. Special Exception for accessory use within 20’ of water body.
- Floodplain Development Ordinance.
- Groundwater Protection Overlay District is an overlay zone that includes wellhead protection areas and areas of stratified drift. Prohibits hazardous waste, junkyards, wastewater treatment facilities and sets performance standards for other uses.
- Identifies the reduction on non-point source pollution as one of the purposes of the ordinance.

Table 3.11 Webster’s Zoning Districts and Requirements

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage / Height	Open Space Requirements
Residential/Agricultural District	Five acres, 250’ of road frontage	100’ / 50’ / 50’	Zoning Board of Adjustment	No

Source: Town of Webster Zoning Ordinance 2017 regulations

Webster has a general statement in their subdivision regulations to promote compact subdivisions that encourage open natural features. Other provisions include protection of natural features to ensure their protection, erosion control with no net change in runoff, and stormwater management requirements. Unsuitable lands for development are also defined, including floodplains, slopes in excess of 25% and poorly and very poorly drained soils. Site plan review regulations include general purpose statement of providing for adequate open spaces and green spaces, landscaping regulations, and an erosion and sedimentation plan.

As mentioned earlier, Webster adopted a Groundwater Protection District as an overlay zone that provides additional local restrictions on development on portions of town that are underlain by stratified-drift deposits. Webster’s Groundwater Protection District includes all Webster properties on both sides of Dustin Road; all Webster properties that are within the corridor are also subject to the groundwater protection regulations.

Hopkinton

That portion of Hopkinton within the corridor is zoned Residential/Agricultural and medium-density residential between the river and Route 103 around Park Avenue. Zoning at the confluence with the Contoocook River is high-density residential, which allows for the small residential lot sizes around Route 103 and Amesbury Road. Water quality land use controls of Hopkinton are summarized in Table 3.12.

Hopkinton’s Zoning Ordinance 2019 includes:

- Septic setbacks of 75’ to any wetland.
- Required setbacks of 75’ from any stream, surface water, and wetlands. No structures are allowed within the 75-foot buffers; stream and wetland crossings must be eliminated whenever possible.

- Stormwater and erosion and sediment control requirements for solar energy systems.
- Stormwater management provisions, increased shoreland protection for solid-waste facilities (both nonconforming and existing). Setbacks of 300 feet from the reference line of public waters and 300 feet from the ordinary high-water mark of rivers, ponds, or impoundments.
- Floodplain Development Ordinance.
- Environmental protection provisions related to hazards such as noise, odor, waste disposal, and environmental pollutants.
- Wildlife habitat protections in conservation subdivision ordinance.
- Conservation subdivisions under conservation ordinance are mandatory in zoning districts within the Warner River corridor unless the lots are greater than 10 acres, or there are five or fewer lots with no new roadways.

The subdivision regulations for Hopkinton include a general statement that an applicant should, to the extent possible, preserve wetlands, floodplains, steep slopes, watercourses, large or unique trees and scenic views. The planning board may require an undisturbed, naturally vegetated buffer along surface waters and wetlands, as well as other natural features that may be affected by erosion or stormwater runoff. Stream and wetlands crossings should be eliminated whenever possible. Other requirements include a site inventory map of all major natural features within 500’ of the proposed development, including aquifers, significant wildlife habitat, vernal pools, wetlands, slopes in excess of 25%, and agricultural soils of statewide and local significance. Erosion and sediment control plans, stormwater and landscaping plans, and open space provisions are additional requirements.

Site plan review regulations have similar requirements as the subdivision regulations. Of particular note are the open space landscape standards, including a soil management plan for any disturbed topsoil and subsoil.

Table 3.12 Hopkinton’s Zoning Districts and Requirements

Zoning District	Minimum Lot Area or Dimensions	Front / Side / Rear Setbacks	Max. Building Coverage % / Height	Minimum % Open Space/Lot
Residential/ Agricultural R-4*	120,000 square feet, 300' of road frontage.	60' / 30' / 60'	20 / 35'	70
Low Density Residential R-3*	120,000 square feet, 300' of road frontage.	60' / 30' / 60'	20 / 35'	70
Medium Density Residential R-2*	80,000 square feet, 250' of road frontage.	40' / 20' / 40'	30 / 35'	30
High Density Residential R-1*	60,000 square feet, 160' of road frontage. Other than residential - 15,000 square feet, 100'	30' / 15' / 40' Other than residential - 25' / 15' / 40'	30 / 35'	30

** Conservation subdivisions are mandatory in these districts, subject to certain exemptions. The dimension requirements for the districts in this Table do not apply to conservation subdivisions.*

Source: Town of Hopkinton Zoning Ordinance 2019 regulations

3.5 Open Space Summary

The five Warner River corridor communities have various regulations that are targeted towards protecting water resources like the Warner River, other surface waters, wetlands, and groundwater. The level of water resource protection in these regulations, both implicit and explicit, were instrumental in incorporating the Warner River into the Rivers Management and Protection Program. The five towns' master plans clearly state the necessity of preserving water resources like the Warner River. Within the individual town zoning ordinances, all five riverfront towns have water course, water body, and/or wetland setbacks or other protection regulations that offer varying degrees of protection to the resource. Only Sutton extends protection to vernal pools. All five have floodplain management regulations are in compliance with the state and FEMA model ordinances, with Warner adopting requirements more stringent than FEMA's minimum restrictions. All the towns have erosion and sediment control and stormwater management regulations in their subdivision and/or site plan review regulations and have adopted certain regulations in their ordinances. Wetland and surface water setbacks vary from town to town. Four of the five have the equivalent of an open space development ordinance. Webster has explicitly mentioned a provision to identify and reduce non-point source pollution. Only Webster has a groundwater protection overlay district.

Rivers do not recognize human-made boundaries, and consistency of regulatory methods and techniques, such as uniformly enforced riparian buffers and stormwater management requirements consistent between the riverfront towns, would greatly benefit the river and ensure a more comprehensive approach to protecting the Warner River's resources. Finding opportunities to work on closer intertown cooperation in regulatory and conservation matters would also be valuable to protecting the quality of the Warner River.

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Chapter 4. Community and Public Outreach

This Chapter summarizes some of the major themes that are supported by the survey results and public meetings for the Warner River corridor. By analyzing the results of the public outreach efforts, certain themes emerge and set the framework for identifying the challenges that need to be addressed through recommendations. For any management plan, this is an important step as public outreach should lead the discussion on issues and help to identify perceived gaps in current planning activities or policies within the Warner River corridor. The public's responses to the survey are a way to identify some of the issues and challenges that face the Warner River corridor.

It is clear from public outreach efforts that there is a deep appreciation for the quality of life in the five riverfront towns and the role the Warner River plays in supporting this interest. The concerns documented throughout the public outreach process provide an understanding of what residents feel strongly about concerning the Warner River and what current actions are working and where specific improvements should be considered. Current demographic, employment and social trends, such as an aging resident population, changing workforce, and lower rates of volunteerism, need to be considered while developing recommendations that help sustain the rural character of the Warner River corridor and the quality of life many residents value.

4.1 Opinion Survey

The opinion survey was available online and by paper copy for five months – from October 2019 through February 2020. WRLAC also mailed the Warner River riparian (riverfront) landowners directly to try to assure a significant response from this very important group. Announcements of the availability of the survey was through each of the five towns' websites, through the Warner Fall Foliage Festival, a number of public venues throughout the riverfront towns, as well as direct marketing by WRLAC. This survey was open to everyone in the five riverfront towns who wanted to share their thoughts on the Warner River's resources.

Appendix C. Survey Results contains the survey and a summary of the results. To retain the privacy of survey respondents, no personal information was collected, only the town in which the respondent lives. WRLAC received a total of 132 responses to the survey.

Riparian property owners were asked to provide responses to a specific part of the survey with questions tailored to them. Owners of Warner River riverfront property roughly between Water Street in Bradford and Amesbury Road in Hopkinton, or along Dustin Road in Webster, received a direct mailing from the Central

WHO TOOK THE SURVEY?



By Town:

WARNER

47%

61 people

SUTTON

19%

25 people

BRADFORD

15%

20 people

HOPKINTON

7%

9 people

WEBSTER

6%

8 people

OTHER

5%

7 people

New Hampshire Regional Planning Commission, on behalf of the WRLAC. In addition, the survey was promoted on the regional planning commission's and town websites and invited anyone within the five riverfront towns to respond. Of the 132 responses received, 32 responses were from riparian landowners.

4.2 What WRLAC Heard

The public opinion survey suggests that the residents of the riverfront towns feel a strong connection to the Warner River, and that there are opportunities to strengthen those bonds.

4.2.1 Riparian Responses

Attachment to the land and the river is a long-standing connection for riparian landowners. Out of the 29 landowners who responded to this question, 28% have lived there over 20 years, with another 28% living there from 10 to 19 years. Of note, however, is that 28% have lived in their riverfront homes less than five years. Over 68% of riparian owners chose to purchase their properties specifically due to the proximity to the Warner River. Land use along the river for those who responded is predominantly low-density residential and undeveloped woodlands with some in agricultural use (around 6%). Most landowners (61%) noted that they do not have trails on their property while 26% do have trails and allow public access. The majority of uses for those owners that do allow public access are passive recreation, including walking (42%), cross-country skiing (33%), fishing (33%), and swimming (21%). A small number of owners allow hunting (17%) and snowmobiling (8%). For those that allow public access, litter (39%) is the overwhelming problem for the landowners, followed by trespassing (16%), and noise at 10%. It should be noted that 52% of landowners stated that there have been no problems with public use of their lands.

Only 10% of riparian landowners have a conservation easement or other legal preservation mechanism on their property to protect their land and the riverfront. A strong majority (64%) is interested in implementing conservation or restoration practices for their property, particularly if there were financial incentives available.

4.2.2 Resident Responses

When asked about the most significant issues that could negatively impact the Warner River's resources, respondents identified development pressure as being of the greatest concern, at 59%. The other top issues are stormwater runoff (49%), lack of permanent land protection (48%), lack of public information (44%), and inbound migration of exotic/invasive species (43%). The lowest perceived impact was threats to drinking water supply at 26%.

Asked what qualities or uses of the Warner River are most important, the overwhelming response was preserving the high water quality at 95%. In descending order, the other high scores were for providing

wetland/wildlife habitat (90%), groundwater quality/quantity (80%), scenic value (73%), and public access (55%).

Preserving and restoring buffer zones for rivers, streams and wetlands scored the highest of actions that can be taken to protect the Warner River, with 78% citing that action as very important.

Other high-rated actions include preserving open space at 69%, improving agricultural practices (69%), keeping adequate river flow (66%), and reducing or limiting stormwater runoff at 63%.

A related question asked survey takers to rank the measures needed to protect the Warner River. About 72% of respondents felt that additional protections are needed, wetland conservation and protection rated next at 58%, followed by environmental planning for utility and highway projects at 52%, establishing and maintaining riparian buffers at 51%, conservation easements to protect sensitive areas at 51% and adoption of water quality goals, objectives, and recommendations into local master plans. Limiting shoreline development through land use zoning also ranked highly (48%).

Other questions in the survey focused on the personal habits that respondents have taken to protect the Warner River. Concerning the conservation of water and preserving water quality, most responded that they have tested their drinking water (64%), reduced their use of pesticides and other chemicals (64%), pumped their septic systems regularly (63%), changed how often they water their gardens and lawns (45%), and changed the way they landscaped their yards (39%). The most popular river-related activities for survey takers were walking and hiking (69%), performing land stewardship or monitoring programs (37%) and birdwatching (37%).

The last two survey questions asked about ways to provide more information to residents about the Warner River, and their likely topics of interest. The most popular topic was information on fish and wildlife habitat needs and protection (72%); followed by river protection techniques at 58%; landscape buffer protection, management, and restoration at 52%; and stormwater management at 47%. Pesticide management and home and garden landscaping rounded out the most popular topics. The overwhelming choice for receiving information on the Warner River corridor was through a website (73%), followed by hands-on activities like nature walks or guided hikes (54%) and fact sheets or articles at 33%.

WHAT ARE THE MOST SIGNIFICANT ISSUES THAT COULD NEGATIVELY IMPACT THE WARNER RIVER?

59% Development pressure and associated impacts

49% Stormwater runoff

48% Lack of permanent land protection

44% Lack of public information, education, and awareness related to Warner River issues

43% Exotic/invasive aquatic species

39% Lack of enforcement of regulations designed to protect natural resources (habitat, water quality, water supply)

38% Recreational abuses (noise, litter, erosion)

4.3 Outreach Themes

An important outcome of this outreach is the recognition of the importance of having a base of active community involvement and support. Engaging both riparian landowners and residents of the five riverfront towns is critical to the success of protecting the Warner River corridor. WRLAC will be able to use the results of the survey to build community interest, participation, and support of the recommendations in this Management Plan. Having an ongoing dialogue with residents, local volunteers, and officials involves sharing the concerns and challenges the Warner River corridor and its communities are facing. WRLAC will need to engage with residents as the WRLAC moves forward to implement the Plan's recommendations in Chapter 6.

Overall themes that can be summarized from the public outreach results are:

- Connect** This theme came through on several questions whether it was connecting the public to the resources of the river, working towards maintaining public access, or continuing land conservation efforts that support wildlife corridors.
- Sustain** Maintaining good water quality and adequate flows were stressed as important measures. Continuing to sustain wildlife/wetland habitat and the scenic views/open spaces were also important. Practicing best management techniques for minimizing and controlling stormwater runoff, agricultural operations, and land development were also highlighted as means for protecting groundwater quality and supplies.
- Improve** Educating the public about the importance of the Warner River's ecosystems was highly ranked in the survey responses. Identifying and implementing opportunities to improve education for residents on river protection techniques and fish and wildlife habitat were also important. An overwhelming number of residents (57%) wanted to learn more about the river through either a website or by participating in guided walks/tours. Coordinating protection efforts and improving the coordination of regulations that protect the river are important takeaways for the five towns in the Warner River corridor.
- Conserve** Preserving open space was identified as one of the most important measures that respondents want implemented. Preserving and restoring riparian buffers were specifically identified as important actions. Riparian owners also expressed a keen interest in doing more to protect the river on their own properties, such as employing best management practices for landscaping and pesticide use.

Chapter 5. Issues of Concern

Through this Plan, the WRLAC seeks to conserve and protect the Warner River corridor and its resources from the adverse environmental impacts of development and overuse and seeks to balance the needs of residents and visitors with the needs of wildlife, plant, and fish communities. Further, the WRLAC seeks to mitigate the adverse effects of climate change such as temperature fluctuation, severe floods, and droughts throughout the watershed. **Chapter 5. Issues of Concern** is the overall interpretation of the most critical issues, as identified through public outreach efforts, that communities need to address in continuing efforts to protect the corridor and its resources.

The natural resources of the Warner River corridor all revolve around the river and its water, and efforts to address issues of concern will require a holistic approach. Issues related to one specific issue cannot be effectively addressed without a full consideration of the possible impacts that regulatory and corrective measures, applied to improve or relieve one issue, could have on the others. The most critical issues for the designated Warner River and the surrounding corridor are not ranked for priority by the WRLAC at this time but are identified as:

- Water Resources Management.
- Habitat Loss and Fragmentation.
- Land Stewardship Sustainability.
- Funding Needs.
- Invasive Species Control.
- Public Access for Recreation.
- Inconsistent Land Use Regulations.
- Public Outreach and Education Needs.

5.1 Water Resources Management

The most important issue facing the Warner River is protection of the quality of the water. The chemistry of the groundwater and the surface water can both be affected by human activities, whether they be development; roadway building, maintenance, and deicing; or discrete releases of contaminants or pollutants. Protecting the quality of the water in the river requires a focus on all the aspects that control the water quality, from the river's sources in the headwaters on the slopes of Mount Sunapee and Mount Kearsarge, to the eventual discharge point at the Contoocook River.

5.1.1 Natural River Quality and Possible Impacts

The quality of the river water at the headwaters is very good, and shows little to no impact from human inputs, except for the air-borne mercury and acid precipitation that has already affected all the waters of

New Hampshire and New England. At the highest reaches of the river, as it rises and runs through undeveloped woodlands and sparsely developed residential areas, the possibility of pollutants degrading the natural quality is remote. As the water continues its journey downstream through its developed reaches, the potential increases markedly that the chemistry and the quality of the water will be affected by releases of contaminants from discrete point sources and from the more diffuse nonpoint sources of pollution. As “guardians” of the river, WRLAC will need to be alert and prepared to address these threats. Much can be accomplished in advance to prepare the riverfront towns to directly confront the risks to the quality of the water in the Warner River. These protection efforts will need to be funded and policed at the local level, through the town governments, and as guided by state regulations and policies. Much of WRLAC’s attention will be drawn toward preserving and protecting the quality of the water in the river.

5.1.2 Nonpoint Sources of Pollutants

The nonpoint source of pollutants that has, perhaps, the most potential adverse effect on the river is stormwater running off directly into the river without detention storage or treatment to remove pollutants. Nearly everyone has seen the negative effects of stormwater at one time or another. Stormwater runoff occurs when water from intense rain and snowmelt flows overland instead of soaking into the ground. As the water flows, it can pick up contaminants, such as sediment, nutrients, heavy metals, pathogens, and toxins that can then pollute the river. Increases in stormwater runoff can increase the occurrence of flooding and can cause erosion of the riverbanks and channel, and potentially causing harm to surrounding habitats. Flooding also can cause damage in developed areas where development has been allowed to occur at elevations below the flood elevations and in other developed areas without adequate stormwater management.

Educating the community about water quality and stormwater should be a priority so that people become aware of why they should care about stormwater and fund improvements to stormwater management systems. Survey results indicate that reducing or limiting the impacts to the river from stormwater runoff is an important action that respondents want to see addressed. Stormwater management regulations and requirements for utilizing best management practices for commercial and residential development should be reviewed for consistency between the riverfront towns. Publicizing the role that wetlands exert on water quality protection is another important strategy.

The second most likely nonpoint source of pollutants to the river is from winter roadway deicing and maintenance. Sand and salt used in winter road maintenance during the cold weather months is the cause of the high levels of electrical conductivity (due itself to the sodium and chloride ions from the salt) in the river water through runoff of roads, driveways, and parking lots. Due to chloride’s highly soluble nature, it often settles at the bottom of a water body, where it can be toxic to aquatic life at high concentrations. Sodium, due to its chemical properties, often undergoes ion exchange, which can alter soil and sediment chemistry by releasing nutrients like calcium, magnesium and potassium into groundwater and surface water. Many towns have winter maintenance policies that attempt to balance safe travel with environmental impacts. These policies should address current equipment status, treatment of roads, materials used, and guidelines for

winter safety. Public works employees should be state-certified under the state Green SnowPro training program implemented by NHDES. Legislation was initially introduced in 2020 as SB713-FN to adapt the program for towns, but legislation stalled due to the COVID-19 emergency, so the bill may be reintroduced in 2021 or future years. Some communities have attended the training, however, and follow some of the recommendations.

Measures to reduce surface runoff can be incorporated into the design of new developments, such as Low Impact Development, that can reduce impacts to surface water. In addition, surface water specialists can implement measures to reduce or eliminate adverse impacts from stormwater generation at existing residential and commercial developments.

5.1.3 Water Quantity Protection

The amount of surface water and groundwater in the corridor should be protected, and its use continued under the reasonable use doctrine. At the present time, the supplies available in the watershed appear to be adequate for the known consumptive uses and to provide adequate wildlife habitat. However, water must remain readily available for human use so as to not impair economic and population growth. Regulatory mechanisms might be needed to prevent possible conflicts between competing uses of the resource.

The [NHDES Instream Flow \(ISF\) Program](#), supported by NH RSA 483 and [Administrative Rules ENV-Wq-1900](#), develops river-specific numerical criteria for stream flow protection and water management plans to implement those criteria. The purpose of the ISF is to ensure rivers continue to flow freely despite human influences such as irrigation, drinking water, or land use changes. Registered water users will be required to take steps to prevent water loss and waste, during low flow users will be required to reduce water withdrawals, and two-day relief pulse of water may be released from dams. The ISF applies to all of the designated rivers in New Hampshire.

In 2018, the Warner River was one of three rivers designated as the highest priority for an Instream Flow Study. The Warner River's Protected ISF Study and Management Plan project is expected to begin in 2021 and conclude in 2022. The study includes calculations of river flow conditions which protect aquatic organisms. Then, the management plan is drafted, describing how water users will operate to satisfy their water needs while maintaining the protected flow conditions.

5.1.4 Aquatic Organism Passage

Trout Unlimited's Basil W. Woods, Jr. Chapter, NH Fish and Game Department, and NH Geological Survey collaborated on an assessment of the physical characteristics of the Warner River watershed's culverts and other stream crossings, which was completed in February 2019. The assessment rated each stream crossing for its Aquatic Organism Passage capability. Most of the watershed's culverts were rated as either "Reduced" or "No Aquatic Organism Passage", indicating that most of the crossings do not allow unrestricted passage to

migrating fish and other aquatic organisms from one side of a road to the other⁵. As an indicator of the overall watershed health, fish in the river and its tributaries need to be able to travel as freely as possible throughout the watershed.

5.2 Habitat Loss and Fragmentation

A major threat to wildlife diversity is sprawl - the dispersed and cumulative development pattern that consumes the rural landscape and fragments the habitat through changes in the landscape from roads, driveways, and manicured lawns. Wildlife sensitive to human encroachment becomes restricted to progressively smaller blocks of undisturbed land, resulting in a loss of native plants, a reduced breeding gene pool, a loss of natural predators, and an increase in wildlife's susceptibility to disease. The size of undeveloped forest lands affects many species, even if other habitat features remain the same. Loss of habitat, especially through fragmentation of large blocks of connected, undeveloped land during development, is a critical factor facing New Hampshire and the corridor.

For optimum wildlife habitat, blocks of unfragmented land should be protected from development and other kinds of significant human activity. Unfragmented lands are generally considered to be large pieces of land that are not crossed by Class V maintained roads. These areas can include forests, meadows, open water, wetlands, and agricultural fields and may include many different landowner parcels. Unfragmented lands often encompass multiple habitat types providing safe travel corridors and migration pathways for wildlife.

The Warner River corridor is a significant wildlife migration route because the corridor is largely undeveloped woodlands that connect large blocks of undeveloped woodlands and wetlands all around; some of those undeveloped surrounding lands are protected, others are undeveloped and privately held without protections. For example, a large section of corridor serves as an important connection between the Chandler Reservation, the Warner Town Forest, and Mount Kearsarge State Forest Park, and other protected or conserved lands. This creates a wildlife corridor reaching from just south of the Warner River into Sutton, Wilmot, Andover and Salisbury to the north totaling nearly 12,000 acres of conservation land.

The river is used by waterfowl, songbirds, and raptors on their annual migrations. It also contains several areas of unfragmented blocks of land which are used by wildlife for general habitat, breeding, and movement.

The Town of Warner's 2011 Master Plan declared that the Warner River corridor is a town conservation priority. The corridor is the most developed part of town, yet the corridor also contains a significant aquifer and the town's current water supply wells, as well as the river itself. The 2009 Warner Natural Resources Inventory specifically notes the importance of the town's stream networks and shoreline areas and their function as critical wildlife corridors used by Warner's terrestrial wildlife. The diversity of the Warner River itself, from its rapids, riffles, and backwaters to floodplain bogs and other wetlands, host a variety of aquatic

⁵ NH Fish and Game Department, Status of Stream Crossings in the Warner River Watershed, February 2019

organisms that rely on specific fluvial characteristics to create their niche habitats. The Warner River has approximately 23 miles of shoreline within the town, which provides both human and wildlife benefits.

Bradford's 2004 (and the 2020 Draft) Master Plan identifies the Warner River as the most notable riparian corridor in town. Several key waterbodies flow into the Warner River including Lake Todd and Lake Massasecum, the latter of which hosts a rare Inland New England Acidic Pond Shore Community. The Master Plan recognizes the importance of preserving river corridors to mitigate the threats these corridors face, most often related to land-development activities. Large mammals observed in Bradford include moose, black bear, fisher, and bobcat. These species use corridors like the Warner River to travel significant distances. In an economy that relies on wildlife observation, fishing, and hunting, the riverfront towns recognize the importance of maintaining these corridors in a condition suitable to host wildlife.

Corridors and greenways are used by wildlife and by people, including along the Warner River.

Pursuing both recreational opportunities and conservation lands along the same corridor can sometimes result in unintended conflicts. In many cases, excessive recreational use can degrade a corridor by compacting the soil, promoting soil erosion, and harming native plant growth, and reducing the amount of food for wildlife, all of which degrades the habitat for wildlife. Maintaining undeveloped corridors and monitoring or restricting human use ultimately improves the biological viability of the animals, particularly the larger mammals and amphibians.

5.3 Land Stewardship and Sustainability

The Warner River corridor is an asset valued by the residents and by the state of New Hampshire. Stewardship plays an important role in the acquisition and maintenance of conserved lands. Maintaining trails, along with other activities such as monitoring easements and controlling invasive species, often fall to volunteers on conservation commissions or those serving on other local committees. Enjoying trails and other passive recreational uses of properties within the Warner River corridor are some of the most popular activities engaged in by residents and visitors. Over 64% of the riparian landowners who responded to the opinion survey expressed interest in pursuing conservation or landscape restoration practices on their lands.

Stewardship of the corridor's natural resources requires a multi-faceted approach. Conservation lands and trails, rivers and streams, wildlife and wetland habitat, and open space are all ecologically intertwined, but each have their own unique challenges, regulatory ramifications, and protection mechanisms. Continuing to protect important lands within the Warner River corridor is critical, particularly in seeking new opportunities to coordinate protection actions with the five riverfront towns and improving regional cooperation and communication with the towns and the regional conservation organizations.

Riparian buffers are a river's key ingredient against excessive bank erosion, flooding damage, habitat protection, and water pollution from non-point sources. Encouraging the riparian landowners to retain and enhance their buffers through education is another important focus for WRLAC. The five riverfront communities should examine their buffer regulations and compare them to the other riverfront towns.

Enlisting volunteers and landowners willing to act as stewards who will assume the responsibility of educating residents about the designated Warner River is a challenge. Active participation and investment by WRLAC can inspire others to get involved. The majority of respondents to the opinion survey agreed that conservation initiatives are important for the river corridor. WRLAC will be the key to cultivating stewardship for conservation efforts in the riverfront towns.

5.4 Funding

Activities such as land acquisition, public education, trail development and maintenance, and invasive species control all come with a cost. Conservation projects usually require funding strategies that combine resources from towns, government grants, and private donations. Community awareness and volunteerism will play an integral role in garnering support and funding for projects that promote management, planning, and restoration projects that could be implemented by WRLAC. Most of the survey respondents indicated that creation of a website would be a critical vehicle for sharing information and education resources. Establishing an active and vital website would require not only funding for development and hosting, but a stream of volunteers to design and continuously maintain the website. Going forward, obtaining funding for WRLAC's goals and objectives will become an important task.

5.5 Invasive Species Control

Invasive species are an increasing concern in most New Hampshire communities and watersheds, particularly as a threat to native plants and wildlife due to their ability to reproduce rapidly with no predators or other natural controls. There are certainly outbreaks in the five riverfront towns, but none are known to be located within the Warner River ½ mile corridor itself. For instance, Lake Massasecum has an active variable milfoil infestation. Some are less vulnerable to diseases than native species and are resistant to removal efforts. Invasive species are competitive with the native plants and animals, decreasing New Hampshire's ecological diversity and native habitat. Working with the five riverfront towns and the state of New Hampshire to coordinate prevention and/or eradication efforts should be a priority for the WRLAC.

5.6 Public Access for Recreation

Recreational use of the corridor and its resources requires public access. Public access for outdoor recreation was a consistent interest of respondents to the opinion survey, as well as being critical to the health and quality of life of residents and visitors. Protecting open space and ensuring public access, as well as providing information on recreation opportunities are important goals that will help to connect people to the outdoors

and promote a healthy lifestyle for residents. Over 90% of survey respondents think that public access and preserving open space is either important or somewhat important to their quality of life. Recreation, scenic views, and an appreciation of natural resources all play a key role in the local and state economy, either through tourism or by attracting future residents expressly for the quality of life they can experience here. People are drawn to the area largely from their appreciation of the corridor's natural resources, the environment, and recreation opportunities.

Hiking paths and foot trails create ready opportunities to access open lands and allow residents and tourists to enjoy the outdoors. Working on ways to improve public access points, and very importantly, to control any misuse in the river corridor are current challenges and will provide WRLAC with an opportunity to work on potential solutions to these ever-growing conflicts. Recreational use must be balanced with the needs of the natural communities and property owners so that all can peacefully coexist.

5.7 Inconsistent Land Use Regulations

Rivers do not respect governmental boundaries! If communities want to protect the designated Warner River or its ½ mile corridor, it is important to review the municipal mechanisms for land use development and evaluate opportunities to improve consistency with regulations and policies within and among riverfront towns. An open dialogue among towns is a simple starting point. The disconnect between how communities typically operate and how the natural resources ecosystem functions has been well documented by many studies and reports.

Reconnecting water and land use across town boundaries will benefit each community's efforts at natural resource protection. Keeping communities sustainable is an important goal for all Warner River communities but reaching across town boundaries is often difficult. With the development of this Corridor Management Plan and the availability of the Central NH Regional Planning Commission, there is a growing awareness and interest in new approaches. The WRLAC can be part of this new approach by providing opportunities for local leaders to interact with one another, perhaps building partnerships and collaborating on new policies and initiatives. Developing regional and local leaders who want to work together on the Warner River corridor should be an important strategy for the WRLAC. Efforts to provide protections to the corridor will benefit from land use regulations that are consistent and applied uniformly between the five riverfront towns.

5.8 Public Outreach and Education Needs

Educating the public more about the importance of the designated Warner River is a clear priority, as survey respondents expressed an interest in learning more about the river and its resources. Over 72% want more information on fish and wildlife habitat needs and protection and 57% want to learn more about land protection techniques. Delivering this type of education will be a challenge for the WRLAC as most survey takers wanted to see a website (73%) and actual workshops or guided walks as the most popular venues. Seeking funding for a website and volunteers for specific programs/activities should be a priority for the WRLAC.

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Chapter 6. Goals and Objectives

Using public input and the array of data available, including a review of master plans and land use regulations for Bradford, Warner, Sutton, Hopkinton, and Webster, the overall goals and focused objectives frame and support the work that the WRLAC will accomplish to further the management of the river corridor. These work activities to be completed will be referred to as actions.

Goals are the long-term vision principles of the WRLAC that summarize the desired outcomes and purposes of the Plan. Objectives are detailed, focused, and measurable strategies to attain the goals. Actions are the specific work activities to be completed to accomplish the objectives. Objectives and actions together support the Corridor Management Plan’s goals.



Accomplishing WRLAC’s general goals and objectives requires an extensive collaboration and coordination effort among the governments of the five riverfront towns, landowners, citizens, and NHDES. WRLAC will also require funding sources as there are real costs associated with most of the action items. Successfully protecting the designated Warner River and the surrounding ½ mile corridor with its valued assets cannot be accomplished without the financial support of and the commitment and the appreciation for the watershed’s natural resources by landowners, town officials, volunteers and others.

The actions appear in a separate document, Appendix B. Action Plan, to enable the actions to be more readily accomplished and updated by WRLAC and partners. Each action is designed with the timeframe for completion, relative cost, responsibility, partners, and more.

Through this Corridor Management Plan, the goals and objectives of the WRLAC are listed below:

6.1 Goal: Promote Conservation Programs and Projects that Protect the Water and Aquatic Resources of the Warner River Watershed.

- 6.1.1 Objective:** Encourage good management and monitoring of the entire Warner River watershed to help ensure both watershed and river corridor health.
- 6.1.2 Objective:** Actively seek funding from USEPA and NHDES to restore reaches of the river that do not meet surface water quality goals.
- 6.1.3 Objective:** Encourage partnerships with the watershed's lake associations (Lakes Todd, Winnepocket, and Massasecum and Blaisdell and Kezar Lakes) to promote better overall watershed water quality.
- 6.1.4 Objective:** Support NHDES efforts to provide fluvial erosion hazard assessments where needed.
- 6.1.5 Objective:** Support efforts to more accurately map the stratified drift aquifers, delineate the areas which provide water to the public water supply sources, and protect land areas above the moderate- to high-capacity stratified drift aquifers for potential future drinking water supplies.
- 6.1.6 Objective:** Encourage municipal governments to reduce their water use, employ conservation measures and implement actions which promote the protection of the Warner River corridor's water quality and water flow levels.
- 6.1.7 Objective:** Ensure the continuation of long-term water quality and flow records, including actions to ensure the US Geological Survey continues to maintain and operate the Davisville Gaging Station.
- 6.1.8 Objective:** Support and publicize the upcoming NHDES Instream Flow Study.
- 6.1.9 Objective:** Review information collected through long term monitoring programs developed by the WRLAC, lake associations, state agencies and other organizations throughout the watershed and identify any actions necessary to address impairments to water quality and flow and help ensure watershed and river corridor health.
- 6.1.10 Objective:** Work with regional stakeholders to identify, prioritize and implement strategies and actions that protect and restore water quality and high priority aquatic habitats throughout the watershed and river corridor.

[Available guidance resources include the Warner River Watershed Conservation Project watershed summary report, the NH Wildlife Action Plan, species recovery plans and the DES Aquatic Restoration Mapper.]

6.2 Goal: **Develop Strategies to Reduce Habitat Loss and Fragmentation.**

6.2.1 Objective: Work cooperatively with the five riverfront towns to protect the Warner River’s natural resources from habitat loss and fragmentation.

6.2.2 Objective: Work to connect conservation lands across municipal boundaries for an extended trail system and extended wildlife corridors.

6.3 Goal: **Promote Corridor Land Stewardship and Sustainability.**

6.3.1 Objective: Protect the ecosystem of the Warner River corridor through active coordination with the towns and landowners.

6.3.2 Objective: Actively engage property owners along the Warner River and seek their support as stewards of the river’s resources while respecting their interests and property rights.

6.3.3 Objective: Establish WRLAC as a regional forum for sharing concerns, discussing issues, and finding areas of cooperation for the riverfront towns.

6.4 Goal: **Control and Mitigate the Impact of Invasive Species.**

6.4.1 Objective: Work with the five corridor towns, landowners, the state, and others to coordinate programs to prevent invasive species from migrating into the corridor, and to control invasive species when they arrive.

6.4.2 Objective: Work with other groups and volunteers on an invasive species management program for the Warner River.

6.5 Goal: Create More Opportunities for Public Recreational River Access.

6.5.1 Objective: Promote responsible community use of the river, riparian lands, and the corridor lands.

6.5.2 Objective: Seek funding for work on trails management and acquisitions.

6.5.3 Objective: Encourage communities and organizations to purchase and utilize riverfront properties for public recreational purposes.

6.6 Goal: Revise Inconsistent Environmental Land Use Regulations.

6.6.1 Objective: Work with the five riverfront towns to coordinate land use regulations as needed to ensure more consistency and uniformity in protecting the Warner River.

6.6.2 Objective: Serve as a regional forum for fostering awareness of land and water uses that impact the Warner River and for the support of local planning mechanism and best practices.

6.7 Goal: Undertake Public Outreach and Education Programs.

6.7.1 Objective: Improve public outreach on the Warner River's natural resources.

6.7.2 Objective: Co-sponsor outdoor environmental outreach events such as guest speakers, fairs, river tours, bird-watching tours, walks, workshops, educational activities, etc. related to, strengthening relationships with surrounding communities and agencies.

WRLAC considers its Action Plan for the future management of the Warner River corridor to be the items shown in **Appendix B. Action Plan**. This Action Plan includes best estimates of approximate cost, timeframe, and perceived responsibility. The WRLAC will work to encourage the Action Plan items to be regularly reviewed and prioritized by the riverfront communities.

New Actions are welcome for consideration into the Action Plan.

Appendix A. Map Folio

The following maps are available in 11x17" format accompanying this document.

- River Classifications Map
- Prime Farmland Soils Map
- Water Resources Map
- Wetlands Map
- Stream Crossing Aquatic Organism Passage Map
- Wildlife Habitat Ranking with Conservation Lands Map
- Cultural and Recreational Resources Map
- State Owned Lands Map
- Conservation Lands Map
- Zoning Districts Map

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Appendix B. Action Plan

Land use decisions in New Hampshire are generally made at the local level by town Planning Boards. Additional input for specific aspects such as wetlands protection and automobile junkyard licensing are provided by Conservation Commissions and Select Boards. WRLAC foresees its future role as assisting the local municipal governments, regional land use agencies, and non-governmental organizations with strengthening ties among the five riverfront towns while protecting the natural resources of designated Warner River and its ½ mile corridor.

Appendix B is the Action Plan that will assist in the future local management of the designated Warner River corridor. Included are approximate estimates of each Action Item’s cost and timeframe in addition to the local agencies best able to implement the ideas. WRLAC will regularly review this Action Plan and periodically reassess the priorities in coordination with the riverfront communities.

WRLAC’s future role will be one of working in collaboration with the five riverfront communities of Bradford, Warner, Sutton, Hopkinton, and Webster regarding land use decision making within the designated Warner River corridor. The Action Plan is the “wish list” of identified measures to be achieved by the local Select Boards, Planning Boards, and Conservation Commissions of the riverfront towns to provide protections to the Warner River. Guidance and support will be provided by WRLAC and other agencies, such as the Central NH Regional Planning Commission, NH Department of Environmental Services and other state agencies, and nongovernmental organizations. The call to action that follows is meant to be both aspirational and inspirational: We aspire to focus our energy on our goals, and we hope to inspire the local communities to enact protection efforts of their own by using our Action Plan as their guide.

Action Plan Keys:

Approximate Cost

\$	Low Cost (< \$500)
\$\$	Medium Cost (\$500 - \$2,000)
\$\$\$	High Cost (> \$2,000)

Action Timeframe to Completion

Short Term	1-2 Years
Moderate Term	3-5 Years
Long Term	Over 5 Years

The Action Plan should be actively utilized, reviewed, and amended by the WRLAC and the riverfront communities, with an annual status report submitted to NHDES. WRLAC will work with the local agencies to establish priorities for implementation.

New Actions are welcome for consideration into the Action Plan.

Warner River Corridor Management Plan 2020

The Action Plan continues from Chapter 6 of the Corridor Management Plan and is numbered to refer to goals and objectives content of that Chapter. New actions will be added as other are completed.

6.1 Goal: Promote Conservation Programs and Projects that Protect the Water and Aquatic Resources of the Warner River Watershed.

Table 6.1 Water Resources Management Actions

Water Resources Management Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.1.1 Objective: Encourage good management and monitoring of the entire Warner River watershed to help ensure both watershed and river corridor health.							
6.1.1-1	Monitor the 303(d) impairment listings.	2020	Moderate Term	\$\$	WRLAC with NHDES to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
6.1.1-2	Work with CNHRPC to generate an inventory of potential sources of contamination within the corridor (provide the inventory as a spreadsheet and GIS map).	2020	Long Term	\$\$\$	WRLAC, NHDES and CNHRPC to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
6.1.1-3	Work with the NHDES's Dam Bureau dam in order to update the dam registrations and conditions and provide a more accurate depiction of the dams and their use and ownership.	2020	Long Term	\$	WRLAC, with NHDES to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
6.1.1-4	Request that New Hampshire Geological Survey perform an up-to-date water balance for the Warner River watershed.	2020	Long Term	\$	WRLAC with NHDES	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
6.1.1-5	Consider new collaborative partnerships with all watershed towns, including Newbury and New London, to ensure support health.	2020	Long Term	\$	WRLAC with NHDES, NHFG, Trout Unlimited	<ul style="list-style-type: none"> • TBD • TBD • TBD • 	
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	

Warner River Corridor Management Plan 2020

Water Resources Management Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.1.2 Objective: Actively seek funding from USEPA and NHDES and other sources to restore reaches of the river that do not meet surface water quality goals.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.3 Objective: Encourage partnerships with the watershed's lake associations (Lakes Todd, Winnepocket, and Massasecum and Blaisdell and Kezar Lakes) to promote better overall watershed water quality.							
6.1.3-1	Publicize impaired waters so residents recognize the quality concerns.	2020	Short Term	\$	Conservation Commissions	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.4 Objective: Support NHDES efforts to provide fluvial erosion hazard assessments where needed.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.5 Objective: Support efforts to more accurately map the stratified drift aquifers, delineate the areas which provide water to the public water supply sources, and protect land areas above the moderate- to high-capacity stratified drift aquifers for potential future drinking water supplies.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.6 Objective: Encourage municipal governments to reduce their water use, employ conservation measures and implement actions which promote the protection of the Warner River corridor's water quality and water flow levels.							
6.1.6-1	Establish a groundwater level monitoring program with Warner Village Water District.	2020	Moderate Term	\$\$	Warner Village Water District, with WRLAC to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.1.6-2	Support and publicize municipal household hazardous waste collection days and municipal solid waste reduction efforts.	2020	Short Term	\$\$	Conservation Commissions and Select Boards	<ul style="list-style-type: none"> TBD TBD TBD 	
6.1.6-3	Encourage the riverfront towns with town sand	2020	Short Term	\$	Conservation Commissions	<ul style="list-style-type: none"> TBD 	

Warner River Corridor Management Plan 2020

Water Resources Management Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
	pits to employ Best Management Practices as needed.					<ul style="list-style-type: none"> TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.7 Objective: Ensure the continuation of long-term water quality and flow records, including actions to ensure the US Geological Survey continues to maintain and operate the Davisville Gaging Station.							
6.1.7-1	Publicize the importance of the Davisville Gaging Station.	2020	Short Term	\$	WRLAC, with Conservation Commissions to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.8 Objective: Support and publicize the upcoming NHDES Instream Flow Study.							
6.1.8-1	Encourage town energy committees to evaluate river reaches for their in-stream hydroelectricity capabilities.	2020	Short Term	\$	Town energy committees and Select Boards	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.9 Objective: Review information collected through long term monitoring programs developed by the WRLAC, lake associations, state agencies and other organizations throughout the watershed and identify any actions necessary to address impairments to water quality and flow and help ensure watershed and river corridor health.							
6.1.9-1	Share VRAP and other water quality monitoring data with the town governments, the watershed public, and lake associations.	2020	Short Term	\$	WRLAC	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.1.10 Objective: Work with regional stakeholders to identify, prioritize and implement strategies and actions that protect and restore water quality and high priority aquatic habitats throughout the watershed and river corridor.							

Warner River Corridor Management Plan 2020

Water Resources Management Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
<p><i>[Available guidance resources include the Warner River Watershed Conservation Project watershed summary report, the NH Wildlife Action Plan, species recovery plans and the DES Aquatic Restoration Mapper.]</i></p>							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	

6.2 Goal: Develop Strategies to Reduce Habitat Loss and Fragmentation.

Table 6.2 Habitat Loss and Fragmentation Actions

Habitat Loss and Fragmentation Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
<p>6.2.1 Objective: Work cooperatively with the five riverfront towns to protect the Warner River's natural resources from habitat loss and fragmentation.</p>							
6.2.1-1	Encourage mapping between the five towns that will be useful in identifying high priority wildlife areas and corridors.	2020	Moderate Term	\$\$\$	WRLAC, with CNHRPC to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.2.1-2	Assist the riverfront towns' departments of public works in replacing existing culverts with more environmentally compatible stream crossings.	2020	Short Term	\$	WRLAC, with Conservation Commissions and Select Boards to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.2.1-3	Implement a public education program or combine with other efforts to educate the public about the presence of endangered, threatened, and/or species of special concern.	2020	Moderate Term	\$\$	Conservation Commissions, with Lake Associations to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	

Warner River Corridor Management Plan 2020

Habitat Loss and Fragmentation Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.2.2 Objective: Work to connect conservation lands across municipal boundaries for an extended trail system and extended wildlife corridors.							
6.2.2-1	Conduct annual meetings with the local land conservation trusts to discuss potential collaborations and initiatives.	2020	Short Term	\$	WRLAC, with Conservation Commissions to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	2020
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	

6.3 Goal: Promote Corridor Land Stewardship and Sustainability.

Table 6.3 Land Stewardship and Sustainability Actions

Land Stewardship and Sustainability Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.3.1 Objective: Protect the ecosystem of the Warner River corridor through active coordination with the towns and landowners.							
6.3.1-1	Develop educational programs that encourage stewardship or conservation practices for riparian landowners.	2020	Short Term	\$	Conservation Commissions	<ul style="list-style-type: none"> TBD TBD TBD 	
6.3.1-2	Identify and work with those riparian landowners who allow public access to assist in control of trash, noise, illegal access, and vandalism.	2020	Moderate Term	\$	Conservation Commissions	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.3.2 Objective: Actively engage property owners along the Warner River and seek their support as stewards of the river’s resources while respecting their interests and property rights.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.3.3 Objective: Establish WRLAC as a regional forum for sharing concerns, discussing issues, and finding areas of cooperation for the riverfront towns.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	

6.4 Goal: Control and Mitigate the Impact of Invasive Species.

Table 6.4 Invasive Species Control Actions

Invasive Species Control Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.4.1 Objective: Work with the five corridor towns, landowners, the state, and others to coordinate programs to prevent invasive species from migrating into the corridor, and to control invasive species when they arrive.							
6.4.1-1	Seek out volunteers to work on management and restoration programs within the corridor and coordinate activities with other groups and the Department of Agriculture, Markets and Food.	2020	Moderate Term	\$	WRLAC, with Conservation Commissions to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	
6.4.2 Objective: Work with other groups and volunteers on an invasive species management program for the Warner River.							
6.4.2-1	Implement a public education program or combine with other efforts to educate the public about invasive species and the need for preventing them.	2020	Moderate Term	\$\$	Conservation Commissions, with Lake Associations to assist	<ul style="list-style-type: none"> • TBD Website • TBD • TBD 	
6.4.2-2	Monitor the known invasive species in the five waterfront towns and establish a public reporting method for the watershed.	2020	Moderate Term	\$	WRLAC, with Conservation Commissions to assist	<ul style="list-style-type: none"> • TBD Website • TBD • TBD 	
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	

6.5 Goal: Create More Opportunities for Public Recreational River Access.

Table 6.5 Public Access for River Recreation Actions

Public Access for River Recreation Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.5.1 Objective: Promote responsible community use of the river, riparian lands, and the corridor lands.							
6.5.1-1	Work with landowners and towns on improving access along the corridor by erecting signs, developing maps, and creating a website to post relevant information.	2020	Short Term	\$\$	WRLAC, with Conservation Commissions and CNHRPC to assist	<ul style="list-style-type: none"> • TBD • TBD • TBD 	
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	
6.5.2 Objective: Seek funding for work on trails management and acquisitions.							
6.5.2-1	Work with town economic development advisory committees to publicize existing trails.	2020	Short Term	\$\$	Town economic development committees	<ul style="list-style-type: none"> • TBD Kiosk • TBD Website • TBD 	
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	
6.5.3 Objective: Encourage communities and organizations to purchase and utilize riverfront properties for public recreational purposes.							
	NEW ACTION					<ul style="list-style-type: none"> • TBD 	

6.6 Goal: Revise Inconsistent Environmental Land Use Regulations.

Table 6.6 Inconsistent Land Use Regulations Actions

Inconsistent Land Use Regulations Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.6.1 Objective: Work with the five riverfront towns to coordinate land use regulations as needed to ensure more consistency and uniformity in protecting the Warner River.							
6.6.1-1	Establish procedures for automatic noticing of WRLAC to receive permit applications for projects proposed in the corridor.	2020	Short Term	\$\$	WRLAC and Town Administrators	<ul style="list-style-type: none"> TBD TBD TBD 	
6.6.1-2	Encourage the towns to enact stringent wetlands and surface water protection ordinances with buffer requirements.	2020	Moderate Term	\$\$	Conservation Commissions, Planning Boards, with WRLAC assistance	<ul style="list-style-type: none"> TBD TBD TBD 	
6.6.1-3	Encourage development of aquifer protection ordinances in Warner and Bradford.	2020	Moderate Term	\$\$\$	WRLAC and Planning Boards, with CNHRPC to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.6.1-4	Support the continued and appropriate regulation of sand and gravel excavation areas in the watershed by local planning boards.	2020	Moderate Term	\$\$\$	WRLAC and Planning Boards, with CNHRPC to assist	<ul style="list-style-type: none"> TBD TBD TBD 	2020
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.6.2 Objective: Serve as a regional forum for fostering awareness of land and water uses that impact the Warner River and for the support of local planning mechanism and best practices.							
6.6.2-1	Conduct annual meetings among the five riverfront towns' Conservation Commissions to discuss potential collaborations and initiatives.	2020	Short Term	\$	WRLAC and Conservation Commissions, with CNHRPC to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.6.2-2	Encourage the preparation of water resources management plans for the Master	2020	Long Term	\$\$\$	WRLAC, with CNHRPC and NHDES to assist	<ul style="list-style-type: none"> TBD TBD TBD 	

Warner River Corridor Management Plan 2020

Inconsistent Land Use Regulations Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
	Plans for the five riverfront towns.						
	NEW ACTION					<ul style="list-style-type: none"> TBD 	

6.7 Goal: Undertake Public Outreach and Education Programs.

Table 6.7 Public Outreach and Education Actions

Public Outreach and Education Actions					Action Status		
Action Number	Action	Year Added to Plan	Action Timeframe	Cost Estimate	Perceived Responsibility	Subtasks (When Identified)	Date Last Reviewed
6.7.1 Objective: Improve public outreach on the Warner River's natural resources.							
6.7.1-1	Publicize WRLAC through a mailer in the Warner Village Water District annual report.	2020	Short Term	\$	WRLAC, with Warner Village Water District to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
6.7.1-2	Design and host a website for the Warner River designated river corridor as a source of information on activities of the WRLAC and other topics.	2020	Short Term	\$\$	WRLAC, with Lake Associations to assist	<ul style="list-style-type: none"> TBD TBD TBD 	
	NEW ACTION					<ul style="list-style-type: none"> TBD 	
6.7.2 Objective: Co-sponsor outdoor environmental outreach events such as guest speakers, fairs, river tours, bird-watching tours, walks, workshops, educational activities, etc. related to, strengthening relationships with surrounding communities and agencies.							
	NEW ACTION					<ul style="list-style-type: none"> TBD 	

New Actions are welcome for consideration into the Action Plan.

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Appendix C. Survey Results

The following October 2019 in Survey Monkey survey results are available in PDF format accompanying this document.

- Warner River Corridor Management Plan Final Survey Letter and Questions, with 132 Confidential Aggregated Responses, October 2019 - February 2020

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Appendix D. Volunteer River Assessment Program (VRAP) Reports 2017-2020

The following reports are available in PDF format accompanying this document. See also <https://www.des.nh.gov/water/rivers-and-lakes/river-and-lake-monitoring>.